심폐재활
게시일시 및 장소 : **2017 년 4 월 21 일 13:00-18:30, 3 층 로비 / 질의응답 일시 및 장소 : 2017 년 4 월 21 일 15:00-15:40, 3 층 로비**
초록순서 : **62** 형식 : **Poster**

An Analysis between Exercise of the Respiratory and Metabolic State for the Acute Stroke Patients

Howard Kim[1*], Dongyoul Lee[1], Jihong Cheon[1], Nana Lim[1], Hyunkyung Lee[1], Sunghoon Lee[1], Younkyung Cho[1†]

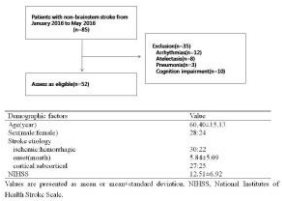
Kwangju Christian Hospital, Department of Rehabilitation Medicine[1]

Objective
 To evaluate oxygenation and metabolic state of the non-brainstem stroke patients after the moderate intensity exercise using arterial blood gas analysis(ABGA).

Methods
Fifty-two stroke patients admitted for rehabilitation exercise were recruited. All the subjects were able to follow the instructions for the exercise, not suffered cardiopulmonary diseases before, and not diagnosed with brainstem disorders(Fig.1.). They were ordered to maintain 70% heart rate of maximal heart rate during exercise(Fig.2.) and checked blood pressure, pulse rate, respiratory rate and ABGA just before and after the exercise, respectively. O2 saturation, PaO2, PaCO2, O2 content, HCO3-, pH, and anion gap were compared between the exercise, and those data changes were performed correlation analysis into age and the time after stroke onset. The data comparison was also done into the subgroup of the severity of the stroke using National Institutes of Health Stroke Scale(NIHSS).

Results
The statistically significant results were observed in the change of O2 saturation, PaO2, PaCO2, O2 content, HCO3-, pH, and anion gap after the exercise. The decrease of HCO3- and increase of respiratory rate were proportional to age(Fig.3.), however the data showed no correlation with the NIHSS.

Conclusion
These results suggest that it is relatively preserved respiratory compensation mechanism and homeostatic effect to maintain metabolic balance among the non-brainstem stroke patients.



Demographic factors	Value
Age(year)	60.40±15.13
Sex(male/female)	28/24
Stroke etiology	
ischemic/hemorrhagic	30/22
onset(month)	5.84±5.69
cortical/subcortical	27/25
NIHSS	12.51±6.92

Values are presented as mean or mean±standard deviation. NIHSS, National Institutes of Health Stroke Scale.

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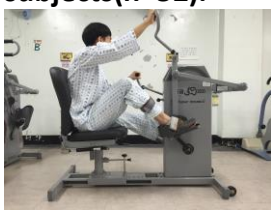
(Up) The algorithm for subject enrollment, (Down) demographics and clinical characteristics of subjects(n=52).



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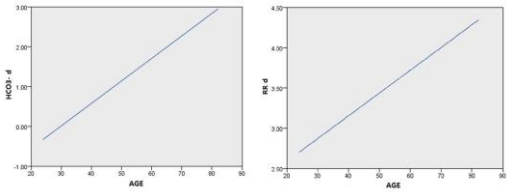
Exercise of moderate exercise intensity by stationary cycling with resistance (ShinGwang 3000 SGMED, Seoul, Korea).



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(Left) The decrease of HCO3-(mEq/L) and (Right) the increase of respiratory rate(breaths per minute) were proportional to age. HCO3- d, HCO3- difference RR d, respiratory rate difference.

뇌신경재활

게시일시 및 장소 : **2017 년 4 월 21 일 13:00-18:30, 3 층 로비 / 질의응답 일시 및 장소 : 2017 년 4 월 21 일 18:00-18:30, 3 층 로비**

초록순서 : **C2** 형식 : **Poster**

Respiratory function in pontine stroke: Case series

JaYoung Kim[1*], Dae Yul Kim[1†]

Asan Medical Center, Department of Rehabilitation Medicine[1]

Objective
The regulatory centers for respiration are located in the pons and medulla. The pontine respiratory group nucleus controls the duration of the respiratory cycle and the post-inspiratory phase. There have been several case reports of respiratory dysfunction in medullary stroke patients. But the respiratory function in pontine stroke patients was not reported yet. We present seven patients with pontine stroke, whose respiratory function is evaluated with overnight capnometry and morning ABGA.

Case presentation
Method
We evaluated seven pontine stroke patients who admitted to the Department of rehabilitation, Asan medical center, from May 2015 to January 2017. Pontine infarction or hemorrhage was confirmed by neuroimaging studies and volume of the lesion was calculated by the ABC/2 method. They could ventilate in room air without oxygen supply and didn't have other pulmonary disease such as COPD or asthma. We tested overnight percutaneous CO2 level with capnometry one or two times, and checked morning ABGA result.

Results
We checked baseline characteristics of seven patients (Table1). Age of the patients was 71±12.7(mean±SD) years, and there were three male and four female. Three were pontine infarction and four were pontine hemorrhage. Volume of the lesions were from 0.52cc to 10.35cc. But at the time of evaluation, all pontine hemorrhage were proved to be resolved at follow up brain CT of the patients. Modified Rankin scale of the patients were range from 3 to 5. Two patients had T-can, two patients had T-can before but removed, and three had no tracheostomy history. Mean percutaneous CO2 level of overnight capnometry was 37.71±3 ㎜ Hg and morning ABGA results were within normal limit (Table2).

Conclusion
We tried to evaluate the respiratory function of the pontine stroke patients, with the measurement of overnight hypercapnia. In this case series, no overnight hypercapnia was detected in overnight capnometry or morning ABGA. Though some patients were tracheostomy state, they didn't need additional oxygen supply. From these cases, we can suggest that pontine lesion does not have significant effect on respiratory function.

Table 1. Demographic, clinical findings of the patients

Case	age/ gender	Lesion	Volume (cc)	Clinical features	MRS	MBI	GCS	MMSE
1	72/M	Rt. pons hemorrhage	0.63*	Lt. hemiparesis	4	4	15	23
2	84/M	Rt. paramedian pons infarction	1.79	Lt. hemiparesis	3	36	15	29
3	82/F	Lt. pons infarction	0.52	Rt. hemiparesis	5	0	15	10
4	52/F	Pontine hemorrhage	10.35*	Ataxia	4	17	15	25
5	70/M	Bilateral paramedian pons infarction	9.24	Quadriparesis	5	2	13	24
6	83/F	Pontine hemorrhage	5.67*	Quadriparesis	4	24	15	20
7	58/F	Pontine hemorrhage	3.75*	Ataxia	5	0	15	21

GCS: Glasgow Coma Scale, MRS: Modified Rankin Scale, MBI: Modified Barthel Index, MMSE: mini mental state examination
* initial hemorrhage volume (resolved state at the time of evaluation)

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Table 1. Demographic, clinical findings of the patients

Table 2. Capnometry and ABGA of pontine stroke patients

Case	Time from onset*	T-can	mean PCO_2 (mmHg)	max PCO_2 (mmHg)	ABGA (pH)	ABGA (pCO_2)
1	22d	none	38.1	38.1	7.45	35.5
2	20d	none	40.5	47.1	—	—
3	15d	none	40.8	45.8	7.45	37.7
4	2m	previous	35.0	44.7	7.47	37.1
5	17d	in situ	38.3	42.7	7.49	36.0
6	17m	in situ	33.3	49.8	7.40	40.3
7	44d	previous	38.0	42.1	7.40	39.4

PCO_2: percutaneous carbon dioxide, max: maximum, ABGA: arterial blood gas analysis
pH: potential of hydrogen (7.35-7.45), pCO_2: partial pressure for carbon dioxide (35-45mmHg)
* d: days, m: months

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Table 2. Capnometry and ABGA of pontine stroke patients

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초록순서 : **8**　　형식 : **Poster**

Periventricular white matter lesions associated with swallowing in older patients with mild stroke

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Bundang Jesaeng General Hospital, Department of Rehabilitation Medicine[1]

Purpose : Older patients with stroke have poor functional prognosis compared to younger patients. Patients with stroke who have severe white matter (WM) lesions have been reported to have poor functional prognosis such as cognitive dysfunction, increased propensity for falling, and gait and balance problems. The aim of this study was to determine whether WM lesions exert negative effects on swallowing function in older patients with mild stroke.
Materials and Methods : We conducted a retrospective analysis of 63 patients aged >65 years who had a National Institutes of Health Stroke Scale score ≤5 and who underwent videofluoroscopic swallowing examination after their first stroke. The severity of WM lesions was determined using fluid-attenuated inversion recovery (FLAIR) magnetic resonance images. Severity was rated based on Fazekas scale, which categorizes WM lesions.
Results : Significant differences were observed in the oral transit time and swallowing response time between the mild WM lesion group and the severe WM lesion group. Specifically, the mean oral transit time and swallowing response time were longer in the severe WM lesion group than in the mild WM lesion group. However, no significant difference in pharyngeal transit time was observed between the two groups (Fig. 1) Linear regression analysis showed that oral transit time tended to increase as Fazekas grade increased (p=0.003). In addition, inadequate mastication was related to the presence of lesions in the left hemisphere (p=0.039). The presence of penetration could also be predicted by Fazekas grade (p=0.015). (Table. 1)
Conclusion : Our findings suggest that WM lesions observed in brain magnetic resonance imaging scans can impact swallowing problems in older patients with mild stroke, regardless of initial stroke severity or other factors associated with lesion location. Accordingly, our data indicate that WM lesions are a predictive factor by which patients can be stratified into favorable or unfavorable outcomes with respect to dysphagia.

VFSS parameter	OR	95% CI	p-value
Oral transit time			
Fazekas grade	3.082	0.037-0.176	0.003
Mastication			
Lesion side, left	2.109	0.012-0.450	0.039
Penetration			
Fazekas grade	2.521	0.018-0.155	0.015

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Table 1. Factors affecting VFSS findings: Prediction models using linear logistic regression analysis

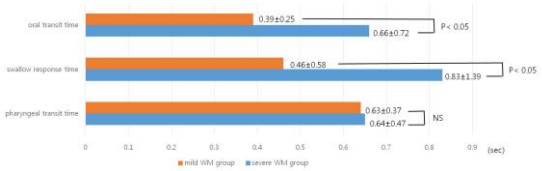

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Fig. 1. Time measurements of VFSS parameters according to Fazekas grade. Significant differences were observed in the oral transit time and swallowing response time between the mild WM lesion group and the severe WM lesion group.

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초록순서 : **9** 형식 : **Poster**

Lesion location associated with gait velocity change after rehabilitation in stroke patients

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Bundang Jesaeng General Hospital, Department of Rehabilitation Medicine[1]

Purpose: Impaired gait function after stroke contributes strongly to overall patient disability. However, the response to rehabilitation varies between individuals. The aim of this study was to identify predictors of gait velocity change and to elucidate lesion location associated with change of balance and gait function.
Materials and Methods: We reviewed 102 stroke patients. The patients were divided into two groups according to gait ability post-rehabilitation, and we analyzed differences in their characteristics, such as demographic information, lesion factors and initial balance function. Linear regression analyses were performed to examine the predictors of rehabilitation response. Lesion location and volume were measured on brain magnetic resonance images. We generated statistical maps of the lesions related to functional gains in gait and balance using voxel-based lesion symptom mapping (VLSM).
Results: The group of patients who regained independent ambulation function showed a smaller lesion size, a shorter duration from stroke onset and higher initial balance function. In the regression model, gait velocity changes were predicted with the initial Berg Balance Scale (BBS) and duration post-onset. Absolute BBS changes were also correlated with the duration post onset, while relative BBS changes were predicted by the lesion volume. (Table. 1) Figure 1 shows the lesion overlap map overlaid on a standard MNI space brain. This map displays bilateral coverage of most of the hemispheres. Using VLSM, lesion locations associated with gait velocity changes adjusting other factors were the insula, internal capsule and adjacent white matter. (Fig. 2)
Conclusion: Both clinical baseline assessment and lesion volume and location analyzed using structural brain MRI were useful to predict functional gains after rehabilitation therapy, particularly changes in gait and balance function. Initial balance function and lesion volume as well as the interval between stroke onset and the initiation of therapy might influence balance recovery and gait velocity changes. Damage to the insula and internal capsule also affected gait velocity change after rehabilitation.

Dependent Variable	Predictors	Overall r^2	r	p-value
Absolute gain in 10-m walk velocity (m/s)	Baseline BBS	0.160	0.399	0.021
	Post onset duration		-0.262	0.022
Absolute gain in BBS	Post onset duration	0.072	-2.69	0.015
Relative gain in BBS	Lesion volume	0.078	-0.231	0.039

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Table. 1. Predictors of therapy response

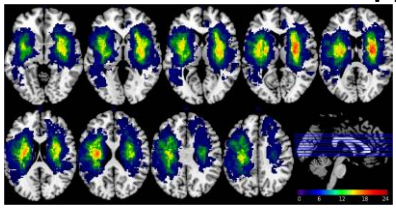

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Figure 1. Lesion overlay map of 102 patients. A lesion overlay map of 102 patients showing bilateral coverage of most of the hemispheres. Numbers are the z-coordinates of the MNI space, with the patient's left hemisphere on the left side of the figure.

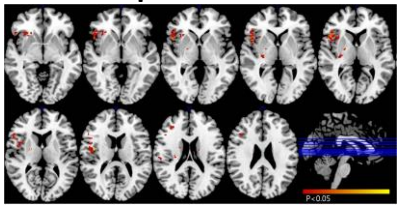

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Figure 2. Lesion patterns associated with gait velocity change. Voxel-based lesion symptom mapping analysis revealed the relationship between gait velocity change and brain lesions. Only voxels significant at

$p < 0.05$ FWE corrected, controlling for age, time since stroke onset, lesion volume, and baseline BBS as nuisance covariates, are color-coded, ranging from red to yellow. Numbers are the z-coordinates of the MNI space, with the patient's left hemisphere on the left side of the figure.

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초록순서 : **49** 형식 : **Poster**

Contralateral involvement of congenital muscular torticollis and clavicular fracture

Shin-Young Yim, MD, PhD[1†], Kihong Chang, MD, PhD[2], Ah-Reum Ahn, MD, MS[1], Eun Ji Park, MD[1*], Jongwoo Kim, MD[1]

Ajou University School of Medicine, Department of Physical Medicine and Rehabilitation [1], Ajou University School of Medicine, Department of Medical Science [2]

Objective: Congenital muscular torticollis (CMT) is known to concur with some conditions such as unilateral
developmental dysplasia of the hip or brachial plexus injury, which gives us some insights for pathogenesis
of CMT. While clavicular fracture is the most common fracture in newborns, little is known about coexistence of CMT and clavicular fracture.
Our clinical experience led us to realize that coexistence of CMT and clavicular fracture tended to occur on
the contralateral side for each other rather than the ipsilateral side. This study aimed to verify contralateral involvement of CMT and clavicular fracture.

Methods: This was a retrospective cohort study conducted at a single tertiary medical center. From January
2010 to December 2012, subjects who visited the Center for Torticollis for an abnormal posture of head and neck were assessed for inclusion. The medical charts along with radiologic findings were reviewed. Subjects
who met 2 of following criteria were included into the study: (1) diagnosis of CMT; and (2) availability of
antero-posterior plain X-ray of cervical spines and/or clavicles at the time of diagnosis of CMT.

Results: This retrospective cohort study included 996 subjects with CMT. Concurrent clavicular fracture was
found in 20 of 996 subjects with CMT, with the coexistence rate being 2.01%. CMT. Clavicular fracture
occurred on the contralateral side for each other in 18 subjects (90%) rather than the ipsilateral side.
This discordance between side of CMT and clavicular fracture was significant (P=0.001), with an odds ratio of 81 (95% confidence interval 4.36-1504.54, P=0.0032).

Conclusions: In conclusion, CMT and clavicular fracture seem to occur significantly more on the contralateral side for each other. Underlying mechanism for this discordance needs to be verified.

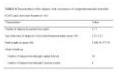

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TABLE 1 Characteristics of the subjects with coexistence of congenital muscular torticollis (CMT) and clavicular fracture (n=20)

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TABLE 2 Contingency table between the location of congenital muscular torticollisand the location of clavicular fracture

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초록순서 : **10** 형식 : **Poster**

The contributions of balance to gait capacity and motor function in chronic stroke

Seong Hoon Lim[1*†], Kyoung Bo Lee[1], Joon Sung Kim[1], Bo Young Hong[1], Bomi Sul[1], Won Jin Sung[1]

St. Vincent's Hospital, College of Medicine, The Catholic University of Korea, Seoul, Republic of Korea, Department of Rehabilitation Medicine[1]

Objective: The aim of this study was to identify the contributions of balance to gait and motor function in chronic stroke.
Subjects and Methods: Twenty-three outpatients participated in a cross-sectional assessment. Gait ability was assessed using the functional ambulation category, self-paced 10-m walking speed, and fastest 10-m walking speed. Standing balance and trunk control measures included the Berg Balance Scale and the Trunk Impairment Scale. Univariate and multivariate regression analyses were performed.
Results: Balance was the best predictor of the FAC, self-paced walking speed, and fastest walking speed, accounting for 57% to 61% of the variances. Additionally, the total score of TIS was the only predictor of the motor function of the lower limbs and the dynamic balance of TIS was a predictor of the motor function of the upper limbs, accounting for 41% and 29% of the variance, respectively.
Conclusion: This study demonstrated the relative contribution of standing balance and trunk balance to gait ability and motor function. They show that balance has a high power of explanation of gait ability and that trunk balance is a determinant of motor function rather than gait ability.

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초록순서 : **12** 형식 : **Poster**

White Matter Tract Damage in Brain Disorder patients with Spasticity

You-Na Yang[1*], Bo-Ram Kim[1], Won-Jin Moon[1], Jongmin Lee[1†]

Konkuk University Medical Center, Department of Rehabilitation Medicine[1]

Introduction: Spasticity is characterized by a velocity-dependent increase in muscle tone with exaggerated tendon jerks, resulting from hyper-excitability of the stretch reflex. It affects neuromotor function after a lesion in the corticospinal and accompanying parapyramidal (corticoreticulospinal) pathways. The study about the dysfunction of other white matter networks has been suggested; however quantitative relationship between spasticity and diffusion properties of white matter tracts has scantly been studied. In this study, we investigated the association between spasticity and motor related pathway, such as cortcospinal tract by using the diffusion tensor image (DTI) parameters. Moreover, we also evaluated the association between spasticity with other white matter tract, such as spinothalamic tract which related with sensory, superior fronto-occipital fasciculus which is an association fiber that is recently studied as the pathophysiology of spasticity.
Methods: Sixteen patients (12 males, 4 females, and mean age 50.06±15.0) who had spasticity and undergone diffusion tensor image (DTI) when they admitted to the inpatient rehabilitation setting, from 2014 to the present, were enrolled the study. The control group (12 males, 4 females, and mean age 51.44±18.22) was selected by the propensity score matching analysis using covariance of age, sex, period from onset. Spasticity was measured using Modified Ashworth Scale (MAS) at the time of admission. The CST, STT and SFOF were isolated using diffusion tensor tractography (DTT), and tract volume (TV) was calculated (Fig. 1). The total volume of each white matter tract separated by ipsilesional/more affected and contralesional/less affected side was analyzed with the t-test analysis.
Result: There were no significant differences in age, sex, period from onset, and FMA score, except contralateral upper extremity score, between the two groups. The mean values of contralateral upper extremity FMA score was 44 ± 25.91 at spasticity group and 60.81 ± 15.39 at control group (p=0.035). Total volume of ipsilesional/more affected CST, contralesional/less affected CST and ipsilesional/more affected STT were significantly different between two groups (1272.25±1638.34 in spasticity group and 3114.81±2877.61 in control group, 4180.63±2035.76 in spasticity group and 6385.56±2335.84 in control group, 464.13±268.14 in spasticity group and 1289.06±1222.89 in control group) (p=0.034, p=0.008 and p=0.018). However, contralesional/less affected STT and bilateral SFOF, have no significant difference between the two groups.
Conclusion: This study suggests that the damage of ipsilesional CST is associated with spasticity in brain disorder patient as we expected. Moreover, the damage of contralesional CST and ipsilesional STT is also associated with spasticity. DTI may be useful for predicting the white matter involvement of spasticity pathway using values of ROIs of each tract.

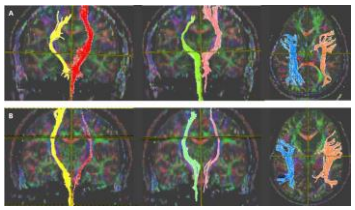

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Fig. 1 A. Bilateral CST, STT and SFOF in a patient without spasticity who has right basal ganglia ICH

Tract	Spasticity (+)	Spasticity (-)	P-value
IP. CST	1272.25±1638.34	3114.81±2877.61	0.034*
CONT. CST	4180.63±2035.76	6385.56±2335.84	0.008*
IP. STT	464.13±268.14	1289.06±1222.89	0.018*
CONT. STT	1034.56±672.78	1144.19±731.93	0.662
IP. SFOF	1823.94±1689.45	1661.81±1346.53	0.766
CONT. SFOF	2465.75±1938.23	2259.06±1586.69	0.883

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Fig. 2 Comparisons in tract volume of the CST, STT and the SFOF

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초록순서 : **C18** 형식 : **Poster**

A rare concurrence of congenital muscular torticollis and malignant tumor in the sternocleidomastoid

Shin-Young Yim[1†], Yul-Hyun Park[1*]

Ajou University Hospital, Department of Physical Medicine and Rehabilitation[1]

While congenital muscular torticollis (CMT) is known to concur with some conditions such as clavicular fracture, brachial plexus injury or unilateral developmental dysplasia of the hip, these concurrent conditions exist outside the sternocleidomastoid muscle (SCM). We experienced a rare case with concurrence of CMT and a malignant tumor inside the same SCM. The malignant tumor turned out to be low-grade fibromyxoid sarcoma which required excision due to the potential for recurrence and metastasis. To the best of our knowledge, the current case is not only the first case of a concurrent condition of CMT inside the same SCM, but also the first report of low-grade fibromyxoid sarcoma in the SCM concurrent with CMT. This case suggests that concurrent conditions of CMT could exist either inside or outside the SCM with CMT. Therefore, a thorough evaluation inside and outside the SCM is required for subjects with CMT, with appropriate imaging modalities.

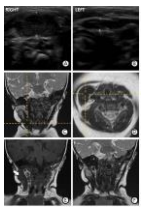

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Fig. 1. Radiologic findings of the sternocleidomastoid muscle (SCM) with of congenital muscular torticollis (CMT). (A-B) Ultrasonogram shows diffuse thickening and heterogenous hyperechogenicity in the right SCM when compared with the left SCM, with 1.03 cm and 0.46 cm of the thickness for the right and left SCM, respectively. (C) Neck magnetic resonance imaging (MRI) of the neck shows diffuse thickening of the right SCM with low signal intensity within the right SCM on coronal T2-weighted image. (D) Axial T1-weighted image also shows asymmetric diffuse thickening of the right SCM with low signal intensity at the same level of the coronal view, suggestive of CMT. (E) The coronal T1-weighted image shows a mass with diameter of 1.5 cm with low signal intensity in the superior portion of the right SCM (white arrow). (F) Coronal T2-weighted MRI shows high signal intensity at the same mass.

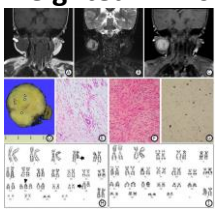

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Fig. 2. Radiologic and histopathologic findings of low-grade fibromyxoid sarcoma (LGFMS). (A-C) The mass on the follow-up MRI showed iso-to-low signal intensity on T1-weighted image and high signal intensity on the coronal T2-weighted image and the gadolinium-enhanced T1-weighted image along with increased size of the mass. (D) The cross section of the mass shows circumscribed light yellow to gray solid mass with focal myxoid change (white arrow heads). (E-F) The histopathologic findings of the mass showed myxoid and fibrous areas which were mainly composed of spindle cells (H&E, ×200). (G) In areas of hypercellularity, it shows positive immunohistochemical staining for Ki-67 which is one of markers of proliferating cells (anti-Ki-67, ×200). (H-I) G-banding karyotyping of primary-cultured cells shows somatic mosaicism with the 3 cells with 47,XX,t(4;18)(q27;q23), +14 and 27 cells with 46,XX among 30 cells.

척수재활

게시일시 및 장소 : **2017 년 4 월 21 일 13:00-18:30, 3 층 로비 / 질의응답 일시 및 장소 : 2017 년 4 월 21 일 18:00-18:30, 3 층 로비**

초록순서 : **C39** 형식 : **Poster**

Spinal cord injury due to congenital vertebral deformity with chromosomal anomaly: a case report

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Asan Medical Center, Department of Rehabilitation Medicine[1]

Objective
Congenital kyphosis is a rare spinal deformity that usually is progressive without intervention. Progression of the deformity has the potential for spinal cord compression, which leads to lower limb weakness, gait disturbance, difficulty controlling urination. The aim of this study is to report a patient with severe kyphosis due to congenital vertebral deformity and chromosomal anomaly, which caused a spinal cord injury.

Case presentation
A 25-year-old woman visited Asan medical center with a chief complaint of gait disturbance on November, 2016. She walked from the age of 24 months with heel rise and waddling pattern until recently. She showed delayed development but visited doctor late about it and diagnosed as intellectual disability when 5 years old. Lately, she had bowel and bladder incontinence from two years ago.
Physical exam at admission revealed weakness on both lower extremities, decreased anal tone, limitation of motion in bilateral ankle, and sensory impairment on both lower extremities including anal sense. Deep tendon reflex on both knees, ankles were hyperactive, bilateral Babinski sign and ankle clonus were positive. Simple x-ray of the thoracolumbar spine showed severe kyphosis (Cobb's angle 51') at L1-L2 with L1 vertebral deformity. The lumbar spine MRI suggested underlying deformity of L1 vertebral body and central canal stenosis at L1-L2 level with suspicious spinal cord signal change.
She was diagnosed as paraplegia secondary to SCI L1 ASIA D due to congenital kyphosis, L1-2 and underwent posterior decompression and fusion T11-12-L1-2-3 operation on December, 2016. After the surgery, her kyphotic angle improved to be 31’. Then she was transferred to the Department of Rehabilitation medicine for comprehensive rehabilitation treatment including gait training. She could walk about 120m with minimal assist, wearing bilateral ankle foot orthosis and using roller walker when she discharge.
We recognized her dysmorphic facial feature and performed gene study. Derivation of 13 chromosome was detected by the study. Dysmorphism with growth retardation, psychomotor retardation, congenital heart defects and vertebral or costal abnormalities are known features of chromosome 13 variations. We can suggest that her symptoms including vertebral deformity probably have correlation with chromosomal anomaly.

Conclusion
This case suggests that severe congenital kyphosis progressively compressed the spinal cord and caused spinal cord injury. Physicians treating patients with congenital kyphosis should be conscious about the possibility of spinal cord injury and check the patient’s symptoms and radiologic finding serially. And to prevent this serious complication, decide early surgical intervention for whom at risk. Furthermore, when vertebral deformity and other dysmorphism is found in a patient, physician should take a detailed history taking and do further evaluation to find hidden chromosomal anomaly.

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Figure1. Preoperative sagittal radiograph of the thoracolumbar spine

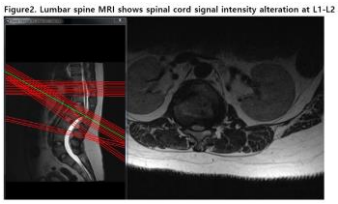

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Figure2. Lumbar spine MRI shows spinal cord signal intensity alteration at L1-L2

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Figure3. Sagittal radiograph of the thoracolumbar spine after posterior decompression and fusion T11-12-L1-2-3

게시일시 및 장소 : **2017 년 4 월 21 일 13:00-18:30, 3 층 로비 / 질의응답 일시 및 장소 : 2017 년 4 월 21 일 15:00-15:40, 3 층 로비**
초록순서 : **84** 형식 : **Poster**

Drug Response Variability of NSAIDs according to the Genetic Polymorphism of COX -2

Sook Joung Lee[1*], Sang Beom Kim[1], Kyeong Woo Lee[1], Min Kyu Park[2], Min Ho Chun[3†]

Dong-A University Hospital, Department of Rehabilitation Medicine[1], Dong-A University Hospital, Department of Clinical Pharmacology[2], Asan Medical Center, Department of Rehabilitation Medicine[3]

Objectives
Cyclooxygenase (COX) is the main pharmacodynamic target of non-steroidal anti-inflammatory drugs (NSAIDs). NSAIDs are the most widely prescribed pharmaceutical agents in the world, and Prostaglandin E2 (PGE2) synthesis is modulated by cyclooxygenase-2 (COX-2). Thus, changes in PGE2 could be used to quantify the COX-2 inhibition after NAIDs administration. Comparisons of COX-2 expression associated with genetic polymorphisms have not been previously conducted using objective pharmacodynamics parameters.
We investigated the inhibitory effects of COX-2 after NSAID administration using an LPS derived COX-2 induction model in whole blood, according to the genotypes of COX-2 single nucleotide polymorphisms (SNPs). Before the clinical trial, the genotypes of seven selected COX-2 SNPs were analyzed from a larger population.

Methods
Seven genotypes of COX-2 SNPs were selected from public databases and analyzed in 324 healthy subjects. The two genotypes showing a high percentage of variability were selected for a clinical trial.
A clinical trial examining pharmacodynamics according to the genotype of two SNPs (rs5275 and rs689466) was conducted. This clinical trial was an open-label, single oral dose, one-treatment study conducted with Korean male subjects at the Clinical Trials Center of the Dong-A University Hospital. Twenty subjects carrying either rs5275(T->C) or rs689466(A->G) were enrolled. The subjects were administered a single oral dose of 200mg of celecoxib, and pharmacokinetics and pharmacodynamics analysis were performed following 24 hours according to a schedule.
The maximum observed plasma concentration (Cmax) and area under the concentration-time curve (AUC) were measured from the pharmacokinetic analysis, and area under the effect curve (AUEC) was evaluated from the pharmacodynamic analysis.

Results
The pharmacodynamic analysis revealed that the maximal drug effects were achieved after 2.0 hours for all genotypes (Fig. 1). In the analysis of the pharmacokinetic parameters Cmax and AUC, significant differences in drug exposure were not investigated for each SNP genotype (Table 1). And in the analysis of pharmacodynamic parameters according to the genotype of SNPs, the AUECs of the rs689466 GG genotype was significantly lower than those for the AA or AG genotype (Table 4).

Conclusion
Our results revealed that the inhibitory effects of celecoxib on COX-2 induction were different according to the genotype of COX-2 SNPs, and the results of the present study indicated that rs689466 is responsible for the variability of the response to NSAIDs, including celecoxib. The GG genotype of rs689466 is more responsive to COX-2 inhibition by NSAIDs.

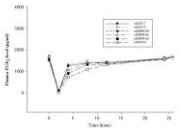

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Fig 1. Inhibition of PGE2 production levels after a single oral administration of 200mg celecoxib according to different genotype

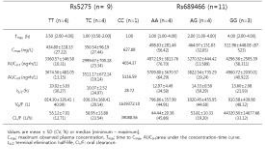

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Table 1. Pharmacokinetic comparisons of celecoxib between genotype after single oral administration of 200 mg celecoxib

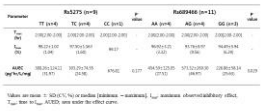

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Table 2. Pharmacodynamic comparisons of celecoxib genotypes after single oral administration of 200 mg celecoxib

통증 및 근골격재활
게시일시 및 장소 : **2017 년 4 월 21 일 13:00-18:30, 3 층 로비 / 질의응답 일시 및 장소 : 2017 년 4 월 21 일 15:00-15:40, 3 층 로비**
초록순서 : **85** 형식 : **Poster**

New method of abdominal curl-up using elastic band without sternocleidomastoid activity

Yong Jin Jo[1*], Hyojun Kim[1], Jihea Jang[2], Jung Hwan Lee[2], Hojun Lee[1], Jin-Woo Park[1], Bumsun Kwon[1], Kiyeun Nam[1†]

Dongguk University Ilsan Hospital, Department of Rehabilitation Medicine[1], Dongguk University Gyeongju Hospital, Department of Rehabilitation Medicine[2]

Objective: To investigate the effects of traditional method or neck flexion restriction versus using elastic band on sternocleidomastoid (SCM) and abdominal muscle activity during abdominal curl-up in healthy subjects.
Background: The abdominal curl-up exercise is recommended for strengthening abdominal muscles and stabilizing the lumbar area as a therapeutic exercise in a rehabilitation program.
However, the curl-up exercise may activate the superficial cervical flexors, such as the sternocleidomastoid (SCM) which induce neck pain and cause cessation of exercise. Thus, the purpose of this study was to assess the effective method of decreasing SCM activity and maintaining abdominal muscle activity during the curl-up exercise.
Methods: Ten healthy subjects participated in this study. All subjects performed a traditional curl-up exercise, a curl-up with neck flexion restriction and curl-up with neck elastic band. Surface electromyography (EMG) signals were recorded from the SCM, RA, and EO during the curl-up. One-way analysis of variance (ANOVA) test was used to determine significant differences in the SCM, RA, EO muscles among abdominal curl-up with various methods.
Results: There were significantly lower RMS value of SCM during abdominal curl-up with elastic band, compared with the EMG activity of SCM during traditional curl-up and curl-up with neck flexion restriction (RMS value of SCM in curl-up with neck elastic band vs traditional curl-up: P<0.000, RMS value of SCM in curl-up with neck elastic band vs curl-up with neck flexion restriction: P<0.021).
Conclusion: The results of this study suggest that curl-up with elastic band would be recommended during abdominal curl-up for reduced SCM activation and maintained activation of abdominal muscles in healthy subjects compared with those in abdominal curl up with traditional or neck flexion restriction curl-up.

Muscle	Traditional curl-up	Curl-up with neck flexion restriction	Curl-up with neck elastic band
SCM*	55.14 ± 21.31	34.13 ± 16.36	13.47 ± 5.76
RA	73.84 ± 31.06	58.89 ± 23.93	60.29 ± 24.62
EO	67.89 ± 21.24	50.88 ± 22.93	55.45 ± 21.68

*p<0.05

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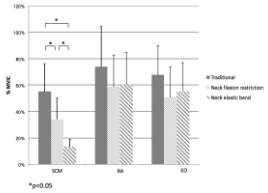
RMS value of normalized EMG muscle activity (% MVIC) of the SCM, RA, EO during the traditional curl-up, curl-up with neck flexion restriction, and curl-up with neck elastic band.



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Post hoc analysis of RMS value of normalized EMG muscle activity (% MVIC) of the SCM, RA, EO during the traditional curl-up, curl-up with neck flexion restriction, and curl-up with neck elastic band.

Effect of intravesical botulinum toxin injection on autonomic dysreflexia in a chronic SCI patient

Il-Young Jung[1*], Kyo Ik Mo[2], Ja-Ho Leigh[1†]

Chungnam National University Hospital, Department of Rehabilitation Medicine[1], Korea Workers' Compensation and Welfare Service Incheon Hospital, Department of Urology[2], Catholic University of Korea Incheon St. Mary's Hospital, Department of Rehabilitation Medicine[3]

There are few treatment options for managing autonomic dysreflexia in patients with chronic spinal cord injury (SCI). According to some studies, intravesical botulinum toxin for SCI patients with autonomic dysreflexia has a preventive effect on symptoms of autonomic dysreflexia. However, the usefulness of an intravesical botulinum toxin injection has never been reported for autonomic dysreflexia in a patient with chronic cervical SCI except for one pediatric case.
 A 62-year-old man with chronic cervical SCI had neurogenic bladder due to C6-7 SCI since sustaining a fall in 1980. He presented with an intermittent headache and severe hypertension because of persistent autonomic dysreflexia. His symptoms did not improve with conservative management, and he could not undergo an operation to resect the lung cancer because of his uncontrolled blood pressure. To control his fluctuating blood pressure, he was taken to an operating room to receive an intravesical botulinum toxin injection for refractory bladder spasms. Subsequently, his blood pressure was controlled, and then the lung mass could be surgically removed. His improved condition lasted for more than 6 months.
 This case suggests that botulinum toxin is a logical treatment option for autonomic dysreflexia as well as neurogenic detrusor overactivity in patients with chronic SCI. Dedicated research is warranted to assess the efficacy of an intravesical botulinum toxin injection, as it was used successfully to stop the symptoms of autonomic dysreflexia in our patient.

뇌신경재활

게시일시 및 장소 : **2017 년 4 월 21 일 13:00-18:30, 3 층 로비 / 질의응답 일시 및 장소 : 2017 년 4 월 21 일 15:00-15:40, 3 층 로비**

초록순서 : **11** 형식 : **Poster**

Changes in Muscle Mass of Subacute Stroke Patients after Rehabilitation Treatment : a Pilot study

Mi-Hyang Han[1*], Hee Ju Yang[1], Min-Wook Kim[1†]

Incheon St. Mary's Hospital, College of Medicine, The Catholic University of Korea, Incheon, Korea, Department of Rehabilitation[1]

Objective : Changes in muscle tissue and body composition are frequently observed in subacute stroke patients, but there was few studies related to the clinical improvement after stroke. The aim of this study is to evaluate muscle mass change in subacute stroke patients after 2 weeks of physical and occupational therapy (PT and OT) and to find a correlation between motor recovery and objective changes in muscle mass.
Method : 24 subacute stroke patients underwent standard PT and OT (Table 1). Modified Bathel Index (MBI), Functional Independent Measure (FIM) Berg Balance Scale (BBS), Motricity Index (MI) of upper and lower extremities, and Fugl-Meyer Assessment (FMA) of upper extremity were measured before and after treatment. At the same time, the value of muscle mass in whole body and segmental limb muscle mass were measured by bioelectrical impedance analysis with Inbody S100® (Biospace, Seoul, South Korea).
Results : 2 week OT and PT made a significant improvement in the MBI, FIM, BBS, MI of paretic side, and FMA of paretic upper extremity. In addition, the values of free fat mass, soft lean mass and skeletal muscle mass in the whole body, and lean muscle mass ratio of upper extremity (paretic /intact side) were increased, but it was not statistically significant (Table 2). In correlation analysis between changes in MBI, FIM, BBS, MI of paretic side, and FMA of paretic upper extremity with the changes of muscle mass after treatment, there was a positive correlation between changes in FMA of paretic upper extremity and changes in soft lean mass, free fat mass and skeletal muscle mass of whole body (Table 3).
Conclusion: There was no statistically significant increase in muscle mass in subacute stroke patients after 2 weeks of rehabilitation. However, there was meaningful positive correlation between the upper extremity motor recovery and changes in soft lean mass, free fat mass and skeletal muscle mass of whole body. Further analysis may help to clarify the relationship between changes in body composition and motor recovery of stroke patients.

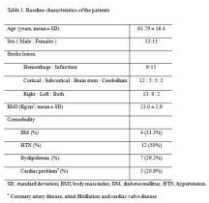

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Table 3. Correlation efficiency between FMA of paretic side and bioelectrical impedance value.

	FFM	SLM	SMM
FMA (paretic*)	0.442*	0.432*	0.452*

Fugl-Meyer Assessment, FMA; FFM, Free Fat Mass; SLM, Soft Lean Mass; SMM, Skeletal Muscle Mass

*paretic; paretic side in hemiplegia and more paretic side in double hemiplegia

*Sperman's rank correlation coefficients, P<0.05

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통증 및 근골격재활
게시일시 및 장소 : **2017 년 4 월 21 일 13:00-18:30, 3 층 로비 / 질의응답 일시 및 장소 : 2017 년 4 월 21 일 15:00-15:40, 3 층 로비**
초록순서 : **86** 형식 : **Poster**

The Hook of Hamate Fracture in People with Playing Racquet Sports

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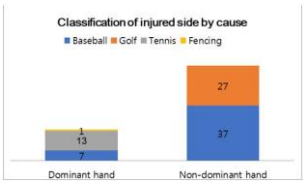
Dongguk University Ilsan Hospital, Departments of Physical Medicine & Rehabilitation[1], Dongguk University Gyeongju hospital, Departments of Physical Medicine & Rehabilitation[2]

ABSTRACT
Introduction The hook of hamate fracture is often missed in diagnosis because of relatively rare incidence, ambiguity of symptoms. We report the delayed diagnosed case and literature review of racquet sports related the hook of hamate fracture.
Materials & methods We performed a search of all published clinical studies to date. The papers of the hook of hamate fracture related to racquet sports are included. We searched MEDLINE, EMBASE, SCOPUS, Web Of Science, the Cochrane Central Register of Controlled Trials (CENTRAL), ClinicalTrials.gov, International Clinical Trials Registry Platform (ICTRP), EU Clinical Trials Register. We didn't put a limit on the language or year of publication when searching. An independent t-test was used to determine whether the development of imaging equipment was effective in early diagnosis by comparing the groups of before and after CT was widely used. Spearman rank correlation was used to identify the correlation between time from injury to diagnosis or surgery and recovery period after surgery.
Results We identified 21 case reports with 120 patients (men 115(96%), women 5(4%)) satisfied with our criteria. The mean age was 33.04 ± 13.64 years, 52 patients (43%) were injured due to golf, non-dominant hand injuries were 65 patients (76.5%). The most common subjective symptom is pain on injury site including ulno-palmar area (76 patients, 38%) and the most common physical examination findings is tenderness over the hook of hamate or ulno-palmar side (57 patients, 56%). CT and/or MRI were most frequently used to confirmed diagnosis (47 cases, 41.6%). In treatment, excisions of fragment of hook were 111(94%) cases. The average time from surgery to return to exercise or daily life was 12.66 ± 11.55 weeks. In an independent t-test, there is no significant difference in the time to diagnosis between the two groups of before and after CT was widely used. In a Spearman rank correlations, there is a statistically significant correlation between time from injury to diagnosis or surgery and recovery period after surgery (correlation coefficient = 0.299, p=0.004)
Conclusions Carefully hearing the patient's history and symptoms, strong clinical suspicion of disease are important for optimal decision making and patient management in the hook of hamate fracture. Early diagnosis can prevent delayed complications and leads to an early return to sports activity or daily life.

Fig 4. Classification of injured side of hands by causal sports. (N=85)



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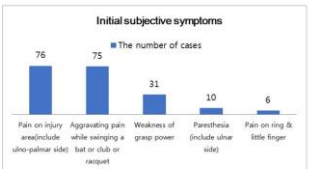
Classification of injured side of hands by causal sports

Fig 5. Initial subjective symptoms of patients with hook fractures.(Allow for multiple answers, N = 120)



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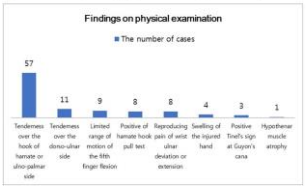
Initial subjective symptoms of patients with hook fractures.(Allow for multiple answers

Fig 6. Revealed findings through physical examination (Allow for multiple answers N=120)



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Revealed findings through physical examination

소아재활

게시일시 및 장소 : **2017 년 4 월 21 일 13:00-18:30, 3 층 로비 / 질의응답 일시 및 장소 : 2017 년 4 월 21 일 15:00-15:40, 3 층 로비**

초록순서 : **50** 형식 : **Poster**

Virtual Reality Therapy for Physical Activity in Cerebral Palsy : A Meta-Analysis

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Uijeongbu St. Mary's Hospital, The Catholic University of Korea, School of Medicine, Seoul, Korea, Department of Rehabilitation Medicine[1]

INTRODUCTION
Virtual reality(VR) provides the user-computer interface to create real-time an interactive simulation, which support an exercise environment to practice intensively and simultaneously receive positive visual and auditory feedback. Recently, diverse VR including commercial game(CG) such as Nitendo Wii, X-box and Sony playstation are an emerging therapeutic methods in rehabilitation, and meta-analysis of cerebral palsy(CP), stroke and aged were published. The aims of this study is to investigate whether VR affects the improvement of physical activity in CP, and whether these changes are dependent on VR subtypes.
METHOD
The method of reporting the meta-analysis was conducted based on PRISM guidelines. A research question was framed by the acronym PICO, which stands for Population (children and adolescents with CP), Intervention (VR therapy including Visual equipment(VE) and CG devices), Comparator (another therapeutic approach), Outcomes (Body function(BF) and activity(ACT) in ICF category). Meta-analysis was conducted using the "metafor" package of software R. Separate meta-analyses were conducted for ICF domain, in combination with VR subtype. The I2 statistic was used to examine the statistical heterogeneity. Publication bias were assessed by inspection of the funnel plots for asymmetry and with Egger's test and Begg's test.
RESULT
A flow diagram outlining the results of the search strategy is shown in Figure1. 8 of which met inclusion criteria for data extraction with total 306 of patients (145 in the VR group and 161 in the comparison group).
According to ICF category, we analyzed BF and ACT results separately. For BF, VR therapy showed a significant improvement effect compared with control group (RE; p=0.0002, SMD 0.9991 (95% CI 0.4804, 1.5177), I2=0%) with no differences according to VR subtypes (P <0.4860). And, VE showed a significant improvement (FE; p=0.0005, SMD 1.1254 (95% CI 0.4967, 1.7541), I2=0%), but CG did not show in BF(FE; P=0.1188, SMD 0.7301 (95% CI -0.1874, 1.6475), I2=0%).
VR therapy showed a significant improvement effect in ACT domain compared with the comparison group (RE; p=.0025, SMD 0.7973 (95% CI 0.2804, 1.3143), I2=36.71%) with no differences according to VR subtypes (p=0.0693). And, VE showed a significant improvement (RE; p=0.0024, SMD 1.2203 (95% CI 0.4318, 2.0088), I2=37.67%), but CG did not show in ACT(FE; P=0.0669, SMD 0.5194 (95% CI -0.0361, 1.0748), I2=0%).
DISCUSSION
VR-therapeutic intervention for CP with GMFCS 1-3 level demonstrates a significant, moderate advantage of functional improvement in BF and ACT of ICF category compared to comparison therapy. Considering analysis for VR subtypes, VE settings for therapeutic purposes could be constituted as a direction that is helpful for the treatment compared to CG. Diverse application of VR devices/programs in CP rehabilitation is a good stimulus for a CG company to develop a more suitable program for CP maintaining many advantages of CG.

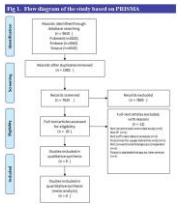

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Fig 1. Flow diagram of the study based on PRISMA

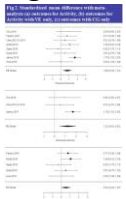

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Fig 2. Funnel plots with meta-analysis (a) outcomes for ACT (b) outcomes with VE only, (c) outcomes with CG only

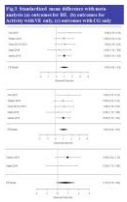

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Fig 3. Funnel plots with meta-analysis (a) outcomes for BF, (b) outcomes with VE only, (c) outcomes with CG only

뇌신경재활
게시일시 및 장소 : **2017 년 4 월 21 일 13:00-18:30, 3 층 로비 / 질의응답 일시 및 장소 : 2017 년 4 월 21 일 15:00-15:40, 3 층 로비**
초록순서 : **13** 형식 : **Poster**

Effects of transcranial direct current stimulation on the somatosenory recovery after stroke

Woo Ram Koo[1*], Chung Reen Kim[1†]

Ulsan University Hospital, Department of Rehabilitation Medicine[1]

Stroke survivors commonly experience upper limb sensorimotor impairments resulting in limitations in functional recovery. In contrast to various treatment methods for motor recovery, only a few treatments have been addressed for somatosensory recovery. Transcranial direct current simulation (tDCS) has been widely used to improve the motor recovery in stroke patients, but has not yet been studied for sensory recovery. However several studies investigated effects of tDCS on pain control by applying on somatosensory cortex, and, in addition to pain control, improvement of sensory function was also observed. Therefore, we aimed this study whether there are any positive effects of anodal tDCS on sensory recovery as well as motor and functional recovery in subacute stroke patients.

This study was a double-blinded sham controlled case-control study. Seventeen first-ever stroke patients with sensory impairments were enrolled and divided into anodal (9 patients) and sham (8 patients) stimulation groups. The anodal and sham tDCS were applied on the somatosensory cortex of the lesion side. After 2 weeks of the stimulation session, changes of the sensory and functional status were measured by Nottingham sensory assessment, Semmes-Weistein monofilament exam, modified Brunnstrom classification, functional ambulation categories, modified Barthel index and manual function test.

As the results, baseline and follow-up scores of all the sensory function tests didn't show any significant difference between groups. However when comparing changes from baseline to follow-up scores between groups, there were significant improvements in Nottingham sensory assessment and Semmes-Weistein monofilament exam of the anodal stimulation group. And, interestingly sensory improvement of non-lesion side was observed as well as the lesion side in the anodal tDCS group. But comparison of motor and functional test between groups didn’t show any significant difference.

In conclusion, the anodal tDCS on somatosensory cortex was thought to be an alternative treatment tool for sensory recovery after stroke. But, in this study, despite the might not be enough to induce the motor and functional recovery more than sham group. We think further studies would be necessary to confirm the usefulness of tDCS on sensory recovery after stroke.

척수재활
게시일시 및 장소 : **2017 년 4 월 21 일 13:00-18:30, 3 층 로비 / 질의응답 일시 및 장소 : 2017 년 4 월 21 일 18:00-18:30, 3 층 로비**
초록순서 : **C41** 형식 : **Poster**

Liver enzyme elevation caused by therapeutic dosage of midodrine in a cervical cord injury patient

Won Min Lee[1*], Kyung Hee Do[1], Hea-Eun Yang[1†], Hea-Eun Yang[1†]

Veterans Health Service Medical Center, 1Department of Physical Medicine and Rehabilitation[1]

INTRODUCTION
Midodrine is often used for the treatment of orthostatic hypotension for patient with spinal cord injury. Frequent adverse effects are scalp paresthesia, piloerection, dysuria, pruritus, supine hypertension, chills, and pain. These are generally mild and can be controlled by reducing the dosage of midodrine. Here, we report liver enzyme elevation caused by therapeutic dosage of midodrine in a tetraplegic cervical spinal cord injury patient.

CASE
A 71 year old male patient with cervical spinal cord injury was admitted to department of physical medicine and rehabilitation for comprehensive rehabilitation. He had become tetraplegic due to hyperextension cord injury 16 months prior to the admission to our center and had underwent surgical intervention(decompressive laminectomy and interbody fusion of C3-4). (Fig 1) Sensory level was C4 in both sides, but motor level was unobtainable. He was recovered from spinal shock and muchdeveloped spasicity of grade 2 in upper limbs and grade 1 in lower limbs. But severe orthortatic hypotension was sustained prohibiting him from wheelchair ambulation or physical therapy. Baseline blood pressure in supine position was 120/70 but dropped to 70/40 in upright sitting position, even though he was on the medication and conservative management. He was taking midodrine 2.5mg three times a day after meal and wearing compression stocking whole day. Orthoststic hypotension was not controlled even after we made him to use abdominal bandage and added salt to his diet. So we changed the dose and interval of midodrine; 2.5mg per every 4 hours during day time(6am, 10am, 2pm, 6pm). After that he was able to ambulate on wheelchair and tolerable to the physical therapy without orthostatic hypotension.
On the eighth day after the dose up, he had fever (body temperature 38.8 ºC) without any sign of infection. Only the liver enzyme was elevated (AST 210 U/L, ALT 371 U/L) but there was no specific finding in abdomen CT taken on the same day. His condition did not get much better under the management with intravenous hydration and hepatotonic. On the tenth day after the dose up, we stopped midodrine. From the next day, body temperature became normal and the liver enzyme gradually became lower and become normal on the 7th day. (Fig 2) Orthostatic hypotension was managed by daily intravenous hydration with normal saline 1 liter after the event.

DISCUSSION & CONCLUSION
Midodrine is a prodrug that is absorbed from the gastrointestinal tract and metabolized by the liver into an active metabolite, desglymidodrine. The starting dose of midodrine is 2.5mg at breakfast and lunch and it is increased daily by 2.5mg increment until reaching a satisfactory response, or a maximum dosage of 30mg. It should be used with caution even at therapeutic doses in some patients, as the liver has a role in the metabolism of midodrine.

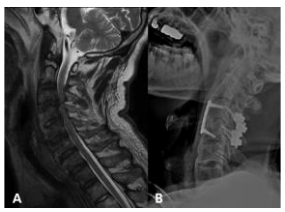

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Fig 1. Cervical spine images of the patient. A) Cervical MRI taken before the surgery showing C3-4 distraction-extension spinal cord injury, B) Cervical spine x-ray taken after the surgery; decompressive laminectomy, discectomy, screw fixation and interbodyfusion C3-4

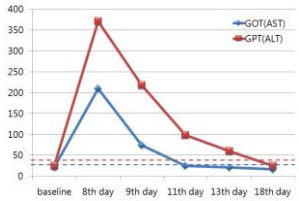

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Fig 2. Liver enzyme level by the days after the dose up. Midorine was stopped on 10th day after the dose up and liver enzyme level dropped dramatically.

통증 및 근골격재활
게시일시 및 장소 : **2017 년 4 월 21 일 13:00-18:30, 3 층 로비 / 질의응답 일시 및 장소 : 2017 년 4 월 21 일 18:00-18:30, 3 층 로비**
초록순서 : **C43** 형식 : **Poster**

Epidural adhesiolysis with hypertonic saline for the treatment of Post Lumbar Surgery Syndrome

Shin, Kyoung ho [1†], Lee, Seung min[1*]

Nanoori Hospital Suwon, Non Operative Treatment & Rehabilitation Center[1]

Purpose : Epidural adhesions are frequently caused by lumbar surgery for many kinds of spine disease, such as HNP, stenosis, spondylolisthesis, hypertrophied facet joints, vertebral metastases, etc. Sometimes post operative epidural adhesions cause severe longstanding intractable lower back pain and/or radiating leg pain, so successful rehabilitation may be delayed. In such situations, percutaneous epidural neuroplasty(or adhesiolysis or neurolysis) may be a good technique for treatment of LBP and leg pain due to epidural adhesions. We experienced 3 cases of post lumbar surgery syndrome showed good result after epidural catheterization using hypertonic saline injection. So we describe 3 cases of post lumbar surgery syndrome who werer treated with percutaneous epidural neurolysis procedure using hypertonic saline solution.

Cases Summary : All 3 cases underwent lumbar suegery (2 cases; laminectomy and microscopic discectomy, 1 case ; fusion) in the past. They have been treated with various interventional methods, such as epidural steroid injection(caudal, interlaminar, transforaminal), median branch block, facet block, trigger point injection, physical therapy modality, etc. for a long time, but their pain were continuous. We checked physical examinations, X-ray and MR. In the MR images, findings of epidural adhesion were seen in all cases at operated segements(Fig 1). So we diagnosed their pain were caused by epidural scar adhesion due to old lumbar surgery. All the procedure was performed under fluoroscopic guidance. 2 cases (Case 1 & 2) were performed epidural epidural cahteterization by interlaminar approach , the other case(case 3) was by caudal approach. Inection of hypertonic saline(10% sodium chloride) after anesthetics injection were executed 2 or 3 times according to the protocl which was suggested by Gabor Racz. All patients were checked NRS(numeric rating scales) and ODI(Oswestry dysability Index) respectively at pre-procedure, discharge.

Result : All patient's NRS & ODI were improved(Table 1). Under fluouroscopic guidance, we observed opening of filling defect at initial epidurogram after 1st or 2nd injection of hypertonic saline in all cases.

Conclusion : Percutaneous epidural adhesiolysis with hypertonic saline is very effective for the treatment of intractable pain in patients of Post Lumbar Surgery Syndrome.

	(NRS/ODI)	
	pre	discharge
Case1	(6/21)	(2/2)
Case2	(5/16)	(2/3)
Case3	(5/16)	(2/4)

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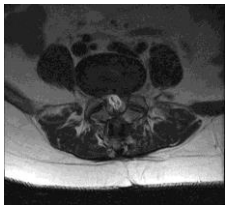
치료전과 치료 후 퇴원시 **NRS/ODI** 변화



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scar adhesion in MR

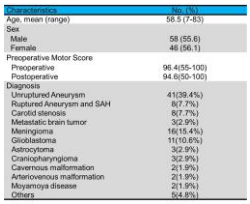
신경근육재활 및 전기진단
게시일시 및 장소 : **2017 년 4 월 21 일 13:00-18:30, 3 층 로비 / 질의응답 일시 및 장소 : 2017 년 4 월 21 일 15:00-15:40, 3 층 로비**
초록순서 : **54** 형식 : **Poster**

Monitoring of Motor and Somatosensory Evoked Potentials during Brain Surgery.

Yeo Hoon Yoon[1], Jinyoung Park[1], Young Seok Kim[1*], Yong Bae Kim[2], Dong Wook Rha[1], Yoon Ghil Park[1†]

Yonsei University, College of Medicine, Department of Rehabilitation Medicine[1], Yonsei University, College of Medicine, Department of Neurosurgery[2]

Objective: During brain surgery, intraoperative monitoring of somatosensory evoked potentials (SEPs) and motor evoked potentials (MEPs) are important for prediction of post-operative motor deterioration. The aim of this study is to identify which cut-off point of SEPs and MEPs changes are most reliable for the postoperative motor deterioration after brain surgery.
Methods: By medical chart review among the patients who underwent brain surgery between December 2015 and December 2016, 104 patients with intraoperative monitoring records of SEPs and MEPs were screened. Muscle strength was assessed by Medical Research Council scale in all patients a day before surgery, within 48 hours postoperatively, and 4 weeks later. We analyzed sensitivity and specificity of each change in intraoperative SEPs or MEPs. To find best cut off point of SEPs and MEPs, receiver operating characteristic (ROC) curve analysis was conducted.
Results: The basic characteristics of total 104 patients were shown in Table 1. Patients with non-tumor disease was 63 (60.6%) and tumor disease was 41 (39.4%). The sensitivity of pre-existing alarm criteria; latency prolongation more than 10% from baseline SEPs was 8.33% and amplitude reduction more than 50% from baseline MEPs was 16.67% (MEPs), and the specificity for predicting motor deterioration was 96.7% for SEPs and 95.7% for MEPs, respectively. By ROC curve analysis, the maximally discriminating point for intraoperative SEPs latency change and intraoperative MEPs amplitude change were 7.1% and 21.0%, respectively. With these cut-offs, the sensitivity of SEPs and MEPs was 66.7% and 91.7%, and the specificity was 79.4% and 55.4%, respectively. Significant intraoperative MEPs changes over the best cut-off value showed higher sensitivity than that of SEPs changes for post-operative motor deterioration. Sensitivity of patients with either SEPs or MEPs changes was 91.7% and specificity was 42.4%. Correlation test didn't prove significant association between SEPs and MEPs change (P=0.29).
Conclusion: For brain surgery, previously used alarm criteria of SEPs latency and MEPs amplitude changes showed low sensitivity and specificity for prediction of post-operative motor deterioration. We suggest new alarm criteria with cut of value of 7.1% prolongation of SEP latency or 21.0% reduction of MEP amplitude, and the latter had the highest sensitivity. Further accumulation of cases would provide more proper cut-off value as precise alarm criteria.



Characteristics	No. (%)
Age, mean (range)	58.5 (7-83)
Sex	
Male	58 (55.6)
Female	46 (56.1)
Preoperative Motor Score	
Preoperative	96.4(55-100)
Postoperative	94.6(50-100)
Diagnosis	
Unruptured Aneurysm	41(39.4%)
Ruptured Aneurysm and SAH	8(7.7%)
Carotid stenosis	8(7.7%)
Metastatic brain tumor	3(2.9%)
Meningioma	16(15.4%)
Glioblastoma	11(10.6%)
Astrocytoma	3(2.9%)
Craniopharyngioma	3(2.9%)
Cavernous malformation	2(1.9%)
Arteriovenous malformation	2(1.9%)
Moyamoya disease	2(1.9%)
Others	5(4.8%)

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BASELINE CHARICTERISTICS

물리의학

게시일시 및 장소 : **2017 년 4 월 21 일 13:00-18:30, 3 층 로비 / 질의응답 일시 및 장소 : 2017 년 4 월 21 일 15:00-15:40, 3 층 로비**

초록순서 : **48** 형식 : **Poster**

Focused Microwave: A Novel Technology of Thermotherapy in Musculoskeletal Disease

Joon Shik Yoon[1*†], Seong Yun Chung[1], Seok Kang[1], Jang-Yeol Kim[2], Seong-Ho Son[2]

Korea University Guro Hospital, Department of Rehabilitation Medicine[1], ETRI, Radio Technology Research Department[2]

Introduction

 Diathermy is electrically induced heat as a form of physical therapy. The diathermy is commonly used for muscle relaxation, and as a method of heating tissue for therapeutic purposes. Typically, the diathermy is produced by three techniques; ultrasound, short wave radio frequency (1-100MHz), and microwaves (915MHz or 2.45GHz). Hyperthermia induced by microwave diathermy raises the temperature of deep tissues from 41℃ to 45℃ using electromagnetic power. The hyperthermia is generally safe if the temperature is kept under 45℃. Microwave diathermy-induced hyperthermia produced short-term pain relief in established supraspinatus tendinopathy.
 Recently, microwave system capable of inducing localized hyperthermia had been developed. We have developed the algorithm of focused heat generation using microwave and investigated the simulation of localized thermal increase using the algorithm in knee pathology model.

Method

 First, the electrical phantom model of normal knee structures was developed. The tissues around the knee were sectioned according to the signals in normal magnetic resonance image (figure 1).
 Then the pathologic phantom model was developed which the pathology was located in posterior distal femur. After mapping of pathologic phantom model according to permittivity and conductivity, we performed electromagnetic analysis. In forward analysis, the signals from a transmitter in target area were analyzed at multiple receivers. In reverse analysis, the transmitter was removed and the signals from multiple transmitters, which were receivers in forward analysis, were analyzed whether they were focusing at the target area. In figure 2, the antenna design in this simulation analysis is presented.
 The power absorption density was used for analysis of thermal focusing at target area. The background temperature was hypothesized to be kept at 30℃ during the simulation. The temperature of phantom at initial stage was set at 36℃. We simulated the focused thermal increase to 43℃ at target area.

Result

 We confirmed that the temperature was increased at target area to 43℃. Simultaneously, the temperature around the target area was below 40℃. The time for thermal increase was 2 minutes, and took 5 minutes with lower electrical power (figure 3).

Conclusion

 In conclusion, we had found the possibility of application of the focused microwave thermal therapy in musculoskeletal disorders. In future, the focused microwave therapy might be one of the non-invasive treatment tool in musculoskeletal disease such as osteoarthritis or tendinitis.

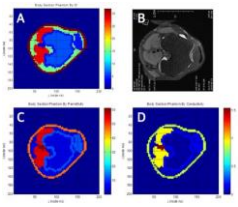

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Fig.1. Electrical phantom model of normal knee. A is the model sectioned according to normal magnetic resonance imainge (B). C and D are the model sectioned according to electrical permittivity and conductivity.

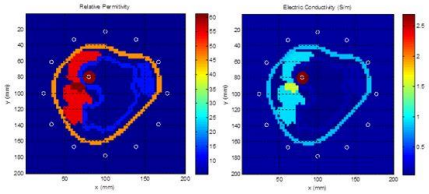

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Fig.2. The antenna design in forward analysis.

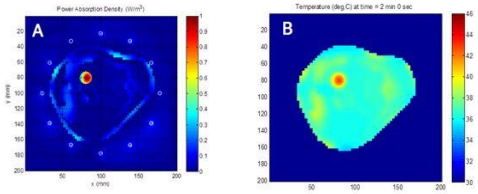

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Fig.3. The focal thermal increase in target area. A shows the increased power absorption density in target area (Red spot). B shows thermal increase to 43℃ in target area after 2 minutes

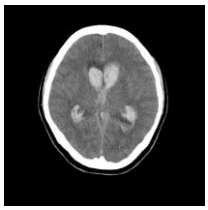
뇌신경재활
게시일시 및 장소 : **2017 년 4 월 21 일 13:00-18:30, 3 층 로비 / 질의응답 일시 및 장소 : 2017 년 4 월 21 일 18:00-18:30, 3 층 로비**
초록순서 : **C3** 형식 : **Poster**

Bilateral Thalamic Infarction Following Intraventricular Hemorrhage : A Case Report

Min Jeong Leem[1*], Hyun Im Moon[1†]

Bundang Jesaeng General Hospital, Department of Rehabilitation Medicine[1]

Introduction : As the main part of the diencephalon, the thalamus plays a crucial role in sensory perception and cognitive function such as memory, executive function and attention. Bilateral infarction of the thalamus account for no more than approximately 0.6% of all cerebral infarction. The bilateral thalamic infarct may be found in three clinical conditions such as the top of the basilar syndrome, occlusion of artery of Percheron, and deep cerebral venous thrombosis. We encountered a 45-year-old female patient with cognitive dysfunction who diagnosed as the bilateral medial thalamic infarction without additional signal abnormality in brain magnetic resonance imaging following massive intraventricular hemorrhage. In our knowledge, bilateral thalamic infarction after intraventricular hemorrhage has not been reported.
Case description : A 45-year-old right-handed female was admitted to an intensive care unit due to sudden onset of mental change. On admission, she was stuporous with no lateralizing neurological sign. A Brain computed tomogram (CT) scan showed large amount of intraventricular hemorrhage (Fig.1) After 6 weeks from onset, she was transferred to the department of rehabilitation medicine for comprehensive rehabilitation. During the rehabilitation, her caregiver complaints of her poor memory function. The patient was alert and cooperative but recalled none of the previous day's events and failed to recognize the attending physician who had been introduced to the patient several times on the previous day. In clinical interview, she didn't remember what she did yesterday or what she ate that morning at all. We reviewed her neuroimaging studies again and we found the initially ignored lesion, bilateral thalamic high signal intensity in brain MRI. In initial CT scan, there were no abnormal density in thalamic region except large amount of intraventricular hemorrhage. In follow-up CT scan 3 days post onset, the low density lesion in bilateral thalamus newly developed. It was also observed in the diffusion weighted image taken in next day. (Fig. 2) During the hospitalization, a comprehensive battery of neuropsychological tests (Table. 1) were performed, presenting the deficits of memory and learning, especially. After 2 months of comprehensive rehabilitation, her balance and functional status of performing activities of daily living was improved, but her amnesia and memory impairment showed no definite interval change compared to initial assessment.
Conclusion : We suggest the careful review of neuroimaging study or serial follow up brain MRI is needed in case of massive intravenous hemorrhage. It could be helpful to confirm the reason of cognitive impairment and start neurocognitive assessment and treatment at an optimal time.



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Initial brain CT (computed tomogram) showed large amount of diffuse acute IVH (intraventricular hemorrhage), both lateral, 3rd and 4th ventricles.

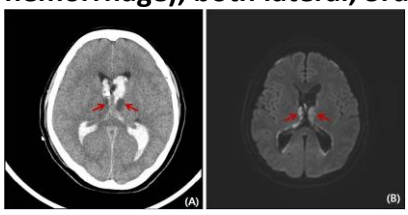

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Fig. 2. (A) In follow-up CT scan 3 days post onset, the low density lesion in bilateral thalamus newly developed. (arrows) (B) It was also observed in the diffusion weighted image taken in next day.

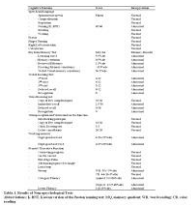

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Table. 1. Results of Neuropsychological Tests

뇌신경재활

게시일시 및 장소 : **2017 년 4 월 21 일 13:00-18:30, 3 층 로비 / 질의응답 일시 및 장소 : 2017 년 4 월 21 일 15:00-15:40, 3 층 로비**

초록순서 : **14** 형식 : **Poster**

A Study on the Correlation Between Phonation and Dysphagia in Post-stroke Patients.

Han Young Jung[1†], Hee Jun Han[1*], Ju Young Im[1]

Inha University School of Medicine, Department of Physical & Rehabilitation Medicine[1]

Objective: The Maximum Phonation Time (MPT) is a basic evaluation of the efficiency of phonation. The individual is asked to sustain a vowel sound /ah/ on one deep breath while the duration is measured in seconds. The best of three attempts at sustaining the vowel is used as the individual's MPT. The objective of study is to confirm the patterns of the MPT and the relationship between MPT and the dysphagia in post-stroke patients.

Subjects and Methods: A group of 31 patients who suffered from stroke with dysphagia and were consecutively admitted to a department of rehabilitation medicine in tertiary hospital were followed prospectively. We checked the MPT before the videofluoroscopic swallowing study (VFSS) and confirmed the factors associated with dysphagia. To find the relationship between MPT and dysphagia, Spearman correlation analysis was performed with independent variable including the Penetration-Aspiration Scale (PAS), the American Speech-Language Hearing Association National Outcome Measurement System Swallowing Scale (ASHA-NOMS), and the Functional Dysphagia Scale (FDS), and the Age, and the Parramatta Hospitals Assessment of Dysphagia (PAHD).

Results: The characteristics of the sample of 31 patients were mean age 66.5 years (range 30-89), 22 men (71.0%). Mean values for MPT of all subjects were 8.5s. It has been established 6.1s for the female gender, and, for the male gender, 9.4s. In the VFSS, it was noticed that 12 patients (38.7%) aspired liquid, 8 penetrated (25.8%) liquid, while 11 patients (35.5%) did not aspire any consistency. No aspiration was observed in the patients who showed MPT values above 8.6 seconds. In the analysis of the correlations, the MPT was correlated significantly with the PAS ($r = -0.810$, $p < 0.01$), the ASHA-NOMS ($r = 0.607$, $p < 0.01$), the FDS ($r = -0.598$, $p < 0.01$) and the Age ($r = -0.596$, $p < 0.01$).

Conclusion: This research comes to the conclusion that the MPT has a great matter of importance on dysphagia evaluation as a vocal parameter. The results suggest that the MPT may be a useful indicator in detecting patients who may be at risk for aspiration.

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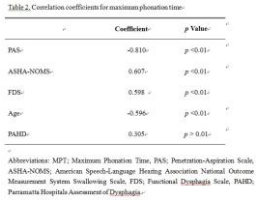
Demographic characteristics



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Correlation coefficients for maximum phonation time

척수재활

게시일시 및 장소 : **2017 년 4 월 21 일 13:00-18:30, 3 층 로비 / 질의응답 일시 및 장소 : 2017 년 4 월 21 일 15:00-15:40, 3 층 로비**

초록순서 : **77** 형식 : **Poster**

Epidemiology and Characteristics of Traumatic Spinal Cord Injury in Korean Military

Jeong-Gil Kim[1*], Kyoung-Eun Kim[2†]

Seoul National University Hospital, Department of Rehabilitation Medicine[1], The Armed Forces Capital Hospital, Department of Rehabilitation Medicine[2]

Objectives; This Study, designed as a retrospective cohort study, aims to study the epidemiology and characteristics of traumatic spinal cord injury (SCI) in Korean military.

Methods; A cohort of 64 male veterans, with traumatic SCI which occurred between May, 2012 to April, 2016 who visited the armed forces military hospital, were assembled from the Defense Medical Statistical Information System. The records were verified by the New Defense Medical Information System and reviewed by a physical medicine & rehabilitation doctor.

Results; Patients consisted of officers (11 persons), sergeants (21 persons), soldiers (28 persons), others (1 person) and unknown (3 persons) rank and were injured in their mid-twenties. The main causes of injury were military training (19 persons, 30%), sports including diving injury (12 persons, 19%), traffic accident (11 persons, 17%). There was a higher incidence of injury during sports in officers and training in sergeants. However, suicide injury was identified only in soldiers. The main causes of injury was carelessness in old age and training in younger age. The severity of injury was 10 persons (21.7%) with American spinal injury impairment scale A, 4 persons (6.3%) with B, 8 persons (12.5%) with C and 38 persons (59.4%) with D. Thirty one patients (48.5%) had continued military service and 26 patients (40.6%) had discharged after injury due to disability, and 48 patients (65.6%) among them had confirmed as official injury. Only 5 patients of 28 patients who received the phone call, were selected as veterans and were being treated at the Veterans hospital.

Conclusions; This is the first study to investigate the epidemiology and characteristics of traumatic spinal cord injury in Korean military. More follow-up studies on the psychologic problems, quality of life and occupation are expected to be published through the cooperation with the Veterans hospitals.

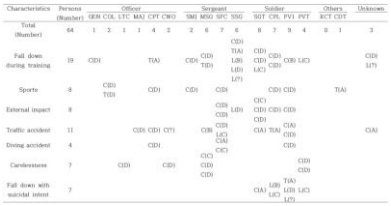

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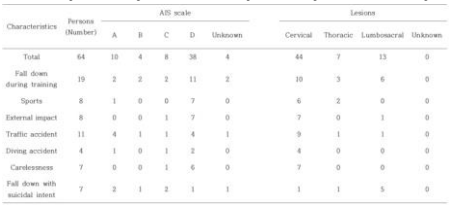
Table 1. Causes of traumatic spinal cord injury by rank // GEN, General; COL, Colonel; LTC, Lieutenant Colonel; MAJ, Major; CPT, Captain; CWO, Chief Warrant Officer; SMJ, Sergeant Major; MSG, Master Sergeant; SFC, Sergeant First Class; SSG, Staff Sergeant; SGT, Sergeant; CPL, Corporal; PV1, Private First Class; PVT, Private; RCT, Recruit; CDT, Cadet * Each items are represented as lesion(AIS).



Characteristics	Persons (Number)	AIS scale					Lesions			
		A	B	C	D	Unknown	Cervical	Thoracic	Lumbosacral	Unknown
Total	64	10	4	8	38	4	44	7	13	0
Fall down during training	19	2	2	2	11	2	10	3	6	0
Sports	8	1	0	0	7	0	6	2	0	0
External impact	8	0	0	1	7	0	7	0	1	0
Traffic accident	11	4	1	1	4	1	9	1	1	0
Diving accident	4	1	0	1	2	0	4	0	0	0
Carelessness	7	0	0	1	6	0	7	0	0	0
Fall down with suicidal intent	7	2	1	2	1	1	1	1	5	0

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Table 2. Causes of traumatic spinal cord injury by AIS and lesions // AIS, American spinal injury association Impairment Scale * Each items are represented as Number.

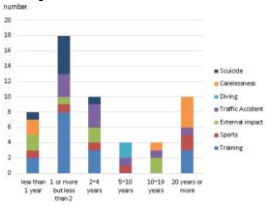

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Figure 1. Causes of traumatic spinal cord injury by military career

뇌신경재활
게시일시 및 장소 : **2017 년 4 월 21 일 13:00-18:30, 3 층 로비 / 질의응답 일시 및 장소 : 2017 년 4 월 21 일 15:00-15:40, 3 층 로비**
초록순서 : **15** 형식 : **Poster**

Crossed Cerebellar Diaschisis : Risk Factors and Correlation to Functional Recovery

Deok Su Sin[1*], Myung Hyun Kim[2], Soon A Park[2], Min Cheol Joo[1], Min Su Kim[1†]

Wonkwang University School of Medicine & Hospital, Department of Rehabilitation Medicine[1], Wonkwang University School of Medicine & Hospital, Department of Nuclear Medicine[2]

Objective: This study investigated predictors of crossed cerebellar diaschisis (CCD), and the effects on outcomes including motor function, activities of daily living, cognitive function, and ambulation 6 months after the onset in patients with intracerebral hemorrhage (ICH).
Methods: A total of 74 patients experiencing their first ICH were recruited. If the asymmetric index (AI) was more than 10% using single photon emission computed tomography (SPECT), a diagnosis of CCD was confirmed. Clinical factors were assessed with medical record review retrospectively. Radiologic factors encompassed the concomitance of intraventricular hemorrhage (IVH), side and location of the lesion, and hemorrhage volume. Motor function was evaluated using the Fugl-Meyer assessment (FMA), Korean version of the mini-mental state examination (K-MMSE), Korean version of the modified Barthel index (K-MBI), and functional ambulatory category (FAC) at the time of SPECT and 6 months post-ICH.
Results: Lesion location, especially in the basal ganglia ganglia (OR=10.841, p=0.034), and hemorrhagic volume (OR=1.090, p=0.017) were independent predictors for CCD according to multivariate logistic regression analysis. In addition, the presence of CCD was significantly related with the improvement in FMA after 6 months (R2=0.188, p=0.034).
Conclusion: Basal ganglia hemorrhagic stroke and a large hemorrhagic volume were predisposing factors for CCD, and the presence of CCD was associated with motor recovery 6 months after the onset.

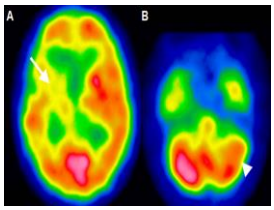

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Figure 1. Brain SPECT image of 69-year old woman. She had a right basal ganglia hemorrhage on the CT. (A) Baseline SPECT showed a severe perfusion deficit in the right basal ganglia and surrounding area. (B) Moderate hypoperfusion in the left lateral zone of cerebellum (white arrowhead) was also noticed.

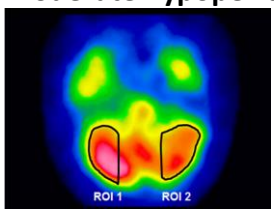

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Figure 2. Determination of the presence of crossed cerebellar diaschisis (CCD). Regions of interest (ROI) were drawn in the lateral zone of cerebellum. The mean counts per pixel of ROIs were quantitatively measured in sequential 3 axial images showing prominent cerebellar perfusion asymmetry and mean value was calculated. The cerebellar interhemispheric asymmetry index (AI) was measured. Finally CCD was confirmed if AI was more than 10%.

신경근육재활 및 전기진단
게시일시 및 장소 : **2017 년 4 월 21 일 13:00-18:30, 3 층 로비 / 질의응답 일시 및 장소 : 2017 년 4 월 21 일 18:00-18:30, 3 층 로비**
초록순서 : **C28** 형식 : **Poster**

Palmaris brevis spasm syndrome : Is that an occupational syndrome as an army cook ?

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Inha University Hospital, Department of Rehabilitation Medicine[1]

Introduction
 Palmaris brevis (PB) is a small quadrilateral shaped muscle. It arises from the transverse carpal ligament and palmar aponeurosis and is inserted into the skin on the ulnar border of the palm of the hand. Hence its action is to increase dimpling of the hypothenar eminence. The superficial branch ulnar nerve supplies PB whereas most of other intrinsic hand muscles are supplied by deep branch of ulnar nerve. Palmaris brevis spasm syndrome (PBSS) is a rare muscular hyperactivity syndrome confined to a rudimentary muscle. The mechanism is unclear. In some of the previous studies they attributed occupation involving frequent use of mouse and keyboard as possible cause. Most cases of PBSS were due to acquired causes like C8 root compression, ulnar nerve injury or followed by decompressive surgery of ulnar nerve but rest of cases were spontaneous without a known etiology. So far as we know , no cases have been reported for as an army cook in a literature. Here we report the case of a rare PBSS in patient as a army cook.

Case
 A 22 year old man complained of paraesthesia in the right little finger after started cooking as an army cook for 6months. And then, for three months he had experienced spontaneous, slightly painful, contractions in the right hypothenar eminence. (Fig. 1.) Spasms were spontaneous and irregular without stereotyped duration or frequency. On examination there was no weakness of intrinsic muscles of hand, no sensory loss, and deep tendon reflexes were intact. An EMG showed no abnormal spontaneuous activity but fasciculation. Motor unit potentials had a normal configuration with amplitude, recurrent with 5 to 10 Hz frequency. Motor and sensory nerve conduction velocities and F wave latencies were normal. Magnetic resonance imaging showed no particular abnormality and no abnormality at ulnar nerve on scanned images. In ultrasonogram, the right PB muscle's spasm was observed with recurrent and spontaneous activity. (Fig. 2.) So we planned to inject the Clostridium botulinum A toxin 50unit, split it into 3 separate trigger point injections to right PB muscle using handheld needle EMG. After injection and 3weeks later, the right hypothenar muscle’s spasm was disappeared but right hypothenar muscle weakness(MRC grade 2) was observed.

Conclusion
 we treated our patient using botulinum toxin A and then dimpling of PB muscle was completely disappeared but hypothenar muscle weakness was observed as a side effect. We considered that weakness may occur due to spread of botulinum toxin to adjacent hypothenar muscles.
 In conclusion, the exact etiology or mechanism of is unknown but local injections of botulinum toxin A is a good treatment choice for PBSS. So, optimal dose and localization of the injection site would be necessary considering the anatomic characteristics of PB muscle.

Fig. 1. Palmaris brevis spasm ; the arrow indicate the dimpling of hypothenar eminence due to spasm of Palmaris brevis.

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Fig. 1. Palmaris brevis spasm; the arrow indicate the dimpling of hypothenar eminence due to spasm of Palmaris brevis.

Fig. 2. Ultrasonogram of Palmaris brevis muscle (PBM).
1. maximum depth of the PBM, 2. minimum depth of the PBM
HM. hypothenar muscle; PB. pisiform bone

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Fig. 2. Ultrasonogram of Palmaris brevis muscle (PBM). 1,maximum depth of the PBM; 2, minimum depth of the PBM; HM, hypothenar muscle; PB, pisiform bone

척수재활

게시일시 및 장소 : **2017 년 4 월 21 일 13:00-18:30, 3 층 로비 / 질의응답 일시 및 장소 : 2017 년 4 월 21 일 15:00-15:40, 3 층 로비**

초록순서 : **78** 형식 : **Poster**

Research on Usage and Needs of the Psychological rehabilitation service for SCI residing community

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National Rehabilitation Research Institute, Dept. of Clinical research for rehabilitation[1], National Rehabilitation Hospital, Department of Rehabilitation Medicine[2]

Purpose: The purpose of this study was to investigate the experience status and needs of psychological rehabilitation services (PRS) for people with spinal cord injury (SCI) residing in the community.
Methods: 231 community living SCI participants were surveyed. The participants were asked to fill out the questionnaires designed to estimate experience and needs of PRS. The items for experience, kind and purpose and re-use intention were included. Also, to determine the needs of PRS were asked demand periods, who are the most in need of PRS among the people with disability and their families and the comments on those services. Statistical analysis was carried out using SPSS for 21.0K for frequency analysis, demand ranking and the demographic characteristics.
Results: 132 (57.1%) had experience in using PRS, and 96 (41.6%) did not. The most common types of services were peer counseling, followed by self-help group. The purpose of using PRS was to find information and plan about life after disability in 71(54.6%), 45(34.6%) to identify the effects of disability and disability, 31(23.8%) to relieve psychological difficulties, such as depression and anxiety. In case of similar psychological difficulties in the future, the re-use intention of PRS was 6.24 points out of 10. And an average score was 7.25 out of 10 for the likelihood of recommending the PRS to people with similar difficulties or their families. The most frequent response to the question about 'how much time is most needed after the disability' was found to be 'within 6 months to 1 year' (29.1%), and longer than one year to three years (28.8%), followed by six months or less (28.1%). Also, when asked for priority, the most frequently response was 'within six months' (59.3%). As for the question about the person who most needs the PRS, the demand for the disabled person was highest (33.5%) and followed by the spouse of the disabled person (28.5%). In particular, we asked whether or not PRS were needed and if they were willing to use them. As a result, 164 (71.0%) answered that they needed a person to provide rehabilitation information continuously. In addition, 152(65.8%) said they needed to discuss situation related to their daily life or physical disability, and 150(64.9%) answered that they needed people or institutions providing psychological help consistently.
Conclusions: The results of this study suggest that the need for rehabilitation services and expectations are very high for post disability life adjustment, and overcoming psychological and emotional difficulties. Also, rehabilitation services in particular are constantly and regularly needed for persons with disabilities and their families. Although the area of rehabilitation psychotherapy after acquiring disability has been unclear so far, it is necessary to improve psychological healthy and quality of life of people with spinal cord disability through PRS such as various rehabilitation intervention programs.

노인재활
게시일시 및 장소 : **2017 년 4 월 21 일 13:00-18:30, 3 층 로비 / 질의응답 일시 및 장소 : 2017 년 4 월 21 일 15:00-15:40, 3 층 로비**
초록순서 : **1** 형식 : **Poster**

The Association between Asymmetry of Knee Extension Strength and Balance function

Seonyoung Han[1*], Jinmann Chon[1†], Hee Sang Kim[1], Jong Ha Lee [1], Seung Don Yoo[2], Dong Hwan Yun[1], Dong Hwan Kim[2], Seung Ah Lee[2], Yoo Jin Han[1], Yun soo Sho[1]

Kyung Hee University Medical Center, Department of Physical Medicine & Rehabilitation[1], Kyung Hee University Hospital at Gangdong, Department of Physical Medicine & Rehabilitation,[2]

Objective
 Physical activities including balance function decrease with age. Many studies have reported that impairment in balance function is the main risk factor for falls in elderly individuals. Strength asymmetry may potentially be due to limb dominance or unilateral pathology and the discrepancy has been shown to increase with age. The purpose of this study was to investigate the association between balance control ability and asymmetry of knee extension strength in a sample of the community dwelling elderly.
 Method
 Strength of the knee extensors was measured in 306 subjects of community dwelling elderly (age 76.70±4.85) and 25 young healthy subject (age 34.23±8.93). Elderly subjects were separated into symmetrical strength (n = 128) and asymmetrical strength (n= 178) groups using an asymmetry cutoff of 20%.
The postural control capabilities of the subjects were assessed using the berg balance scale (BBS), timed up and go test (TUG), short physical performance battery (SPPB) and Inbody posturography®. The subjects were checked for their stability index (SI) in four positions using posturography.
 Results
 Three physical performance tests (BBS, TUG, SPPB) of the symmetrical strength group and asymmetrical strength group did not show a statistically significant difference. Asymmetrical strength group had a significantly decreased balance function (higher SI) than the symmetrical strength group in normal position with eyes open (NO) and eyes open on pillows (PO).
 Conclusion
 Ambulatory elderly with knee extension strength asymmetry, even in normal clinical balance test, have more deficits in balance control ability in several posturographic parameter.

뇌신경재활
게시일시 및 장소 : **2017 년 4 월 21 일 13:00-18:30, 3 층 로비 / 질의응답 일시 및 장소 : 2017 년 4 월 21 일 18:00-18:30, 3 층 로비**
초록순서 : **C4** 형식 : **Poster**

Effect of Intrathecal Baclofen on Paroxysmal Sympathetic Hyperactivity following Pontine Hemorrhage

Hyeon Su Kim[1*], Na Young Kim[1], Yong Wook Kim[1†]

Yonsei University College of Medicine, Department and Research Institute of Rehabilitation Medicine[1]

Introduction: Paroxysmal sympathetic hyperactivity (PSH) could occur after various acquired brain injuries, especially in acute phase of traumatic brain injury. It is characterized by increased activity of the sympathetic nervous system such as hyperthermia, tachycardia, tachypnea, hypertension, diaphoresis and dystonic posture. Although several treatments have been proposed for PSH, the efficacy of treatment is uncertain. We report a case in which intrathecal baclofen (ITB) pump was applied to the patient with intractable PSH after pontine hemorrhage.

Case Description: The patient with 61-year-old man was diagnosed with pontine hemorrhage expanding to bilateral midbrain(Fig. 1). Since two weeks after onset, he had developed paroxysmal hyperthermia, tachycardia, tachypnea, hypertension, and generalized dystonic movements. Even though a variety of medications were administered including opioids, dantrolene, gabapentin and beta blockers, PSH episode had occurred more than twice a day. Seven months after onset, we performed a test trial of ITB injection for 8 days. The severity and frequency of PSH reduced during the trial period. Therefore, the ITB pump was implanted. Continuous ITB infusion rate was started at 100μg/day and gradually increased up to 200ug/day for two months. Oral medications including diazepam, dantrolene and beta bloker used to control symptoms were tapered off, and PSH episode did not occur for 4 weeks and the patient was discharged.

Discussion: Baclofen is an inhibitory GABA-B receptor agonist which is the first choice medication of spasticity control in acquired brain injury. ITB may have effect on PSH by suppressing sympathetic activities by stimulating GABA-B receptors in brain stem regions such as rostral ventrolateral medulla and nucleus tractus solitarius.

Conclusion: Our case suggests that ITB pump implantation could be an option for the management of intractable PSH.

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Figure 1. The initial Brain CT shows pontine hemorrhage expanding to bilateral midbrain

암재활
게시일시 및 장소 : **2017 년 4 월 21 일 13:00-18:30, 3 층 로비 / 질의응답 일시 및 장소 : 2017 년 4 월 21 일 15:00-15:40, 3 층 로비**
초록순서 : **66** 형식 : **Poster**

Effect of Hyaluronic Acid by Different Molecular Weight on the Proliferation and Migration of LEC

Seok Gyo Park[1*], Kyung-Moon Kang[2], Jee Yeong Jeong[3], Ghi Chan Kim[1], Ho Joong Jeong[1], Young-Joo Sim[1†]

Kosin University College of Medicine, Department of Physical Medicine and Rehabilitation[1], Haedong hospital , Department of Rehabilitation Medicine[2], Kosin University College of Medicine, Busan, Korea, Department of Biochemistry[3]

Objective: The increase of hyaluronic acid in lymphedema had influence on lymphatic endothelial cells or was related to inflammatory process associated with cytokine secretion. It is assumed that hyaluronic acid with different molecular weights and pro-inflammatory cytokines such as recombinant human tumor necrosis factor alpha (TNFα) affect the inflammatory cytokine activated pathway including cell proliferation and migration in lymphatic endothelial cells (LEC). The purpose of this study was to investigate cell proliferation and migration in LEC through immunochemical experimental study.
Methods: Human lymphatic micro-vesicular endothelial cells (hLMVEC) and human prostate cancer cell line PC-3 were used and cultured under the proper conditions of temperature, time, and gas. In addition, for the analysis of cell proliferation, TNF-α and hyaluronic acid with different molecular weight were added at each concentration and analyzed using crystal violet staining and cell counting kit-8. And cell migration was analyzed by cell scratch test.
Results: Cell proliferation including metabolic activity and cell count were measured by cell counting kit-8 and crystal violet staining. As a result, when treated with TNF-α alone or with hyaluronic acid with different molecular weight together with TNF-α, metabolic activity and cell count were not significantly different between hLMVEC and PC-3 cells. (Figure 1., 2.) Cell migration was measured by scratch test, which determine the number of cell migration in hLMVEC cells and PC-3 cells. In the hLMVEC cells, TNF-α was treated alone, the number of cell migration was increased compared to the control. But when the high molecular weight hyaluronic acid was treated alone, the number of cell migration was decreased compared with the control, and high molecular weight hyaluronic acid was treated with TNF-α, the number of cell migration more decreased. In the PC-3 cells, the number of cell migration increased when treated with TNF-α alone. However, when low molecular weight hyaluronic acid was treated alone, the number of cell migration decreased compared with the control, and low molecular weight hyaluronic acid was treated with TNF-α, the number of cell migration was more decreased. (Figure 3.)
Conclusion: Hyaluronic acid did not affect the cell proliferation in the lymphatic endothelial cells regardless of TNF-α and molecular weight, but cell migration was found to decrease in the high molecular weight hyaluronic acid regardless of treatment with TNF-α. It is thought that there is a signal transduction system in the cell migration that differs from the signaling pathway of the nuclear factor kappa-light-chain-enhancer of activated B cells (NF-κB) depending on the molecular weight of hyaluronic acid, and further study is needed.

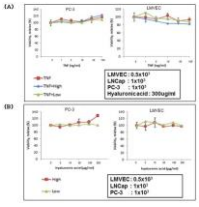

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Figure 1.(A) TNF and Hyaluronan effects on the metabolic activity in PC-3 and hLMVEC cells. (B) Hyaluronan effects on the metabolic activity in PC-3 and hLMVEC cells. Metabolic activity was measured by cell counting kit-8. When treated with TNF-α alone or with hyaluronic acid with different molecular weight together with TNF-α, metabolic activity were not significantly different between hLMVEC and PC-3 cells.

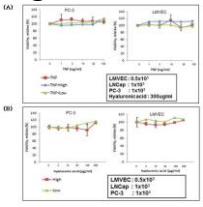

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Figure 2. (A) TNF and Hyaluronan effects on the cell count in PC-3 and hLMVEC cells. (B) Hyaluronan effects on the cell count in PC-3 and hLMVEC cells. Cell count was measured by crystal violet staining. When

treated with TNF-α alone or with hyaluronic acid with different molecular weight together with TNF-α, metabolic activity were not significantly different between hLMVEC and PC-3 cells.

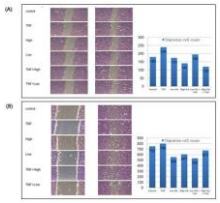

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Figure 3. TNF and Hyaluronan effects on the cell migration in hLMVEC(A) and PC-3(B) cells. Cell migration was measured by scratch test. In the hLMVEC cells, when the high molecular weight hyaluronic acid was treated alone, the number of cell migration was decreased compared with the control, and high molecular weight hyaluronic acid was treated with TNF-α, the number of cell migration more decreased. In the PC-3 cells, when low molecular weight hyaluronic acid was treated alone, the number of cell migration decreased compared with the control, and low molecular weight hyaluronic acid was treated with TNF-α, the number of cell migration was more decreased.

척수재활

게시일시 및 장소 : **2017 년 4 월 21 일 13:00-18:30, 3 층 로비 / 질의응답 일시 및 장소 : 2017 년 4 월 21 일 15:00-15:40, 3 층 로비**

초록순서 : **79** 형식 : **Poster**

Autonomic Dysreflexia and Blood Pressure Variability in Persons with Spinal Cord Injury

Kwang Min Lee[1*], Min Cheol Joo[1†]

Wonkwang University School of Medicine, Department of Rehabilitation Medicine[1]

Objectives
Increased blood pressure variability (BPV) relates to the risk of cardiocerebrovascular events such as myocardial infarction or stroke, independently of mean blood pressure (BP). The aim of this study was to investigate the prevalence of autonomic dysreflexia (AD) and the BPV using 24-hour ambulatory BP monitoring (ABPM) in persons with spinal cord injury (SCI) and suggest the need for appropriate BP control.

Methods
From March 2015 to May 2016, 46 patients with SCI were enrolled. The neurological level of injury and severity were classified according to the AIS (ASIA impairment scale). 24-hour ABPM measured systolic BP (SBP), diastolic BP (DBP) and heart rate (HR) automatically using a Schiller BR 102 plus (Schiller AG, Baar, Switzerland). The baseline BP divided into daytime and night-time established by calculating the average of 3 consecutive resting BPs at that time of wake-up and sleep. AD was defined as an increase in SBP >20 mmHg from baseline. Each AD frequency and AD severity were evaluated for daytime, night-time, and 24-hour. AD severity was measured by the difference between baseline SBP and peak SBP at maximum AD event. BPV was estimated by using mean value, standard deviation (SD) and coefficient of variation (CV) of BP over the daytime, night-time or 24-hour period. CV of BP was calculated as the percentage of SD of BP divided by mean BP.

Results
Of the 46 patients, 25 were cervical SCI, 5 were upper thoracic (T1-5) SCI, 10 were lower thoracic (T6-12) SCI, and 6 were lumbar SCI. The mean age of the patients was 57.8 ± 13.2 years, with 35 males and 11 females. AD was diagnosed in 58.7% (27/46) of the overall patients, 76.7% (23/30) of the above T6 group and 25% (4/16) of the T6 or below group (p=0.001). Physiologic nocturnal dip was disappeared in 71.7% of the 46 patients. The AD frequency was significantly higher in the above T6 group at 24-hour, daytime, and night-time. The AD severity was significantly higher in the above T6 group at 24-hour and daytime, and was not statistically significant at night-time, but showed a high tendency (Table 1). The results of BPV analysis between the AD group and the non-AD group showed no significant difference in mean BP, but SD of BP and CV of BP were significantly higher in the AD group during 24-hour and daytime (Table 2). A significant positive correlation was observed between BPV values and AD frequency and severity (Table 3).

Conclusions
In this study, the prevalence, frequency, and severity of AD were significantly higher in the above T6 group than in the T6 or below group. Independently of mean BP, SD of BP and CV of BP were higher in the AD group compared with those in the non-AD group. In order to manage cardiocerebrovascular risk due to BPV, early consideration of the active diagnostic and therapeutic intervention is needed.

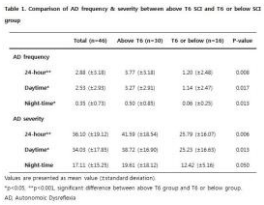

Table 1. Comparison of AD frequency & severity between above T6 SCI and T6 or below SCI group

	Total (n=46)	Above T6 (n=30)	T6 or below (n=16)	P-value
AD frequency				
24-hour**	2.88 (±3.18)	3.77 (±3.18)	1.20 (±2.48)	0.006
Daytime*	2.55 (±2.93)	3.27 (±2.91)	1.14 (±2.47)	0.017
Night-time*	0.33 (±0.73)	0.50 (±0.85)	0.06 (±0.25)	0.013
AD severity				
24-hour**	36.10 (±19.12)	41.59 (±18.54)	25.79 (±16.07)	0.006
Daytime*	34.03 (±17.85)	38.72 (±16.90)	25.23 (±16.65)	0.013
Night-time	17.11 (±15.25)	19.61 (±18.12)	12.42 (±5.18)	0.090

Values are presented as mean value (±standard deviation).
*p<0.05, **p<0.001, significant difference between above T6 group and T6 or below group.
AD, Autonomic Dysreflexia

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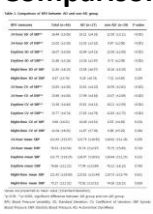
Comparison of AD frequency & severity between above T6 SCI and T6 or below SCI group



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Comparison of BPV between AD and non-AD group

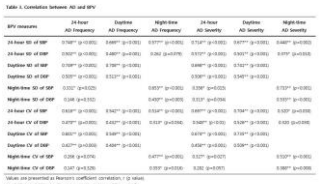

Table 3. Correlation between AD and BPV

BPV measures	24-hour AD Frequency	Daytime AD Frequency	Night-time AD Frequency	24-hour AD Severity	Daytime AD Severity	Night-time AD Severity
24-hour SD of SBP	0.768** (p<0.001)	0.695** (p<0.001)	0.577** (p<0.001)	0.714** (p<0.001)	0.677** (p<0.001)	0.660** (p<0.001)
24-hour SD of DBP	0.502** (p<0.001)	0.487** (p<0.001)	0.262 (p=0.079)	0.727** (p<0.001)	0.707** (p<0.001)	0.370* (p=0.018)
Daytime SD of SBP	0.709** (p<0.001)	0.798** (p<0.001)		0.698** (p<0.001)	0.742** (p<0.001)	
Daytime SD of DBP	0.505** (p<0.001)	0.513** (p<0.001)		0.506** (p<0.001)	0.546** (p<0.001)	
Night-time SD of SBP	0.332* (p=0.025)		0.653** (p<0.001)	0.336* (p=0.023)		0.733** (p<0.001)
Night-time SD of DBP	0.246 (p=0.152)		0.439** (p<0.001)	0.313* (p=0.034)		0.555** (p<0.001)
24-hour CV of SBP	0.639** (p<0.001)	0.542** (p<0.001)	0.514** (p<0.001)	0.697** (p<0.001)	0.734** (p<0.001)	0.520* (p=0.038)
24-hour CV of DBP	0.470** (p=0.001)	0.431** (p<0.001)	0.313* (p=0.034)	0.548** (p<0.001)	0.576** (p<0.001)	0.320 (p=0.098)
Daytime CV of SBP	0.601** (p<0.001)	0.589** (p<0.001)		0.678** (p<0.001)	0.716** (p<0.001)	
Daytime CV of DBP	0.427** (p=0.003)	0.436** (p<0.001)		0.458** (p<0.001)	0.559** (p<0.001)	
Night-time CV of SBP	0.206 (p=0.274)		0.477** (p<0.001)	0.327* (p=0.027)		0.723** (p<0.001)
Night-time CV of DBP	0.247 (p=0.329)		0.359* (p=0.016)	0.282 (p=0.057)		0.396** (p=0.006)

Values are presented as Pearson's coefficient correlation, r (p value)
*p<0.05, **p<0.001, significant correlation between BPV and AD
BPV: Blood Pressure Variability; SD: Standard Deviation; CV: Coefficient of Variation; SBP: Systolic Blood Pressure; DBP: Diastolic Blood Pressure; AD: Autonomic Dysreflexia

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Correlation between AD and BPV

뇌신경재활
게시일시 및 장소 : **2017 년 4 월 21 일 13:00-18:30, 3 층 로비 / 질의응답 일시 및 장소 : 2017 년 4 월 21 일 15:00-15:40, 3 층 로비**
초록순서 : **16** 형식 : **Poster**

Case report: Dysphagia after stroke due to chronic retropharyngeal inflammation

Sang Eun Jung[1*], Seong Hoon Lim[1†], Bomi Sul[1], Joon-Sung Kim[1], Bo Young Hong[1], Jung-Hae Cho[2]

The Catholic University of Korea St. Vincent[1], The Catholic University of Korea St. Vincent[2]

Case report: A 74 year-old male patient with double hemiplegia due to previous traumatic EDH with brain edema in left temporo-parietal lobe referred to our inpatient clinic within six months of onset. The primary goal was evaluation of dysphagia and plugging off T-tube. Pre-evaluation was perforemed. Laryngoscopy showed that airway was intact but with a prominent saliva pulling. Otorhinolaryngology specialist recommended that T-tube plugged off should be performed when improving swallowing function and relieving arytenoid swelling. Patient treated with dysphagia therapy, especially strengthening exercise of swallowing muscle and training of clearing sputum, and taking Varidase for relieving swelling. After one week, T-tube was removed and the following day VFSS was performed. VFSS showed dysfunction of upper esophageal sphincter opening and continuing over-flow aspiration (Fig 1). Esophagoscopy revealed narrowing of upper esophagus lumen. Accordingly, Contrast-enhanced computer tomographic scan of the neck was done following suspicion of structural cause. A bulging contour of posterior hypopharyngeal wall was seen due to retropharyngeal fluid collection. Surgical exploration of the neck was performed via external approach to retropharyngeal space. There were necrotic changes extending to choricoid cartilage and fistula formation to retropharynx. Tracheal stoma showed chronic inflammatory change but no narrowing of lumen. Debridement of necrotic tissue and drainage was done. Revision of Tracheotomy and L-tube insertion was performed to prevent compromising airway and progression of stricture. To understand the cause of retropharyngeal infection, history taking was checked once again. He didn't have any underlying disease including diabetes or trauma history. He had had a complaint of heartburn, hoarseness and nausea for three years even before traumatic brain injury. However he never properly treated for these symptoms.
The important issue of post operative care was preventing from saliva overflow. One of life threatening complication was meditational infection due to vulnerability in tracheal stoma which could cause impending airway compromise. He also took Amitriptyline with side effect of dry mouth and anti-reflux drug (proton pump inhibitors) because we believed infection caused by chronic reflux. While preventing post-operative complication, dysphagia therapy was maintained to strength swallowing muscles. After one month, swelling in esophagus lumen gradually was relieved. In Fallow up VFSS , even though there was some amount of delayed aspiration, improvement in opening upper esophageal sphincter was observed (Fig 2). However, after six more weeks, VFSS finding still showed no interval change and clinicians started to think possible esophageal stricture or hypertrophy. In fallow up endoscopy, operator confirmed rigidity of the esophageal wall and

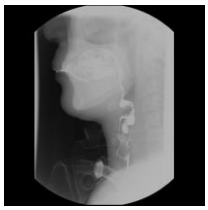

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Fig 1. Initial VFSS finding- Dysfunction of upper esophageal sphincter opening and continuing over-flow aspiration

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Fig 2. Fallow up VFSS finding- Some improvement in opening upper esophageal sphincter compared to previous study

재활정책
게시일시 및 장소 : **2017 년 4 월 21 일 13:00-18:30, 3 층 로비 /** 질의응답 일시 및 장소 : **2017 년 4 월 21 일 15:00-15:40, 3 층 로비**
초록순서 : **72** 형식 : **Poster**

Research on Body Mass Index Reference Values for People with Disabilities

Ye-Soon Kim[1*], Seung Hee Ho[1†], Ye-Ji Choi[1], Eun Young Lee[1], Hyun Min Oh[1]

Korea National Rehabilitation Center, Department of Rehabilitation Standard & Policy, Korea National Rehabilitation Research Institute[1]

Background : Body Mass Index(BMI) is a simple index of weight-for-height that is commonly used to classify underweight, overweight and obesity in adults. World Health Organization(WHO) has recommended classification of BMI cut-off points for determining overweight and obesity. There was a growing debate on whether there are possible needs for developing different BMI cut-off points for the populations-specific groups due to the increasing evidence that the associations between BMI.

Objective : The purpose of the study was a comparative analysis on the BMI of disabled and non-disabled people.

Methods : We used a health check-up data of the people with disabilities(PWD) from the Korea National Health Insurance(KNHI) 2014. A total of 658,859 subjects were studied. Also we used The National Health Screening Statistical Yearbook of the people without disabilities from the National Health Insurance Service(NHIS). A total of 131,218 subjects were studied. We assessed the diagnostic performance of BMI using WHO reference standard. WHO BMI ranges are underweight: under 18.5kg/m², normal weight: 18.5 to 24.9kg/m², pre-obese: 25 to 29.9kg/m², obese: over 30kg/m². WHO cut-off point of overweight is 25kg/m².

Results : The results are listed as follows: 1) The average BMI of the PWD was 24.29±3.42 in Korea. BMI was observed in 24.13±3.21 of men and 24.55±3.71 of women. 2) The proportion of overweight PWD was 45.59% compared to 35.53% of people without disabilities. Especially, the obesity rate of the physical PWD was higher than other PWD. 3) 44.08% of men with disabilities, 48.05% of women with disabilities were overweight. 33.40% of men without disabilities, 37.24% of women without disabilities were overweight. Both disabled and non-disabled people, overweight percentage of women was high.

Conclusions : We confirmed that the BMI reference value differ between disabled and non-disabled people. BMI reference values should be applied differently by gender, and type of disability. We suggest that reference ranges of some health factors might be reestablished or adjusted according to disabled status through the further studies on current reference ranges.

소아재활
게시일시 및 장소 : **2017 년 4 월 21 일 13:00-18:30, 3 층 로비 / 질의응답 일시 및 장소 : 2017 년 4 월 21 일 15:00-15:40, 3 층 로비**
초록순서 : **51** 형식 : **Poster**

Long term neurodevelopmental outcome in children born very low-birth-weight

JaYoung Kim[1*], Kyoung Hyo Choi[1†], In Young Sung[1], Seo Yon Yang[1]

Asan Medical Center, Department of Rehabilitation Medicine[1]

Objective
As perinatal care develops, survival rate of very low-birth-weight (VLBW, birth weight<1500mg) infants is increasing. However those infants still experience neonatal complications and have a risk of neurodevelopmental impairments. Several studies looked into neurodevelopmental outcomes of VLBW infants at the age around two years, but long-term outcomes are not completely known. The aim of this study is to investigate the long term neurodevelopmental outcome in children born very low-birth-weight.

Method
The authors reviewed the medical records of VLBW infants admitted from January 2006 to December 2010, Asan medical center. Among 516 newborns born with birth weight less than 1500mg, 370 infants were assessed development at the age around two years. We reviewed those infants' medical records at three years and five years and checked neurodevelopmental outcomes. Neurodevelopmental outcomes were classified into cerebral palsy (CP) and non-cerebral palsy neurodevelopmental impairment (non-CP NDI). Mental and psychomotor developmental index (MDI and PDI) of Bayley Scales of Infant and Toddler Development (BSID) were checked and classified as mild developmental delay (70≤ developmental index <85) and significant developmental delay (developmental index <70).

Results
The number of VLBW newborns is increasing, but the mean birth weight and gestational age shows no significant change (Table 1). The prevalence rate of the CP was 6.76 percent (Table 2). Among 25 children with CP, 23 children were followed up at the age of three and only 1 children's diagnosis was changed as normal development. The prevalence rate of non-CP NDI infants is increasing and mean birth weight of those group were significantly lower than that of normal developed group in 2010 (Table 3). Among 120 children with non-CP NDI, 78 children were followed up at the age of three, and diagnosis of 28 children(35.9%) were changed to normal development. At the age of five, 49 children with non-CP NDI were followed up and diagnosis of 13 children were changed to normal development. Among the children whose development is improved to be normal, there were more mild developmental delay than significant developmental delay children.

Conclusion
Considerable number of neurodevelopmental impairments is still occurring in VLBW infants. But this study suggest that there is possibility for non-CP NDI infants, improve to be normal development in long term. Therefore, it seems that decide the neurodevelopmental state of VLBW infants at two years is too early. We recommend to make the diagnosis at least at the age of three years. Furthermore, physician who care VLBW infants should consider early rehabilitation treatment for them.

Table 1. Demographic characteristics of Very low-birth-weight infants

	2006	2007	2008	2009	2010
Total	84	88	102	120	122
Follow up at 24months	64	60	85	84	77
Follow up loss rate (%)	23.81	31.82	16.67	30	36.89
Gender (male:female)	37:27	33:27	41:44	40:44	39:38
Birth weight, total*, g	1106.34 ±254.76	1083.63 ±285.51	1071.0 ±255.25	1109.82 ±251.43	1072.83 ±283.47
1000-1499g	43	34	49	53	52
<1000g (%)	21 (32.81)	26 (43.33)	36 (42.35)	31 (36.90)	25 (32.47)
Gestational age*, wk	29.06±3.04	28.52±3.08	29.15±3.08	28.96±3.03	29.15±3.08

Values are Number unless otherwise indicated
* Values are mean ± standard deviation

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Demographic characteristics of Very low-birth-weight infants

Table 2. Rate of cerebral palsy among Very low-birth-weight infants at the age around two years and Diagnosis consistency

	2006	2007	2008	2009	2010	Total
Total	64	60	85	84	77	370
Cerebral palsy, No.(%)	5 (7.80)	5 (8.30)	3 (3.53)	6 (7.14)	6 (7.79)	25 (6.76)
Follow up at 3 years	5	4	3	5	6	23
Changed diagnosis at 3 years	0	0	0	0	1	1
Follow up at 5 years	4	3	3	5	5	20
Changed diagnosis at 5 years	0	0	0	0	0	0

Values are Number unless otherwise indicated

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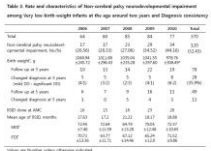
Rate of cerebral palsy among Very low-birth-weight infants at the age around two years and Diagnosis consistency



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Rate and characteristics of Non-cerebral palsy neurodevelopmental impairment among Very low-birth-weight infants at the age around two years and Diagnosis consistency

재활정책
게시일시 및 장소 : **2017** 년 **4** 월 **21** 일 **13:00-18:30, 3** 층 로비 **/** 질의응답 일시 및 장소 : **2017** 년 **4** 월 **21** 일 **15:00-15:40, 3** 층 로비
초록순서 : **73** 형식 : **Poster**

The economic burden of people with disabilities in Korea

Seung Hee Ho[1*†], Hyun-Jin Kim[1], Sol Lee[1], Ju Hee Kim[1]

Korea National Rehabilitation Center, Department of Rehabilitation Standard & Policy[1]

Objective: The objective of this study to estimate the economic burden of people with disabilities between 2008 and 2011 in Korea.
Methods: We used a prevalence-based approach to estimate the medical costs of people with disabilities by claims data from the Korean National Health Insurance. Data from the National Disability Registry, the National Survey on Persons with Disabilities and the National Statistical Office, were used to calculate direct non-medical costs and indirect costs. The direct costs were divided into direct medical costs for inpatient and outpatient visits due to disability-related diseases and direct non-medical costs, such as transportation and nursing costs. The indirect costs referred to costs of lost opportunity due to premature death and productivity loss using a 3% discount rate.
Results: Total economic burden of disability-related diseases substantially increased from $7.20 billion (2008) to $9.88 billion (2011) by explaining approximately 37% increments of economic burden. According to the proportions of costs, in 2011, direct costs were 61% and indirect costs were 39% of the economic burden of people with disabilities, compared to 2008 where the direct costs were 51% and indirect costs were 49%, showing increase of direct costs ratio, on the other hand, decrease of indirect costs ratio from 2008 to 2011.
 By disability type, in 2011 the cost of physical disability accounted for the highest burden ($3.92 billion), followed by brain disability($2.90 billion), renal disability($1.43 billion), psychiatric disability($0.53 billion), and visual disability($0.32 billion).
Conclusion: The economic burden of people with disabilities represented a huge economic burden, and the estimate cost was 0.85% of the Korean gross domestic product in 2011. Owing to the rapidly aging population in Korea, the number of people with disabilities and related costs are expected to increase. Therefore effective health management programs are necessary to reduce the economic burden of people with disabilities in Korea.

뇌신경재활

게시일시 및 장소 : **2017 년 4 월 21 일 13:00-18:30, 3 층 로비 / 질의응답 일시 및 장소 : 2017 년 4 월 21 일 15:00-15:40, 3 층 로비**

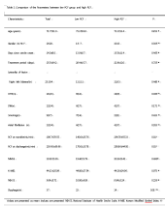
초록순서 : **17** 형식 : **Poster**

The Peak Cough Flow as Promising Early Predictor in Acute Stroke Patients.

Jun Ho Shin[1*], Tae Sik Yoon[1†], Ga Hee Park[1], Jun Hee Lee [1]

, college of Medicine, Ewha Woman's University, Department of Rehabilitation Medicine[1]

Objective: To investigate peak cough flow(PCF) as the predictor improvement of the clinical outcome in acute ischemic stroke patients.
Methods:
We reviewed 206 patients and 46 in the analysis. They were transferred to the rehabilitation department within 30 days from onset and who underwent PCF measurements. They were classified into two groups according to the level of PCF (low <160mL/min or high ≥160mL/min).
Both group underwent comprehensive rehabilitation programs pulmonary rehabilitation. Neurological impairment and functional status were evaluated using the National Institutes of Health Stroke Scale (NIHSS) , Korean version of Mini-Mental State Examination (MMSE-K) and Korean version of Modified Barthel Index (K-MBI) at transfer. K-MBI were used to measure the functional clinical outcome at discharge.
Results:
No statistically significant differences were found in the age, gender, risk factors of stroke, K-MBI, NIHSS and MMSE-K at transfer between two groups. Both groups showed significant improvement of K-MBI at discharge . The degree of Improvement of K-MBI in the high PCF group was significantly higher than that in low PCF group (p<0.01). The PCF positively correlates with initial stroke severity and negatively correlate with K-MBI at transfer.
Conclusion: Among patients with acute ischemic stroke, improvement of functional outcome significantly higher in in high PCF group than low PCF. Our study found that PCF emerged as one of the predictors of good clinical outcomes in short-term period.



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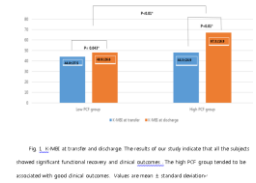
Comparison of the Parameters between low PCF group and high PCF



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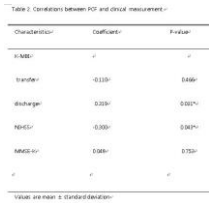
1 K-MBI at transfer and discharge. The results of our study indicate that all the subjects showed significant functional recovery and clinical outcomes . The high PCF group tended to be associated with good clinical outcomes.



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Correlations between PCF and clinical measurement.

심폐재활

게시일시 및 장소 : **2017 년 4 월 21 일 13:00-18:30, 3 층 로비 / 질의응답 일시 및 장소 : 2017 년 4 월 21 일 15:00-15:40, 3 층 로비**

초록순서 : **63** 형식 : **Poster**

Effects of High-Intensity Interval Training on the Cardiac Rehabilitation in the Elderly Patients

Kwang Min Lee[1*], Ji Hee Kim[1†]

Wonkwang University School of Medicine, Department of Rehabilitation Medicine[1]

Objectives
To investigate the effect of high-intensity interval training (HIIT) on the outcomes of cardiac rehabilitation (CR) in elderly patients and young patients after myocardial infarction (MI)

Methods
From January 2015 to December 2015, we retrospectively reviewed the medical records of the patients who received HIIT through the outpatient clinic. A total of 15 patients were enrolled, 6 of whom were the elderly (≥55 year) and 9 were the younger (<55 year). The HIIT program was composed of 10 minutes of warm-up, 30 minutes of interval aerobic exercise, and 10 minutes of cool-down. The interval aerobic exercise consisted of 3-minute usual intensity work phase (60-70% of heart rate/VO2 reserve) and 4-minute of high-intensity work phase (70-90% of heart rate/VO2 reserve). Exercise capacity was measured by symptom-limited exercise tests before and after hospital-based CR.

Results
All 15 patients were male and the mean age of the overall patients was 53.4±9.2 years. The mean age of the younger (<55 year) group was 47.2±4.2 years, and that of elderly group (≥55 year) was 62.7±6.3 years. Between before and after HIIT, resting heart rate and submaximal rate pressure product at stage 3 were significantly decreased and metabolic equivalent tasks, peak oxygen consumption and maximal oxygen pulse were significantly increased in the elderly group. In comparison of the percent changes in the exercise capacity before and after HIIT, there was no significant difference between the two groups (Table 1).

Conclusions
There was significant improvement on exercise capacity in the elderly group after HIIT. The degree of improvement in cardiopulmonary exercise capacity after HIIT between the elderly group and the younger group was similar. For improving cardiac function, active interventions in possible elderly groups are necessary.

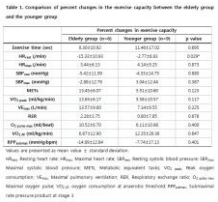

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Table 1. Comparison of percent changes in the exercise capacity between the elderly group and the younger group

통증 및 근골격재활
게시일시 및 장소 : **2017 년 4 월 21 일 13:00-18:30, 3 층 로비 / 질의응답 일시 및 장소 : 2017 년 4 월 21 일 18:00-18:30, 3 층 로비**
초록순서 : **C44** 형식 : **Poster**

Sinuvertebral Nerve Block for the Management of Low Back Pain which Unresponsive to Epidural block

Seungmin Lee[1*], Kyoung ho Shin[1†]

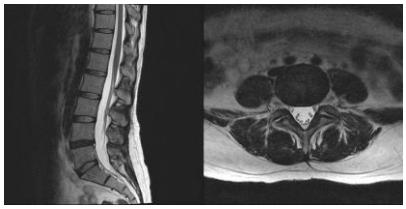
Nanoori Hospital Suwon, Non Operative Treatment & Rehabilitation Center[1]

Epidural nerve block is commonly performed to treat chronic low back pain because of lumbosacral disc herniation. But, 39 % of chronic low back pain is known to be caused by internal disc disruption and a considerable number of patients do not response using epidural nerve block. Sinuvertebral nerve block (SVNB) is an alternative technique of discography for lumbar discogenic pain and it showed good relief of pain and physical restriction. Discogenic pain in internal disc disruption is presumed to result from nociceptive ingrowth into annular fissures and sinuvertebral nerves and its branches are main afferent pathways for discogenic pain. Discography is a standard test to diagnose discogenic pain. It is also helpful to reduce pain, as reported by the analgesic discography of 80% of painful intervertebral discs, but it also has the disadvantage of accelerating the progression of disc degenerations. So, SVNB may be an alternative useful tool in diagnosis as well as in treatment for lumbar discogenic pain. We hypothesized that SVNB would manage chronic pain unresponsive to epidural nerve block.

 We retrospectively describe a series of nine patients with internal disc disruption or disc degeneration confirmed by magnetic resonance imaging (MRI) (Fig. 1) who had undergone an epidural nerve block but had not significant relief. These patients were performed SVNB using the lidocaine 0.5% 2cc and dexamethasone 2.5mg for each block under CT guidance. (Fig. 2) We recorded the Numeric Rating Scale for back pain (NRS back) and Oswestry Disability Index (ODI) at pretreatment, 1 week, and 4 weeks after treatment.

 Significant decrease in NRS back and improvement in ODI were observed in 8 out of 9 patients at 1 week and 4 weeks after the SVNB. The mean NRS back changed from 6.9±1.04 (median 7) to 2.3±1.09 (median 2) at 1 week after and 2.9±1.57 (median 3) at 4 weeks after the treatment. The mean ODI changed from 31.8±4.09 (median 31.1) to 13.8±6.72 (median 8.89) at 1 week and 16.8 ± 7.57 (median 11.1) at 4 weeks.

 In conclusion, SVNB showed an effective outcome for chronic low back pain which was not responding to epidural nerve block. In the future, the long-term stability and the effect of pain control of SVNB should be studied.



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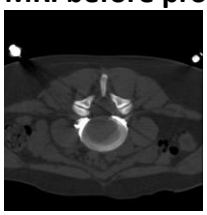
MRI before procedure



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After needle insertion, the contrast agent is injected and spread well over the fiber under CT guide

The effect of 3-D balance trainer on balance and cognitive function in subacute stroke patients

Sung Hoon Kim[1†], Jin Park[1*], Ji Hyun Kim[1], Tae-jun Park[1], Hi Chan Lee[1], Ji Yoon Jang[1]

Wonju Severance Christian Hospital, Department of Rehabilitation Medicine[1]

Objective: To investigate the efficacy of 3-D Balance trainer on the balance control, gait, and cognitive function in subacute stroke patients.
Methods: Thirty-five subacute stroke patients were included in this study. The balance control study group (n=18) was trained with 3-D balance trainer for 30 minutes daily, 5 days a week for 3 weeks, and received 30-min daily session of conventional physical therapy. The control group (n=17) received daily conventional physical therapy for the same amount of time. The primary outcome measurement was Berg Balance Scale (BBS), while secondary outcome measures were evaluated by 10-meter walking test, 6-minute walking test (6mWT), and Timed Up and Go (TUG) test. All outcome measures were evaluated before the training and 3 weeks, 5 weeks after the training in both groups.
Results: Both study and control groups showed statistically significant increase in Berg Balance Scale and 6-min walking test at 3 weeks, 5 weeks after treatment. The balance control training group showed significantly greater improvements compared to the control group. Timed Up and Go test and 10-meter walking test also showed statistically significant decrease, with no significant difference between the two groups. As for cognitive function and ADL assessments, MMSE, GDS, K-MBI all showed significant increase at 3 weeks, 5 weeks after training, and GDS showed significantly greater improvements in the training group. Quantitative EMG in biceps femoris, quadriceps showed no significant difference in both groups.
Conclusion: The task-oriented balance training with the balance control trainer could be useful in the rehabilitation of subacute stroke patients, by improving not only balance and gait ability but also cognitive function in stroke patients when combined with conventional physical therapy.

뇌신경재활
게시일시 및 장소 : **2017 년 4 월 21 일 13:00-18:30, 3 층 로비 / 질의응답 일시 및 장소 : 2017 년 4 월 21 일 15:00-15:40, 3 층 로비**
초록순서 : **19** 형식 : **Poster**

Long term effect of rTMS for improving ADLs and motor function in subacute patients with stroke

Kyung Eun Nam[2*], Seong Hoon Lim[1†], Joon Sung Kim[1], Bo Young Hong[1], Bomi Sul[1]

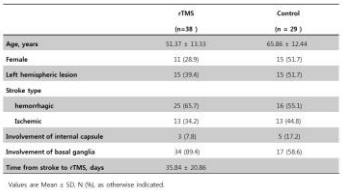
St. Vincent's Hospital, College of Medicine, The Catholic University of Korea, Department of Rehabilitation Medicine[1], Yeouido St. Mary's Hospital, College of Medicine, The Catholic University of Korea, Department of Rehabilitation Medicine[2]

Introduction
Stroke is the cause of motor impairment and long-term neurologic disability. Functional recovery after stroke is associated with neural plastic change in the brain. According to the concept of interhemispheric competition, cortical excitability are decreased in the affected hemisphere, whereas excitability in the unaffected hemisphere is enhanced. Repetitive transcranial magnetic stimulation (rTMS) is noninvasive method that modulates cortical excitability between the hemispheres and may facilitate motor function after stroke. In the current study, we assess the long term effect of rTMS to reduce impairment in activities of daily living (ADLs) and motor function in subacute patients with stroke.

Methods
A total of 67 patients with subacute stroke (mean age, 57.64±14.75) hospitalized for post-stroke rehabilitation were reviewed. We divided into two groups: rTMS group (38 patients) and control group (29 patients). The rTMS group received 10 Hz rTMS over the primary motor cortex of the affected hemisphere for 10 days with a daily dose of 1000 pulses of subthreshold. All patients received a standard physical therapy. For evaluation of disability, we used the Modified Barthel index (MBI). For evaluation of motor function, we used hand function categorized as 6 grade (0, 1, 2, 3, 4 and 5), Functional ambulation classification (FAC) and Medial Research Council (MRC) scale of affected arm. The differences in outcome between groups at before treatment, and 3 and 6 months after stroke were investigated using a linear mixed model, which made it possible to include all patient events in the analysis even if there were some missing variables.

Result
The demographic characteristics of the patients are shown in table 1. All of the rTMS group tolerated rTMS well without any adverse effects. During follow up, improvement in all functional assessment across time was observed in both groups. Regarding all functional assessment, the effect of time from baseline to 6 month was observed on linear mixed model analysis ($p < 0.01$, all assessment). Control group had consistently higher values compared with rTMS group regarding hand function and MRC grade of arm, on the other hand, rTMS group had consistently higher values compared with control group regarding MBI and FAC (Figure1). The time × rTMS treatment interaction effect was not found on linear mixed model analysis.

Conclusion
rTMS treatment was not associated with clinically meaningful improvement on ADLs and motor function in subacute patients with stroke.



	rTMS (n=38)	Control (n = 29)
Age, years	51.37 ± 13.33	65.86 ± 12.44
Female	11 (28.9)	15 (51.7)
Left hemispheric lesion	15 (39.4)	15 (51.7)
Stroke type		
hemorrhagic	25 (65.7)	16 (55.1)
Ischemic	13 (34.2)	13 (44.8)
Involvement of internal capsule	3 (7.8)	5 (17.2)
Involvement of basal ganglia	34 (89.4)	17 (58.6)
Time from stroke to rTMS, days	35.84 ± 20.86	

Values are Mean ± SD, N (%), as otherwise indicated.

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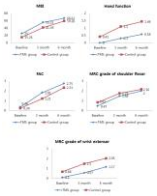
Demographic and clinical characteristics in the two groups



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Functional assessment across time in the two groups

통증 및 근골격재활
게시일시 및 장소 : **2017 년 4 월 21 일 13:00-18:30, 3 층 로비 / 질의응답 일시 및 장소 : 2017 년 4 월 21 일 18:00-18:30, 3 층 로비**
초록순서 : **C45** 형식 : **Poster**

Extensor tendon rupture in non-rheumatic hand : clinical similarity with radial neuropathy

Sora Baek[1*†], Hee-won Park[1], Gowun Kim[1]

Kangwon National University Hospital, Department of Rehabilitation Medicine[1]

The author reports a case of progressive weakness of finger and wrist extension who was finally diagnosed as tendon rupture. A 68-year-old man presented with weakness in right 4th to 5th finger extension since 1 year ago and weakness in right 3rd finger extension and right wrist dorsiflexion since 3 weeks ago. He did not complain of sensory disturbance or pain around the hand and the wrist. In inspection of dorsal surface of wrist, the ulnar head was prominently observed. Radial neuropathy was clinically suspicious and referred for electrophysiologic diagnosis. In electromyography, there wat no evidence of radial neuropathy. Ultrasonography and magnetic resonance imaging revealed rupture of extensor tendons at the wrist. X-ray showed positive ulnar variance and dorsal subluxation of ulnar head. Intraoperative findings showed that total rupture extensor digitorum communis tendons to 3rd to 5th digits, extensor digiti minimi tendon and extensor carpi ulnaris tendon in association with osteoarthritis of distal radioulnar joint. Repair was accomplished by side-to-side repair to adjacent intact tendon. Tendon rupture in non-rheumatic hand is rare and has clinical features somewhat resembling the radial neuropathy which is weakness of finger extension without sensory disturbance, more frequent involvement of ulnar side tendons, and sometimes progressive pattern of weakness. To differentiate the cause of hand weakness, history of wrist arthritis or wrist pain could be helpful in diagnosis, and both electromyography for evaluation about radial neuropathy and imaging study for evaluation about tendon rupture would be needed.

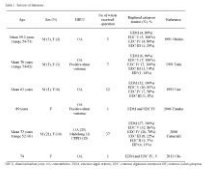

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Table 1. Review of literature

뇌신경재활

게시일시 및 장소 : **2017 년 4 월 21 일 13:00-18:30, 3 층 로비 / 질의응답 일시 및 장소 : 2017 년 4 월 21 일 15:00-15:40, 3 층 로비**

초록순서 : **20** 형식 : **Poster**

Differences in VFSS Findings According to the Etiology of Dysphagia

Ja Ryung Yang[1*], Hea Eun Yang[1†]

Veterans Health Service Medical Center, Department of Physical medicine and Rehabilitation[1]

Introduction
Dysphagia is a dysfunction of swallow function and relatively common disease with approximately 33.7% prevalence rate among age group of 65 years old or over in Korea. Many of cause of dysphagia are brain disorder or neurodegerative disease. But, dysphagia caused by conditions other than brain disorder or neurodegenerative disease is considerable in number. Nevertheless, for the patients without brain disorder or neurodegenerative disease, dysphagic sign is easy to be ignored. Therefore the aim of this study was to investigate if there are any differences in videofluoroscopic swallowing study (VFSS) finding between the patients with brain disorder or neurodegenerative disease and without brain disorder or neurodegenerative disease.

Material & Method
Retrospective chart reviews were completed on 311 dysphagic patients undergoing the VFSS from April 2015 to January 2017. They were divided into two groups according to the presence or absence of brain disorder or neurodegenerative disease(patients with brain disorder or neurodegenerative disease; group Ⅰ(n=236), patients without brain disorder or neurodegenerative disease; group Ⅱ(n=75)). Dementia was classified to group II since it is not recognized as definite cause of dysphagia in current situation.
Penetration-Aspiration Scale (PAS), Videofluoroscopic dysphagia scale (VDS) were evaluated based on the VFSS by one experienced rehabilitation physician.
PAS is 8-point scoring system that reflect abnormalities of pharyngeal phase.
VDS is 100-point scoring system and composed with oral(40) and pharyngeal(60) score. We analyzed oral score, pharyngeal score and total score separately.

Results
Among the all patients who complained dysphagia, 24.1% of patients did not have brain disorder or neurodegenerative disease(Figure 1). Of the general characteristics of two groups, age and duration showed statistically significant differences. ; Group Ⅰ is younger and have longer duration of dysphagia than group Ⅱ. But, sex and K-MMSE didn`t show statistically significant differences (Table 1).
In the PAS, VDS-oral, VDS- pharyngeal and VDS-total, there were no statistically significant differences between the two groups. (Table 2).

Discussion & Conclusion
This study found that a significant number of patients who complained dysphagia had no brain disorder or neurodegenerative disease and their dysphagia was severe as dysphagia of brain disorder or neurodegenerative disease on the basis of VFSS findings.
Therefore, more assertive evaluation and treatment should be carried out regardless of the existence of brain disorder or neurodegenerative disease.

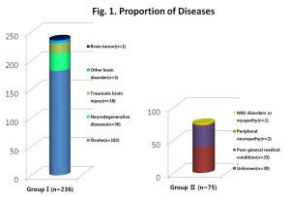

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Figure1. Proportion of diseases

Table 1. General characteristics of the two groups

Characteristics	Group Ⅰ	Group Ⅱ	p-value
Sex	male 215 (91.1%)	male 65 (86.7%)	0.264
Age (years)	74.31±11.15	77.92±8.82	0.010*
K-MMSE	16.42±9.21	17.03±8.70	0.665
Duration from onset (months)	15.69±22.95	10.66±17.09	0.036*

Values are presented as mean±standard deviation
K-MMSE, Korean version of Mini-Mental State Examination
*p<0.05

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Table 1. General characteristics of the two groups

Table 2. VFSS findings of the two groups

Scale	Group Ⅰ (n=236)	Group Ⅱ (n=75)	p-value
PAS	4.14±2.78	3.77±2.88	0.273
VDS-oral	3.68±5.13	3.14±4.87	0.149
VDS-pharyngeal	22.20±13.50	20.80±14.51	0.445
VDS-total	25.89±15.75	23.94±17.25	0.328

Values are presented as mean±standard deviation
PAS, Penetration-Aspiration Scale
VDS, Videofluoroscopic Dysphagia Scale
*p<0.05

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Table 2. VFSS findings of the two groups

신경근육재활 및 전기진단
게시일시 및 장소 : **2017 년 4 월 21 일 13:00-18:30, 3 층 로비 / 질의응답 일시 및 장소 : 2017 년 4 월 21 일 18:00-18:30, 3 층 로비**
초록순서 : **C29** 형식 : **Poster**

A variant of anterior interosseous nerve syndrome confirmed by MR imaging and EMG: Two cases

In Soo Kim[1*], Il-Young Jung[2†]

Seoul National University Hospital, Department of Rehabilitation Medicine[1], Chungnam National University Hospital, Department of Rehabilitation Medicine[2]

Introduction: Anterior interosseous nerve (AIN) syndrome is rare and has complex clinical presentations. The anatomical variation of proximal median nerve has been reported and should be recognized before identifying the lesion of AIN.
Methods: We report two similar cases of AIN variants who presented with hand weakness and preceding pain. To confirm the denervated muscles and compression causes of the proximal median nerve at the forearm, electromyography and magnetic resonance imaging (MRI) were performed.
Results: Electrodiagnostic study was suggestive of injury of proximal median nerve including AIN. However, there are no abnormal findings in the median sensory nerve and abductor pollicis brevis. Denervation of muscles innervated by proximal median nerve was observed in MRI.
Conclusion: Uncommonly, AIN variant innervates muscles dominated by proximal median nerve. It is necessary to carry out the examination with the above possibilities, and additionally to confirm lesions of whole median nerve fascicles through MRI.

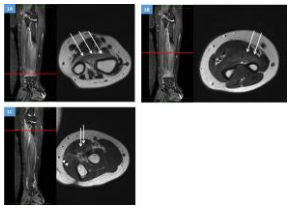

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Figure 1 : T2-weighted images demonstrates abnormal signal intensity in the pronator quadartus (A, arrow), flexor digitorum profundus (2nd, 3rd), flexor pollicis longus(B, arrow), pronator teres (C, arrow) and flexor digitorum superficialis (C, arrowhead). However, there was no demonstrable space-occupying mass around the elbow and forearm.

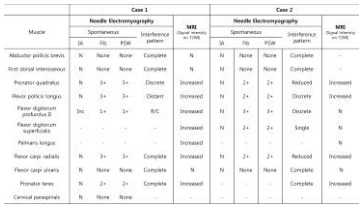

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Table 1 : Needle Electromyography Results & Magnetic Resonance Imaging Findings

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게시일시 및 장소 : **2017 년 4 월 21 일 13:00-18:30, 3 층 로비 / 질의응답 일시 및 장소 : 2017 년 4 월 21 일 18:00-18:30, 3 층 로비**
초록순서 : **C30** 형식 : **Poster**

Rare Case of Thoracic Myelopathy with Spinal Arteriovenous Fistula

Hye Hoon Choi[1*], So Yeon Jun[1], Bomi Sul[1], Bo Young Hong[1], Seong Hoon Lim[1], Joon-Sung Kim[1†]

St. Vincent's hospital, College of Medicine, The Catholic University of Korea, Department of Rehabilitation Medicine[1]

Introduction
Spinal arteriovenous fistula (AVF) is very rare disease. Spinal AVF commonly occur in male older than 50 years. If not treated properly, spinal AVF cause progressive and devastating neurologic deficit. There may be time lag from symptom onset to diagnosis of spinal AVF, because it is very rare and symptom is mimicking other common spinal disease. For treatment of spinal AVF, there are two options. Surgical clipping and endovascular embolization of AVF.
Case report
A 74-year-old male visited to the department of rehabilitation medicine in March, 2015. The patient had been treated with hepatocellular carcinoma with surgical resection in 2014, chemotherapy and trans-hepatic arterial chemoembolization (TACE) in 2014 and 2015. Since June 2014, patient experienced slowly progressed bilateral lower limbs weakness, constipation, frequency and residual urine sensation. On spinal MR in April 2014, there was thoracic myelopathy and lumbar spinal stenosis, L1-L2.
 When the patient came to clinic, lower extremities motor power grades were grossly fair, and had difficulty with walking alone, so walked with walker and used wheel chair for locomotion. Light touch or pain sensation were impaired below both knees. Frequently had voiding, about 100-200cc for each times, and post-voiding residual urine was about 200cc. There were decreased deep tendon reflexes on both knees, ankles.
 On follow up spinal MR in March 2015. previous thoracic myelopathy and spinal stenosis of L1-L2 were still noticed. On EMG, there were diffuse paraspinalis muscles denervation potentials and diffuse bilateral lower limb muscle denervation potentials, below L2 myotomes. This finding was compatible with cauda equine syndrome involving below L2 root levels (Table 1). However, thoracic spinal cord myelopathy was also persistent. Another spinal MR taken in March 2015 showed serpentine pattern signal on posterior aspect of spinal cord, suggesting spinal AVF (Figure 1). Diagnosis was confirmed with spinal angiography (Figure 2), and surgical clipping was done on April 2015, but L1-L2 spinal stenosis was not surgically decompressed. Patient had been received rehabilitation treatment since then, showing some degree of recovery.
Conclusion
 Considering symptom relief after AVF surgery, paraplegia and bladder symptoms may be caused by thoracic myelopathy. However, there was no definite upper motor neuron sign, so cauda equine syndrome also could be cause of symptoms. Perhaps, both were cause of paraplegia.
 This case showed that it is important physicians should consider other possibilities when proper management for diagnosis did not work.

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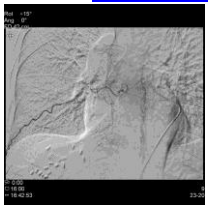

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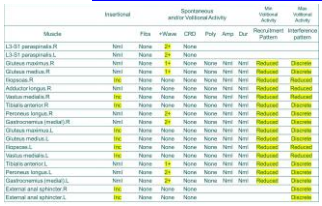

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뇌신경재활

게시일시 및 장소 : **2017 년 4 월 21 일 13:00-18:30, 3 층 로비 / 질의응답 일시 및 장소 : 2017 년 4 월 21 일 15:00-15:40, 3 층 로비**

초록순서 : **23** 형식 : **Poster**

The Effect of Body Weight Supported Overground Walking Training in Chronic Stroke Patients

Ji Hyun Kim[1*], Jae Young Han[1†], Pyoung Yop Kim[1], Min Keun Song[1], Hyung Kyu Park[1], In Sung Choi[1]

Chonnam National University Hospital , Department of Physical & Rehabilitation Medicine, Regional Cardiocerebrovascular Rehabilitation Center[1]

Objective: Up to now, little has been known about the effects of body weight supported overground walking training (BSOWT). Most studies concerning body weight support (BWS) have been about the effect of BWS treadmill training (BWSTT). However, favorable outcomes derived from BWSTT have limited feasibility to actual improvement of gait pattern in daily life due to the differences between treadmill walking and overground walking. Therefore, this study aimed to investigate the effect of BSOWT on walking velocity and, if any, to find out the reason for the change of walking velocity in chronic stroke patients.
Methods: A single blind randomized controlled trial was conducted at a single rehabilitation center. Forty chronic stroke patients, who were able to walk 10 m independently without any walking assistance devices, were randomized to either BSOWT group or conventional gait training (CGT) group. Thirty-minute walking interventions (CGT or BSOWT) were administered three times a week for six weeks. Both groups performed five types of gait training (comfortable walking, fast walking, transition, picking up an object from the floor and changing directions) under the supervision by a physical therapist. To identify the effects of BSOWT, 10-meter walking test (10MWT), timed up and go test (TUG), balance function test using 3D dynamic posturography and gait analysis using 3D motion analysis system were performed before and immediately after the end of intervention. Manual muscle test (MMT), Modified Ashwarth Scale (MAS) and Korean version of Modified Barthel Index (K-MBI) were also assessed.
Results: Twenty nine patients of the subjects completed all the study protocol. 10MWT and TUG showed significant improvement only in the BSOWT group. There were no significant changes in MMT and MAS of the affected side and K-MBI in both groups. The ratio of stance phase and single support phase of the affected side, which means the degree of asymmetry of walking, was improved significantly only in experimental group. On the balance function test, peri-meter with eye closed showed significant improvement, but peri-meter with eyes open was not significant.
Conclusion: Although muscle strength and spasticity did not change significantly, walking velocity was significantly improved with BSOWT. Improvement of walking velocity is probably related to the improvement of gait asymmetry and balance function such as proprioception. Therefore, BSOWT might be adopted as an effective and promising strategy for gait rehabilitation in chronic stroke patients.
Key Words: Stroke, Rehabilitation, Gait, balance, gait training

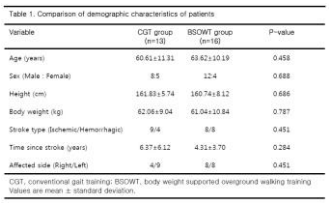

Table 1. Comparison of demographic characteristics of patients

Variable	CGT group (n=13)	BSOWT group (n=16)	P-value
Age (years)	60.61±11.31	63.62±10.19	0.458
Sex (Male : Female)	8:5	12:4	0.688
Height (cm)	161.83±5.74	160.74±8.12	0.686
Body weight (kg)	62.08±9.04	61.94±10.84	0.787
Stroke type (Ischemic/Hemorrhagic)	9/4	8/8	0.451
Time since stroke (years)	6.37±6.12	4.31±3.70	0.284
Affected side (Right/Left)	4/9	8/8	0.451

CGT, conventional gait training; BSOWT, body weight supported overground walking training
Values are mean ± standard deviation.

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Table 1. Comparison of demographic characteristics of patients

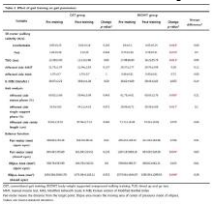

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Table 2. Effect of gait training on gait parameters of patients with chronic stroke

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Fig 1. This figure showed the picture of participants undergoing gait training. (A) conventional gait training(CGT), (B) body weight-supported overground walking training(BSOWT)

뇌신경재활
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초록순서 : **21** 형식 : **Poster**

Amantadine Facilitates the Effects of tDCS in Repetitive mTBI Rat Model.

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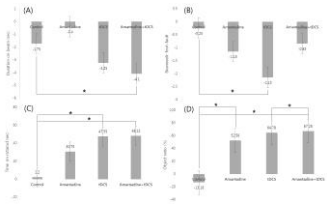
School of Medicine, Ewha Womans University, Department of Rehabilitation Medicine[1]

The aim of this study was to compare the effects of amantadine alone treatment, transcranial direct current stimulation (tDCS) alone treatment and combination of amantadine and tDCS treatment in rats that repetitive mild traumatic brain injury (mTBI). We hypothesized that combination therapy of amantadine and tDCS would improve behavioral and motor function more than either treatment alone.

 Forty repetitive mTBI rats (4-week-old Sprague-Dawley rats) were divided into 1 of 4 groups: a control group that did not undergo additional treatment; an amantadine group that received intraperitoneal injections of amantadine alone (10mg/kg); a tDCS group that underwent tDCS alone (0.2mA for 30minutes on left motor cortex); and an combination of amantadine and tDCS (amantadine+tDCS) group that underwent amantadine injections and tDCS (n= 10 in each group). Each treatment began on the first day after repetitive mTBI and continuing for 4 days. All evaluations were repeated: 24 h after repetitive mTBI (pre-treatment); and after completing treatments (post-treatment). Behavioral studies, such as beam walk, rota-rod and novel object recognition tests were performed, and motor-evoked potential (MEP) study was conducted. After all evaluations, brains of all rats were removed and stained with antibody against glial fibrillary acidic protein (GFAP), and integral intensity of GFAP was calculated. To compare the treatment effects in each group, the differences between pre- and post-treatment were first calculated for each group, these were then compared among the groups.

All treatment groups showed improvement in one or more behavior tests, compared with control group, especially in combination group. Compared with control group, combination treatment group exhibited a significant increase in time on rotarod (p = 0.01), a significant increase in the novel object recognition ratio (p = 0.00), and a tendency for an increase in MEP amplitude (p=0.05). Also, they showed a significant increase in the novel object recognition ratio compared with the tDCS group (p = 0.04) (Fig. 1, Fig. 2). In GFAP immunostaining of both motor cortex and hippocampus, the integral intensity was lowest in the combination treatment group, followed by the amantadine group, the tDCS group and, finally, the control group (Fig. 3).

Results of the present study suggested that amantadine and tDCS have a beneficial effect on behavioral and cognitive recovery in a repetitive mTBI rat model. In particular, it showed that performing both treatments simultaneously appeared to be more effective than using only one of the two treatments. Amantadine acts as an N-methyl-D-aspartate receptor antagonist, protecting from neural death and reducing neural damage after mTBI, while tDCS contributes to behavioral recovery by increasing excitability in the motor cortex. We expected that the combined amantadine and tDCS therapy may be considered as a promising treatment option in the repetitive mTBI patients.



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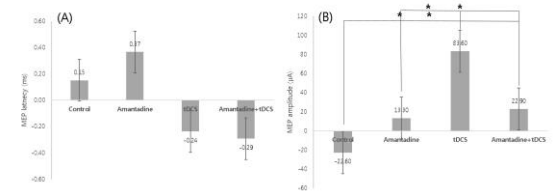
Comparison of calculated differences between pre- and post-treatment in behavioral tests. (A) Combination of amantadine and tDCS group showed significant decreased duration on crossing beam, compared with control group (p<0.05). (B) tDCS significantly decrease bealwalk foot-fault than control group (p<0.05). (C) tDCS group and combination group significantly stayed longer time on the rotarod roller (p<0.05). (D) In novel object recognition test, amantadine and combination group showed higher object ration than control group. The combination group had higher ratio than tDCS group.



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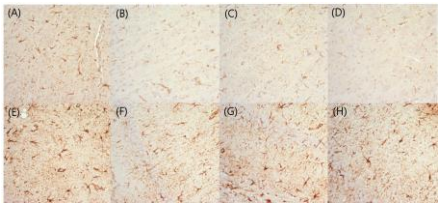
Comparison of calculated differences between pre- and post-treatment in motor evoked potential test. (B) MEP amplitude was increased in tDCS and combination of amantadine and tDCS groups, compared with control and amantadine groups. (A) There was no significant change in the aspect of MEP latency.



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Representative photographs of the cerebral motor cortex and hippocampus with GFAP immunostain labeling. ((A)-(D): motor cortex, (E)-(H): hippocampus, (A, E): control group, (B, F): amantadine group, (C, G): tDCS group, (D, H): combination of amantadine and tDCS group, x 200 magnification). The calibration bar is 100 µm.

노인재활

게시일시 및 장소 : **2017 년 4 월 21 일 13:00-18:30, 3 층 로비 / 질의응답 일시 및 장소 : 2017 년 4 월 21 일 15:00-15:40, 3 층 로비**

초록순서 : **2** 형식 : **Poster**

Relationship between Sarcopenia and Cardiopulmonary Fitness in Elderly

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Wonkwang University, School of Medicine, Department of Rehabilitation Medicine[1]

Purpose: The purpose of this study was to investigate the relationship between sarcopenia and cardiopulmonary fitness in elderly.

Methods: This study was designed as a cross-sectional, case controlled study. A total of 47 healthy participants were recruited for 2 consecutive years from February 2015. The body mass index, skeletal muscle mass, body fat mass were measured by bioelectrical impedance analysis. All of the subjects were divided into the sarcopenia and the control group based on skeletal muscle mass index (SMI). Cardiopulmonary fitness encompassing aerobic capacity, cardiovascular, and ventilator responses was assessed by exercise tolerance test (ETT) using Bruce protocol.

Results: Of the 47 subjects, 37 were males and 10 were females and the mean age of the patients was 63.9 ± 3.8 years. Sarcopenia was diagnosed in 36.1% (n=17) of the participants and the SMI was significantly decreased in experimental group (8.2±0.6 kg/m2) compared with control (10.6±0.9 kg/m2). Correlation analysis revealed that SMI was significantly related with the maximal oxygen uptake (VO2max, R=0.637, p<0.01), heart rate (HRmax, R=0.413, p<0.05), minute ventilation (VEmax, R=0.542, p<0.05), and tidal volume (Vtmax, R=0.462, p<0.05). Also, the sarcopenia was significantly associated with the HRmax (R2=0.389, p=0.001) and VO2max (R2=0.381, p<0.05) after multivariate analysis.

Conclusion: Sarcopenia had relevance to cardiopulmonary fitness and proper management for the sarcopenia should be considered to improve cardiopulmonary fitness in elderly.

재활보조기구
게시일시 및 장소 : **2017 년 4 월 21 일 13:00-18:30, 3 층 로비 / 질의응답 일시 및 장소 : 2017 년 4 월 21 일 15:00-15:40, 3 층 로비**
초록순서 : **70**　　형식 : **Poster**

Usability test of robot-assisted gait training systems with a spinal cord patient: a pilot study

Bum-Suk Lee[1†], Jung Ah Lee[2*], Eun Joo Kim[1], Sung-Phil Yang[1], Han Ram Pak[2], Hyun Choi[2], Ji Min Kim[1], Seung Hyun Kwon[1], Hyun Soo Shin[1], Hae Young Kim[1]

Korea National Rehabilitation Center, Department of Rehabilitation Medicine [1], Korea National Rehabilitation Research Institute, Department of Clinical Research on Rehabilitation[2]

Objective
Robot assisted gait training systems for patients with spinal cord injury have been developed continuously. However, usability test of these systems has not been conducted for the users. The purpose of this study was to compare four robot-assisted gait training system for a patient with spinal cord injury.

Methods
A 31-year-old man with spinal cord injury (T8/T8 SCI, ASIA Impairment Scale-A) was recruited. The usability of the robot-assisted gait training systems was tested using exo-skeletal (Lokomat, Walkbot) and end-effector (Morning walk, GEO) type robots. The patient had 3 training sessions for each type of the 4 robot-assisted gait training systems. The usability test was formed through consultations with experts on usability assessment. The content of the usability test was based on safety, efficiency, and satisfaction according to ISO standards. The usability test was evaluated by a questionnaire constructed by the investigator which included 3 categories of safety(6), efficiency(7), and satisfaction(7). The 5-point Likert scale was used for each (1-very dissatisfied, 2-somewhat dissatisfied, 3-neither satisfied nor dissatisfied, 4-somewhat satisfied, 5-very satisfied).

Result
For all 4 robot-assisted gait training systems, the average score of safety was 3.6, efficiency 3.0, and satisfaction 3.8. For Lokomat, mean saftey score was 3.5, efficiency 3.0, and satisfaction 3.4. while for Walkbot, mean saftey score was 3.8, efficiency 3.1, and satisfaction 4.0. For Moring walk, mean saftey score was 3.7, efficiency 3.1, and satisfaction 4.0, and as for GEO,mean saftey score was 3.5, efficiency 2.9, and satisfaction 3.6. The patient did not report any adverse events when using the 4 robot-assisted gait training systems.

Conclusion
In this pilot study, the patient was satisfied with the ‘safety’ and ‘satisfaction’ of the 4 robot-assisted gait training systems, but the ‘efficiency’ was not satisfactory. The patient suggested that the Walkbot system was better than others in terms of safety, and Walkbot and Morning walk systems were better than others in efficiency and satisfaction. Through the usability test, we found that each of 4 robot-assisted gait training systems had its own advantages. Therefore, it is necessary to use robot-assisted gait training systems according to the level of injury and severity of injury of the spinal cord patient. Further research should be concucted with a larger sample sizes to explore the generalizability of our finding.

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Table1. Usability test for robot-assisted gait training systems

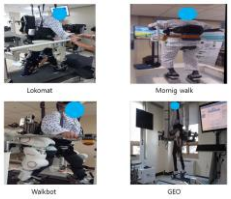

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Fig1. The 4 robot-assisted gait training systems

척수재활

게시일시 및 장소 : **2017 년 4 월 21 일 13:00-18:30, 3 층 로비 / 질의응답 일시 및 장소 : 2017 년 4 월 21 일 15:00-15:40, 3 층 로비**

초록순서 : **80** 형식 : **Poster**

The Effect of Gait Training Using End-Effector Type Robotic Device in Patients with Incomplete SCI

Ha Ra Jeon [1†], Seong Woo Kim[1], Jang Woo Lee[1], Da Wa Jung[1], Sang Yoon Lee[1*]

National Health Insurance Service Ilsan Hospital, Department of Physical Medicine and Rehabilitation[1]

The Effect of Gait Training Using End-Effector Type Robotic Device in Patients with Incomplete Spinal Cord Injury

Ha Ra Jeon, Seong Woo Kim, Jang Woo Lee, Da Wa Jung, Sang Yoon Lee

Introduction

Recovery of walking ability is a major goal in patients with spinal cord injury (SCI). To regain walking ability, various treatments were undertaken to assist gait training including robotic-assisted gait training (RAGT). There were two types of robotic-assisted gait training devices: exoskeleton type and end-effector type. A few clinical researches were published whether RAGT had benefits to improve walking ability or not in patients with SCI. However many of these studies were done using exoskeleton type. There was few study using end-effector type robotic device in SCI patients. In this study, we reported the effect of gait training using end-effector type robotic device in patients with incomplete SCI.

Subjects & Methods
Among SCI patients who had been hospitalized our clinic from September 2015 to Febuary 2017, 21 SCI patients who were classified as ASIA impairment scale (AIS) grade C or D were enrolled. All participants were assessed ASIA impairment scale, Spinal Cord Independence Measurement III (SCIM-III), the walking index for spinal cord injury version II (WISCI-II) and SCI functional ambulation inventory (SCI-FAI) before and after RAGT.

Results
The stubjects consisted of 14 male and 7 female and the mean age was 64.6 years. Subjects received RAGT on 24 times. Comparing baseline, ASIA motor score and lower extremity motor subscore, SCIM-III, mobility domain of SCIM-III, WISCI-II and SCI-FAI were improved after RAGT. All outcome measures except ASIA sensory subscore were improved significantly after RAGT.

Conclusion
This study showed RAGT using end-effector type device has benefit to improve walking ability in SCI patients. End-effector type robotic device can be considered as one of gait training tools to recover gait function in patients with SCI.

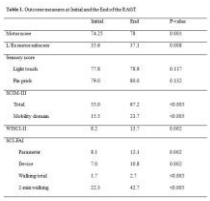

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Table 1. Outcome measures at Initial and the End of the RAGT

통증 및 근골격재활
게시일시 및 장소 : **2017 년 4 월 21 일 13:00-18:30, 3 층 로비 / 질의응답 일시 및 장소 : 2017 년 4 월 21 일 18:00-18:30, 3 층 로비**
초록순서 : **C46** 형식 : **Poster**

Eosinophilic Fasciitis Presenting as Unilateral Leg Swelling : Case report

Il Gyu Lim[1*], So Young Lee[1], Yong Min Choi[1], Du Hwan Kim[1†]

Keimyung University School of Medicine, Department of Rehabilitation Medicine[1]

Introduction
Eosinophilic fasciitis (EF) is a rare disease characterized by diffuse fasciitis with peripheral eosinophilia and progressive induration and thickening of the skin and soft tissue. A definite diagnosis of EF is usually based on histopathologic examination and a good response to systemic corticosteroid therapy is characteristic of EF. We report one patient with EF presenting unilateral leg swelling.
Case
 A 16-year-old female presented with 1-year history of progressive right leg (thigh and calf area) swelling and stiffness. She had no previous medical history and took neither medication or nor toxic oil. None of her family members had a history of similar symptoms or specific disease. On physical examination, there was tenderness and swelling on right leg with mild diffuse skin induration. Range of motion was limited in the hip flexion and knee flexion without motor weakness.
 Laboratory results revealed hypereosinophilia (725 cells/μL), but serum creatin kinase (CK), erythrocyte sedimentation rate (ESR), C-reactive protein (CRP), aldolase and serum immunoglobulin concentration were within the normal limits. Rheumatoid factor and antinuclear antibodies were negative. There was no evidence of parasitic infection. During the time of evaluation, the patient's blood eosinophil count increased to 890cells/μL. An electromyography study showed myopathic motor unit potential (MUP) recruitment pattern in the right vastus medialis and tibialis anterior (Figure 1C). A magnetic resonance imaging (MRI) of the lower limbs demonstrated hyperintense fascia on T2-weighted images (T2WI) and fascial enhancement on T1-wieghted (T1WI) gadolinium-enhanced images (Figure 1A, B). Positron emission tomography/computed tomography (PET-CT) demonstrated an increased uptake of fluorodeoxyglucose (FDG) in the fascia of the right lower limb (Figure 2A). Histopathologic examination of muscle biopsy specimens showed inflammatory infiltrates composed of lymphoplasmocytic cells (Figure 3). Based on clinical feature, MRI, PET-CT and biopsy results, we diagnosed EF.
 We started oral corticosteroids therapy (prednisolone 15mg/day). After 1 month of oral corticosteroids therapy, the right leg swelling and stiffness improved and the eosinophil count decreased from 890 to 10cells/μL. At 5 months after the start of treatment, uptake of FDG in the fascia of the right lower limb was decreased (Figure 2B). She was monitored in an outpatient clinic after cessation of therapy and no relapses were observed.
Discussion
Because EF is an unusual disorder, the diagnosis of EF might be delayed in patients presenting swelling of the unilateral leg. A proper diagnosis and therapeutic approach are critical for preventing long-term morbidity.

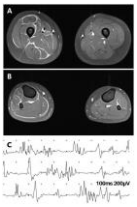

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Figure 1. T1-weighted contrast-enhanced MRI demonstrating diffuse thickening and maked enhancement along the deep fascia of the (A) right thigh and (B) calf. (C) The MUPs of right vastus medialis showing short duration and low amplitude consistent with myopathic recruitment pattern.

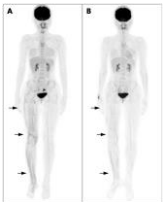

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Figure 2. (A) PET-CT showing marked uptake of FDG in the fascia of the right lower limb sparing toes. (B) After 5 months of corticosteroid therapy, follow-up PET-CT showing decreased uptake of FDG in the fascia of the right lower limb compared with previous study.

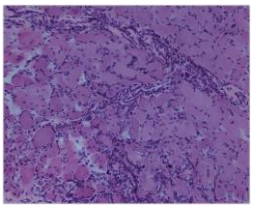

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Figure 3. The haematoxylin-eosin staining showing inflammatory infiltrates within consisting mainly of lymphocytes and plasma cells.

신경근육재활 및 전기진단
게시일시 및 장소 : **2017 년 4 월 21 일 13:00-18:30, 3 층 로비 / 질의응답 일시 및 장소 : 2017 년 4 월 21 일 18:00-18:30, 3 층 로비**
초록순서 : **C31** 형식 : **Poster**

Overlapping of MillerFisher syndrome, GuillainBarre syndrome and Bickerstaff brainstem encephalitis

Sung Jun Kim[1*], Jung Soo Lee[1], Choong Sik Chae[1], Kyoung Min Kwon[1], Yeo Hyung Kim[1†]

The Catholic University of Korea Uljeongbu St. Mary[1]

Introduction
Guillain–Barré syndrome (GBS) and its variant, Miller Fisher syndrome (MFS), exist as several clinical subtypes with different neurological features and presentations. And patients with overlapping MFS, GBS, and Bickerstaff's brainstem encephalitis (BBE) were rarely reported. We herein report a patient with an overlapping syndrome. She showed all of the clinical features of MFS, GBS and BBE, supported by cerebrospinal fluid albuminocytologic dissociation and serologic anti-GQ1b antibody. Electrophysiologic study also supported the diagnosis of GBS, showing acute motor and sensory axonal neuropathy. We discussed the clinical presentations, treatment and recovery of an overlapping syndrome of MFS, GBS and BBE, and also included a review of the literature.
Case report
A 76-year-old female was admitted as MFS with diplopia, opthalmopleigia and ataxic gait after antecedent infection. On day 3, all 4 limb weakness rapidly progressed, suggesting overlapping GBS. The deterioration of consciousness and sluggish pupil reflex started on day 5, and suggested that BBE was also overlapped. After intravenous immunoglobulins and corticosteroid therapy, she began to recover consciousness and weakness from day 18. After 6 months, she was able to open and move her eyes without difficulty and swallow food without aspiration, but cannot walk without assistance and the tracheostomy remained in place because of persistent respiratory muscle weakness.
Discussion
We report the unusual case of overlapping MFS, GBS and BBE. She was initially diagnosed with MFS given the classic triad of ataxia, ophthalmoplegia and areflexia, but she later developed limb weakness consistent with GBS on day 3. On day 5, her mental status was changed to stupor state with sluggish pupil reflex, suggesting overlapped BBE. Anti-GQ1b antibody was detected in serum sample of day 2. Electrophysiologic study revealed axonal variant of GBS. Clinical features of our patient were summarized in Table 1.
To our knowledge, 6 cases of overlapping MFS-GBS-BBE including our patient has been reported (age 20-76, M:F 2:4) since 2002, as shown in Table 2. Unsteady gait and oculomotor dysfunction were commonly observed as initial presentation. The overlap of second entity occurred within 2 weeks in all of the cases, and the overlap of third entity varied from day 5 to 42.
In summary, this overlapping case of MFS-GBS-BBE supports the recently proposed new diagnostic criteria and classification for GBS and MFS. The disease course of overlapping cases is variable and unpredictable, and there are few reports of treatment and prognosis. Therefore, conventional narrow diagnostic criteria cannot properly diagnose and treat overlapping cases. Because overlapping cases are not common, multi-center studies are needed to find appropriate treatment regimens.

Classification	Clinical features	Presence	Onset-Recovery
General syndrome			
All GBS spectrum	Symmetric limb or motor cranial nerve weakness	Yes	Day 3 - continued
	Antecedent infectious symptoms	Yes	3 days ago
	Presence of distal paraesthesia	Yes	Day 3 - continued
	Cerebrospinal fluid albuminocytological dissociation	Yes	Day 1
Specific diagnoses			
Classic GBS	Weakness and areflexia / hyporeflexia in all four limbs	Yes	Day 3 - continued
	Electrophysiological evidence of neuropathy	Yes	Day 5
MFS	Ophthalmoplegia	Yes	Day 1 - Day 52
	ataxia	Yes	Day 1 - continued
	areflexia / hyporeflexia	Yes	Day 1 - continued
	Absence of limb weakness and hyperosmolence	No	
	Presence of anti-GQ1b Ig antibodies	Yes	Day 2
BBE	Hyperosmolence	Yes	Day 5 - Day 30
	Ophthalmoplegia and ataxia	Yes	Day 1 - Day 52
	Absence of limb weakness	No	
	Presence of anti-GQ1b Ig antibodies	Yes	Day 2

GBS, Guillain–Barré syndrome; MFS, Miller Fisher syndrome; BBE, Bickerstaff's brainstem encephalitis

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Table 1. Clinical features of our patient

	Age /Sex	Initial symptoms	Comorbidity	Clinical course	Albumin-cytologic dissociation	NCS	Antibodies (sampling day)	Treatment	Outcome
Arai et al. 2002 [9]	34/F	Diplopia unsteady gait	Not reported	BBE day 1 MFS day 2 GBS day 5	Not reported	Not reported	GQ1b (day 2)	IVIG (7 sessions)	Tandem gait on day 22
Stenmoen et al. 2003 [8]	43/F	facial numbness, diplopia, vertigo, extremity tingling sense and weakness	Not reported	BBE day 1 GBS day 6 MFS day 10	Yes (Not reported)	demyelinating	GM1 (Not reported)	SBG (1 session)	Independent gait on day 27
Fujii et al. 2012 [7]	72/F	Diplopia unsteady gait	Not reported	MFS day 1 GBS day 3 BBE day 5	Negative	AMSAN	GM1/GT1a, GQ1b, GT1a (day 4)	SBG (2 sessions), immunoadsorption	Full recovery after 10 months
Han et al. 2012 [6]	20/M	Unsteady gait	Asthma	MFS day1 BBE day22 GBS day25	Negative(1) Yes(day22)	AMSAN	Negative	IV Dexamethasone	Walk around with support on day 102
Pegg et al. 2016 [5]	59/M	Hands tingling, unsteadiness, diplopia	Negative	MFS day1 GBS day7 BBE day42	Negative(4) Yes(day7)	AMSAN	GD1a, GQ1b (Not reported)	SBG (2 sessions), PE	Walk with a frame after 4-5 months
Our case 2017	76/F	Diplopia opthalmoplegia ataxia	Diabetes HTN	MFS day 1 GBS day 3 BBE day 5	Yes(day3)	AMSAN	GQ1b (day 2)	IVIGG session) IV Methamesolone	Walker gait for short distance after 6 months

NCS, nerve conduction study; HTN, hypertension; AMSAN, acute motor sensory axonal neuropathy; IVIG, intravenous immunoglobulin; IV, intravenous; PE, plasma exchange.

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Table 2. Reported cases of overlapping MFS-BBE-GBS

통증 및 근골격재활
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초록순서 : **C47** 형식 : **Poster**

Morel-Lavallée lesion of lateral thigh, presenting delayed clinical signs: A case report

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Hallym University College of Medicine, Department of Physical Medicine and Rehabilitation[1]

Introduction
Morel-Lavallée lesion(MLL), a closed internal degloving soft tissue injury, is when the subcutaneous layer separates from the deep fascia. And This MLL causes seroma, hematoma, and fat necrosis as a secondary reaction. MLL is owing to direct trauma with tangential force followed by the separation of the subcutaneous tissue from the underlying fascia. This direct tangenital force bring about rupture of small perforating vessels with formation of a cavity filled with blood, lymph and necrotic fat materials. MLL has originally been suggested to present most commonly in the lateral proximal thigh. This case reports MLL of the lateral aspect of thigh which was perceived one month after the trauma. This MLL case have rarely been reported in Korea

Case report
A 67-year-old male initially presented at orthopedics for contusion at C1-2 level was transferred to department of rehabilitation medicine on Jan 31, 2017 for rehabilitation therapy. He was hit by a car one month ago from the back while waiting at the crosswalk. He had MRI scan and was diagnosed of a spinal cord contusion at C1 level and interspinous ligament tear at C1-2 level. The patient was admitted and told to be bed rested as an expectant management. After few days in the hospital, he presented with huge swelling at lateral aspect of his right thigh. He also complained of right hip pain when walking. On physical examination, diffuse flabby mass extending from greater trochanter of femur to superior pole of patella over right lateral thigh was seen. Clinically, there were no signs of inflammation and the aforementioned lump was painless. Moreover, its movement had no relationship with hip joint pain. Ultrasound scan showed large fluid collection measuring approximately 22cm long at the subcutaneous area of superficial fascia of the right thigh. As a management of this huge mass, we went through percutaneous needle aspiratioin of the fluid. Total of 38.5cc of bloody fluids from the swelling was extracted and elastic bandage was applied at the aspiration site for compression. The extracted fluid did not show any significant result but red blood cells. Then the patient was discharged in better condition.

Discussion
MLL is missed on initial evaluation in up to one-third of the cases and may have a delay in presentation ranging from hours to months after the inciting injury. MLL typically arise at the flank, hips, thigh, and prepatellar regions as a result of shear injuries by traffic accident. Clinical signs usually present within hours following the trauma, however, clinical signs in our case turned out one month later. This case suggests that delayed signs cannot be noticed, with patient in rehabilitation unit, until weeks or months have passed after the trauma.

심폐재활

게시일시 및 장소 : **2017 년 4 월 21 일 13:00-18:30, 3 층 로비 / 질의응답 일시 및 장소 : 2017 년 4 월 21 일 15:00-15:40, 3 층 로비**

초록순서 : **64** 형식 : **Poster**

Correlation between body composition and exercise capacity in cardiac elderly patients

Dong Joo Kim[1*], Min Keun Song[1], Hyung Kyu Park[1], In Sung Choi[1], Jae Young Han[1†]

Chonnam National University Hospital & Medical School, Department of Physical & Rehabilitation Medicine[1]

Objective :In the elderly, adiposity and cardiorespiratory fitnessare significant mortality predictors. In previous study, overweight or obese was associated with a higher rate of survival in patients with cardiopulmonary disease. This paradoxical relationship suggests that the influence of body composition on functional parameters should be further investigated. Furthermore,there is no report on the relation between rate of skeletal muscle on body composition and exercise capacity in acute coronary syndrome (ACS). The aim of this study is to investigate the correlation of fat-free mass index (FFMI) with exercise capacity in elderly ACS patients.
Methods: This study was retrospectively conducted by review of medical records. Among ACS patients, who were referred to our rehabilitation center after percutaneous coronary intervention or coronary artery bypass surgery between September 2014 and July 2016, 166 ACS patients were enrolled. All patients went through body composition analysis by bioelectrical impedance method before exercise tolerance test (ETT), and then they underwent ETT to determine exercise capacity. Body composition analysis and ETT were conducted at two assessment points; at 3weeks (T0) after acute myocardial infarction attack and at 6 weeks after T0 (T1). FFMI and body mass index (BMI) were parameters of body composition analysis. Maximal oxygen consumption (VO2max) and Maximal metabolic equivalents (METs) were parameters of ETT. All the patients were divided into two groups according to their age: elderly group (age ≥65 years) and non-elderly group(age <65 years). Paired t-test and Pearson's correlation coefficient were used for establishing the link between exercise capacity and body composition.
Result: 1) In non-elderly group, height, weight, body mass index (BMI), fat-free mass (FFM), peak VO2 and METs were higher at T0. FFMI distribution was similar between the age groups. 2) There was asignificant correlation between FFMI and VO2max in both groups over time. However, BMI was significantly correlated with VO2max in non-elderly group. 3) Δexercise capacity for 6 weeks was significantly correlated with ΔFFMI in only elderly group (VO2max, r=0.535, p<0.01; METs, r=0.478, p<0.01).
Conclusion: In elderly ACS patients, FFMI and ΔFFMI were correlated with exercise capacity, whereas BMI was not. Therefore, FFMI should be considered as more important than BMI in elderly ACS patients.

Table 1. Comparison of the mean values of clinical, physiologic variables (n=166) at T0.

	Age ≥65		Age < 65		p-value
	n=51	Mean±SD	n=115	Mean±SD	
Age		71.6±5.7		50.4±10.1	p<0.01
Height (cm)		161.1±7.2		167±7.3	p<0.01
Weight (kg)		62.1±10.1		71±14.1	p<0.01
		23.8±3.0		25.3±3.7	
BMI (kg/m²)	M(n=32)	23.4±7.9	M(n=98)	25.3±3.7	p<0.05
	W(n=19)	23.1±3.5	W(n=17)	25.5±3.4	
Fat-free mass (kg)		45.7±9.0		53.1±9.7	p<0.01
Fat-free mass index (kg/m²)		17.0±3.3		17.9±4.4	p=0.18
Peak VO_2 (mL/min)		1.34±0.44		1.83±0.65	p<0.01
METs (L/kg/min)		6.1±1.6		7.3±2.2	p<0.01

BMI: body mass index, Peak VO_2: Maximal oxygen consumption, METs: Maximal metabolic equivalents, T0: ETT at 3-week after AMI attack, M: man, W: woman

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Comparison of the mean values of clinical, physiologic variables (n=166) at T0.

Table 2. Correlation between body composition and cardiopulmonary exercise capacity

	VO_{2max} at T0	METs$_{max}$ at T0	VO_{2max} at T1	METs$_{max}$ at T1
Age ≥65	r=0.299	r=0.299	r=0.305	r=0.305
FFMI	P=0.033*	P=0.033*	P=0.004*	P=0.004*
Age < 65	r=0.533	r=0.533	r=0.312	r=0.312
FFMI	P=0.000*	P=0.000*	P=0.001*	P=0.001*
Age ≥65	r=0.264	r=0.264	r=0.150	r=0.150
BMI	P=0.061	P=0.061	P=0.293	P=0.293
Age < 65	r=0.498	r=0.498	r=0.298	r=0.298
BMI	P=0.000*	P=0.000*	P=0.003*	P=0.003*

VO_{2max}: Maximal oxygen consumption, METs: Maximal metabolic equivalents
FFMI: fat free mass index, BMI: body mass index

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Correlation between body composition and cardiopulmonary exercise capacity

Table 3. Correlation between Body Composition and Change of Cardiopulmonary Exercise Capacity

		ΔVO_{2max}	ΔMETs
ΔFFMI	Age ≥65	r=0.535	r=0.478
		P<0.01	P<0.01
	Age < 65	r=0.020	r=0.057
		P=0.833	P=0.546
ΔBMI	Age ≥ 65	r=0.078	r=0.237
		P=0.585	P=0.094
	Age < 65	r=-0.106	r=0.021
		P=0.258	P=0.826

VO_{2max}: Maximal oxygen consumption, METS: Maximal metabolic equivalents
FFMI: fat-free mass index, BMI: body mass index

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Correlation between body compositionand change of cardiopulmonary exercise capacity

뇌신경재활
게시일시 및 장소 : **2017 년 4 월 21 일 13:00-18:30, 3 층 로비 / 질의응답 일시 및 장소 : 2017 년 4 월 21 일 15:00-15:40, 3 층 로비**
초록순서 : **22** 형식 : **Poster**

Voxel based lesion-symptom brain mapping (VLSM) study of dysphagia of oral phase in stroke patients.

Soo Jin Jung[1*], Deog Young Kim[2†], Yoon Ghil Park[3], Woo Kyoung Yoo[4], Seung-Koo Lee[5], Hyo sun Choi[2], Kyung-Ho Seo[1]

Dongtan Sacred Heart Hospital, Hallym University College of Medicine, Department of Physical medicine and Rehabilitation[1], Yonsei University College of Medicine, Departments of Rehabilitation Medicine and Research Institute of Rehabilitation Medicine[2], Yonsei University College of Medicine, Department of Rehabilitation Medicine, Rehabilitation Institute of Muscular Disease[3], Hallym Sacred Heart Hospital, Hallym University College of Medicine, Department of Physical medicine and Rehabilitation[4], Department of Radiology and Research Institute of Radiological Science, Yonsei University College of Medicine[5]

The Purpose of this study is to define brain lesion related to dysphagia of oral phase after stroke by using voxel based lesion-symtom brain mapping (VLSM).
We recruited the patients who underwent brain MRI within 3 months after stroke, and performed Video fluoroscopic swallowing study (VFSS) after 2 weeks, or 1, 3 months after stroke. We analyzed functional dysphagia scale (FDS) at the time of VFSS. 291 patients (M:F= 168:123, Age 64.5 ± 14.5) were recruited in this study. Brain lesions submitted to statistical mapping analyses using VLSM algorithms.
At the results, total FDS subscales of oral phase within 2 weeks after stroke was related to left middle, inferior frontal gyrus and inferior parietal lobule. FDS within 1month after stroke was related to left inferior frontal gyrus. FDS within 3 months after stroke showed no significant related lesion (Mann-whitney U test, P<0.01). And subscale like lip closure, oral bolus formation, residue in oral cavity, oral transit time showed significant related lesion as below (Fig 1).
In conclusion, FDS subscales of oral phase showed significant correlation with specific brain lesion. For further study, More sample size and controlled control group would be needed.

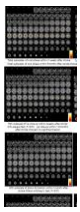

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Fig 1. Brain lesion correlated with functional dysphagia scale (FDS) subscales of oral phase within 2 weeks, 1 months, 3 months after stroke, using VLSM algorithm.

통증 및 근골격재활
게시일시 및 장소 : **2017 년 4 월 21 일 13:00-18:30, 3 층 로비 / 질의응답 일시 및 장소 : 2017 년 4 월 21 일 15:00-15:40, 3 층 로비**
초록순서 : **87** 형식 : **Poster**

Dysphagia Following Hip Surgery

Byung Wook Kim[1*], Jung Keun Hyun[1,2], Seo Young Kim[1], Tae Uk Kim[1†]

Dankook University Hospital, Department of Rehabilitation Medicine[1], Dankook University, Department of Nanobiomedical Science & BK21 PLUS NBM Research Center for Regenerative Medicine[2]

Objective: To delineate characteristics of dysphagia on the video fluoroscopy swallowing study (VFSS) following hip surgery, and the factors associated with dysphagia.

Method: The patients who presented with dysphagia for the first time following hip surgery from 2002 to 2016 were included, and evaluated with VFSS. The patients who had history of previous stroke, traumatic brain injury, cranial nerve injury and other previous neurologic disorders which could lead to dysphagia were excluded. The baseline characteristics and VFSS findings of all patients were documented. In addition, the underlying diseases which could adversely affect swallowing functions were investigated.

Results: A total of 16 cases (14 hip fracture patients, 1 avascular necrosis of hip, 1 dislocation of hip) which had dysphagia without any neurologic disorders were analyzed. Oral phases including lip closure and bolus formation were relatively preserved, but pharyngeal phases were more affected. Post-operative delirium delayed oral transient time (p=0.016). Bolus formation was more injured in patients with diabetes mellitus (p=0.026). Anesthetic time, American Society of Anesthesiologists physical status classification system and Garden classification of hip fracture were not correlated with VFSS findings.

Conclusion: More attention needs to be paid to the rehabilitation of dysphagia following hip surgery in patients with diabetes mellitus and post-operative delirium.

암재활

게시일시 및 장소 : **2017 년 4 월 21 일 13:00-18:30, 3 층 로비 / 질의응답 일시 및 장소 : 2017 년 4 월 21 일 15:00-15:40, 3 층 로비**

초록순서 : **67** 형식 : **Poster**

Clinical features of patients with breast cancer related lymphedema and effects on hand strength

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Wonkwang University School of Medicine, Department of Rehabilitation Medicine[1]

Objectives
 To investigate the clinical characteristics of lymphedema patients with breast cancer and assess the effect of lymphedema on hand muscle strength
Methods
 We retrospectively reviewed the medical records of 18 patients who first visited to our department and were diagnosed with lymphedema January 2016 to February 2017 at outpatient clinic. The demographic data, Beck Depression Inventory (BDI), Montreal Cognitive Assessment (MOCA), BMI (Body Mass Index) swelling and handgrip strength were recorded. The arm circumference measurements were taken of wrist, 5 centimeter below the elbow, and 10 centimeter above the elbow joint. Jamar dynamometer was used to determine hand grip strength.
Results
 Among the 18 patients, the mean age was 55.0±12.1. The mean BDI score was 19.7±5.5. In addition, average MOCA score was 23.3 ± 5.6 and BMI score was 23.7 ± 1.9. Circumference of lymphedema side was higher than other side at all levels. The hand grip strength of lymphedema side was lower than the other side strength (p=0.015) and significantly lower than normal group (p=0.029, Table 1). A positive correlation was noted between hand grip strength difference and circumference difference (P<0.05, Table 2).
Conclusions
 The degree of edema is related to the strength of the hand with breast cancer related lymphedema patients. Also, mild depressive pattern and overweight may appear in patients with lymphedema. These findings will help us to understand breast cancer rehabilitation and more comprehensive research is needed in the future.

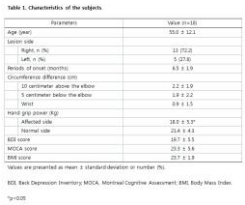

Table 1. Characteristics of the subjects

Parameters	Value (n=18)
Age (year)	55.0 ± 12.1
Lesion side	
Right, n (%)	13 (72.2)
Left, n (%)	5 (27.8)
Periods of onset (months)	4.5 ± 1.9
Circumference difference (cm)	
10 centimeter above the elbow	2.2 ± 1.9
5 centimeter below the elbow	1.9 ± 2.2
Wrist	0.9 ± 1.5
Hand grip power (Kg)	
Affected side	18.0 ± 5.3*
Normal side	21.4 ± 4.3
BDI score	19.7 ± 5.5
MOCA score	23.3 ± 5.6
BMI score	23.7 ± 1.9

Values are presented as mean ± standard deviation or number (%)

BDI, Beck Depression Inventory; MOCA, Montreal Cognitive Assessment; BMI, Body Mass Index

*p<0.05

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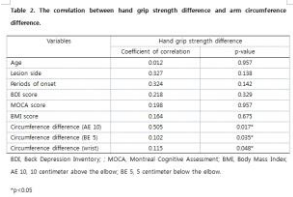

Table 2. The correlation between hand grip strength difference and arm circumference difference.

Variables	Hand grip strength difference	
	Coefficient of correlation	p-value
Age	0.012	0.957
Lesion side	0.327	0.138
Periods of onset	0.324	0.142
BDI score	0.218	0.329
MOCA score	0.198	0.957
BMI score	0.164	0.675
Circumference difference (AE 10)	0.505	0.017*
Circumference difference (BE 5)	0.102	0.035*
Circumference difference (wrist)	0.115	0.048*

BDI, Beck Depression Inventory ; MOCA, Montreal Cognitive Assessment; BMI, Body Mass Index; AE 10, 10 centimeter above the elbow; BE 5, 5 centimeter below the elbow.

*p<0.05

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심폐재활

게시일시 및 장소 : **2017 년 4 월 21 일 13:00-18:30, 3 층 로비 / 질의응답 일시 및 장소 : 2017 년 4 월 21 일 18:00-18:30, 3 층 로비**

초록순서 : **C36** 형식 : **Poster**

Effects of game-based respiratory exercise for people with cervical cord injury: a pilot study

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National Rehabilitation Center, Department of Clinical Research of Rehabilitation[1], National Rehabilitation Center, Health Promotion Center for Persons with Disabilities[2]

Introduction
Respiratory complications are major causes of morbidity and mortality in people with tetraplegia. The injuries to the spinal cord above the level of C5 may involve the phrenic nerve and thus cause partial or complete paralysis of the diaphragm. Because of this wide range of respiratory muscle dysfunction, people with high cervical tetraplegia are unable to generate an adequate vital capacity due to reduced inspiratory and expiratory functions. But most of respiratory exercise for them is boring and uninteresting.
The purpose of this study is to investigate whether game-based respiratory exercise is effective for individuals with complete C3 cervical cord injury.

Method
The subjects were 3 individuals with complete C3 cervical cord injury. The game-based respiratory exercise was consist of warm up (gentle stretching and range of motion exercise), game-based inspiratory and expiratory exercise, cool down (flexibility and relaxation). The exercise was carried out for 16 sessions of 8 weeks (2 times a week); the duration of the exercise per day was 60 minutes.
The pulmonary function measured with spirometry, coughing ability measured with peak flow meter, and perceived difficulty of breathing at rest were performed before training and at the end of 8 weeks of training.

Results
Most of the pulmonary parameters (FVC, FEV1, FEV1/FVC%, ERV, IC, VC, IRV), PCF, and Borg scale showed improvements after 8 weeks of game-based respiratory rehabilitation exercise.

Conclusion
The game-based respiratory exercise is effective in improving the pulmonary function, coughing ability, and the perceived difficulty of breathing in individuals with complete C3 cervical cord injury.

Table 1. Outcomes of pulmonary parameter, PCF, Borg scale

	FVC(L)	FEV1(L)	FEV1/FVC%(%)	ERV(L)	IC(L)	VC(L)	IRV(L)	PCF(L/s)	Borg scale (score)
Pre	1.18 ±1.03	1.03±0.90	89.36±7.76	0.07±0.05	0.93±0.88	0.98±0.85	0.57±0.64	169.83	2.5
post	1.21 ±1.05	1.12±0.93	95.03±4.77	0.08±0.09	1.11±1.08	1.13±1.07	0.81±0.81	211.66	1.16

mean±SD

FVC, forced vital capacity; FEV1, Forced vital capacity in 1 second; ERV, expiratory reserve volume; IC, inspiratory capacity; IRV, inspiratory reserve volume; PCF, peak cough flow

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Outcomes of pulmonary parameter, PCF, Borg scale

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Game-based respiratory exercise program

통증 및 근골격재활
게시일시 및 장소 : **2017 년 4 월 21 일 13:00-18:30, 3 층 로비 / 질의응답 일시 및 장소 : 2017 년 4 월 21 일 15:00-15:40, 3 층 로비**
초록순서 : **88** 형식 : **Poster**

Incidence and Etiology of Knee Pain after Hip Fracture Surgery

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Dankook University Hospital, Department of Rehabilitation Medicine[1], Dankook University, Department of Nanobiomedical Science & BK21 PLUS NBM Research Center for Regenerative Medicine[2]

Objective: The aim of this study is to investigate incidence and etiology of the knee pain in patient receiving rehabilitation after hip fracture surgery.
Methods: Patients who were operated on for fracture of the hip and who were referred to Rehabilitation Department from January 1, 2008 to February 28, 2017 were screened. Those who had knee pain in last 3 months, operation on around knee, or severe disability of gait before fracture of the hip were excluded. Patients were divided into two groups; one group is patients with knee pain during hospital stay in rehabilitation medicine, and other group is without knee pain. We compared presurgical diagnoses, types of the surgery, post-operative days (POD) to tolerate training of standing or gait and length of hospital stay between two groups. The treatment methods and their effect on knee pain were also investigated.
Results: Incidence of knee pain was 35.8% (64 of 179 patients) in patients who were operated on for fracture of the hip. All patients except one had knee pain on the side of fracture. There was no significant difference in gender, age, and post-operative days at the time of transfer to Rehabilitation Department between patients with knee pain and those without knee pain. Length of hospital stay in rehabilitation department was longer in the group with knee pain (20.86±9.89 days vs.15.13±10.35 days, $p< 0.05$). According to preoperative diagnosis, the incidence of knee pain was higher in group of patients with intertrochanteric fracture (47.6% vs. 25.8%, $p< 0.05$), and similar with subtrochanteric fracture (83.3% vs. 34.1%, $p< 0.05$). According to the types of surgery, there was no significant difference in the incidence of knee pain in the group of patients with intertrochanteric fracture (closed reduction and internal fixation vs. hemiarthropasty), and similar with femur neck fracture (closed reduction and internal fixation vs. hemiarthroplasty vs. total hip replacement arthroplasty). There were no differences in POD to tolerate training of standing or gait between patients with knee pain and without knee pain in each group of intertrochanteric fracture and femur neck fracture. Twenty-seven patients underwent trigger point injection on periarticular muscles at knee (18 patients) and/or periarticular injection with steroid (14 patients). All patients except one patient showed pain relief of visual analogue scale 3 or more.
Conclusion: Incidence of knee pain in patients undergoing rehabilitation after fracture of the hip is not low as it can be overlooked. There is also a significant relationship between length of hospital stay and knee pain. So, it is important to evaluate knee pain in patients with fracture of the hip, especially in intertrochanteric fracture and subtrochanteric fracture. Also, appropriate injection may be a good way to control such knee pain.

통증 및 근골격재활
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초록순서 : **89** 형식 : **Poster**

Intraarticular pulsed radiofrequency to treat refractory lumbar facet joint pain

Min Cheol Chang[1], Yun-Woo Cho[1], Da Hyun Ahn[2*], Kyung Hee Do[2†]

Yeungnam University Medical Center, Department of Rehabilitation Medicine [1], VHS Medical Center, Department of Rehabilitation Medicine [2]

Background: Many treatment techniques have been used for refractory lumbar facet joint pain; however, their efficacy has been controversial. In this study, we investigated the clinical efficacy and safety of intraarticular pulsed radiofrequency for the treatment of refractory lumbar facet joint pain in patients with low back pain.
Methods: Twenty patients with refractory lumbar facet joint pain were recruited and each patient was treated using intraarticular pulsed radiofrequency. The treatment effects were measured using a numerical rating scale, and the technical accuracy of intraarticular pulsed radiofrequency treatment was evaluated independently by two radiologists. Any adverse events or complications were also checked.
Results: We performed intraarticular pulsed radiofrequency treatment at 48 levels of the lumbar facet joints in 20 patients (5 men and 15 women; mean age, 64.50 ± 10.65 years) with refractory lumbar facet joint pain. Pain scores were significantly reduced at 1 month, 3 months, and 6 months after treatment ($p < 0.05$). The face validity revealed good intraarticular pulsed radiofrequency results in all 20 patients, without any serious adverse effects.
Conclusions: The treatment using intraarticular pulsed radiofrequency is an alternative to other techniques in patients with refractory lumbar facet joint pain.

Key Words: Zygapophyseal Joint; Low Back Pain; Pulsed Radiofrequency; Treatment; Chronic Pain

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Figure 1 Fluoroscopic image of an intraarticular pulsed radiofrequency cannula in a patient with refractory lumbar facet joint pain Oblique fluoroscopic view showing the pulsed radiofrequency cannula directed toward the tip of the superior articular process of the lumbar facet joint. An arthrogram was obtained by injecting 0.3 mL of contrast material.

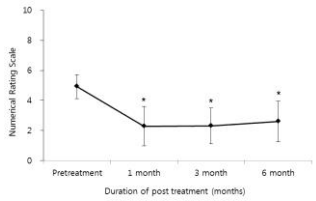

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Figure 2 Numerical rating scale of refractory lumbar facet joint pain in patients with low back pain *p < 0.05: for before treatment versus 1, 3, and 6 months after treatment.

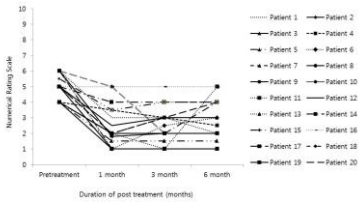

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Figure 3 A graph showing the pain scores of all patients over time from before treatment to 1, 3, and 6 months after pulsed radiofrequency treatment for refractory lumbar facet joint pain in patients with low back pain

뇌신경재활
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초록순서 : **C5** 형식 : **Poster**

DVT caused after Botox treatment on the upper limbs.

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Kwangju christian hospital, Department of Rehabilitation Medicine[1]

Introduction

 Botox treatment widely has been used to improve spasticity and the patients suffering from the symptom after having a stroke and pain at the injection site, infection, inflammation, swelling, redness, bleeding and bruising are well-known side effects. In this case, we are going to address deep vein thrombosis (DVT) caused after botox treatment on the upper limbs.

Case

 The 42 years old male patient was injured on Oct 13, 2013, who was diagnosed left spasticitic hemiplegia d/t A-com aneurysm rupture. A post stoke rehabilitation was implemented for around 3 years after injuring. The MMT of left upper muscle was 3 to 4 grade and spasticity grade was MAS 2. The slight limit of function was shown because of spasticity, so botolinium toxin A was injected in left biceps 100 and brachialis 100 international unit, July 12, 2016. An improvement of ROM(range of motion) has been shown since the third day of treatment. An active P-ROM and stretching exercises were performed accordingly, the joint working range has been improved gradually.

[Fig.1]

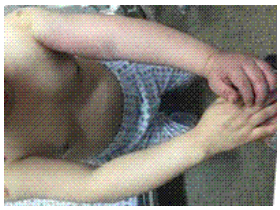
 7 days post-procedure, he has shown redness and painful swelling in left brachial area and measured 31.8cm and 33.5cm for both brachial circumferences, above of elbow joint. There was no drastic problem except the fact that PT sec was increased mildly and D-dimer was 2.2 on the chart of blood coagulation test. As per X-ray, there were no signs of fracture and heterotrophic ossification. From upper extremity doppler, cephalic vein DVT was seen but no hematomas were found. We perform upper extremity CT-venogram. Deep vein thrombosis was identified in a left cephalic vein in this test so we implemented conservative management such as compression, bed rest, ice pack apply. The pain and edema have been subsided as time goes by and the range of motion improved by botox remains the same resulting in positive implication.

[Fig.2]

[Fig.3]

Conclusion

 DVT caused after botox treatment on the lower limbs was reported before. The issues are still addressed before the treatment. One possible reason is that with expanding of muscles that has not been used often stretching of vessels also have been expanded because of the increased range of motion after botox. Therefore, vessels that have kept the consistent length for years were affected by drastic expansibility then coagulation pathway was activated due to intima injury inside vessels, which might have caused DVT.
But, the additional study regarding the change of hemodynamic study and coagualtion cascade should be considered. As drastic increased ROM after botox treatment can cause complication, It is believed that post procedure requires intensive care.



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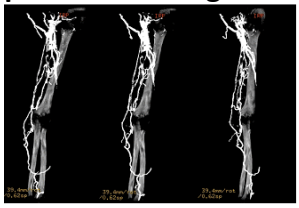
painfull swelling and erythema on left brachial area.



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DVT involving brachiocephalic. internal jugular vein, axilla, and brachial vein

PT sec.	12.9 (9.8 ~ 12.7 sec.)
PT INR	1.12 (0.85 ~ 1.15 INR)
PT %	71.2 (75 ~ 130 %)
APTT	30.1 (23.0 ~ 39.0 sec.)
D-Dimer	2.2 (0 ~ 1.0 ug/mL)

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Coagualtion study after 8 days.

통증 및 근골격재활
게시일시 및 장소 : **2017 년 4 월 21 일 13:00-18:30, 3 층 로비 / 질의응답 일시 및 장소 : 2017 년 4 월 21 일 15:00-15:40, 3 층 로비**
초록순서 : **90** 형식 : **Poster**

Clinical Significance of Imaging Modalities in Patients with Adehesive Capsulitis

Gi-Young Park[2], Dong Rak Kwon[2], Dae-Gil Kwon[2], Jinyoung Park[1], Jung Hyun Park[1*†]

Gangnam Severance Hospital, Rehabilitation Institute of Neuromuscular Disease, Yonsei University College of Medicine, Department of Rehabilitation Medicine[1], Catholic University of Daegu School of Medicine, Department of Rehabilitation Medicine[2]

Objective: To date, no studies have assessed the correlation between arthrography, magnetic resonance imaging (MRI), and ultrasonography (US) findings in patients with adhesive capsulitis (AC) of the shoulder and their clinical presentation as well as functional impairment. The purpose of this study is to evaluate the relationship between the clinical features and the specific findings of diagnostic imaging modalities in patients with AC of the shoulder.
Material and Methods: Seventy-five patients (27 males, 48 females; age 55.3 ± 9.8 years) with a clinical diagnosis of unilateral AC were recruited. All patients were assessed using a visual analogue scale (VAS), passive shoulder range of motion (ROM), the Constant-Murley Shoulder Function Assessment Score (CMS), and Cyriax stage for frozen shoulder. Contrast-enhanced MRI, single-contrast arthrography, and US were performed in all patients. The thickness of axillary recess, coracohumeral ligament (CHL), and the enhanced portion in the rotator cuff interval were measured by using MRI. Arthrography as used to calculate the total score of shoulder arthrographic criteria. US was used to measure the thickness of the inferior glenohumeral ligament (IGHL) and CHL, and the IGHL ratio and CHL ratio were calculated by comparing with the unaffected side.
Results: None of MRI parameters was correlated with clinical assessment scores. The total score of shoulder arthrographic criteria was correlated with passive shoulder ROM and CMS. The infusion volume in arthrography, which indicated joint capacity, was correlated with shoulder ROM. The IGHL and CHL ratio, measured by US, was correlated with the shoulder external rotation ROM and VAS.
Conclusions: The findings of arthrography and US in patients with AC of the shoulder were correlated with the clinical assessment scores. However, all measuring parameters on MRI were not correlated with clinical impairments. US is recommended as the preferred option for diagnosing AC of the shoulder because it is non-invasive, reflects the clinical features of AC, and provides anatomic accuracy.

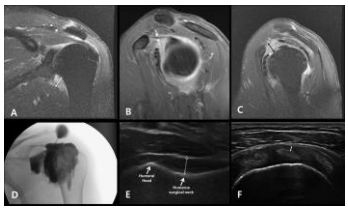

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Figure 1. A 61-year-old man with adhesive capsulitis of the shoulder. (A-C) Magnetic resonance imaging (coronal T1-weighted with gadolinium-chelate enhancement). Note the marked enhancement of the joint capsule and synovial membrane in the axillary recess, measured perpendicular to the adjacent cortex (A, white opposed arrows). CHL (B, between white arrows). The ERCI was the widest portion of the capsule and synovium at the center part of the rotator cuff interval (C, black opposed arrow). (D) Arthrography. Note the absent axillary recess and irregularity of the capsular margin. The glenohumeral joint capacity was decreased to 8 mL. (E-F) Ultrasonography. The IGHL thickness (dashed line) was measured on a longitudinal image of the mid-axillary line at the anatomical neck of the humerus in the affected shoulder (E). The CHL thickness was measured on a transverse ultrasound image of the rotator cuff interval (F). Abbreviations: CHL, coracohumeral ligament; ERCI, enhanced portion in rotator cuff interval; IGHL, inferior glenohumeral ligament

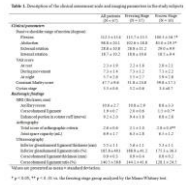

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Table 1. Description of the clinical assessment scale and imaging parameters in the study subjects Values are presented as mean ± standard deviation.

Table 2. Correlation between imaging parameters and clinical impairment scales

	Passive shoulder ROM					VAS			CMS	[illegible]
	Total	Fl	Abd	ER	IR	Rest	Motion	Night		
MRI (thickness)										
Axillary recess	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
CHL	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
ERCI	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Arthrography										
Total score of criteria	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Joint space capacity	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Ultrasonography										
IGHL thickness	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
IGHL ratio	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
CHL thickness	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
CHL ratio	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Values are Spearman's correlation coefficient (ρ)

* $p < 0.05$, ** $p < 0.01$

Abbreviations: Abd, abduction; CHL, coracohumeral ligament; CMS, Constant-Murley score; ER, external rotation; ERCI, enhanced portion in rotator cuff interval; Fl, flexion; IGHL, inferior glenohumeral ligament; IR, internal rotation; MRI, magnetic resonance imaging; ROM, range of motion; VAS, visual analog scale

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Table 2. Correlation between imaging parameters and clinical impairment scales

암재활
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초록순서 : **68** 형식 : **Poster**

Change in the Fecal Symptoms and Muscle Size after Pelvic Floor Muscle Exercise in Rectosigmoid Cancer Patients with Low anterior resection syndrome

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Purpose
To determine the effect of supervised pelvic floor muscle exercise in recto-sigmoid cancer patients with low anterior resection syndrome (LARS) in clinical aspects of fecal symptoms, quality of life and change in the size of core muscles.

Methods
Twenty-eight recto-sigmoid cancer patients with low anterior resection (LAR) operation history and who had LARS score bigger than 20, were reviewed in this study. The medical records of 14 patients with high compliance (exercise group) and 14 patients with low compliance (control group) of self-exercise were reviewed. The patients underwent 1:1 exercise and education of self pelvic floor muscle exercise once by a physical therapist with specialty in cancer rehabilitation. They were provided with a paper material to take home and were recommended to perform the exercise daily. The main outcomes were reviewed through medical records on clinical symptoms of daily bowel frequency, LARS score and quality of life (QoL) at 3 months follow up. QoL was assessed using the European Organization for Research and Treatment of Cancer (EORTC) QLQ-C30 questionnaire and Fecal Incontinence Quality of Life Scale (FIQL) questionnaire. The change in core muscle size was analyzed through comparison of the abdominal computed tomography (CT) prior to the start of exercise and after at least 3 months of self-exercise.

Results
After 3 months of follow up, both groups showed significant reduction in stool frequency. However, the amount of change was significantly larger in the exercise group. Improvement in LARS score was only significant in exercise group after 3 months of self-exercise. Many domains of quality of life were improved in exercise group, with the amount of improvement significant in lifestyle, coping behavior, embarrassment, fatigue and appetite loss symptom compared to the control group. The physical and role functioning was also significantly improved in the exercise group after 3 months of self exercise.
After 3 months of pelvic floor muscle exercise, there was size increase in paraspinal and abdominal muscles of exercised group compared to the control group. The change in muscle size was only significantly bigger in paraspinal muscle compared to that of control group. Other muscles such as quadratus lumborum, psoas muscle were decreased in size in both groups. However, the reduction in muscle size was less severe in exercise group compared to that of control group.

Conclusion
The supervised pelvic floor muscle exercise was effective in colorectal cancer patients with LARS, in exercise group with good compliance both in improvement of clinical symptoms and increase in muscle size. Therefore, when performed appropriately, pelvic floor muscle exercise has additional therapeutic benefits to spontaneous resolution of the symptoms both in improvement of clinical symptom and increase in muscle size.

통증 및 근골격재활
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초록순서 : **91** 형식 : **Poster**

A New Innovative Method of Joint Range of Motion Measurement with Reliability Evaluation by RCT

Soojae Kim[1,2*], Jong-Hyun Park[2], So Young Ahn[1,2], Kang Hee Cho[1,2†]

Chungnam National University, Department of Rehabilitation Medicine, School of Medicine[1], Chungnam National University Hospital, Department of Rehabilitation Medicine[2]

Objective
An accurate and reliable measurement of joint range of motion (ROM) is integral component in musculoskeletal physical examination as well as disability evaluation. The goal of this study was to develop a new measurement protocol (Korean ROM Standard Protocol(KRSP) by CNU guideline) and to establish the reliability and validity of joint ROM measurements using a KRSP application compared with conventional goniometer measurement.

Materials & methods
Before proceeding with this research, a technical committee and an expert committee (including two members of relevant research institutes, two affiliated industry members, one uncertainty expert, and two university professors) were organized to set research directions, analyze pilot studies, establish a standardized protocol.
The establishment of a standardized protocol was devided into 3 part. In the first part, ankle flexion and extension, knee flexion were investigated, shoulder, elbow, wrist joint in the second part, and hip joint, ankle inversion/eversion in the third part. Dualer IQ Inclinometers was used as a tool for measuring the range of motion, Commander Muscle Tester or Micro FET2 were used to define the force. Each of the standard measurement protocols was completed through the expert committee and the technical committee to clarify the problem of the current method, measurement position and method, after the pilot study on 20-30 healthy adults.
 To evaluate the reliability and validity of these standardized protocols, we conducted a randomized, controlled trial involving 91 healthy elderly in which we compared two strategies of measuring joint range of motion: first, the Korean ROM Standard Protocol (KRSP) by CNU guideline and second, handheld goniometric measurements. In the first strategy, 3 raters independently measured 6 subjects randomly selected, in the second strategy, another 3 raters measured 45 subjects randomly selected. Reliability of each protocol was calculated using intraclass correlation coefficients and RMSE (root mean square error).

Results
Both group showed good to excellent intra-observer reliability. While in case of goniometer, the interrater reliability was low, IR(ICC(2.1)(95%CI) ranged from 0.643(0.486-0.783) to -0.078(-0.296-0.494) and higher RMSE was observed. For the inclinometer, the interrater showed excellent reliability ranged from 0.846 (0.686-0.931) to 0.986(0.972-0.994) and lower RMSE was observed compared with goniometer.

Conclusion
The conventional goniometer-based measurement method showed very low reliability, making it difficult to use it for objective physical examination. Measurements of the ROM using KRSP protocol show excellent reliability. These results indicate that this protocol can be the reference standard protocols of measuring ROM in clinical setting as an alternative to goniometer. Further study of simplification and computerization of the developed protocol will make it more useful for clinical field.

신경근육재활 및 전기진단
게시일시 및 장소 : **2017 년 4 월 21 일 13:00-18:30, 3 층 로비 / 질의응답 일시 및 장소 : 2017 년 4 월 21 일 18:00-18:30, 3 층 로비**
초록순서 : **C32** 형식 : **Poster**

Neuralgic Amyotrophy on lower extremity in Neuropsychiatric Patient

Sang Jun Mo[1*], Kihun Hwang[1†], Jong Kyoung Choi [1†]

Dong-eui Medical Center, Department of Physical Medicine & Rehabilitation[1]

Introduction:
Neuralgic amyotrophy is a plexopathy with acute onset of severe pain followed by loss of muscle strength and atrophy of the muscles innervated by the involved part of the plexus. Although neuralgic amyotrophy is mostly common in the upper extremity, other peripheral nerves outside the brachial plexus can also be involved, such as lower cranial nerves or the lumbosacral plexus. We report a case of Neuralgic amyotrophy with invasion of Lumbosacral plexus, which was difficult to diagnose on unexplained causes of lower extremity weakness and pain in woman undergoing drug therapy for neuropsychiatric disorder.

Case report:
A 52-year-old woman complained of acute pain and weakness on right leg. The patient had no history of trauma or infection, and she had mild intermittent pain in the right lower extremity after 4 years of hysterectomy. she was undergoing medication due to major depressive disorder and had no difficulty in daily life until she visited the hospital.
She complained of pain within the thigh and around the patella, the blood test was no abnomalities, and C-reactive protein and erythrocyte sedimentation rate were also in the normal range. On the next day of admission, electromyography was performed in both lower limbs but no abnormal findings were found. Additionaly brain MRI, whole spine CT, 3-phase bone scan were performed, did not have an abnormal finding. Medical staff regarded her as a pain caused by somatization syndrome in consideration of history of major depressive disorder and psychiatric medication and continued medication for it. However, the symptoms continued and she visited our clinic. One month after admission, a prominent atrophy was seen in the medial side of her right thigh. Considering the possibility of underlying disease, we performed electromyography and found abnormal findings(Table 1,2). This is the Lumbar plexus neuritis on the right side, which was thought to be a subacute stage. To confirm the lesion site, enhanced MRI was performed and enlargement of the right L2-4 nerve root was observed in T2 image.(Fig. 1).
We performed steroid pulsing therapy and tappering. Thereafter, the pain and strength were improved, and the walking was improved to the extent that it was possible for everyday life without a cane or crutches.

Conclusion:
Neuralgic amyotrophy in the lower extremities is a very rare disease and may be difficult to diagnose in a short period of time. Furthermore, in the case of patients with neuropsychiatric disorders, including major depressive disorder, most of the medical staff may have difficulty in diagnosing neuralgic amyotrophy because they often see psychiatric problems as a cause of symptoms rather than underlying problems. Therefore, It is necessary to perform periodic evaluation of treatment effect and aspect through physical examination and observation continuously and to find underlying cause.

Nerve stimulation (Record)	Latency (right/left)	Amplitude (right/left)	Distance (right/left)	Conduction velocity (right/left)
Motor	(msec)	(mV)	(cm)	(msec)
Peroneal (EDB)	3.6 / 2.8	6.8 / 5.9	26.0 / 25.0	52.8 / 50.8
Tibial (AH)	3.7 / 3.9	13.8 / 12.8	28.0 / 29.0	53.8 / 50.4
Femoral (RF)	N/E / 3.1	N/E / 11.4		
Femoral (VM)	N/E / 4.0	N/E / 9.7		
Sensory	(msec)	(mV)	(cm)	(msec)
Supf. Peroneal (ankle)	3.0 / 3.2	25.4 / 20.9	12.0 / 13.0	51.7 / 52.0
Sural (post. ankle)	2.4 / 2.9	25.2 / 21.8	10.0 / 12.0	54.5 / 52.6
Saphenous (ankle)	N/E / 4.1	N/E / 11.9	N/E / 12.0	N/E / 61.3
LFCN (ant. thigh)	N/E / 4.8	N/E / 9.8	N/E / 18.0	N/E / 49.5

EDB, Extensor digitorum brevis; AH, Abductor hallucis; RF, Rectus Femoris; VM, Vastus medialis; LFCN, Lateral femoral cutaneous nerve; N/E, not evoked potential

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Table 1. Nerve Conduction Studies in the Lower Extremities bilaterally

Muscle (right)	Fib	PSW	MUAP	Interference pattern	Recruitment Pattern
Vastus medialis	None	1+	N	Reduced	Reduced
Tibialis anterior	None	None	N	Nearly full	Nearly full
Gastrocnemius	None	None	N	Nearly full	Nearly full
Tibialis posterior	None	None	N	Nearly full	Nearly full
Tensor fascia latae	None	None	N	Nearly full	Nearly full
Adductor of thigh	None	3+	N	Reduced	Reduced
Iliopsoas	None	2+	Polyphasic	Nearly full	Reduced
Lower lumbar spinalis	None	None			

Fib, fibrillation potential; PSW, positive sharp wave; MUAP, motor unit action potential, N, normal

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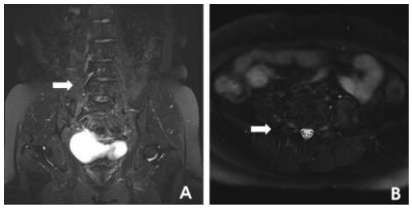
Table 2. Results of Needle Electromyography



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Spine magnetic resonance image(MRI) scan at the level of lumbar spine, coronal T2-weighted view image(A) and axial T2-weighted image(B). MRI scan demonstrates an enlarged and high signal intensity lesion on right L2-L4 nerve(arrow).

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초록순서 : **92** 형식 : **Poster**

Reliability of new MRI scoring for assessing lower back pain

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Inha University Hospital, Department of Rehabilitation Medicine[1]

Objective: Low back pain (LBP) is a common symptom, affecting more than 80% of the general population. Using MRI, many physicians evaluate structural abnormalities causing LBP. For severity grading, many tools have been used such as thoracolumbar injury classification and severity score (TLICS) conceptualized based on a survey given to the Spine Trauma Study. This describes the morphology of trauma thoracolumbar spine and instability. With components of neurologic status and posterior ligamentous integrity, the physicians consider additional facets of instability and severity. Additionally, there are a lot of tools such as Magnetic Resonance Classification of Lumbar Intervertebral Disc Degeneration using T2 weighted image signal change of disc and collapsed disc space, and grading system for lumbar central canal stenosis on MRI using obliteration of the anterior CSF space in front of the cauda equine, and divided to grades according to obliteration of anterior CSF space and central stenosis with/without cauda-equina. These had disadvantage that these are not able to represent comprehensive summation about various causes for LBP. Thus, purpose of this study was to demonstrate reliability of new MRI scoring for assessing LBP by various causes.

 Methods: Fifty three participants who come to our university hospital in 2016 and complained lower back pain occurred within six months were enrolled. Their mean age was 47.0 ± 15.7 yrs. Among them, men were twenty three. Using MRI, we evaluate structural abnormalities causing LBP and with the help of skilled radiology specialists, two physicians performed a new tool using severity score of lumbar spine MRI (OOSSLMRI, total 12 points, Table 1.). Interobserver and intraobserver agreements were analyzed using intraclass correlation coefficient (ICC), along with Cronbach alpha.

 Results: The ICC for interobserver agreement was 0.944 (0.904–0.968), indicating good-excellent agreement. The overall intraobserver agreement was 0.882 (0.796-0.932) and this was excellent agreement.

Conclusion: This new grading system (OOSSLMRI) may be helpful to physicians a simple and practical evaluation of lower back pain. OOSSLMRI to represent comprehensive summation about various causes of LBP provides a reliable assessment of lower back pain. We showed comprehensive reliability with intra- and inter-observer reliability agreement.

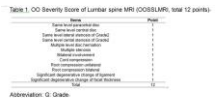

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Table 1. OO Severity Score of Lumbar spine MRI (OOSSLMRI, total 12 points)

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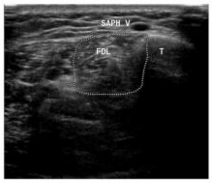
초록순서 : **93** 형식 : **Poster**

Identifying Anatomical Landmarks of Flexor Digitorum Longus by Ultrasonography

Junghoon Yu[1,2*], Kyunghoon Min[1,2†], Jinkyoo Moon[1,2], Sang Hee Im[1,2], MinYoung Kim[1,2]

Bundang CHA, Department of Rehabilitation Medicine[1], CHA University, Rehabilitation and Regeneration Research Center[2]

Objectives
The flexor digitorum longus(FDL) functions to plantar flex and invert the foot. The FDL arises from the posterior side of the tibia. In patients with L5 radiculopathy, electrodiagnostic evaluation of FDL is useful, because the FDL is innervated by the spinal nerve roots of L5 and S1 through the tibial nerve. However, the FDL is considered to be the least accessible muscle for needle insertion. This study was performed to investigate the anatomy of FDL using ultrasonography, and identify accurate and safe needle insertion site for FDL.
Subjects and Methods
A total of 8 healthy subjects with 16 legs volunteered to participate in this study. The patients were in a supine position on the bed with their legs in a slight external rotation. After measuring the lengths of the tibia (from the medial condyle of tibia to the lateral malleolus), the lower quarter from the lateral malleolus was determined, and its circumference was measured. Using ultrasonographic, the distance from skin, width and thickness of the FDL were measured. The simple regression analysis was used for comparing anthropometric and ultrasonographic parameters. Statistical analysis was performed using SPSS (IBM, version 21).
Results
The mean ± SD of height, body weight and BMI were 175.2±1.76cm, 75.8±5.76kg, 24.7±2.16kg/m2 respectively. As a result of analyzing the values of anthropometric and ultrasonographic parameters, the circumference showed a significant positive correlation with width of FDL (r = 0.681; P<0.007, Fig. 2). Also, another significant positive correlations were observed between the circumference and the distance from skin (r = 0.785; P<0.001, Fig. 3.). However, there was no significant positive correlation between the circumference and depth of FDL.
Conclusion
Measuring of circumference at the lower quarter of tibia is a helpful method to FDL needle insertion study. Further researches with larger sample size would be necessary to confirm our results. Also, it would be helpful to design a study to compare subjects according to their degree of obesity.



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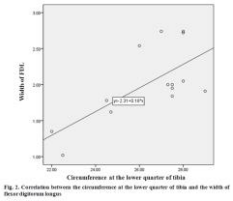

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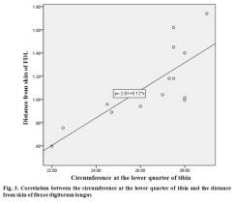

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노인재활
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초록순서 : **C1** 형식 : **Poster**

Patients with vertebral fracture who visited the hospital with chest wall pain rather than back pain

Hyun Jung Kim[1†], Yong Han[1*], Deok Ryeong Kim[2]

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[Introduction]
Sudden onset severe back pain is a typical and common symptom develops after vertebral fracture. However, not all patients complain the symptoms uniformly. We report two elderly cases with thoracic vertebral fracture, that their chief complaint was chest wall pain rather than back pain.

[Case]
Case 1
A 84-year-old female patient was transferred from a local hospital with severe left side chest wall pain for three weeks. Ten years ago, she underwent a T12 kyphoplasty to treat fracture. At first, she had a mild left side chest wall pain with a visual analogue scale 3 out of 10 while lying on bed. Two weeks after, she felt exacerbation of pain while sitting at home. Therefore she was admitted to the local general hospital for evaluation. She underwent chest and abdominal CT for work-up. Left 3rd and 4th rib fractures were detected at chest CT. However, she was told that this finding is not considered as a cause of her severe chest wall pain. Her pain evolved to an incapacitating nature that she was not able to lie down. Thereafter, she was transferred to our hospital.
On physical examination, there was no definite localized tenderness over back and chest walls. She reported severe, sharp pain in a band-like distribution at her left lower costal area, with a visual analogue scale of 8 out of 10. Symptom was exacerbated by trunk movement. No skin lesion was observed.
T spine MRI showed recent stable T8 bursting fracture. She received patient-controlled epidural anesthesia with a regimen of ropivacaine 0.2%, however symptom relief was only temporary. Therefore, neurosurgery consultation for kyphoplasty evaluation was done. After T8 kyphoplasty, her pain dramatically ceased (VAS 8→2) and she was able to discharge from the hospital.

Case 2
A 83-year-old female patient presented with a sudden onset of severe bilateral chest wall pain with a visual analogue scale of 8 out of 10. She reported that pain began when she was wiping the floor in the morning. Since the pain persists, the patient was admitted to our department for evaluation.
Upon admission, a physical examination revealed mild localized tenderness over bilateral costal area without any significant tenderness over the spine. Her past medical history includes diabetes and osteoporosis.
A rib series was taken and multiple rib fractures were noticed. The patient continued to have persistent severe pain despite immobilization, oral analgesics and intercostal nerve block. An MRI of her spine was obtained and recent T9 burst fracture was revealed.
Thereafter kyphoplasty was performed by neurosurgeon. As her symptoms improved (VAS 8→3), she was discharged from the hospital.

[Discussion]
Vertebral fractures may not always accompany obvious clinical signs. Therefore high degree of suspicion with careful examination is required for diagnosis. We conclude that a vertebral fractures must be considered as a possible cause of chest wall pain in osteoporotic elderly population.

소아재활

게시일시 및 장소 : **2017 년 4 월 21 일 13:00-18:30, 3 층 로비 / 질의응답 일시 및 장소 : 2017 년 4 월 21 일 18:00-18:30, 3 층 로비**

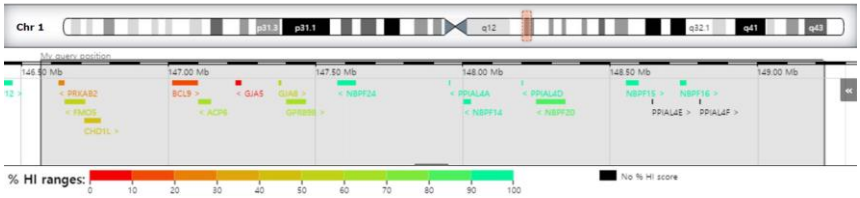
초록순서 : **C19** 형식 : **Poster**

Diffusion Tensor Tractography of a Case of 1q21.1-q21.2 Deletion with Global Delayed Development

Hae-yeon Park[1*], Ah-Ra Cho[1], Woori Jang[2], Myungshin Kim[2], Joo Hyun Park[1†]

The Catholic University of Korea Seoul St. Mary[1], The Catholic University of Korea Seoul St. Mary[2]

1q21.1 microdeletion is a rare condition, and many people with 1q21.1 microdeletion have developmental delay and health problems which affect heart, eye, joint, and etc. There are two types of 1q21.1 microdeletion. In a class 1 deletion, DNA is deleted between around 146Mb and 147.8Mb, and the second type has DNA deletion between around 145.5Mb and 147.8Mb. We describe here the case with 1q21.1-q21.2 deletion with DNA deletion between around 146.5Mb and 149.2Mb. We review the genes related with the phenotypes of the case, and describe the various white matter tracts which were demonstrated in the patient by diffusion tensor tractography(DTT).
 A 18 months-old male patient visited rehabilitation department with global developmental delay. He was born at 37 week gestation by spontaneous vaginal delivery. During labor, the patient suffered fetal distress, and was taken care of at intensive care unit for about 2-weeks. Auditory evoked potential and echocardiography done at admission showed no abnormalities.
 The patient's growth parameters at the visit were height of 80.7cm (25-50th percentile), body weight of 8.7kg (0-5th percentile), and head circumference of 44.5cm (0-5th percentile). Bayley Scales based developmental evaluation administered at the visit revealed cognitive, receptive-communication, expressive-communication, fine-motor, and gross-motor skill equivalents of 16, 17, 19, 16, and 15 months, respectively.
Chromosome analysis revealed 46, XY at the 550 band level. An array comparative genomic hybridization (CGH) revealed a 1q21.1-q21.2 deletion(146564743-149224043). The deletion was estimated to be 2.7Mb in size and it contained about 17 known genes (Fig 1).
 Further evaluation with brain magnetic resonance imaging(MRI) with DTT was done. Brain MRI showed no structural abnormalities. DTT showed reduced volume of the bilateral corticospinal tracts and corpus callosum, especially in splenium area. Reduced volume was observed in both arcuate fasciculus with more decreased frontoparietal tract volume at the left side. Inferior fronto-occipital fasciculus were reduced bilaterally, and inferior longitudinal fasciculus and optic radiation were more decreased at the right side (Fig 2).
 GJA 5 gene and GJA8 gene are located in 1q21.1, and are associated with the development. We report here some brain neural tracts of the patient with 1q21.1 deletion by DTT. By using array CGH and DTT together, it would be useful to evaluate the patients with developmental delay and suspected genetic deficit.



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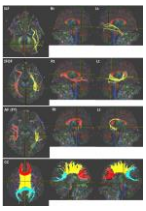
The comparative genomic hybridization for chromosome 1 of the case. Breakpoints were demonstrated on 1q21.1-q21.2 deletion (146564743- 149224043). The deletion was estimated to be 2.7Mb in size and it contained about 17 known genes.



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Diffusion tensor tractography of the patient. Inferior longitudinal fasciculus and optic radiation were more decreased at the right side.

뇌신경재활
게시일시 및 장소 : **2017 년 4 월 21 일 13:00-18:30, 3 층 로비 / 질의응답 일시 및 장소 : 2017 년 4 월 21 일 15:00-15:40, 3 층 로비**
초록순서 : **24** 형식 : **Poster**

Use of Mechanical Insufflation Exsufflation for augementing peak cough flow in dysphagic patients.

YONGJUN JANG[2*], SUN IM[1†], GEUN-YOUNG PARK[1]

The Catholic University of Korea Bucheon St. Mary's Hospital , Department of Rehabilitation Medicine[1], The Catholic University of Korea Seoul St. Mary's Hospital , Department of Rehabilitation Medicine[2]

Introduction
Stroke patients are at risk of aspiration and respiratory complications not only due to presence of swallowing disturbances, but due to impaired cough responses. Moreover, stroke patients with dysphagia have weakened peak cough flow compared to those without dysphagia, despite similar neurological deficits or disability. Many clinical trials with respiratory training have attempted to elucidate whether respiratory strengthening exercises may help improve the cough response, but results have been equivocal. To date, there are no established techniques that have been proved to effectively help increasing the peak cough flow strength in stroke patients with dysphagia. Cough augmentation techniques have been shown to be safe and effective for increasing peak cough flow (PCF) in stable neuromuscular disease patients with motor neuron disease and myopathies. Their efficacies in stroke patients need to be established. Therefore, the objective of this non-randomized double blind controlled trial was to determine whether cough augmentation techniques using mechanical insufflation exfoliation(MIE) could be helpful in improving the PCF in stroke patients with dysphagia.

Method
Total of 11 patients with dysphagia who had confirmed finding of weak PCF were consecutively enrolled. Before their 14 sessions of MIE (Cough&Suction (Sungdo MC CO., LTD.), their cough strength and respiratory pressure meter were evaluated by a blind assessor to patient’s medical and functional status. The patients underwent MIE treatment with a blind physiotherapist in accordance to published protocols and guidelines. A follow up assessment after the MIE treatment were performed. These results were compared to 11 control patients also with weak PCF who had received conventional treatment of respiratory physical therapy that included percussion, inspiratory, and expiratory muscle strengthening trainings but without cough augmentation training.

Result
After 2 weeks of treatment, those with MIE showed significant increase of PCF (60(33.25-91.75) to 153(117.5-194.25), p=0.01), Maximal Inspiratory Pressure(MIP)(19(13-33.25) to 35(26.5-49.50), p=0.01), and MEP(Maximal Expiratory Pressure(MEP)(32(24-51) to 53(42-62), p=0.01), compared to baseline and even compared to the control group. Although group B showed small increase of maximal inspiratory pressure (16(6-29.50) to 22(11.25-31.50)cmH2O, p=0.04) compared to baseline, no significant increase of PCF(74(56-114) to 86(80.50-132.25), p=0.08) and MEP(40(31-45) to 40(34-65), p=0.62) were observed. Between group analysis showed that only the PCF(86(80.50-132.25) vs 153(117.50-194.25) L/min, p=0.04) in those who underwent MIE treatment were significantly increased compared to those with conventional respiratory treatment.

Conclusion
MIE may help assist in improving the weakened PCF in post stroke dysphagia patients after 2 weeks of treatment. Further prospective trials at a larger scale are needed.

소아재활
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초록순서 : **C20** 형식 : **Poster**

Xp22.3 Microdeletion female patient complained speech disturbance without short stature

Ah-Ra Cho[1*], Chung Sik Chae[2], Joo Hyun Park[1†], Myung Shin Kim[3], Woo Ri Jang[3]

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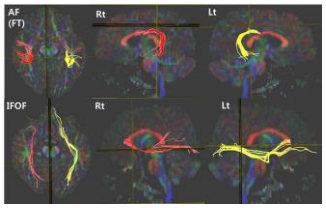
Introduction
The terminal or interstitial deletions of Xp22.3 can be associated with short stature, mental retardation, Kallmann syndrome, ichthyosis, ocular albinism depend on the deletion size. The two female cases with microdeletion of Xp22.3 previously reported in Korea were diagnosed during the assessments for short stature. We present a female case of with a 10.0Mb heterozygous deletion of Xp22.33p22.2 with average height.
 Case report
A 5 years old female was visited for unclear articulation. She was born at 37 weeks with weighting 4,000g by uncomplicated spontaneous vaginal delivery. Until 4 years old her parents thought she showed slightly delayed development and she got speech therapy for 6 months. She showed dysmorphic features which included hirsutism and lower set hair line. Her weight was 34 Kg (>97%ile) with normal height of 114 cm (50%ile). Madelung deformity was not shown. In Denver Developmental Screening Test (DDST) checked at the age of 5 years 9months old, gross motor functions were rated at 3 years 6 months and personal social skill and fine motor adaptive skill were rated at 4 years old. Psychometric evaluation showed a total IQ of 42 indicating moderate mental retardation. Brain magnetic resonance imaging demonstrated normal structure. Diffusion tensor tractography showed decreased volume of left Arcuate fasciculus compared to Rt hemisphere and decreased volume of inferior fronto-occipital fasciculus on bilateral hemisphere (figure 1). She had normal female karyotype, but microdeletion sized 10.0Mb on Xp22.3-22.2 was detected by array CGH study.
Conclusion
The representative phenotypes in female with an heterozygous deletion of Xp22 was mesomelic short stature, Madelung wrist deformity as signs of Leri-Weill dyschondrosteosis caused by the defect of SHOX gene due to preferential X chromosome inactivation of the structurally abnormal X chromosome. This patient was diagnosed the genetic defects and associated phenotypes during the process for evaluating delayed development. To early identify X chromosomal abnormality which showed various phenotypes depend on involving locus, molecular genetic testing such as array CGH is useful.



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Arcuate fasiculus(Frontotempral tract) and Inferior fronto-occipital fasciculus

Anterior chest pain caused by monoarthritis of the manubriosternal joint

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Nowon Eulji Medical Center, Eulji University , Department of Rehabilitation medicine[1]

[Introduction]
The manubriosternal joint(MSJ) may be involved in rheumatoid disease. However, monoarticular arthritis in the MSJ is a rare condition; therefore, reaching a diagnosis is not easy. As arthritis of the MSJ causes chest pain, we need to rule out any serious causes of chest pain. We report a case of patient presenting with anterior chest pain caused by monoarthritis of the MSJ.

[Case]
A 52-year-old woman visited a department of Rehabilitation medicine presented with a history of chest discomfort and increasing anterior chest pain of 5 months' of duration. Her past medical history includes hypertension and she has been taking thyroid hormone after receiving thyroidectomy due to cancer one and half years ago.
She denied any recent significant trauma. She worked at parcel delivery service company where she was exposed to repetitive lifting work. Her symptoms were aggravated by activities using upper extremities, sneezing, and coughing, that it was difficult for her to lift upper body while lying supine.
On examination, there was a localized tenderness at sternum mostly at MSJ area. Shoulder movements were painful but were improved when anterior chest area was supported. EKG, chest x-ray and laboratory workup, including serology and inflammatory markers were not significant. Sternal view x-ray showed arthritic changes at MSJ. Whole body bone scan showed focal increased uptake in MSJ and both elbow joints. MRI showed osteophytes, chondral thinning, and subchondral cysts with edema in SMJ. In addition, mild joint capsule bulging was noticed.
Under the diagnosis of MSJ arthritis, the patient was treated initially by conservative means, including medication. While she was refrained from manual labor, her symptom improved. However, it was a temporary relief; therefore an intra-articular steroid injection was done.

[Discussion]
MSJ is a symphysis, a type of cartilaginous joint. Anteroposterior displacement is limited and only a small range of angulatory movement between longitudinal axes of the body of the sternum and manubrium is allowed. Monoarthritis of the MSJ can be attributed to repetitive strenuous activities applied on this joint. For this patient, repeated overexertion by manual work in parcel delivery service company may have affected as the repetitive stress and caused the localized arthritis of the MSJ.
Since chest pain is a major concern in population, awareness of this rare condition is helpful to make differential diagnosis among other serious medical conditions.

소아재활
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초록순서 : **C21** 형식 : **Poster**

A case of 13q12.3 duplication in a child with developmental language delay and behavioral problem

KeeBoem Park, MD[1*], Ah-Ra Cho, MD[1], Woori Jang, MD[2], Myungshin Kim, MD[2], Joo Hyun Park, MD, PhD[1†]

The Catholic University of Korea Seoul St. Mary's Hospital , Department of Rehabilitation Medicine[1], The Catholic University of Korea Seoul St. Mary's Hospital , Departmet of Laboratory Medicine[2]

Introduction
Chromosome 13q12.3 abnormality has rarely been reported. There are several reported cases of microdeletion, but a case of 13q12.3 duplication has never been reported. 13q12.3 microdeletion syndrome is characterized by intellectual disability, delay of speech, behavioral problem, microcephaly and eczema/atopic dermatitis as the predominant symptoms. We present with the first case in Korea of 13q12.3 duplication in a child with delay of speech accompanied by behavioral problem.

Case
A boy was vaginally delivered at the gestation age of 40 weeks. He suffered from episodes of tachypnea and desaturation. Prompt evaluation was made and, bronchoscopy revealed laryngotracheomalacia and bronchomalacia. The child improved with conservative management and discharged from the hospital at day 9.
He was referred to our unit for developmental assessment at the age of 3 years 6 months because of speech and language delay. His father and both of his sisters had history of dysarthria and sisters had history of language therapy. Motor milestones were delayed; skipped crawling and walked at 24 months. Language development was markedly impaired; spoke 1 word at 26 months and did not improve by 42 months. He displayed behavioral problems with hyperactivity and impulsivity: avoided eye contacts and seen mostly screaming and crying. The Denver Developmental Screening Test performed at 3.5 years revealed personal social age rated at 18-22 months, fine motor rated at 15 months, language rated at 8 months and gross motor rated at 24 months. Array-based comparative genomic hybridization (array-CGH) revealed a 1.2Mb duplication of chromosome 13q12.3 (30,656,355-31,905,182). Mutation point included KATNAL1, LOC100188949, HMGB1, USPL1, ALOX5AP, C13orf33, C13orf26, HSPH1 and B3GALTL genes.

Conclusion
Patients form previous reported cases of 13q12.3 microdeletion syndrome had characteristic of intellectual disability combined with delayed speech, but motor milestone status were variable. Previous studies suggest HMGB1 and KATNAL1 genes present in chromosome 13q12.3 in particular are closely related to intellectual disability. Being the first case report in Korea of 13q12.3 duplication in a child with delay of speech, array CGH could be a useful diagnostic tool for patients of delayed development with prominent delayed speech.

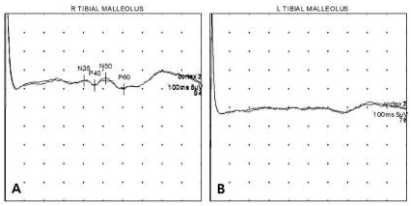
신경근육재활 및 전기진단
게시일시 및 장소 : **2017 년 4 월 21 일 13:00-18:30, 3 층 로비 / 질의응답 일시 및 장소 : 2017 년 4 월 21 일 15:00-15:40, 3 층 로비**
초록순서 : **55** 형식 : **Poster**

Sequestered Lumbar Disc Masquerading as Spinal Tumor

Taejoon Park[1*], Bumsun Kwon[1], Jinwoo Park[1], Hojun Lee[1], Junghwan lee[1], Kiyeun Nam[1†]

Dongguk University College of Medicine, 1Departments of Physical Medicine & Rehabilitation[1]

BACKGROUND: Posterior epidural migration of a lumbar intervertebral disc fragment (PEMLIF) is uncommon because of anatomical barriers. It is difficult to diagnose PEMLIF definitely because of relatively rare incidence and ambiguity of radiologic findings, and it can masquerade as spinal tumor.
OBJECTIVE: It is clinically important that differential diagnosis of PEMLIF because its diagnosis can affect the treatment and prognosis of the patient. We report a case and review the literature on the PEMLIF masquerading as spinal tumor.
METHODS: We performed a search of all published clinical studies of PEMLIF to date. We analyzed all of cases in a multidisciplinary way about anatomical review, etiology, symptom, diagnosis, and management.
RESULTS: We identified 40 patients of PEMLIF from 28 literatures. The most common presentation of PEMLIF was sudden onset radiculopathy (70.0%), followed by cauda equina syndrome (CES) (27.5%). The most frequently used diagnostic modality was magnetic resonance imaging (MRI), conducted in 36 cases (90.0%), followed by computed tomography in 14 cases (35.0%). After the imaging studies, preoperative diagnosis was in the order of ‘mass’ (45.0%), ‘lesion’ (20.0%), and ‘tumor’ (12.5%). Characteristic MRI findings in PEMLIF are helpful for diagnosis. PEMLIF typically displays low signals on T1-weighted images and high signals on T2-weighted images with respect to the parent disc. In addition, most of the disc fragments show peripheral rim enhancement on MRI with gadolinium administration. Electrodiagnostic test is useful for verifying nerve damage. Surgical treatment was performed in all cases and neurologic complications were observed in 12.5%.
CONCLUSIONS: The possibility of PEMLIF should be considered when rim enhancement is observed in MRI scans with sudden symptoms of radiculopathy or CES. Early diagnosis can lead to early surgery, which can reduce complications.



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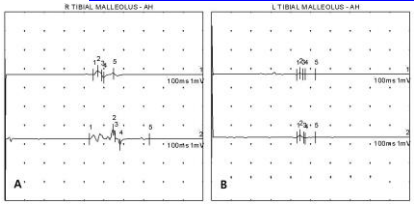

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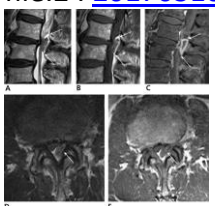
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뇌신경재활
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초록순서 : **C6**　　형식 : **Poster**

Botulinum toxin injection of open jaw dystonia using ultrasound in progressive supranuclear palsy

Bo Ram Ahn[1*], Hyo Jung Kang[1†], En Jung Choi[1], Seung Min Kim[2]

VHS Medical Center, Department of Rehabilitation Medicine[1], VHS Medical Center, Department of Neurology[2]

Objective
Dystonia has been infrequently manifested in progressive supranuclear palsy (PSP). Axial dystonia in extension has been reported sporadically; however, other type of dystonia such as limb dystonia, bleopharospasm, oromandibular dystonia, and cranial dystonia were also reported. Oromandibular dystonia (OMD) is an infrequent condition in PSP, which may results in dysfunctional movements of facial, tongue muscles, mandible and temporomandibular joint. It can be subdivided into jaw opening, jaw closing, jaw deviation and lip pursing types. Regards of treatments, medical treatment usually showed a little effect on dystonia, botulinum toxin injection has been focused on an alternative treatment for OMD. In this case, we aim to report the treatment of jaw opening dystonia with botulinum toxin A in PSP using ultrasonography
Methods
A 64-year-old man presented with tonic, extended dystonia of axial and OMD, open jaw type. He was diagnosed as PSP at 2014, and prescribed many medicines since then. He was suffering from constant opened jaw, which results in poor mastication, dry mouth and impaired communication. However, there was no response on medications. The patient was treated with injection of botulinum A toxin (Botox) at the lateral pterygoids and the anterior digastrics muscles involved in jaw opening dystonia.
At first, lateral pterygoid muscle was identified using ultrasonography (Accuvix XQ, Medison, Seoul, Korea), with landmarks of condylar head and coronoid process of the mandible (Fig. 1-A). The muscle was over condylar head of the mandible, and extended to the coronoid process of the mandible. The patient was treated with injections of total 25 units of botulinum A toxin at two points in each lateral pterygoid muscle. The digastric muscle was also identified with ultrasonography (Fig. 1-B) with transverse view over hyoid bone. Ultrasonography guided botulinum toxin A was injected in two points of each anterior digastric muscle, total 25 units at both sides.
Results
Before the procedure, the patient showed constant open jaw state with an impossible of speaking and feeding (Fig. 2-A). After the procedure, the patient showed much improved jaw movement with voluntary jaw movements and even full closed jaw (Fig. 2-B). The improvement was manifested 6 days later after the procedure, and there has been no report of severe side effect after botulinum toxin injection.

Conclusion
Botulinum toxin is a potent neuromuscular paralyzing agent, which cause reversible chemodenervation by blocking the presynaptic release of acetylcholine. There has been reported that jaw closing dystonia usually showed better results than jaw opening type in botulinum A toxin injection. In this regards, this case suggested that botulinum toxin A has been proved to be superior to medical treatment in focal dystonia.

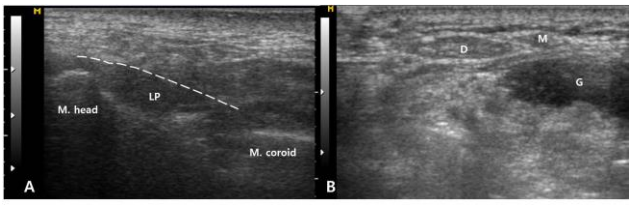

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Figure 1. A. Illustration of a longitudinal ultrasound image between the condylar head and coroid process of the mandible and the lateral pterygoid muscle (LP: lateral pterygoid muscle, M.coroid: coroid process of the mandible, M. head: the condylar head of the mandible) B. Transverse ultrasound image of the floor of the mouth (D: Anterior digastric muscle, G: Genioglossus and geniohyideus muscle, M: Mylohyoid muscle)

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Figure 2. A. Constant open jaw state before the procedure of botulinum toxin A injection. B. Full closed jaw after the procedure

소아재활
게시일시 및 장소 : **2017 년 4 월 21 일 13:00-18:30, 3 층 로비 / 질의응답 일시 및 장소 : 2017 년 4 월 21 일 18:00-18:30, 3 층 로비**
초록순서 : **C22** 형식 : **Poster**

Clinical presentation of infantile torticollis attributed to throacic scoliosis

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Konkuk University Medical Center, Department of Rehabilitation Medicine[1]

Introduction: Torticollis is the common term for various dystonic conditions of the head and neck resulting in abnormal, asymmetrical position of the head in the forms of laterocollis, rotational torticollis, anterocollis, retrocollis, and combinations of the aforementioned postures. In infants, it is mostly associated with a shortening or excessive contraction of the sternocleidomastoid muscle, typically tilting the head in lateral bending toward the affected muscle and rotated toward the opposite side. A diagnosis of choice is ultrasonography, in which a fibromatosis colli can be visualized in the affected side.

Case Report: A nine-month-old male infant was presented with left tilting of the head. He was born at 40 week's gestation and weighted 3.93 kg at birth. There were no known perinatal complications including seizure. The infant had reached developmental milestones such as crawling and standing with support, appropriate for his age. A physical examination of the cervical area revealed a head tilt of 10 degrees to the left and no definite palpable mass on both sides of the neck with full cervical range of motion. Having been referred to from a local pediatric clinic for evaluation of torticollis, the patient underwent a cervical radiography and ultrasonography. (figure 1) However, the bilateral sternocleidomastoid muscles documented no evidence of fibromatous colli in the ultrasound, while the cervical radiography showed a thoracic scoliosis. Subsequently, a plain radiography of the entire spine was ordered, (figure 2) in which the diagnosis a thoracic scoliosis with segmentation fusion anomaly of T-spine was made.

Conclusion: In assessing infants presented with a head tilt showing clinical impression of a torticollis, consideration and evaluation of the spinal deformities such as thoracic scoliosis should be included for proper management.

Key words: throacic scoliosis, torticollis

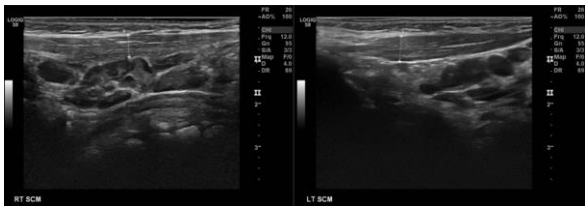

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Figure 1. Ultrasonography of the sternocleidomastoid muscles

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Figure 2. Plain radiography of the entire spine

노인재활

게시일시 및 장소 : **2017 년 4 월 21 일 13:00-18:30, 3 층 로비 / 질의응답 일시 및 장소 : 2017 년 4 월 21 일 15:00-15:40, 3 층 로비**

초록순서 : **3** 형식 : **Poster**

Swallowing Function in the Elderly

Kyo Jun Youn[1,2*], Ji Eun Kim[2], Kang Hee Cho[1,2†]

Chungnam National University, Department of Rehabilitation Medicine, School of Medicine[1], Chungnam National University Hospital, Department of Rehabilitation Medicine[2]

Objective : To investigate the characteristics of swallowing function in the elderly with age.
Methods : A total of 104 community-dwelling geriatrics, aged 65 years or older were volunteered to participate in the study and divided 3 group with age. Those who had a history of medical treatment for dysphagia, who were diagnosed with neurological disease or other condition that might affect swallowing and who underwent surgery for the structure related to the swallowing were excluded. The videofluoroscopic swallowing study (VFSS) with plain yogurt, porridge, rice, 2.5ml and 5ml water were conducted in the elderly and Videofluoroscopic dysphagia scale (VDS), the American Speech-Language-Hearing Association National Outcome Measurement System (ASHA NOMS), modified penetration-aspiration scale (mPAS) were measured.
Results : In the first elderly group between the ages of 65 and 69, the abnormal findings of VDS were observed in Bolus Formation(4.2%), Premature Bolus Loss(4.2%), Vallecular Residue(45.8%), Pyriform Sinus Residue(8.3%), Coating on the Pharyngeal Wall(29.1%), Pharyngeal Transit Time(4.2%). In the second elderly group between the ages of 70 and 79, 3 volunteers showed abnormal findings in mPAS level and the abnormal findings of VDS were observed in Lip Closure(1.9%), Bolus Formation(5.8%), Premature Bolus Loss(28.4%), Triggering of Pharyngeal Swallow(1.9%), Vallecular Residue(75%), Pyriform Sinus Residue(25%), Coating on the Pharyngeal Wall(63.5%), Pharyngeal Transit Time(3.8%), Aspiration & Penetration(5.8%). In the third elderly group between the ages of 80 and 89, the abnormal findings of VDS were observed in Lip Closure(3.6%), Premature Bolus Loss(7.1%), Vallecular Residue(67.9%), Pyriform Sinus Residue(25%), Coating on the Pharyngeal Wall(39.3%).
Conclusion : In this study, the abnormal findings were observed in most of the elderly(79.8%), but most of abnormal findings were mild, except 3 volunteers. For the safe dietary intake of the elderly, we suggest the necessity of elderly-friendly foods. This data could be used as the data basis for evaluation of swallowing function in the elderly.

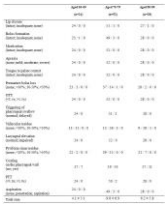

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Table 1. Videofluoroscopic dysphagia scales in the elderly

Bilateral Radial Nerve Palsy Following Chiropractic Manipulation Therapy: A Case Report

Shin Who Park[1*], Yong Sung Jeong[1], Hyo Sik Park[1], Young Jae Seo[1], Kang Jae Jung[1], Ja Young Choi[1], Jong Youb Lim[1†]

Eulji University Hospital and Eulji University School of Medicine, Department of Physical Medicine and Rehabilitation[1]

Introduction
The radial nerve injury classically occurs by humeral shaft fracture, repetitive motion or external pressure. The patient with radial nerve palsy will experience the condition known as wrist drop and will be unable to perform the hitch hike sign. The prognosis is variable and timely expert assessment and appropriate interventions are critical to maximize long-term limb function. To the best of our knowledge, no case of iatrogenic radial nerve palsy has been previously documented following manipulative therapy.
Case Report
The patient was a 34-year-old right-handed male with no past medical history. The patient started to receive a chiropractic manipulation therapy because of the persistent numbness and tingling sense in his right forearm and 5th finger. The chiropractor, after using the activator, proceeded to a various stretching and soft tissue massage technique. The patient then felt sudden onset of a burning sensation in his both arms. Eventually he noticed weakness and was unable to actively lift his both wrists. His typical work duty was making designs on a metal plate with tweezers but he was unable to perform his usual duties. Local clinic practitioner managed the patient for 2 weeks, and eventually referred him to our hospital for further management.
The patient’s complaints were weakness in his bilateral wrist and finger extensors associated with numbness and hypesthesia in dorsum of hands. He brought electrodiagnosis report and diagnosis was bilateral radial nerve lesion at or around upper arm level. On physical examination, he had fair minus grade and poor minus grade muscle power on his both wrists as well as both fingers. Bilateral elbow extensors showed normal grade muscle power. He had decreased sensation to light touch around his dorsum of hands and the Tinel’s sign for radial nerves were positive. He was prescribed prednisolone 10mg and aceclofenac 200mg for 2 weeks. The wrist extensor and finger extensor strengthening physical therapy and occupational therapy were also applied. After 4 months of rehabilitation, significant restoration of function was found. His both wrist extensor power was good grade and both finger extensor power was fair grade. Follow-up electrodiagnostic examination revealed significantly increased conduction velocity and amplitude of both radial nerves.
Discussion
This case report suggests the lesion to be either a pre-existing condition exacerbated by manipulation or trauma resulting from the manipulation itself. The hypothesized mechanism of injury in this case involved a high-velocity distraction force. A thorough history and physical examination should be performed for the injured patients including neurological and provocation-based testing. It will determine contraindications for manipulative therapy and referral for other specialist if required. Without careful attention during manipulation therapy, even bilateral radial nerve palsy can occur.

통증 및 근골격재활
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초록순서 : **94** 형식 : **Poster**

Current state of ROM Measurement between Measurement Technique and Disability Evaluation Guideline

HANBIT KO[1,2*], JONG-HYUN PARK[2], SO YOUNG AHN[1,2], KANG HEE CHO[1,2†]

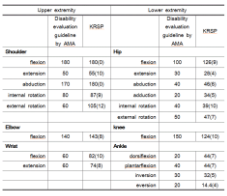
CHUNGNAM NATIONAL UNIVERSITY, DEPARTMENT OF REHABILITATION MEDICINE, SCHOOL OF MEDICINE[1], CHUNGNAM NATIONAL UNIVERSITY HOSPITAL , DEPARTMENT OF REHABILITATION MEDICINE [2]

Objective: To investigate the difference of active range of motion(ROM) of major joint according to our measurement technique and disability evaluation guideline using American medical association (A.M.A).

Subjects & Methods: 20-30 aged healthy adults were included in the study. One examiner measured the active ROM of shoulder flexion/extension/abduction/internal roation/external rotation, elbow flexion, wrist flexion/extension, hip flexion/extension/abduction/adduction/ internal rotation/external rotation, knee flexion, ankle dorsiflexion/plantarflexion/inversion/ eversion by Dualer IQ Inclinometers (J-tech, Torrance, Calif., USA) using KRSP(korean reference standard protocol). The study referred to the A.M.A guides to evaluation of permanent Impairment (3-6th edition) and an inclinometer manual. Pilot study was carried out for detailed and fixed measurements technique. We made molded device which is attached to digital inclinometer for fix inclinometer sensors to measure spine ROM. Difference of ROM between our measurement technique and disability evaluation guideline were measured.

Results:
 Difference between our study and disability evaluation guideline was shown Table 1. Our study showed large difference in shoulder external rotation, wrist flexion/extension, hip flexion/extension over 20% of normal reference value of Disability evaluation guideline by AMA reference. Disability evaluation defined measurement axis and ROM values using AMA guideline but we can`t identify its reference.

Conclusion:
There are some difference between our measurement techniques and disability guideline by A.M.A. We need strict reference to evaluate limitation of range of motion for disability evaluation.



Upper extremity			Lower extremity		
	Disability evaluation guideline by AMA	KRSP		Disability evaluation guideline by AMA	KRSP
Shoulder			**Hip**		
flexion	180	180(3)	flexion	100	126(9)
extension	50	55(10)	extension	30	28(4)
abduction	170	180(3)	abduction	40	46(6)
internal rotation	80	87(9)	adduction	20	34(5)
external rotation	60	108(12)	internal rotation	40	38(10)
			external rotation	50	47(7)
Elbow			**knee**		
flexion	140	143(8)	flexion	150	124(10)
Wrist			**Ankle**		
flexion	60	62(10)	dorsiflexion	20	44(7)
extension	60	74(8)	plantarflexion	40	44(7)
			inversion	30	32(5)
			eversion	20	14.4(4)

*SD means standard deviation.

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Table 1. Comparison of measurements of KSRP protocol with normal referene value of A.M.A. Values are Mean(SD)(°).

뇌신경재활
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초록순서 : **25** 형식 : **Poster**

Effect of Skater Exercise on Cardiopulmonary Fitness and Balance in Patients with Chronic Stroke

Soo Hyun Soh[1*], Na Ri Yun[1], Soh Young Lee[1], Hyun Young Park[2], Dae Won Kim[3], Min Su Kim[1†]

Wonkwang University School of Medicine, Department of Rehabilitation Medicine[1], Wonkwang University School of Medicine, Department of Neurology[2], Wonkwang University School of Medicine, Department of Neurosurgery[3]

Purpose: The purpose of this study was to investigate the effects of skater exercise on cardiopulmonary fitness and balance function in patients with mild chronic stroke.

Methods: This study was designed as a randomized controlled, single blinded trial. A total of forty six patients with mild neurologic deficits over 6 months from the onset were randomly assigned to the two groups. The patients in the experimental group were performed with skater exercise, whereas conventional physical therapy was conducted in the control group. One session of the therapy was carried out for 30 minutes, and a total of 24 sessions were administered three times per week for eight weeks equally in both groups. The primary outcomes were cardiopulmonary responses and the balance function, which were measured by gas analysis, and quantified posturography and Berg balance scale (BBS) before and after the intervention. Also, the health related quality of life was investigated by Euro-Quality of Life-5 Dimension (EQ-5D).

Results: Any specific adverse effects were not reported during and after skater exercise. Significant difference in the peak oxygen uptake was found between the experimental and the control group ($p<0.05$). The falling/stability indices, the BBS, and the EQ-5D were significantly improved in the experimental group ($p<0.05$) compared with the control group. In addition, the difference in EQ-5D after the intervention was significantly related to the peak oxygen uptake ($p<0.05$) and the falling index ($p<0.05$).

Conclusion: Skater exercise contributed to improve cardiopulmonary fitness and balance function effectively in patients with mild chronic stroke.

통증 및 근골격재활
게시일시 및 장소 : **2017 년 4 월 21 일 13:00-18:30, 3 층 로비 / 질의응답 일시 및 장소 : 2017 년 4 월 21 일 15:00-15:40, 3 층 로비**
초록순서 : **95** 형식 : **Poster**

The change of Gastrocnemius muscle stiffness measured by ARFI according to the position of ankle

Min-soo Jeon[1*], Shin-seung Yang [1†], Bong-Ok Kim[1]

Chungnam National University Hospital, Department of Rehabilitation Medicine[1]

Introduction
To investigate the feasibility of quantitative analysis of muscle stiffness by Acoustic Radiation Forced Impulse (ARFI) elastography over a course of voluntary ankle dorsiflexion and plantarflexion.

Methods
The stiffness of the unilateral (Left) gastrocnemius muscle of 15 healthy volunteers was measured by ARFI elastography, while the ankle was at 15 degrees of dorsiflexed and 50 degrees of plantarflexed position.
ARFI imaging was obtained by two physiatrists using the ultrasonography with 9L4 linear transducer (Virtual Touch Imaging. ACUSON S2000 Ultrasound Unit, Siemens, Mountain View CA). Shear wave velocity (SWV) was obtained by scanning at the highest point of gastrocnemius muscle in the transverse plane. Three trials were performed and the mean value was used for comparing. Mann-Whitney U test were used for comparison between the ankle position and the inter-observer difference was also analyzed.

Result
The mean SWV of gastrocnemius at dorsiflexion and at plantarflexion position were 1.48±0.79 m/sec, 2.41±1.09 m/sec, respectively. (physiatrists 1: Mann-Whitney U=1562.5, p=0.000), (physiatrist 2: Mann-Whitney U=1,677.00, p=0.000). The inter-observer reliability for measuring SWV was significantly high (Dorsiflexion r=0.852, Plantarflexion r=0.942).

Conclusion
ARFI elastography is a feasible and reliable imaging modality for quantifying the stiffness of contracting muscles. Additionally, the characterization of pathological soft tissues by ARFI elastography would be a promising clinical practice for patients with musculoskeletal issues.

소아재활
게시일시 및 장소 : **2017 년 4 월 21 일 13:00-18:30, 3 층 로비 / 질의응답 일시 및 장소 : 2017 년 4 월 21 일 18:00-18:30, 3 층 로비**
초록순서 : **C27** 형식 : **Poster**

Urinary urgency with occasional incontinence in Juvenile onset Alexander's disease: a case report

In-Sik Lee[1†], Jong Won Lee[1*]

Konkuk University Medical Center and Konkuk University School of Medicine, Department of Rehabilitation Medicine[1]

Introduction:
Alexander's disease (AxD) is a rare genetic disease caused by mutations in the glial fibrillary acid protein (GFAP) gene characterized by a progressive neurological decline in children and infants. On the other hand, the clinical course of juvenile onset (typically presents between ages 4 and 14) forms of AxD is usually more prolonged and the clinical symptoms are very diverse. In those diverse clinical symptoms, juvenile onset AxD is generally presenting with vague and progressive muscular and bulbar symptoms. In contrast, here we present a case of juvenile onset urinary urgency with marked atrophy of the corpus callosum and the degeneration of the white matter on magnetic resonance imaging (MRI).
Case Report:
A 20-year-old female otherwise healthy female presented with a 8-year history of slowly progressive urinary urgency with occasional incontinence. She developed normally without past history and familial history. Since early teens symptoms of urinary urgency with occasional incontinence appeared. She complaints about two to three times of unintentional voiding while sleep at night. Furthermore symptoms of urgency and frequency also present in day time. To alleviate these symptoms, she underwent uroflowmetry examination and test results were severe storage problem with urinary tract infection. Since then, she stayed without the symptoms progression but she was hospitalized for further examination about the untreated voiding symptoms. The initial physical examination revealed no definite motor weakness but she had a balance problem caused by a pes planus and signs of spasticity on both ankles. On neurologic exam there was a mild to moderate mental retardation and she scored 26/30 on the Mini Mental State Examination. Brain MRI was performed and increased in extent of T2 high signal intensity lesions in bilateral frontal subcortical white matter and parietal periventricular white matter along with atrophic change of corpus callosum was observed. She was discharged with voiding control medication and had a plan for genetic study of adrenoleukodystrophy(female variant) and AxD. Several weeks later, she visited on an outpatient clinic with genetic results. There are well concentrations of very long chain fatty acids(VLCFA) and their respective ratios were normal. In contrast, molecular genetic analysis revealed a novel missense mutation in the GFAP gene. Therefore she finally diagnosed Alexander disease. Recently, she takes anti spasticity medication, cognition enhancer, urinary medication and having a physical therapy based on outpatient clinic due to low extremities spastic muscle condition.
Conclusion:
Clinical progression in our patient was relatively slow compared with that previously known in childhood onset of AxD and it was a case showing AxD, which mainly complained of urinary urgency with incontinence.

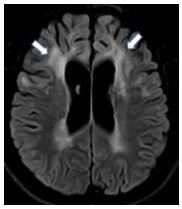

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Fig.1. Axial T2-weighted MRI shows hyperintensity in FLAIR image around the periventricular

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Fig.2. Sagittal T1-weighted FLAIR MRI shows atrophy change of corpus callosum

척수재활

게시일시 및 장소 : **2017 년 4 월 21 일 13:00-18:30, 3 층 로비 / 질의응답 일시 및 장소 : 2017 년 4 월 21 일 15:00-15:40, 3 층 로비**

초록순서 : **81** 형식 : **Poster**

nutritional status according to neurological level and severity in patients with spinal cord injury

Jae Joong Lee[1*], Sang Won Hwang[1], Shin Hye Jang[1], Ji Cheol Shin[1†]

Yonsei University College of Medicine, Dept. and Research Institute of Rehabilitation Medicine[1]

Objective
It has been reported that incidence rate of dyslipidemia and coronary heart disease increases in spinal cord injury(SCI) patients more than that of general population, and on the other hand obesity is known to cause complications such as pressure ulcer. Studies on nutrition status of SCI patients in the country are just not enough in its numbers and we intend to see changes in state upon result observation and proper training as well as evaluating nutrition state of SCI patients.

Method
Targeting 75 adult participants older than 19 among SCI patients who were hospitalized in rehabilitation center of Sinchon Severance Hospital during 2016, initial inbody was measured upon hospitalization followed by continuous rehabilitation therapy and after 1-2 months, follow up inbody was done to evaluate nutrition state of SCI patients upon early hospitalization and the study was about how nutrition state changes after hospital treatment and training for 4-8 weeks. Among them, patients who could not keep constant nutrition intake due to complications during hospitalized period and those with diabetes, CVD, HTN, Dyslipidemia, CVD, hormonal pathologies history which occurred before spinal injury were excluded from this study.

Result
As a result of analyzing initial Inbody data after classifying it according to onset, level of injury, severity through Independent T-test, inbody data such as weight, weight loss, BMI and skeletal muscle mass, fat-free mass showed no significant difference. When Initial Inbody data was measured followed by rehabilitation treatment to have follow up after 1~2 months, changes shown were classified according to categories of onset and level of injury, analyzed through Paired T-test and it showed in patients with spinal cord injury not older than 3 months did not show significant difference , however, in tetraplegia patients who have had it longer than 3 months but less than a year, there was significant increases in initial body weight and BMI, on the other hand, tetraplegia and paraplegia older than 3 months but younger than 1 year showed significant increase view in skeletal muscle mass, soft lean mass, fat-free mass. Changes in Segmental lean mass were mainly observed to be lean mass increase in both lower limb, decrease in percent body fat.

Conclusion
Through this study, we tried to investigate nutrition state of patients with spinal injury and to see changes in skeletal muscle mass and percent body fat when rehabilitation treatment is done, to implement proper training, to evaluate nutrition state. Mainly, there was no significant difference between initial inbody data and follow up inbody data due to heterogeneous data in spinal cord injury patients from 3 months but in spinal cord patients from over 3 months, we could observe decrease in body fat mass and increase in skeletal muscle mass when training is done after nutrition evaluation.

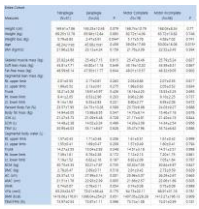

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Fig 1. body composition evaluation from classification of Initial Inbody data according to onset, level of injury and severity.

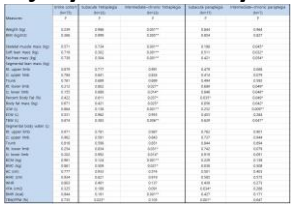

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Fig 2. Chances of changes when f/u is done after 1~2 months of Initial inbody implementation

뇌신경재활

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초록순서 : **26** 형식 : **Poster**

The Stroke Incidence Rate Difference related to the Diurnal Range of Temperature

Seojin Song[1*], Sun Jae Won[1†], Hye Jung Park[1], Won Ihl Rhee[1], Yeonji Yoo[1]

Yeouido St. Mary's Hospital, College of Medicine, Catholic University, Seoul, South Korea, Department of Physical Medicine and Rehabilitation[1]

BACKGROUND: Among the studies conducted so far, there have been conflicting results with relationship of diurnal temperature range (DTR) and stroke incidence. So we designed this study to determine the effects of diurnal temperature variations on the incidence of the stroke in Seoul, South Korea which has four seasons and great diurnal variation.
METHODS: From January 1, 2005 to December 31, 2014, data of all stroke patients visited our clinic were collected. The cases occurred in Seoul, South Korea were confined to be not related to trauma, brain tumor. Information on daily temperature was obtained from the Korea Meteorological Administration. We compared the mean DTR of stroke days with overall DTR in 10 years by groups. And we analyzed difference of stroke incidence by monthly on January basis. Lastly, we conducted correlation analysis between the number of strokes and DTR of that day, average values of DTR in 1, 2 and 4 weeks before of stroke onset day.
RESURTS: The average of DTR of attacked day has no difference (P=0.610) compared to average of DTR of whole days of 10 years. The incidence of stroke with monthly variation was observed compared to January basis in some subgroups. Daily incidence of stroke was related to the DTR of that day, average value of DTR in 1 week before, 2 weeks before and 4 weeks before onset day (P<0.05) in some hypertensive groups. Daily incidence of stroke was not related to the mean temperature of that day.
CONCLUSION: We observed monthly variation of the incidence of stroke with its subgroups. In some hypertensive groups, we found the positive correlation between DTR and the incidence of stroke. This correlation gets stronger with farther (more distinct) DTR data.

Table 1. Characteristics of Patients With Stroke in Seoul, Korea, 2005 to 2014

Characteristics	All stroke (N=1973)	Infarction (N=1298, 65.7%)	ICH (N=409, 20.7%)	SAH (N=266, 13.4%)
Sex, n(%)				
Men	1097(55.6%)	746(57.5%)	248(60.6%)	103(38.7%)
Women	876(44.4%)	552(42.5%)	161(39.4%)	163(61.3%)
Age distribution, n(%)				
<65	945(47.9%)	497(38.3%)	255(62.3%)	193(72.6%)
≥65	1028(52.1%)	801(61.7%)	154(37.7%)	73(27.4%)
Risk factor, n, (%)				
Hypertension	1097(55.6%)	773(59.6%)	206(50.4%)	118(44.4%)
Diabetes mellitus	452(22.9%)	369(28.7%)	64(15.6%)	19(7.1%)

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Table 1. Characteristics of Patients With Stroke in Seoul, Korea, 2005 to 2014

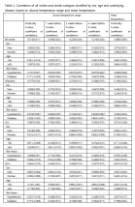

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Table 2. Correlation of all stroke and stroke subtypes stratified by sex, age and underlying disease, based on diurnal temperature range and mean temperature

재활정책
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초록순서 : **74** 형식 : **Poster**

Cost of rehabilitation treatment of cerebral palsy in Korea

Seong Woo Kim[1†], Ha Ra Jeon[1*], Jiyong Kim[2], Soo Jin Choi[1]

National Health Insurance Service Ilsan Hospital, Department of Rehabilitation Medicine[1], Inje University Ilsan Paik Hospital, Department of Rehabilitation Medicine[2]

Subjective: Cerebral palsy is a serious disorder among neurodevelopmental diseases that occur in childhood, and it requires many treatments over a long period of time. The purpose of this study is to investigate the rehabilitation cost of patients with cerebral palsy as a basic data of future health policy.
Method: From 2007 to 2013, we analyzed the cost of rehabilitation treatment for patients who were diagnosed with cerebral palsy based on data requested by National Health Insurance Service.
Result: In recent years total cost of rehabilitation treatment of cerebral palsy had increased. The cost per capita was KRW 8,066,013 in aged 0-6, KRW 7,448,412 in aged 7-18 and KRW 11,518,434 in 19 years or older as of 2013. When the total rehabilitation treatment pattern according to age was observed, the rate of increase in the number of inpatient and outpatient per year was similar in the age group of 0-6 and 7-18 years, but the rate of increase in the inpatient number in the age group of 19 years or older was about double that of outpatient. It could be said that inpatient rehabilitation is the main treatment method rather than outpatient treatment in adult period. Botulinum toxin injection was the most frequent in infants and toddlers group and orthopedic surgery was performed most frequently in school age and adolescence group. In case of selective dorsal rhizotomy, we found that this operation was performed very rarely in all ages and was most commonly performed in 7-18 year old group.
Conclusion: The purpose of this study was to investigate the expenditure of rehabilitation treatment for patients with cerebral palsy based on the National Health Information Database. It was found that using pattern of rehabilitation treatment of patients with cerebral palsy was different according to the life cycle, and the rehabilitation treatment cost increased over the years. The results of this study are expected to be used as a basis for establishing the insurance policy and the support system of medical expenses for patients with cerebral palsy in the future.

척수재활

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초록순서 : **82** 형식 : **Poster**

Robot-assisted gait training in people with spinal cord injury: a systematic review

Dayun Park[1*], Bumsun Kwon[1], Jinwoo Park[1], Hojun Lee[1], Junghwan Lee [1], Kiyeun Nam[1†]

Dongguk University Collage of Medicine, Department of Physical medicine and Rehabilitation Medicine[1]

BACKGROUND: Robot-assisted gait training (RAGT) after spinal cord injury (SCI) induces several different neurophysiological mechanisms to restore walking ability, including the activation of central pattern generators, task-specific stepping practice and massed exercise. However, there is no clear evidence for the optimal timing and efficacy of RAGT in people with SCI.
OBJECTIVE: The aim of our study was to assess the effects of RAGT on improvement in walking-related functional outcomes in patients with incomplete SCI compared with other rehabilitation modalities according to time elapsed since injury.
METHODS: This review included 10 trials involving 502 participants to meta-analysis.
RESULTS: The acute RAGT groups showed significantly greater improvements in gait distance, leg strength, and functional level of mobility and independence than the over-ground training (OGT) groups. The pooled mean difference was 45.05 m (95% CI 13.81 to 76.29, P = 0.005, I2 = 0%; two trials, 122 participants), 2.54 (LEMS, 95% CI 0.11 to 4.96, P = 0.04, I2 = 0%; three trials, 211 participants) and 0.5 (WISCI-II and FIM-L, 95% CI 0.02 to 0.98, P = 0.04, I2 = 67%; three trials, 211 participants), respectively. In the chronic RAGT group, significantly greater improvements in speed (pooled mean difference = 0.07 m/s, 95% CI 0.01 to 0.12, P = 0.01, I2 = 0%; three trials, 124 participants) and balance measured by TUG (pooled mean difference = 9.25, 95% CI 2.76 to 15.73, P = 0.005, I2 = 74%; three trials, 120 participants) were observed than in the group with no intervention. Thus, RAGT improves mobility-related outcomes to a greater degree than conventional OGT for patients with incomplete SCI, particularly during the acute stage.
CONCLUSIONS: RAGT treatment is a promising technique to restore functional walking and improve locomotor ability, which might enable SCI patients to maintain a healthy lifestyle and increase their level of physical activity.

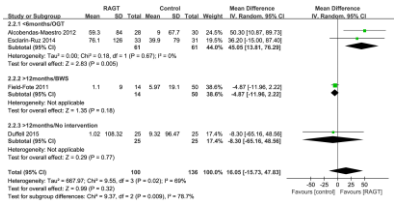

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Figure1. Weighted mean difference (95% CI) of the effect of RAGT compared with control on gait distance by pooling data from 4 trials (n = 298) with subgroup analysis by (a) time since injury (acute < 6 months, chronic > 12 months) and (b) type of intervention (BWS, OGT, and no intervention) in people with SCI.

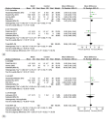

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Figure2. Weighted mean difference (95% CI) of the effect of RAGT compared with control on leg strength (LEMS) by pooling data from 6 trials (n = 314) with subgroup analysis by (a) time since injury (acute < 6 months, chronic > 12 months) and (b) type of intervention (BWS, OGT, and strength) in people with SCI.

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Figure3. Weighted mean difference (95% CI) of the effect of RAGT compared with control on functional level and independence (WISCI-II and FIM-L) by pooling data from 5 trials (n = 250) with subgroup analysis by

time since injury (acute < 6 months, chronic > 12 months) and type of intervention (BWS, OGT and strength) in people with SCI.

통증 및 근골격재활
게시일시 및 장소 : **2017 년 4 월 21 일 13:00-18:30, 3 층 로비 / 질의응답 일시 및 장소 : 2017 년 4 월 21 일 15:00-15:40, 3 층 로비**
초록순서 : **96** 형식 : **Poster**

Quantitative measurement of supraspinatus muscle on ultrasonography after rotator cuff repair

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Objective
The purpose of this study is to investigate the advantage of using ultrasonography as a quantitative examination for muscle evaluation. The cross-sectional area (CSA, evaluation of muscle atrophy) and echogenicity (evaluation of fat infiltration) of the surgery side and non-surgery side of the supraspinatus muscle were measured through ultrasonography. The ratio of the surgery side to the non-surgery side was obtained in order to quantitatively measure the degrees of muscle atrophy and fat infiltration, and analyze the associations between the degrees of muscle atrophy and fat infiltration, and shoulder function.

Method
Three to four months after undergoing arthroscopic supraspinatus tendon repair, the CSA of the supraspinatus muscle was measured via ultrasonography. In order to measure the CSA of the supraspinatus muscle, the outermost and innermost sides were checked by palpating the scapular spine, and a straight line for connecting the two points was drawn. The image obtained was saved after confirming the CSA by vertically placing the ultrasonic probe at the midpoint of the straight line. A third researcher, who was not involved in the ultrasound measurement and unaware of the patient information, measured the CSA and echogenicity by using an image processing software program called Philips Q-LAB in which the CSA and echogenicity are calculated if the CSA boundaries of the saved image are specified(Fig. 1). The degrees of muscle atrophy and fat infiltration were quantitatively evaluated by obtaining the ratio of the surgery side to the non-surgery side by using the symmetry of the human body. Moreover, the associations between the morphologic change of the supraspinatus muscle and its functions were investigated by assessing the active range of motion of the shoulder of the surgery side and visual analogue scale and a shoulder constant score.

Result
There was a statistically significant difference in the CSA and echogenicity between the surgery and non-surgery sides (Table 2). The CSA ratio had associations with shoulder forward flexion, external rotation, and constant score. However, the fat infiltration ratio did not have any association with the shoulder function (Table 3). There was also no association between the CSA and echogenicity ratios (correlation coefficients (p value) = -0.43 (0.359). In the comparison between the full thickness tear and partial thickness tear groups, the muscle atrophy and fatty infiltration were more severe in the full thickness tear group than in the partial thickness tear groups. However, there was no statistically significant difference (Table 4).

CONCLUSION
Although ultrasonography has always been known to rely upon a subjective measurement, this study has confirmed its possibility as an objective evaluation through a quantitative measurement based on the unaffected side using the symmetry of the human body .

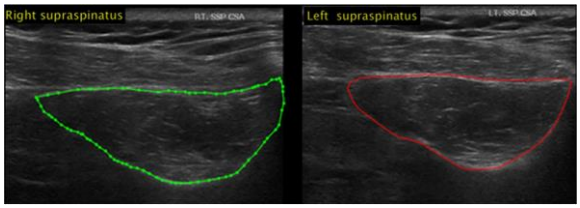

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Fig1. Ultrasonograph evaluation 3 months after athroscopic left supraspinatus muscle tendon repair. Right supraspinatus muscle; Cross sectional area : 532.91 mm2, Echo intensity : 77.59 Left supraspinatus muscle; Cross sectional area : 489.13 mm2, Echo intensity : 87.78

	Operation side	Sound side	P value
SSP CSA			
mean±SD	532.4 ± 132.8	596.1 ± 119.4	<0.001
median (range)	485.3 (310.34 - 838.96)	584.75 (367.18 - 841.57)	
Echogenecity			
mean±SD	65.3 ± 14.4	58.7 ± 13.7	<0.001
median (range)	68.97 (35.88 - 90.39)	56.10 (34.62 - 89.07)	

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Table 2. Comparing supraspinatus muscle cross sectional area(CSA) and echogenecity between operation side and sound side. Wilcoxon signed rank test

	Shoulder active ROM				Pain(VAS)	Constant score
	flexion	abduction	internal rotation	external rotation		
SSP CSA ratio	0.55 (0.04)	0.47 (0.186)	0.24 (>0.999)	0.65 (0.002)	-0.45 (0.269)	0.57 (0.025)
Echogenecity ratio	-0.52 (0.072)	-0.45 (0.299)	-0.26 (>0.999)	-0.42 (0.422)	0.5 (0.101)	-0.53 (0.066)

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Table 3. The correlation coefficients between supraspinatus muscle cross sectional area(CSA) ratio, supraspinatus muscle echogenecity ratio and shoulder function. Spearman correaltion correlation coefficient (p value), SSP CSA ratio (%) & Echogenecity ratio (%) : operation side / sound side * 100

신경근육재활 및 전기진단
게시일시 및 장소 : **2017 년 4 월 21 일 13:00-18:30, 3 층 로비 / 질의응답 일시 및 장소 : 2017 년 4 월 21 일 15:00-15:40, 3 층 로비**
초록순서 : **56** 형식 : **Poster**

Diagnostic cut-off value for ultrasonography of radial nerve in radial neuropathy at spiral groove

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The Catholic University of Korea Yeouido St. Mary's Hospital , Department of Rehabilitation Medicine[1]

Objective : The aim of this study was to determine the diagnostic cut-off value of the cross-sectional area (CSA) of radial nerve using ultrasonography in radial neuropathy at the spiral groove.

Methods : Twelve patients with electrodiagnostic evidence of radial neuropathy at the spiral groove and thirty healthy controls underwent radial nerve ultrasonography at the spiral groove(SG), antecubital fossa(AF) before branching into the posterior interosseous and superficial radial nerves, posterior interosseous nerve(PIN) and superficial radial nerve(SRN), 1 cm distal from the branching point. Cross-sectional areas(CSAs) at each point, differences and ratio of CSA at the SG between symptomatic and asymptomatic sides, and the CSA ratio of SG to AF in symptomatic side were analyzed to get optimal cut-off value.

Results : In the receiver operator characteristic (ROC) curve, significant results were obtained in CSA values at the SG and AF in symptomatic side, and the differences of CSA at the SG between symptomatic and asymptomatic sides, which showed high sensitivity and specificity. The cut-off CSA value was 4.95mm2 at SG (sensitivity 91.7%, specificity 60%) in diagnosing radial neuropathy at the SG.

Conclusion : This reference value of CSA of radial nerve at the SG may be helpful in investigation of pathologies involving the radial nerve at the SG.

	Control (n=30)	Radial neuropathy (n=12)
Sex(male/female)	15/15	8/4
Age(years)	45.23±13.35	39.08±15.17
Duration of symptoms(months)		7.38±8.81
Side (right : left)	30 : 0	6 : 6

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Table 1. Baseline characteristics of subjects

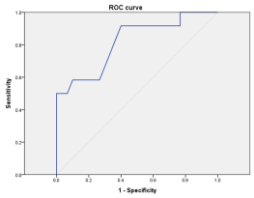

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Figure 1. A receiver operator characteristic (ROC) curve showing the relationship between sensitivity and specificity for cross-sectional area at the spiral groove in symptomatic side.

뇌신경재활
게시일시 및 장소 : **2017 년 4 월 21 일 13:00-18:30, 3 층 로비 / 질의응답 일시 및 장소 : 2017 년 4 월 21 일 15:00-15:40, 3 층 로비**
초록순서 : **27** 형식 : **Poster**

Brain mapping for long-term recovery of gait ability after stroke

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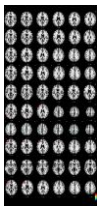
Veterans Health Service Medical Center, Seoul, Department of Physical Medicine and Rehabilitation[1], Yonsei University College of Medicine, Seoul, Severance Biomedical Science Institute[2], Korea University Ansan Hospital, Department of Physical Medicine and Rehabilitation[3], SRC Rehabilitation Hospital, Department of Physical Medicine and Rehabilitation[4]

Objective: Recovery of independent gait after stroke is a major goal, and understanding the relationship between brain lesions and recovery of locomotion can help physicians set viable rehabilitation plans. Our study investigated the relationship between variables of temporal-spatial, kinematic and kinetic gait parameters of chronic stroke patients to brain lesions.
Methods: A total of 50 post-stroke patients with mean age of 67.5 ± 1.3 years and average duration after onset of 62.2 ± 7.9 months were included (table 1). Three-dimensional gait analysis and magnetic resonance image were obtained for all patients. Gait analysis was conducted with an eight infrared camera motion analysis system with three force plates (Motion Analysis Corporation, Santa Rosa, CA). 12 quantified gait parameters of temporal-spatial (walking speed, stride length, cadence), kinematic (maximal hip extension angle in stance phase, maximal knee extension angle in stance phase, maximal ankle dorsiflexion angle in stance phase, maximal hip flexion angle in swing phase, maximal knee flexion angle in swing phase, maximal ankle dorsiflexion angle in swing phase) and kinetic (maximal hip extensor moment, maximal knee extensor moment, maximal ankle plantarflexor moment) datas of the affected side were under consideration. To correlate gait parameters with specific brain lesions, we used a voxel-based lesion symptom mapping analysis.
Results: The corona radiata and posterior limb of internal capsule of lower limb fibers were significantly associated with speed and cadence. The proximal corona radiata of lower limb were significantly associated with stride length and maximal hip extension angle in stance phase. The paracentral lobule including the cortical area was significantly associated with maximal knee flexion in swing phase and maximal ankle dorsiflexion in stance phase. Motor planning areas such as the frontal lobe and basal ganglia were associated with maximal moments of hip, knee and ankle joints (uncorrected p < .005, cluster size > 10 voxels; Table 2 and Fig 1).
Conclusion: Cortical and proximal white matter lesions for lower limb are mainly associated with the ability to ambulate after stroke. Motor planning related areas may affect joint moments during gait after stroke.



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Voxel based lesion symptom mapping results. 1~3 rows: temporal-spatial parameters, 4~7 rows: kinematic parameters, 8~10 rows: kinetic parameters

	Mean ± SD
Age(yrs)	67.5 ± 1.3
Sex (male : female)	50 : 0
Height (cm)	165.3 ± 0.9
Weight (kg)	67.1 ± 1.3
Affected hemisphere (Rt: Lt)	22 : 28
Ischemia : hemorrhage	46 : 4
Disease duration (months)	62.2 ± 7.9
Spatiotemporal parameters	
Speed (cm/sec)	48.9 ± 3.1
Stride length (cm)	64.3 ± 3.0
Cadence (steps/min)	92.4 ± 4.6
Kinematics	
Maximal hip Ex in ST (degree)	14.7 ± 1.4
Maximal knee Ex in ST (degree)	18.0 ± 1.7
Maximal ankle DF in ST (degree)	11.8 ± 0.8
Maximal hip Fl in SW (degree)	39.6 ± 1.2
Maximal knee Fl in SW (degree)	53.2 ± 1.8
Maximal ankle DF in SW (degree)	7.7 ± 1.2
Kinetics	
Maximal hip Ex moment (Nm/kg)	0.5 ± 0.1
Maximal knee Ex moment (Nm/kg)	0.9 ± 0.1
Maximal ankle PF moment (Nm/kg)	0.7 ± 0.1

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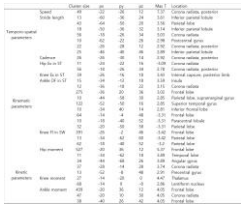
General characteristics of the included patients.



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Results of the voxel-based lesion symptom mapping analysis correlating with 3D gait analysis.

뇌신경재활
게시일시 및 장소 : **2017 년 4 월 21 일 13:00-18:30, 3 층 로비 / 질의응답 일시 및 장소 : 2017 년 4 월 21 일 15:00-15:40, 3 층 로비**
초록순서 : **28** 형식 : **Poster**

White matter changes and functional recovery after stroke

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Veterans Health Service Medical Center, Seoul, Department of Physical Medicine and Rehabilitation[1]

Objective: Changes in white matter for recovery after stroke are still largely unknown. The aim of this study is to investigate the relationship between clinical functional factors and white matter changes in both hemispheres after stroke.
Methods: A total of 14 patients with mean age of 73.3 ± 8.1 years and average duration after onset of 78.3 ± 106.9 months were included (Table 1). We obtained diffusion tensor imaging measures of fractional anisotropy (FA) and clinical functional factors were measured via Fugl-Meyer motor assessment of the upper & lower extremity, functional ambulation category and mini mental status examination. Regression analysis was done with patient age, duration from stroke onset for the relationship between clinical measurements and FA values.
Results: The anterior corpus callosum and bilateral corona radiata were significantly related with scores of Fugl-Meyer motor assessment of the upper & lower extremities. Balance associated brain areas such as the middle cerebellar peduncle and basal ganglia were significantly related with functional ambulation category. Ascending cholinergic system areas in brainstem were significantly related with the scores of mini mental status examination (Fig 1, uncorrected p < .005, cluster size > 10 voxels).
Conclusion: Motor recovery for upper and lower extremity may be associated with both affected and unaffected white matter regeneration. The ability of ambulation showed association with balance related brain areas, while cognition showed association with the ascending cholinergic system in the brainstem.

Subject	Gender	Age(yrs)	Diagnosis	Duration (months)	FMUE	FMLE	FAC	MMSE
1	M	68	Rt hemiplegia d/t Lt temporal infarction	13.7	34	22	2	28
2	M	66	Rt hemiparesis Lt MCA infarction	18.6	65	33	4	25
3	M	71	Rt hemiplegia d/t Lt MCA infarction	317.4	40	25	1	3
4	M	73	Lt hemiplegia d/t Rt basal ganglia ICH	9.3	11	9	2	26
5	M	70	Rt hemiparesis d/t Lt MCA infarction	9.5	50	26	4	19
6	M	65	Rt hemiparesis d/t Lt MCA infarction	14.2	54	30	4	16
7	M	71	Rt hemiplegia d/t Lt thalamus infarction	117.4	32	14	3	21
8	M	74	Rt hemiplegia d/t Lt borderzone infarction	8.0	4	4	0	1
9	M	71	Rt hemiplegia d/t Lt MCA infarction	317.4	40	25	1	3
10	M	73	Lt Hemiplegia d/t Rt thalamic ICH	6.0	30	11	3	30
11	M	87	Lt hemiparesis d/t Rt MCA infarction	64.6	32	19	0	5
12	M	71	Rt hemiparesis d/t Lt basal ganglia infarction	101.4	44	23	4	28
13	M	71	Rt hemiparesis d/t Lt internal capsule infarction	31.2	56	31	4	26
14	M	95	Lt hemiplegia d/t Rt MCA infarction	34.3	18	11	0	6

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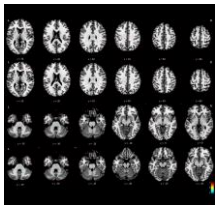
General characteristics of included patients



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. Results of multiple regression analysis of fractional anisotropy values (1~2 rows: upper and lower extremity of fugl-meyer motor assessment, 3 row: functional ambulation category, 4 row: mini-mental status examination)

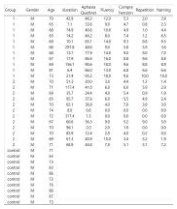
뇌신경재활
게시일시 및 장소 : **2017 년 4 월 21 일 13:00-18:30, 3 층 로비 / 질의응답 일시 및 장소 : 2017 년 4 월 21 일 15:00-15:40, 3 층 로비**
초록순서 : **29** 형식 : **Poster**

Grey matter and white matter structure and language outcomes in chronic left hemisphere stroke

Won Min Lee[1*], Hee Seung Yang[1], Eun Young Park[1], Dae Hyun Kim[1†]

Veterans Health Service Medical Center, Seoul, Department of Physical Medicine and Rehabilitation[1]

Objective: Aphasic syndromes usually result from injuries to the dominant hemisphere's speech area of the brain. Role of the nondominant hemisphere in recovery of lingual function after stroke in the dominant hemisphere remain unclear. We aimed to determine the relationship between bilateral hemispheric changes and severity of aphasia in chronic dominant hemisphere stroke patients.
Methods: Twenty-three left hemisphere stroke patients with aphasia and 10 healthy controls were enrolled. High-resolution T1-weighted images and diffusion tensor images were obtained from all. The twenty-three aphasia patients were assessed with the Korean version of the Western Aphasia Battery (K-WAB) and severity of aphasia was quantified using the WAB Aphasia Quotients (AQ). Aphasia patients were divided in two groups: 1) 11 patients with mild to moderate aphasia (group 1, mean age of 69.3 ± 1.3 years and mean duration after stroke of 60.2 months), and 2) 12 patients with severe aphasia (group 2, mean age of 69.8 ± 0.7 years, mean duration after stroke of 88.3 months) (Table 1). Voxel-based morphometry and fractional anisotropy map of diffusion tensor images were used to detect the relationship between bi-hemispheric changes and aphasia severity.
Results: There are no statistically significant differences in total intracranial volume between group 1, group 2 and control (1.52 ± 0.04 liters, 1.54 ± 0.04 liters and 1.47 ± 0.05 liters respectively). Gray matter volume of Broca's area, thalamus and mirror area of Wernicke's area in the nondominant hemisphere were significantly decreased in group 2 compared with group 1 and control. Fractional anisotropy of Broca's area, Wernicke's area and mirror areas in nondominant hemisphere were significantly decreased in group 2 compared with group 1 and control (Table 2).
Conclusion: This study shows the importance of mirror regions of the speech area in the nondominant hemisphere in aphasic patients.



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General characteristics of included patients.

	Group 1	Group 2	Control	p value
Total intracranial volume	1.52±0.04	1.54±0.04	1.47±0.05	0.46
Broca's area	0.35±0.03	*0.17±0.04*	0.40±0.03	< 0.001
Wernicke's area	0.45±0.02	0.37±0.03	0.43±0.03	0.13
Broca matched area in non-dominant hemisphere	0.35±0.04	*0.27±0.03*	0.39±0.03	0.04
Wernicke matched area in non-dominant hemisphere	0.35±0.05	*0.26±0.04*	0.44±0.03	0.03
Fractional anisotropy of Broca's area	0.22±0.03	*0.08±0.01*	0.25±0.02	< 0.001
Fractional anisotropy of Wernicke's area	0.23±0.03	*0.15±0.02*	0.22±0.02	0.03
Fractional anisotropy of Broca matched area in non-dominant hemisphere	0.20±0.02	*0.13±0.02*	0.20±0.01	0.02
Fractional anisotropy of Wernicke matched area in non-dominant hemisphere	0.15±0.03	*0.11±0.02*	0.22±0.01	0.03

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Results of the voxel-based morphometry and fractional anisotropy value of diffusion tensor image.

뇌신경재활

게시일시 및 장소 : **2017 년 4 월 21 일 13:00-18:30, 3 층 로비 / 질의응답 일시 및 장소 : 2017 년 4 월 21 일 15:00-15:40, 3 층 로비**

초록순서 : **30** 형식 : **Poster**

Effect of reducing assistance during robot-assisted gait training on step length asymmetry

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Veterans Health Service Medical Center, Seoul, Department of Physical Medicine and Rehabilitation[1]

Objective: A common gait pattern abnormality in stroke patients is step length asymmetry. Asymmetric gait pattern is caused mainly by reduction of step length in the unaffected limb. Assist-as-needed mode of robot assisted gait training (RAGT) allows active movement via the exoskeletal robotic leg. We compared the effects of assist-as-needed RAGT in the affected and unaffected limb.

Methods: A total of 12 patients with chronic stroke patients were enrolled. Patients in each group underwent 20 sessions (2 times per week, 45 minutes for each session) of RAGT with the Walkbot (P&S mechanics, Seoul, Korea). Assisted-as-needed RAGT was applied on the unaffected limb in group 1 and on the affected limb in group 2. Three-dimensional gait analysis and clinical measurements were obtained before (T0), after 10 sessions (T1) and 20 sessions (T2) of RAGT.

Results: Repeated-measures analysis of variance revealed a significant interaction between time and group for the maximal ankle dorsiflexion angle in swing phase (F = 4.584, p = 0.023). However, FMLE, FAC, speed, cadence, step length, maximal hip extension angle in stance phase, maximal hip flexion angle in swing phase, maximal knee flexion angle in swing phase, maximal hip, knee, ankle moment did not (table 1, 2).

Conclusion: Application of assist-as-needed mode of RAGT on the affected limb may help control ankle motion in swing phase.

		T0	T1	T2
FMLE	Group 1	21.3±2.6	22.7±2.8	24.5±2.8
	Group 2	23.0±2.5	23.8±2.3	25.7±1.6
FAC	Group 1	3.3±0.3	3.3±0.3	4.0±0.3
	Group 2	3.7±0.2	3.7±0.2	4.0±0.3
MI	Group 1	61.3±4.0	67.3±5.9	73.0±5.9
	Group 2	61.3±2.9	64.2±3.2	67.0±4.9
TCT	Group 1	71.8±4.0	78.3±4.3	72.0±12.6
	Group 2	74.0±4.7	78.3±4.3	57.0±15.4

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Table 1. Changes of clinical assessments

			T0	T1	T2
Temporo-spatial parameters	Cadence (step/min)	Group 1	77.4±10.4	78.3±11.6	76.2±11.0
		Group 2	86.3±9.1	85.6±11.6	88.9±12.4
	Speed (cm/sec)	Group 1	43.3±8.7	44.3±8.0	43.6±8.8
		Group 2	42.6±5.9	41.8±8.8	47.2±7.7
	Step/Width (cm)	Group 1	20.6±1.3	19.2±2.3	21.5±1.3
		Group 2	16.7±1.2	18.0±1.7	18.7±1.9
Kinematic parameters	Maximal hip Ex angle	Group 1	13.4±5.2	11.5±3.4	13.6±3.3
		Group 2	13.7±2.3	13.3±2.8	11.8±2.9
	Maximal hip Fl angle	Group 1	40.3±2.7	37.5±3.3	38.7±3.1
		Group 2	39.0±3.0	39.1±3.7	39.1±3.7
	Maximal knee Fl angle	Group 1	44.0±4.2	44.9±5.3	43.2±5.5
		Group 2	46.3±7.4	46.0±7.2	47.1±6.7
	Maximal ankle DF angle	Group 1	8.1±1.2	8.1±1.6	8.0±1.7
		Group 2	11.8±1.4	11.3±2.8	11.0±1.7
Kinetic parameters	Maximal hip moment (Nm/kg)	Group 1	0.7±0.4	0.5±0.1	1.4±1.0
		Group 2	1.1±0.4	0.6±0.1	0.9±0.3
	Maximal knee moment (Nm/kg)	Group 1	0.5±0.1	0.5±0.2	0.6±0.2
		Group 2	0.8±0.1	1.0±0.3	1.0±0.1
	Maximal ankle moment (Nm/kg)	Group 1	1.1±0.5	0.9±0.2	1.7±0.9
		Group 2	1.1±0.5	0.7±0.2	0.8±0.4

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Table 2. Changes of temporo-spatial, kinematic and kinetic measurements

뇌신경재활

게시일시 및 장소 : **2017 년 4 월 21 일 13:00-18:30, 3 층 로비 / 질의응답 일시 및 장소 : 2017 년 4 월 21 일 15:00-15:40, 3 층 로비**

초록순서 : **31** 형식 : **Poster**

Gait pattern analysis and subgroup identification in various neurologic condition

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Veterans Health Service Medical Center, Seoul, Department of Physical Medicine and Rehabilitation[1], Yonsei University College of Medicine, Seoul, Severance Biomedical Science Institute[2]

Objective: The variability of gait deviations seen in patients with various neurologic condition is quite vast. We aimed to identify subgroups in each neurologic conditions using quantitated gait analysis.

Methods: A total of 3,155 three-dimensional gait analysis during the past 16 years (from 2000 to 2016) usingmotion analysis system were retrospectively collected. After excluding repeatedly measured data, 424 patients with hemiplegia, 205 patients with Parkinson disease, 216 patients with radiculopathy, 167 patients with musculoskeletal pain and 316 normal control were enrolled. The following quantified gait parameters were under consideration; temporal-spatial (walking speed, stride length, cadence, step length, initial double support time, single support time, terminal double support time), kinematic (maximal hip extension angle in stance phase, maximal knee extension angle in stance phase, maximal ankle dorsiflexion angle in stance phase, maximalhip flexion angle in swing phase, maximal knee flexion angle in swing phase, maximal ankle dorsiflexion angle in swing phase) and kinetic (maximal hip, knee, ankle extensor moment, maximal hip, knee, ankle power) data of both right and left side. A total of 36 parameters of gait analysis were selected to evaluate subgroupsusing patient-patient network. For each neurological condition, we generated a fully connected adjacency matrix using Pearson's correlation, and then the sparse adjacency matrix was obtained with the applied standard of $P < 0.05$ (corrected for false discovery rate). The Louvain community detection method uses a heuristic algorithm to compute the modularity and the heuristic modularity optimization algorithm detects slightly different communitiesrun by run.

Results: We identified three to four subgroups for each neurological condition. In hemiplegia, gait speed, maximal hip extension angle in stance phase and step length were the main three factors that best characterized the subgroups. In Parkinson disease, gait speed, stride length and asymmetry were the main three factors that best characterized the subgroups. In radiculopathy, maximal hip extension angle in stance phase and maximal knee flexion angle in swing phase were the main two factors that best characterized the subgroups. Inmusculoskeletal pain, gait speed and maximal hip extension angle in stance phase were the two main factorsthat best characterized the subgroups. In normal control, gait speed and stride length were the two main factors that best characterized the subgroups.

Conclusion: Different factors were identified to subgroup comparison in each neurologic condition.

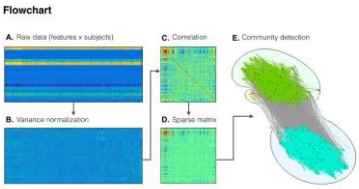

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Fig 1. Study flowchart

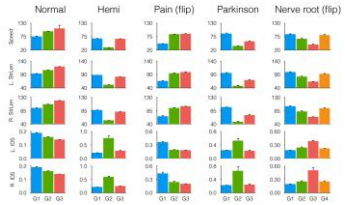

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Fig 2. Temporal-spatial parameters in each neurologic condition

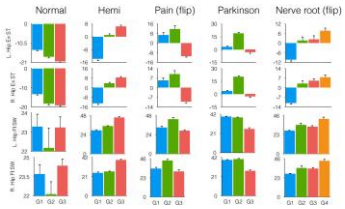

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Fig 3. Kinematic parameters in each neurologic condition

뇌신경재활
게시일시 및 장소 : **2017 년 4 월 21 일 13:00-18:30, 3 층 로비 / 질의응답 일시 및 장소 : 2017 년 4 월 21 일 18:00-18:30, 3 층 로비**
초록순서 : **C7** 형식 : **Poster**

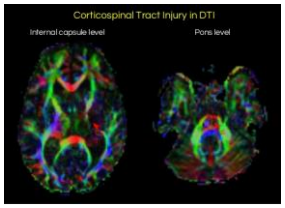
Case : changes in DTI metrics in the rubrospinal tract in a patient of complete corticospinal tract

Hanjun Kim[1*], Suk Hoon Ohn[1], Kwang-Ik Jung[1], Woo-Kyoung Yoo[1†]

Hallym University College of Medicine, Department of Physical Medicine and Rehabilitation[1]

Introduction
Rubrospinal tract(RST) is one of the descending motor tracts, which is known to be involved in skilled reaching movement. Red nucleus lesions interfere with several components of the reaching action, including limb aiming, pronation, and supination of the paw in animal study. In human, however, it is difficult to have some insight about RST function as there are only limited chance in finding a complete corticospinal tract(CST) injury patients. In this case, we found increased DTI metrics in the rubrospinal tract with severe spasticity in the paretic arm, who showed some extensor activity although the patient had any observable CST in the lesion side.

Case
66 years old male patient had spontaneous intracerebral hemorrhage in left basal ganglia and intraventricular hemorrhage 18 months ago. Motor evoked potential(MEP) was recorded in right first dorsal interossei muscle, stimulations were form both contralateral and ipsilateral side. Behavioral data including manual muscle test, modified ashworth scale was done. Diffusion tensor imaging(DTI) was acquired using a diffusion-weighted Echo-planar imaging(EPI) sequence (TR = 5,000 ms; TE = 100 ms; slice thickness = 5 mm; no gap; in-plane resolution = 2.4 x 2.4 mm, 32 independent diffusion gradient directions using b = 1,000 s/mm2). DTI data was analyzed using FMRIB's Diffusion Toolbox (FDT) from the FSL package. We draw tractography by drawing region-of-interests on the red nucleus and pons level for RST.
Motor evoked potential was not evoked form neither contralateral and ipsilateral motor cortex. Manual muscle test grades were all trace in every right upper extremity joints. Spasticity was grade 2 in shoulder, grade 3 in elbow and wrist. After release of co-contraction of proximal muscles, we tried to induce contraction of 2nd finger, which showed some voluntary extension movement. We couldn't obtain either diffusion metrics in lesion side internal capsule and anterior pons and also 3D tractography of CST. Contrast to CST, RST was observable in lesion side even more dense compared to contralateral side.
Conclusion
We observed weak voluntary finger extensor activity in a patient with complete CST injury, which might be due to compensatory increased RST activity.



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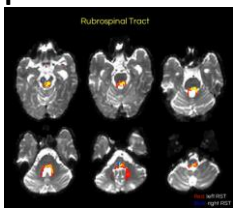
patient CST



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patient RST

뇌신경재활
게시일시 및 장소 : **2017 년 4 월 21 일 13:00-18:30, 3 층 로비 / 질의응답 일시 및 장소 : 2017 년 4 월 21 일 18:00-18:30, 3 층 로비**
초록순서 : **C8** 형식 : **Poster**

Meningitis Retention Syndrome, A Case Report

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Introduction
Voiding difficulty is one of the common issues encountered in rehabilitation medicine. In case of persistent acute urinary retention occurs in patients with meningitis, meningitis retention syndrome (MRS) should be ruled out. We experience a case of MRS in an aseptic meningitis patient, and are hereby reporting this case to share authors' experience with readers.
Case
A healthy 42-year-old male made chief complaint of altered mentality and neck stiffness. In the cerebrospinal fluid study, elevated WBC of 39/ul, lymphodominant, and decreased glucose of 42mg/dl were noticed. On the brain magnetic resonance imaging, prominent leptomeningeal enhancement was observed. Medications against tuberculosis and virus were administered. After one month of hospitalization, Foley catheter was tried to be removed, but the patient was unable to pee on his own. Considering normal prostate-specific antigen level and no history of myogenic bladder damage, the patient was suspected of having urinary retention syndrome and then clean intermittent catheterization started. Three months after hospitalization, the symptom was persistent that urodynamic study was performed: detrusor areflexia were confirmed. There was also no evoked potential in pudendal somatosensory evoked potential study and no reflex in electrodiagnostic bulbocavernosus reflex study. No definite evidence of abnormality in perianal muscle electromyography. Although nine months have elapsed since the disease onset, the patient is incapable of peeing and is undergoing outpatient follow-ups while maintaining clean intermittent catheterization.
Discussion
Since the first report, persistent urinary retention following systemic herpes simplex virus type 2 infection in a young male was reported in 1984, acute urinary retention accompanied by aseptic meningitis, referred as MRS, has been suspected to be caused as a result from a spinal variant of acute disseminated encephalomyelitis or infectious lumbosacral polyradiculitis. It takes about 2-10 weeks to recover from usual MRS and treatment including clean intermittent catheterization should be maintained until spontaneous recovery happens. But nobody knows the exact duration of disease course and this case also shows an atypical duration (more than nine months) of urinary retention period. Because of the low incidence of MRS, it can be overlooked when urinary retention occurs. This case also highlights the importance of considering MRS when urinary retention occurs in meningitis.
Conclusion
If urinary retention develops in patients with meningitis, meningitis retention syndrome should be considered even though it may not be a common cause. In therapeutic point of view, clean intermittent catheterization should be maintained until spontaneous recovery happens. Although usual MRS has 2-10 weeks of urinary retention period, nobody knows the exact duration of disease course. In severe cases, the duration may be more than nine months like our case.

Epidemiology of work-related limb amputation from 2001 to 2013.

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Seoul National University Hospital, Department of Rehabilitation Medicine[1], Incheon St. Mary's hospital, The Catholic University of Korea, Department of Rehabilitation Medicine[2]

Introduction

Amputation is the major work-related musculoskeletal injury. However the trends and characteristics of amputation have not been reported on a national scale in South Korea. The aim of this study is to investigate the trends of amputation by affected limbs, and to find demographic characteristics of amputated workers.

Methods

National Worker's Compensation Insurance database (2001-2013) were analyzed. Cases with KCD-10 code related to amputation and its complications (S383, S480~S984, T019, T050~059, T116, T136, T145~147, T873~T876, T926, T936) were searched from this database. Among this raw data, body trunk amputation and disease which were miscoded to amputation such as crushing injury, nail bed injury without artery involvement or rotator cuff tear wax excluded. The annual incidence of amputation was analyzed by major limb joint such as shoulder, elbow, wrist, hip, knee and ankle. Demographic factors such as sex, age and nationality were also analyzed.

Results

Total 64,140 work-related amputation accidents occurred for 13 years in South Korea. The most amputated site was below wrist (95.0%) and the second most was below ankle (2.19%). Amputation incidence had increased up to 4.77 per 10,000 workers until 2006, and rapidly declined thereafter. This trend was mainly due to distal amputation. The number of proximal amputation didn't change significantly. The ratio of right side amputation to left side was about the same (right side is 49%).

Limb amputation occurred the most in 40's. and the age of amputation workers are increasing. 82.5% of amputated workers was male. The proportion of Koreans among total amputees decreased from 94.2% (2001) to 84.3%(2013). while that of workers from abroad except China increased from 3.69% to 15.1%

Conclusion

Most amputation occurred at fingers and hands (95.3%). Distal amputation accounted for 97.5% of all amputation and was decreasing since 2007. However, proximal amputation which caused severe disability was not decreasing. The age of amputated workers was increasing. Therefore more efforts for rehabilitation are needed to return them to work. Percentage of foreign workers among amputation accidents was continuously increasing, so medical care for foreigners is also necessary.

노인재활

게시일시 및 장소 : **2017 년 4 월 21 일 13:00-18:30, 3 층 로비 / 질의응답 일시 및 장소 : 2017 년 4 월 21 일 15:00-15:40, 3 층 로비**

초록순서 : **4** 형식 : **Poster**

Relationship between types of exercise and quality of life in a Korean elderly population

Sang Ho Oh[1*], Don-Kyu Kim[1], Kyung-Mook Seo[1], Sang Yoon Lee[1†]

Chung-Ang University College of Medicine, Department of Physical Medicine & Rehabilitation[1], Chung-Ang University College of Medicine, Department of Physical Medicine & Rehabilitation[2], Chung-Ang University College of Medicine, Department of Physical Medicine & Rehabilitation[3], Seoul National University Boramae Medical Center, Department of Rehabilitation Medicine[4]

Relationship between types of exercise and quality of life in a Korean elderly population: a cross-sectional study

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1 Department of Physical Medicine & Rehabilitation, Chung-Ang University College of Medicine, Seoul, South Korea
2 Department of Rehabilitation Medicine, Seoul National University Boramae Medical Center, Seoul, South Korea

Objective: Several types of exercises have been recommended to improve the quality of life (QoL) in elderly. Aging also has an independent correlation to QoL. However, few studies have examined the association between exercise and QoL in elderly. The aim of this study was to ascertain the relationship between exercise and QoL in a Korean elderly population.
Subjective & Methods: This was a cross-sectional study using the public data from the sixth Korean National Health and Nutrition Examination Survey in 2014 (n = 7550). Demographic factors, three types of exercise (resistance, flexibility, walking), five subsets of EuroQoL (mobility, self-care, usual activities, pain/discomfort, anxiety/depression), and QoL scores (EQ-VAS) were investigated. Independent associations of each exercise on five subsets of QoL were determined using odds ratios (OR) adjusted for four demographic factors (age group, sex, weight change, and area of residence) using multivariate logistic regression analysis.
Results: The number of elderly (≥ 65 years) is 1586 (21.0%) and the ratio of subjects performing either resistance, flexibility, or walking exercise was 82.3%, 82.3%, and 81.7% among this population, respectively. All types of exercisers were younger and had higher EQ-VAS than non-exercisers (P < 0.001 in all). Men worked out more resistance exercise than women (P < 0.001). In the adjusted logistic regression model, men took more resistance exercise than women (P < 0.001), and urban dwellers worked out more exercise than rural dwellers (P < 0.001). Although resistance exercise did not correlate with any subsets of QoL, mobility and self-care were significantly associated with flexibility (OR=0.700, 95% CI=0.544-0.900 and OR=0.507, 95% CI=0.328-0.784, respectively) and walking exercise (OR=0.489, 95% CI=0.365-0.655 and OR=0.487, 95% CI=0.323-0.734, respectively).
Conclusion: All exercisers showed higher QoL scores than non-exercisers. Among QoL subsets, mobility and self-care were independently associated with flexibility and walking exercises in elderly population. Regular flexibility and walking exercises were important to higher QoL in the elderly.
Key Words: aging, quality of life, resistance training, muscle stretching exercise, walking

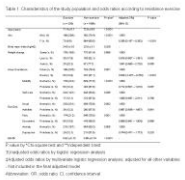

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Table 1. Characteristics of the study population and odds ratios according to resistance exercise

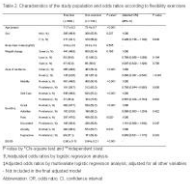

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Table 2. Characteristics of the study population and odds ratios according to flexibility exercises

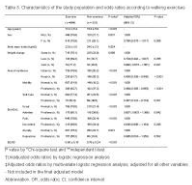

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Table 3. Characteristics of the study population and odds ratios according to walking exercises

신경근육재활 및 전기진단
게시일시 및 장소 : **2017 년 4 월 21 일 13:00-18:30, 3 층 로비 / 질의응답 일시 및 장소 : 2017 년 4 월 21 일 15:00-15:40, 3 층 로비**
초록순서 : **57** 형식 : **Poster**

Modified hand elevation test as an aid in diagnosing carpal tunnel syndrome

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St. Vincent's Hospital, College of Medicine, The Catholic University of Korea, Department of Rehabilitation Medicine[1]

Introduction
Carpal tunnel syndrome (CTS) is the most common entrapment neuropathy. It causes pain in the hand area innervated with median nerve and shows intermittent sensory paralysis, with a prevalence of 2 to 4%. The mechanism of this disease is thought to be caused by ischemia or compression of the wrist tunnel, but further studies are needed. There are several methods of physical examination to detect CTS. In 2001, Ahn D-S announced a new method called hand elevation test (HET), to reproduce the symptoms of CTS. Several studies have reported that HET had sensitivity of 75.5-88% and specificity of 88.9-98.5%, which is more useful when compared to Tinel's test and Phalen's test. In this study, we will investigate the effect of modified hand elevation test (MHET) to increase the pressure of the wrist joint by fully bending both wrists to induce ischemia. This can improve the diagnosis rate through physical examinations of patients with suspected carpal tunnel syndrome.

Materials and Methods
We enrolled patients with symptoms of CTS and also showed a reasonable finding of in electrodiagnostic test. We enrolled 53 patients from 2014 to 2017 and exclude 24 patients. Finally there were 46 hands of 29 patients in experimental group. To doing the HET, patients raised their hands based on their own strength, against gravity above the head. (Figure 1) MHET also maintain same position with HET but additionally fully flex wrist joint. We expect this position force the ischemia and compression of median nerve around the wrist. We did these tests in 2 minutes, and the time until the symptom is induced is measured by a stopwatch. All patients enrolled this study, were examed electromyography (EMG) exam and sonogram at the wrist and mid forearm level (Table 1).

Results
In 46 hands enrolled in this study, 29 patients showed positive response and 17 showed negative responses in HET. 31 patients showed positive and 15 showed negative response in MHET (Table 2). Sensitivity of HET was 77.4% and 80.6% in MHET. Specificity was 66.7% in HET and 60% in MHET. Positive predictability was 82.7% in HET and 80.6% in MHET. Negative predictability was 58.8% in HET and 60% in MHET. In enrolled patients, 17 subjects showed shorter time till induced symptoms in MHET than HET. 3 subjects showed positive response in MHET with no response in HET. 7 subjects showed longer time till induced symptoms in MHET than HET, and in this group, 2 subjects were diagnosed with no evidence of carpal tunnel syndrome in EMG.

Conclusion
We made the hypothesis that the MHET might make more ischemic situation than HET. In this study MHET showed superior to HET in sensitivity and negative predictability and shortened time to response. Especially, 17 subjects showed reductions in time to response in MHET than HET. So we thought the clinical implication of theses statistical findings is that the MHET may be valid and usable diagnostic method.

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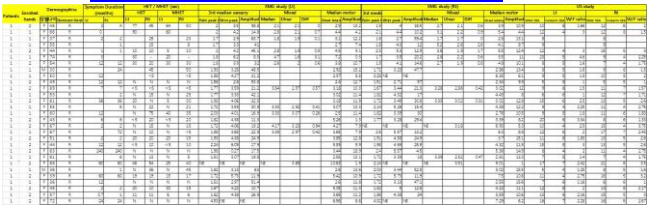

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	Hand elevation test		Modified hand elevation test	
	Positive response	Negative response	Positive response	Negative response
CTS Positive	24	7	25	6
CTS Negative	5	10	6	9

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뇌신경재활
게시일시 및 장소 : **2017 년 4 월 21 일 13:00-18:30, 3 층 로비 / 질의응답 일시 및 장소 : 2017 년 4 월 21 일 18:00-18:30, 3 층 로비**
초록순서 : **C9** 형식 : **Poster**

Case report: The improvement of crycopharyngeal dysfunction after balloon dilatation

Jaewoo Choi[1*], Kye Hee Cho[1,2], MinYoung Kim[1,2], MinYoung Kim[1,2], Sang Hee Im[1,2†]

CHA Bundang Medical Center, CHA University, Department of Rehabilitation Medicine[1], CHA University, Rehabilitation and Regeneration Research Center[2]

Introduction
Cricopharyngeal dysfunction (CPD) has several treatment options such as botulinum toxin injection, balloon dilatation and myotomy of crycopharyngeus muscle (CPM). However, there are still no published guidelines or consensus of treatment for CPD. Among these methods, balloon dilatation has several advantages as it is less invasive and easy to perform under videofluoroscopy guide. A few reports of balloon dilatation have demonstrated successful treatment effect of CPD, however none of the studies elucidated the mechanism of improvement. Therefore, this study aims to reveal physiologic changes of CPD after videofluoroscopic-guided balloon dilatation by high resolution manometry (HRM), through a case report of a 44-year-old TBI patient who developed dysphagia with CPD, which was treated using videofluoroscopy-guided balloon dilatation.
Case report
A 44-year-old male developed dysphagia with CPD after large epidural hemorrhage in the left brain hemisphere concurrent with diffuse axonal injury. He was transferred to the department of rehabilitation medicine at 10 weeks after the traffic accident. Dysphagia with CPD was manifested on videofluoroscopy swallow study (VFSS) and videofluoroscopy-guided balloon dilatation was conducted for the first time. Repetitive dilatation procedures were performed at 1, 4, 7, 27 and 38 weeks after the first intervention and the successive physiological changes were observed using high resolution manometry (INSIGHT HRM; Sandhill Scientific Inc., High lands Ranch, Co, USA). Meanwhile, functional improvement was observed in VFSS. Collected data include ratio of normal shape of UES nadir, pressure and duration of UES nadir from HRM, and Rosenbeck penetration aspiration score (Rosenbeck PAS) from VFSS. After the first and second interventions, definite changes of UES nadir shape and pressure were noted, however no significant changes on HRM were observed from the consecutive third to sixth interventions, although the patient reported subjective improvement of swallowing function. After the second intervention, aspiration was not observed. (PAS score changed from 8 to 3) In short, VFSS results correlated with the changes on HRM after first and second intervention.
Conclusion
Videofluoroscopy-guided balloon dilatation intervention was successful in normalizing the abnormal UES opening pressure in a patient with CPD in long-term follow-up. This case report supports the early application of ballooning dilatation for CPD to be more effective in recent onset patients. In the future, study elucidating the physiology of therapeutic effect of balloon dilatation for CPD with more patients is needed.

소아재활
게시일시 및 장소 : **2017 년 4 월 21 일 13:00-18:30, 3 층 로비 / 질의응답 일시 및 장소 : 2017 년 4 월 21 일 18:00-18:30, 3 층 로비**
초록순서 : **C23** 형식 : **Poster**

A patient with developmental delay diagnosed with Sotos syndrome caused by a Novel mutation in NSD1

Ne Eun Jeon[1*], Dae-Hyun Jang[2†]

The Catholic University of Korea Seoul St. Mary[1], Incheon St. Mary[2]

Case report: A 21-months-old boy visited our outpatient clinic because of delayed development with especially expressive language impairment. He was born at 41 weeks gestation after normal pregnancy and cesarean delivery with a birth weight of 4200g (90-97th percentile). He was first child and his parents had no specific history of illness. The patient had a patent ductus arteriosus (PDA) and when the age of 2 weeks he underwent an operation for PDA closure. He started to walk at age of 17 months without passing through the creeping and crawling stage. His parents certainly recognized that their son was not progressing at the same rate as other children the same age. On the first visit, his body weight 14kg (50-75th percentile), body length 87cm(50-75th percentile) and occipitofrontal circumference was 51cm (> 97th percentile). He had a prominence of forehead, macro-plagiocephaly and hypertelorism. His language was also delayed and used limited vocabulary in conversation compared to their peers. His developmental milestones were evaluated using the Bayley Scales of Infant and Toddler, Third Edition (Bayley-3) at age of 23 months, and the result showed that global delay developmental in all items such as cognitive 11 months, receptive language 9 months, expression language 13 months, fine motor 15months and gross motor 14 months. Brain MRI discovered persistent cavum septum pellucidum and thinning of the corpus callosum(Figure 1.). The patient was suspected of Sotos syndrome based on his clinical features. Conventional chromosome analysis showed the normal male karyotype, 46, XY and, also no abnormality was found in the array comparative genomic hybridization. NSD1 gene PCR sequencing study targeting Sotos syndrome identified a heterozygous variants in intragenic NSD1 gene with deletion of 13 nucleotides from 5675 to 5687 and replacing isoleucine with threonine at 1892th nucleotide position (c.5675_5687 del (p.Ile1892Thrfs*12), heterozygous), resulted in a frameshift mutation and a premature stop codon at the NSD1 gene(Figure 2-A). Parental genomic investigations for NSD1 gene mutation gave normal results, providing the de novo occurrence of mutation in patient(Figure 2-B,C). This Novel deletion mutation was considered ‘pathogenic’ variant by scoring rules for variant classification based on 2015 ACMG/AMP guideline. According to the clinical presentation, neuropathology, and molecular genetic study, he was given a diagnosis of Sotos syndrome.
Discussion: We reported a patient with Sotos syndrome caused by the first known genetic mutation of NSD1 gene. Sotos syndrome is a rare disease, so it may be difficult to diagnose without doubt. Sotos syndrome has risk of tumor development during childhood and should be evaluated regularly for surveillance of malignancy. Therefore, Sotos syndrome should be considered when encountering overgrowth and delay development in routine practice.

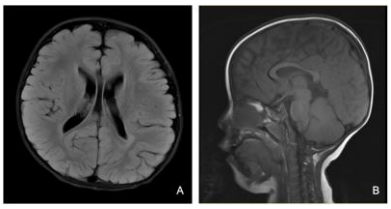

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Figure 1. Brain MRI. A, persistent cavum septum pellucidum et vergae. B, thinning of the corpus callosum in posterior portion.

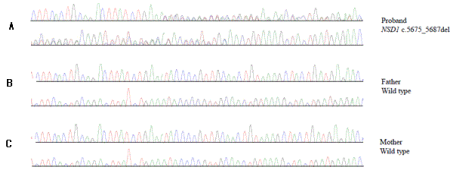

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Figure 2. Chromatogram of the patient and his parents. A, Patient’s chromatogram; partial sequences of the NSD1 gene show a heterozygous deletion of 13 nucleotides from 5675 to 5687 and replacing isoleucine with

threonine at 1892th nucleotide position, causing premature termination of the NSD1 protein. B and C, His parents' chromatograms show no abnormality.

암재활
게시일시 및 장소 : **2017 년 4 월 21 일 13:00-18:30, 3 층 로비 / 질의응답 일시 및 장소 : 2017 년 4 월 21 일 15:00-15:40, 3 층 로비**
초록순서 : **69** 형식 : **Poster**

Use of mHealth with IoT in physical performance of colorectal cancer patients under chemotherapy

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Purpose
In several studies, colorectal cancer patients during chemotherapy experience cancer-related symptoms, reduction in physical performance and negative impact on quality of life. Smart aftercare using mobile application provides a wide range of management from lifestyle intervention to regular physical exercise. The purpose of this study was to investigate the effects of using mobile health (mHealth) with Internet of things (IoT) on physical performance of colorectal cancer patients during chemotherapy.

Subjects and Methods
The outpatients with colorectal cancer who were undergoing chemotherapy were recruited to this study. A hundred colorectal cancer patients from colorectal cancer center were enrolled for receiving a 12-week smart after care using mobile application. The patients were provided cancer-related general information, nutritional information and regular rehabilitation exercises through the mHealth application. The intensity of exercise was individualized to the patient's fitness level according to the results of the grip strength test, 30-second chair stand test and 2-minute walk test. The physical performance was measured by the grip strength test, 30-second chair stand test and 2-minute walk test. Patient-Generated Subjective Global Assessment (PG-SGA) was used to evaluate nutritional status, and the health-related quality of life was measured using European Organization for Research and Treatment of Cancer (EORTC) QLQ-C30 questionnaire. All of the measurements were performed total three times at the baseline, 6 weeks and 12 weeks follow up.

Results
The participants had significant improvements in physical performance showing improvement in 30-second chair stand test score and 2-minute walk test distance although the increase in grip strength was not significant. According to PG-SGA stage, the number of patients with stage A status (well nourished) was increased at 6 weeks follow-up. PG-SGA stage at 12 weeks follow-up was not significantly different from 6 weeks follow-up. Among domains of quality of life, fatigue and appetite loss was significantly improved after the management using mobile application.

Conclusion
The provision of rehabilitation exercise protocol and surveillance using mHealth application was effective in promoting improved physical performance of the colorectal cancer patients under active chemotherapy. This study provides a basis of mHealth research in colorectal cancer patients for progressing further developing field.

심폐재활
게시일시 및 장소 : **2017 년 4 월 21 일 13:00-18:30, 3 층 로비 / 질의응답 일시 및 장소 : 2017 년 4 월 21 일 18:00-18:30, 3 층 로비**
초록순서 : **C37** 형식 : **Poster**

Testicular cancer in a duchenne muscular dystrophy patient : A case report

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Daejeon Eulji University Hospital, Department of Physical Medicine & Rehabilitation[1]

Introduction

Duchenne muscular dystrophy is a severe muscular dystrophy mainly inherited as x-linked recessive. It is known to be an abnormality of a gene involved in dystrophin protein. It may cause various symptoms such as muscle weakness, fatigue, musculoskeletal disorder and contracture. The precise treatment for the disease is not yet established, and physical therapy, musculoskeletal surgery and medication such as steroid can be tried, and assisted ventilation is used for respiratory muscle weakness. Typical lifetime is known as 2nd decade. The incidence of cancer in patients with duchenne muscular dystrophy is not known exactly, but it is very rare. We present a case of 29-year-old duchenne muscular dystrophy identified as having testicular cancer.

Case report

A 29-year-old male patient was diagnosed with duchenne muscular dystrophy in virtue of genetic testing. About 5 years ago, dyspnea became worse and the home ventilator was applied. The patient was admitted regularly to the Department of Rehabilitation Medicine of our hospital from 2012 and was undergoing cardiopulmonary function monitoring.
On February 17, 2017, He was admitted to our hospital for regular cardiopulmonary function evaluation, At admission, the patient complained of left scrotal swelling. The swelling of the left scrotum was increased 4 days before admission. Laboratory test showed 4.9 mIU/mL of β-hCG, 12.2 ng/mL of alpha-fetoprotein and 3063 IU/L of lactate dehydrogenase. Ultrasonographic evaluation showed left scrotal mass like lesion. The mass was suspected to be a malignant tumor. Abdominopelvic computed tomography showed 7.5 cm-sized mass-like lesion in the left scrotum, and paraaortic lymph node metastasis was confirmed. (Fig. 1)
On February 22, 2017, he underwent radical orchiectomy under general anesthesia in the Department of Urology (Fig. 2). The mass was confirmed as a seminoma after histological examination. We have planned additional chemotherapy with confirmed paraaortic lymph node metastasis.

Conclusion

In general, it is known that the most common cause of death in patients suffering from duchenne muscular dystrophy is respiratory or cardiovascular problems. There is an increasing trend in the survival rate after comprehensive and multimodal treatment. However, as in the case of this patients, there was little reports about cancer in the patients with duchenne muscular dystrophy.
Because hidden malignancy can occur without and special symptoms as the survival time increases, careful review of systems and detailed physical examination should be performed even in the routine check-up of duchenne muscular dystrophy.

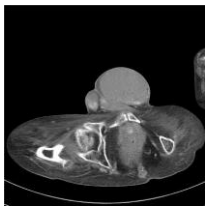

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Fig 1. Abdomiopelvic computed tomography showing 7.5cm-sized Lt. scrotal mass lesion

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Fig 2. Gross photo of Lt. scrotal mass after radical orchiectomy operation

Uncontrolled Blood Pressure In Chronic Stroke, Right Insular ICH : A Case Report

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Introduction
Autonomic dysfunction after a stroke involves the cardiovascular and respiratory systems. The present study was undertaken to study autonomic reflexes reflecting parasympathetic and sympathetic influence on heart rate and blood pressure in patients with monofocal stroke to determine whether such reflexes are affected differently depending on the side of the lesion. For the past two decades, there has been an increased interest in studying the association of autonomic function alteration with hemispheric stroke locations, including the insular cortex and the frontal and parietal lobes.

Case
A 49 year old man with chronic stroke referred to ER with loss of consciousness. He had medical history of the previous right basal insular hemorrhage, 2 years ago. There was no seizure like movement and neurologic symptoms about cerebrovascular accident. Brain CT reveal that no acute lesion and encephalomalacia in right insular. So he was admitted to a cardiology department for evaluation. He presented with dizziness and fluctuation of blood pressure at sitting or standing position(systolic pressure 50~200). There was no problem in TTE, holter, 24 h ambulatory BP monitoring. For management of general weakness, he was transferred to department of rehabilitation medicine. After few days, his muscle power was improved but still had fluctuation of blood pressure and dizziness. We suspected the autonomic dysfunction and orthostatic hypotension, so performed the study of autonomic dysfunction. The charts below show the result.
 Figure1. Blood pressure fluctuation
 Table1. Respiratory Heart Rate Variability
 Table2. Tilt table test
These findings were compatible with autonomic dysfunction and orthostatic hypotension. After the patient was taken the fludrocortisone, fluctuation of blood pressure was improved but still remained(systolic pressure 80~160).
Conclusion
With unusual case, We report the case about Autonomic dysfunction in chronic stroke, Right insular ICH.

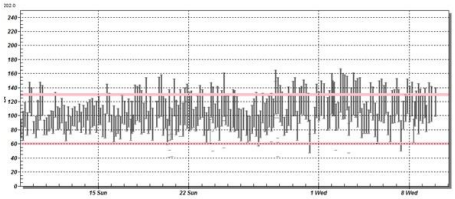

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Figure1. Blood pressure fluctuation

	Patient	Normal value
Deep breathing (Max – Min)/mean * 100	7.4%	≥ 10
Valsalva maneuver Max / Min	1.08	1.44

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Table1. Respiratory Heart Rate Variability

0 도 / B.P : 111/68
30 도/ B.P : 69/42
60 도/ B.P : 54/29
90 도/ B.P : 52/24

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Table2. Tilt table test

뇌신경재활

게시일시 및 장소 : **2017 년 4 월 21 일 13:00-18:30, 3 층 로비 / 질의응답 일시 및 장소 : 2017 년 4 월 21 일 15:00-15:40, 3 층 로비**

초록순서 : **32** 형식 : **Poster**

Clinical course and outcome in patients with severe dysphagia after lateral medullary syndrome

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Dongguk University Ilsan Hospital, Department of Rehabilitation Medicine[1], Dongguk University Gyeongju Hospital, Department of Rehabilitation Medicine[2]

PURPOSE: Although the prognosis of dysphagia in lateral medullary syndrome (LMS) is favorable, there is little information about progression of severe dysphagia over time in perspective of video fluoroscopic study (VFSS) findings, diet and/or postural modification. The purpose of this study was to verify the clinical course and outcome in patients with severe dysphagia after LMS.
MATERIALS AND METHODS: The patients with 'severe dysphagia after LMS' who admitted in rehabilitation unit from December 2013 to December 2016 were collected by retrospective medical record review. The criteria of 'severe dysphagia after LMS' was defined as: (1) acute or subacute LMS patients, (2) initially required tube feeding, (3) decreased pharyngeal constriction and not showing any esophageal passage in VFSS findings. Data were collected including VFSS findings, types of diet and postural modification.
RESULTS: Eleven patients (6 men, 5 women, mean age, 59.5 years; range, 38-74 years) were identified who had 'severe dysphagia after LMS' among the 36 cases of LMS patients. The lesion side was left in 4 cases and right in 7 cases. Initial VFSS was performed at 16.1±18.0 days after the onset and serially conducted at every 2 weeks interval. Esophageal passage was begun to show at an average 32.7±18.5 days and the patients could begin partial oral diet feeding with postural modification (head rotation). There were 52.2±21.8 days required to change into full oral diet feeding. After 68.1±25.1 days, postural modification was not required any more in 7 cases.
CONCLUSION: Every patient with 'severe dysphagia after LMS' could start partial oral feeding approximately at about 5 weeks after the onset and they were allowed normal diet without any diet modification and limitation after 10 weeks. This clinical course and outcome might help in predicting the prognosis and planning the strategy of rehabilitation program in severe dysphagia after LMS.
Key Words: Dysphagia, Lateral medullary syndrome, Stroke, Rehabilitation, Deglutition

Table 1. Demographics and clinical characteristics of patients at initial evaluation

Patient	Sex	Age (years)	Lesion side	Initial diet feeding	Initial MBI score
A	M	38	Left	Tube feeding	100
B	M	74	Right	Tube feeding	76
C	M	44	Right	Tube feeding	92
D	F	59	Right	Tube feeding	74
E	M	62	Left	Tube feeding	98
F	F	61	Right	Tube feeding	32
G	F	58	Right	Tube feeding	57
H	M	74	Right	Tube feeding	76
I	M	73	Left	Tube feeding	63
J	F	56	Right	Tube feeding	55
K	F	55	Left	Tube feeding	100

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Table 1. Demographics and clinical characteristics of patients at initial evaluation

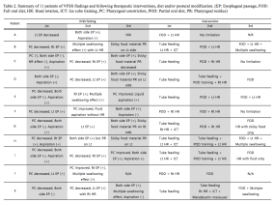

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Table 2. Summary of 11 patients of VFSS findings and following therapeutic interventions, diet and/or postural modification. (EP: Esophageal passage, FOD: Full oral diet, HR: Head rotation, ICT: Ice cube training, PC: Pharyngeal constriction, POD: Partial oral diet, PR: Pharyngeal residue)

Table 3. Summary of clinical course and outcome of 11 patients with severe dysphagia after LMS.

Patient	Initial VFSS	Partial oral diet	Full oral diet	Stop postural modification
A	37	37	37	72
B	33	47	82	NA
C	7	21	42	42
D	3	31	53	NA
E	43	59	72	NA
F	5	5	19	96
G	3	17	38	80
H	33	47	82	NA
I	2	23	51	93
J	8	8	29	29
K	3	65	69	65
Average (Min-Max)	16.1 (2-43)	32.7 (5-65)	52.2 (19-82)	68.1 (29-96)

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Table 3. Summary of clinical course and outcome of 11 patients with severe dysphagia after LMS.

신경근육재활 및 전기진단
게시일시 및 장소 : **2017 년 4 월 21 일 13:00-18:30, 3 층 로비 / 질의응답 일시 및 장소 : 2017 년 4 월 21 일 18:00-18:30, 3 층 로비**
초록순서 : **C33** 형식 : **Poster**

Superficial peroneal neuropathy in a patient with cavus foot – A case report

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Introduction
The cavus foot deformity can be caused by neuromuscular conditions such as Charcot-Marie-Tooth disease, or non-neuromuscular process (traumatic, congenital, and idiopathic), and it is also known that less severe form may occur in normal populations. The cavus foot is associated with many injuries occurring in athletes with ankle-twisting events, most commonly ankle instability and lateral foot overload, and frequently leading to ankle sprains. Peroneus longus muscle contribution to cavus foot alignment is potentiated by equinus ankle position. With the foot in equinus the relative strength of the peroneus longus muscle is greater than the tibilais anterior muscle.
The association of superficial peroneal neuropathy with cavus foot has not been reported yet. We report the entrapment of the superficial peroneal nerve associated with the long-standing overloading of the peroneus longus muscle as a mechanism for superficial peroneal neuropathy.

Case
A 45 years old man complained of tingling sensation on both dorsum of feet for 6-7 years. The patient was 178 cm tall and weighed 105 kilograms. He had no special problems when walking, but ankle inversion sprain was easily caused by exercises, and occurred several times in the 20s. In physical examination, hypesthesia was noted on both dorsum of the foot and high-arched foot was observed. Also, palpation of the lateral third of both legs elicited a sensation of tingling or "pins and needles", and deep tendon reflex was hypoactive in both lower extremities.
The plain radiography and foot pressure analysis showed typical findings of the high arched foot. On EMG, the sensory nerve conduction study of left superficial peroneal nerve showed decreased amplitude and reduced interference pattern on needle electromyography of both peroneus brevis muscles. On the surface EMG performed while walking, the RMS values of the bilateral peroneus longus muscles were higher than those of the tibialis anterior muscle. In the peroneal nerve ultrasonography, a focal swelling of the distal third of the superficial peroneal nerve was observed on both sides. However magnetic resonance imaging showed no evidence of tumor. The patient was applied for Barton's lateral wedge on both insoles and reported some improvement of tingling sensation in follow-up.

Discussion
 The patient's symptoms gradually developed without definite trauma history, and nerve swelling was observed in the distal third of superficial peroneal nerve. It was hypothesized that nerve entrapment was caused by the long-standing overloading of the peroneus longus muscle or wrapping superficial peroneal nerve in relation to the cavus foot, and the lateral wedge was prescribed to observe the symptomatic improvement in follow-up.

신경근육재활 및 전기진단
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초록순서 : **C34** 형식 : **Poster**

A case of neurogenic thoracic outlet syndrome accompanied by arterial thoracic outlet syndrome

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Uijeongbu St. Mary's Hospital, Department of Rehabilitation Medicine[1]

Introduction
Among three main entities of thoracic outlet syndrome (TOS), the most common type is neurogenic TOS (nTOS), accounting for more than 90% of all TOS cases. Venous and arterial TOS (aTOS) are very rare. We report a case of nTOS, accompanied by aTOS, and compartment syndrome in forearm caused by ischemia resulting from thromboembolism.
Case report
A 25-year-old man presented with left arm tingling sensation, and undertook electrodiagnostic study (EDX), which raised the possibility of TOS. New abrupt symptoms such as grip power weakness, swelling, and even cold sensation in left hand developed after several days.
On physical examination, he showed weak pulsation in left forearm. Computed tomography scan showed left cervical rib and space narrowing of thoracic outlet. Subclavian and brachial angiography revealed delayed blood flow in subclavian artery, and occlusion of brachial artery.. After direct thrombolytic treatment, brachial artery was recanalized, but radial artery was still occluded in the distal portion. After two days, the symptoms still persisted, and severe swelling developed in left forearm, which was highly suspicious findings of compartment syndrome. Emergency fasciotomy was performed, which revealed diffusely found hematoma in the forearm. Weakness persisted after fasciotomy. He was referred to EDX laboratory 4 months after the onset of symptoms. Manual muscle test showed from 2 to 3 grade in wrist and fingers' flexor and extensor muscles. Sensory nerve action potential (SNAP) was not evoked in left median and ulnar nerve. Decreased amplitudes of SNAPs in left superficial radial and medial antebrachial cutaneous nerve were shown. Compound motor action potential (CMAP) showed no response in median nerve, and small amplitudes of CMAPs in left ulnar and radial nerves. In needle EMG, there were abnormal spontaneous activities at rest in all forearm and hand muscles innervated by ulnar, median, and radial nerves. The results of EDX indicated left brachial plexopathy involving lower trunk, and median and radial neuropathy around proximal forearm, combined with compartment syndrome. After 5 months of first symptoms onset, he had left cervical rib excision and regular rehabilitation program. At 6 weeks after cervical rib excision, follow-up EDX and motor functions showed improved status compared to the previous study.
Discussion
Symptoms of nTOS include pain, paresthesia, and/or weakness in affected upper limb. aTOS can lead to upper limb ischemic symptoms. Subclavian artery thrombosis may result in embolic events manifested by abrupt onset of distal limb ischemia. Our case presents the clinical features of aTOS and nTOS and functional improvement through optimal intervention.

통증 및 근골격재활
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초록순서 : **98** 형식 : **Poster**

Outcomes in HNP pain patients with focal RFA using percutaneous disc decompression device

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Korea University Anam Hospital, Department of Rehabilitation Medicine[1]

Title
Clinical Outcomes in patients with low back and radiating pain related to herniated nucleus pulposus
after focal radiofrequency ablation using a navigable percutaneous disc decompression device
: results of a 2-year follow-up study

Objective
This study aimed to analyze 2-year patients-reported outcomes and physical tests after selectively focal ablation using a navigable disc decompression device.in patients with low back and radiating pain related to herniated nucleus pulposus

Methods
170 patients who suffered from low back and radiating pain related to herniated nucleus pulposus on magnetic resonance images were treated in our clinical center from April 2009 to March 2014. After conservative and appropriate management in consideration of patients' symptom, signs, and prior therapeutic methods, the herniated portion of target disc was ablated using the navigable catheter under a well-instructed protocol and with informed consent. All of the patients was assessed for pain intensity (visual analogue scale [VAS]), measure of disability (Oswestry Disability Questionnaire [ODI]), health-related quality of life (Bodily Pain scale of Short Form-36 version 2 [SF-36BP]), and angles of passive straight leg raising test (SLR). Outcome data were prospectively collected before the procedure and 1 week after procedure, and then 1, 3, 6, 12, 24 months post-procedure. For statistical analysis, repeated measures analysis of variance was applied.

Results
VAS fell from 7.1±1.7 to 2.1±1.9 scores at 2 year post procedure. ODI decreased from 50.9±17.2 to 20.3±14.6%. SF-36 BP increased from 30.1±5.1 to 45.8±5.7.($p<0.05$) In SLR test, the angular change of 2-year showed considerable improvement from 51.2±17.3 to 85.0±9.3 degrees.

Conclusion
This study suggests that selectively focal ablation of herniated disc using a navigable disc decompression device is effective in relieving pain and decreasing disability related to lumbar herniated nucleus pulposus. During 2-year observation, the recurrent rate of low back pain is significantly low, and then the therapeutic method and navigable devise can be good option of initial intervention for long-term exercise management

뇌신경재활
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초록순서 : **33** 형식 : **Poster**

Neural substrates of aphasia in acute stroke using voxel based lesion-symptom brain mapping(VLSM)

Eun Ji Park[1,3*], Yong Wook Kim[1], Hyo Suk Nam[2], Hyo Seon Choi[1], Deog Young Kim[1†]

Yonsei University College of Medicine, Department of Rehabilitation Medicine[1], Yonsei University College of Medicine, Department of Neurology[2], National Police Hospital, Department of Rehabilitation Medicine[3]

Purpose:
An acquired communication disorders, characterized by an impairment of language modalities, are most often caused by sequelae of stroke. The theory about brain lesions related to aphasia has well reported. However, it is unclear how these brain lesions fit into the language processing in acute stroke. In this study, we aimed to investigate neuroanatomical lesion related to language processing in acute post-stroke patients with left hemispheric lesion using voxel-based lesion-symptom mapping.
Methods:
This retrospective study included 73 patients with acute first-ever stroke (within 1 month after onset) from January 2011 to April 2016. Magnetic resonance images (MRIs) of the brain and evaluation of aphasia using Korean version of the Western Aphasia Battery (K-WAB) were conducted within 1 month after stroke onset. Brain MRIs including 3-dimensional T1-weighted, T2-weighted, fluid attenuation inversion recovery (FLAIR) scans and diffusion weighted images were obtained. Region of interests (ROIs) were aligned manually at each affected slice of T1 weighted image with monitoring corresponding FLAIR and diffusion images to confirm extent of infarction. Normalization of ROIs and voxel-based statistical analysis have been done using Statistical Parametric Mapping 8 (SPM8) running under Matlab. The K-WAB assessment were included aphasia quotient (AQ), scores of four subtests. Each voxel, lesioned or non-lesioned, was compared with AQ and subtest scores as dependent variable.
Results:
In our consecutive 73 subjects, 58 patients (79.5%) were verified to be less than 90 in AQ. Those who below 20 in AQ were 33 patients (45.2%). Aphasia group showed significantly much more involvement of inferior frontal gyrus, superior temporal gyrus, inferior parietal lobule and insular cortex (BA 13) compared to non-aphasia group (p <0.001). The lesion on inferior frontal gyrus (BA 46), middle frontal gyrus, supramarginal gyrus and insular cortex (BA 13) were highly correlated with score of fluency subtest (p <0.001). The lesion on superior temporal gyrus (BA 41, 22), inferior parietal lobule (BA 39, 40) were correlated with score of comprehension subtest (p <0.001). The lesion on insular cortex (BA 13) and inferior parietal lobule were correlated with score of repetition subtest (p <0.001). The lesion on insular cortex and inferior frontal gyrus were correlated with score of naming (p <0.001).
Conclusion:
In this study, it is possible to localize the brain lesion related to language processing using voxel-based lesion-symptom analysis from early MRI imaging study in acute stroke. It may be useful to understand the language process and brain lesion after stroke.

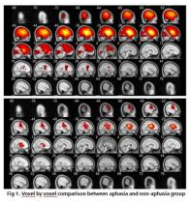

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Figure 1. Voxel by voxel comparison between aphasia and non-aphasia group

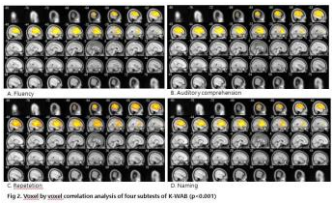

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Figure 2. Voxel by voxel correlation analysis of four subtests of K-WAB (p<0.001)

통증 및 근골격재활
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초록순서 : **C50** 형식 : **Poster**

Atlantoaxial Instability accompanied by Cervical Spine Fracture in a Rheumatoid Arthritis Patient

Jung Hyun Park[1†], Joon Sang Park[1], Soojin Choi[1*]

Gangnam Severance Hospital, Department of Rehabilitation Medicine[1]

Introduction
 Atlantoaxial instability(AAI) has been shown to have 40-85% prevelance among individuals with rheumatoid arthritis(RA). The high risk of AAI and limited symptoms could increase malpractice of physical therapy to RA patients with AAI who have not been noticed yet. In the following case, a patient showed cervical myelopathy and through cervical MRI she was thought to have cervical tumor. However while going through operation for tumor removal and spinal fusion tumor turned out to be pseudotumor due to RA and we revealed atlantoaxial instability accompanied with C2 fracture.

Case report
 A 73-year-old female who chronically had lower back pain and both thigh pain developed posterior neck pain on June 2016. She did not remember of any fall down events nor trauma events but she had multiple compression fractures of thoracic and lumbar spines and had received vertebroplasty. She also chronically had both hand PIP joints' pain and right elbow pain for about 10 years but had not received any particular treatments. She had developed bisphosphonate-associated osteonecrosis of the jaw on anterior mandible, so she received marginal mandibulectomy, open reduction and internal fixation on March 2016 and stopped taking medicine since then.
 On December 2016 she developed weakness of whole extremities and both upper arm tingling sensation. The symptom worsened that she was not able to eat alone nor walk alone by January 2017. On January 19th, 2017, she underwent cervical spine MRI, heard the impression of cervical myelopathy with C2 bone tumor. On January 26th, 2017 she was admitted to the Neurosurgery department for operation, and underwent C1-2 posterior spinal fusion, C2-3-4 pedicle screw fixation for atlantoaxial instability. During surgery, the tumor-like mass was revealed as pseudotumor which was considered as inflammation developed after C2 fracture. On February 16th, 2017 the patient was transferred to the department of Rehabilitation medicine. On initial lab after transmission, she showed rheumatoid factor elevated to 113.9, so we went through RA evaluation. After performing autoimmune lab, she was diagnosed as rheumatoid arthritis. She started taking hydroxychloroquine, celecoxib, prednisolone for RA medication and she restarted osteoporosis management with calcium carbonate, vitamin D medication and teriparatide injection.

Discussion
 This case shows atlantoaxial instability accompanied with fracture in cervical spine which developed into a tumor-like mass through inflammatory process. The patient showed arthralgia of both hands first, but had not gone through RA evaluation. It should be noticed that fracture along with RA could develop more severely than the fracture who does not have arthritis. Bone mineral densitometry screening should be recommended for people with RA and also cervical manipulation as rehabilitative treatment should be adjusted with extra caution for those who have the possibility of RA.

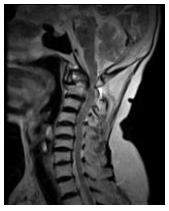

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Fig 1. The cervical spine MRI showing a tumor-like mass of C2 fracture with atlantoaxial instability

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Fig 2. The cervial AP and lateral X-ray showng postoperative status of cervical instability

뇌신경재활
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초록순서 : **34** 형식 : **Poster**

The Correlation between Clinical Characteristics and Salivagram in Patients with Brain-lesion

Donghwi Park[1†], Seung Beom Woo[1*], Dae Hee Lee[1], Kwang Jae Yu[1], Ju Yong Cho[1], Zee-Ihn Lee[1], Jong Min Kim[1]

Daegu Fatima Hospital, Department of Rehabilitation Medicine [1]

Objective:
To evaluate the correlation between radionuclide salivagram findings and clinical characteristics in dysphagic patient with brain-lesion.
Subjects and Methods:
Medical record of 35 dysphagic patients with brain-lesion who underwent both videofluoroscopic swallowing study (VFSS) and radionuclide salivagram were analyzed retrospectively. We divided subjects into two groups according to whether aspiration was present in salivagram or not. The difference of clinical characteristics and VFSS findings (penetration-aspiration scale ; PAS) between two groups were analyzed (group A ; patient with aspiration on salivagram, group B ; patient with no aspiration on salivagram).
Results:
Eleven out of 35 patients were showed salivary aspiration on radionuclide salivagram. There were no significant difference between two groups on age, sex, disease duration, PAS and feeding methods. Incidence of aspiration pneumonia was significantly higher in group A. In multivariate logistic regression analysis with forward stepwise method, mini-mental state examination (MMSE) score was only significant parameter in predicting positive findings in salivagram (odds ratio, 0.760; 95% confidence interval (CI), 0.625–0.923; p=0.006). The areas under the receiver operating characteristic curves of MSSE score for detect positive in salivagram was 0.855 (95% CI, 0.689–0.953.; p<0.0001). The optimal cut-off values was 7 or less on MMSE score (sensitivity 72.73%, specificity 100%)
Conclusion:
In patient with brain-lesion who complained of dysphagia, MMSE score was correlated with salivary aspiration. If score of 7 or less on MMSE, performing radionuclide salivagram may helpful for early detecting high risk patient of aspiration pneumonia, induced from salivary aspiration.

뇌신경재활
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초록순서 : **35** 형식 : **Poster**

The Effect of Gait Training Using End-Effector Type Robotic Device in Patients with Stroke.

Seong Woo Kim[1†], Ha Ra Jeon[1], Da Wa Jung[1], Sang Yoon Lee[1], Soojin Choi[1*]

National Health Insurance Service Ilsan Hospital, Department of Rehabilitation Medicine[1]

Introduction
 Being able to walk with better balance would be one of the ultimate goals of many patients with brain injury (BI). Various treatments are taken to assist gait training, and many new devices are attempted including robotic-assisted gait training (RAGT). There are two types of robotic-assisted gait training devices: exoskeleton type and end-effector type. There are many studies evaluating whether exoskeleton type RAGT has benefits in improving walking abilities in stroke patients but there were few studies evaluating the effect of end-effector type robotic devices in BI patients. In this study, we report the effect of gait training using end-effector type robotic devices in hemiplegic or quadriplegic patients with brain injury.

Subjects & Methods
 Among stroke patients who had been hospitalized in our clinic from July 2015 to June 2016 , 34 patients were enrolled. All participants were assessed with Functional Ambulatory Classification(FAC), Modified Barthel Index (MBI), 6 minute walking test, and Manual muscle testing grades(MMT) before and after RAGT. RAGT was applied for 15 timeseach person.

Results
 Of the participants 5 were female and the rest 29 were male, and the mean age was 56.7. 7 were quadriplegic and 27 were hemiplegic patientsCompared to the baseline, 6 minute walking test wasimproved with statistical significance. We assessed MMT of hip flexion, extension, abduction, adduction, knee flexion, and extension. We divided MMT grades into 10 scores from 0 to 9 which each represents motor grade zero, trace, poor minus, poor, poor plus, fair minus, fair, fair plus, good and normal. All MMT grades were significantly improved except for knee flexion.

Conclusion
 This study showed RAGT using end-effector type devices has benefits in improving walking abilities in stroke patients. End-effector type robotic devices can be considered as one of useful and effective gait training tools to recover gait function in patients with stroke. However, this study has limitations of small sample size with short term follow up. Larger study with longer follow up would be required to confirm the effectiveness of end-effector type robotic device.

	Initial	End	p-value
FAC	3.15	3.47	0.083
MBI	70.25	80.50	0.18
6min walking test	90.65	131.88	<0.005
Manual Muscle Test			
Hip Flexion	5.03	5.18	0.023
Hip Extension	4.62	4.97	0.032
Hip Abduction	4.68	4.94	0.037
Hip Adduction	4.91	5.06	0.023
Knee Flexion	4.62	4.79	0.083
Knee Extension	5.24	5.35	0.044

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Table 1. Outcome measures at Initial and the End of the RAGT

The Initial Pathophysiology of Carpal Tunnel Syndrome: Ultrasound Imaging Study

Donghwi Park[1*†], Kwang Jae Yu[1], Seung Beom Woo[1], Dae Hee Lee[1], Ju Yong Cho[1], Jong Min Kim[1], Zee-Ihn Lee[1]

Daegu Fatima Hospital, Department of Rehabilitation Medicine[1]

Background: To date, there have been conflicting suggestions regarding the initial pathogenesis of CTS. It has been characterized as either inflammation of the median nerve caused by compression or non-inflammatory fibrosis of the subsynovial connective tissue (SSCT).
Objective: To investigate the initial pathogenesis of CTS, we compared the deformation and displacement of the median nerve in accordance with the electrophysiological severity between patients with CTS (via Bland`s scale) and healthy controls.
Design: Cross-sectional, case-control study.
Setting: General teaching hospital, rehabilitation unit
Patients: Thirteen hands of 10 healthy participants and 39 hands of 27 patients with carpal tunnel syndrome were recruited and classified into 4 groups (stage 0~3) according to the severity of the electrodiagnostic test.
Methods: Ultrasound images of the median nerve in response to the wrist and finger motions were analyzed.
Main Outcome Measure: We measured the deformation of the median nerve (the maximal change values of the median nerve area, and aspect ratio of minimum-enclosing rectangle (MER)) and movement of the median nerve (the maximal change value of the median nerve displacement) in response to the motions of wrists and finger. The maximal change value of the median nerve displacement was normalized with respect to the width of the wrist. Moreover, the maximal change values of the median nerve area, and aspect ratio of MER were also normalized to the median nerve area and the aspect ratio of MER in wrist neutral position with finger extension.
Result: CTS patients in stage 3 showed a significantly lower normalized maximal change of the median nerve movement compared with CTS patients in stages 0, 1, and 2. ($p < .001$) Regarding the deformation of the median nerve, however, there were statistically significant differences between all groups (area; $p < .001$, MER; $p < .001$). According to the multivariate logistic regression analysis, normalized maximal change of the aspect ratio of MER is a meaningful parameter in diagnosing of initial stage of CTS ($p < .014$).
Conclusion: These results showed that the deformation of the median nerve may be associated with the initial pathogenesis, but further studies are necessary to validate the findings of this study.

뇌신경재활
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초록순서 : **C11** 형식 : **Poster**

A complicated case of bulbar myasthenia gravis superimposed in a medullary infarction patient

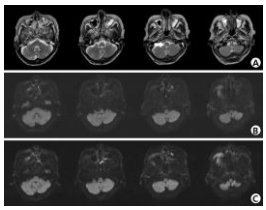
Donggyun Sohn[1*], Seokhyun Hong[1†], Sungjun Kim[1], Saerom Kang[1], Sun Im[1]

Bucheon, St. Mary's Hospital, College of Medicine, The Catholic University of Korea, Department of Rehabilitation Medicine[1]

[Introduction]
In the elderly, Myasthenia gravis (MG) can present with bulbar symptoms, which may be clinically difficult to diagnose from other neurologic comorbid conditions. We describe a case of a 75-year-old man who had been previously diagnosed with dysphagia associated with medullary infarction, but who showed aggravation of dysphagia later on due to superimposed development of bulbar MG. We report a case of medullary infarction patient who suddenly developed ptosis, aggravated dysphagia, and dysarthria. Diagnosis of superimposed bulbar MG was made after performing the FEES-Tensilon test.

[Case description]
A 75-year-old man who had been diagnosed with dysphagia associated with medullary infarction 4 months prior. The patient had previously underwent multidisciplinary rehabilitation including dysphagia rehabilitation and showed mild aspiration only with liquid. He had improved to a level so that he was allowed to be put on dysphagia diet with proper compensation and had been discharged from our hospital to home.
 But 1 month later, he complained of ptosis characterized by abnormal fatigability that improved with rest, and worsened slurred speech. Follow up swallowing performance using the FEES was revealed increased saliva pooling with aspiration to the laryngeal vestibules. A recurrence of infarction was suspected, but brain magnetic resonance imaging (MRI) performed at post 2 days and 5 days after onset of ptosis showed no evidence of recurrence of acute infarction.
 For the further evaluation of aggrevated dysphagia, we conducted electrodiagnostic examination. But there was no definite electrodiagnostic evidence of peripheral neuropathy, motor neuron disease, or myopathy. Subsequent RNS was nonspecific with no decremental response. Due to the technical challenges in making a proper diagnosis, he was consulted to a neurologist and a Tensilon test was recommended. Due to presence of aggravated swallowing performance, a FEES-Tensilon test was performed to the patient at 12 days after onset of ptosis.
 After application of a cumulative dose of 5 mg of intravenous pyridostigmine in the FEES-Tensilon test, the patient showed improved swallowing performance with tolerable saliva swallowing, partial swallowing of boluses, and reduced residues in the valleculae and pyriforme sinus to baseline post infarction state with a FOIS level from 1 to 3. The patient expressed resolution of diplopia. After pyridostigmine and prednisolone had been initiated, the patient showed gradual improvement of ptosis and swallowing performance.

[Conclusion]
MG is the most common disorder affecting neuromuscular transmission. However, in the elderly, it may be difficult to diagnose when it involves the bulbar muscles. In this case, we report the rare presentation of superimposed MG in a medullary infarction patient, which had been successfully managed after proper diagnosis with the aid of an emerging novel test, the FEES-Tensilon test.



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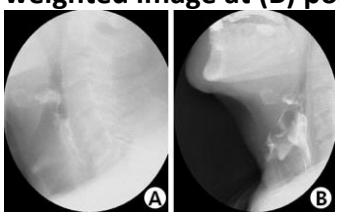
(A) Initial brain magnetic resonance images (MRI) of T2-weighted image show subacute infarction in right medulla. After onset of ptosis, follow up MRI of the brain demonstrate no acute lesion in diffusion weighted image at (B) post 2 days and (C) 5 days.



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(A) 5 weeks prior to onset of ptosis, Videofluoroscopic swallowing study (VFSS) images reveal reduced residues in the valleculae and the pyriforme sinus with mild aspiration in lateral view at time of discharge.

(B) 6 days after onset of ptosis, VFSS images demonstrate maximal amount residues in the valleculae and the pyriforme sinus with overflow aspiration in consistencies in lateral view.

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Videoendoscopic findings of the FEES-Tensilon test show (A) at baseline, prior to Tensilon application, continuous silent saliva aspiration and pooling of secretions in the pyriforme sinus and (B) after applying a cumulative dose of 5 mg of Tensilon, improved clearance of secretions and tolerable swallowing of nectar bolus. (C) In comparison to prior to Tensilon application, (D) a ptosis is significantly improved after applying a cumulative dose of 5 mg of Tensilon.

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초록순서 : **C51** 형식 : **Poster**

Ultrasound-guided S1 Transforaminal Epidural Injection Using Colour Doppler

Donghwi Park[1*†], Seung Beom Woo[1], Dae Hee Lee[1], Kwang Jae Yu[1], Ju Yong Cho[1], Zee-Ihn Lee[1], Jong Min Kim[1]

Daegu Fatima Hospital, Department of Rehabilitation Medicine[1]

A lumbosacral transforaminal epidural injection (TFEI) is a useful treatment for lumbosacral radiculopathies. It is generally performed under X-ray fluoroscopy, which has several disadvantages, namely exposure of the patient to radiation and the need for fluoroscopy equipment.
Recently, several studies have investigated the effectiveness of the ultrasound-guided lumbosacral TFESI. Among the lumbosacral TFEI techniques, S1 TFEI can be performed easily, unlike other lumbar spine level, because the S1 foramen is easy to find due to its position near the skin. Although a previous study investigated the usefulness of lumbar TFEI using in-plane approach, there has been no study of the S1 TFEI using in-plane approach. However, the ultrasound-guided S1 TEFI using an out-of-plane approach, which was previously reported, may cause an intestinal injury or intravascular injection because the needle tip tends to be invisible in the out-of-plane approach. In this study, therefore, we report a new method of ultrasound-guided S1 TEFI using the in-plane approach and colour Doppler. In addition, we also report the usefulness of colour Doppler imaging for finding the S1 foramen and confirming the accuracy of the injection.

뇌신경재활
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초록순서 : **36** 형식 : **Poster**

Reduced diaphragm excursion during reflexive citric acid cough test in subacute stroke patients

Yeonjae Han[1*†], Donggyun Sohn [1*], YongJun Jang[1], Hyunjung Koo MD[1], Geun-Young Park[1], Sun Im[1]

The Catholic University of Korea Bucheon St. Mary's Hospital , Department of Rehabilitation Medicine[1]

[Background]
The role of pharyngeal afferents in the recruitment of respiratory muscles in reflexive coughing is a topic that has not gained much attention. Laryngectomized patients who lack afferent information from the larynx, are known to have impaired mechanisms subserving the motor unit recruitment rate and motor output of the expiratory muscles during reflexive coughing (RC). Post-stroke patients with swallowing problems at risk of silent aspiration, are known to have impaired cough sensitivities. However, whether these patients also show reduced cough strength and respiratory muscle output during reflexive coughing is not known.

[Methods]
This cross-sectional study was conducted at a university-affiliated rehabilitation department on subacute stroke patients (mean stroke onset days = 13.6 days) at risk of silent aspiration (penetration-aspiration scale = 8). The reflexive cough strength induced by citric acid nebulization (2.8 mol/L) was recorded. Diaphragmatic excursions were assessed in real time. These values were compared to those of stroke patients with no dysphagia or aspiration.

[Results]
Both groups had similar range of initial National Institutes of Health Stroke Scale (NIHSS) scores and similar level of disability as measured by the modified barthel index. During reflexive coughing the median (interquartile range) PCF values were significantly reduced in patients with silent aspiration (n = 21) at 45 L/min (0–83 L/min) than in the control group patients at 97 L/min (66–162 L/min) (P = 0.0004). Diaphragmatic excursions observed during these reflexive coughs were also significantly reduced (P = 0.001). The reflexive cough strength was significantly correlated with the number of coughs generated (rs = 0.685), voluntary cough strength (rs = 0.845), and degree of diaphragm excursion on both sides (rs = 0.50 [hemiplegic] and rs = 0.55 [nonhemiplegic]) but not to degree of hemiparesis of the extremities. A 6-month follow up revealed that 7 patients in group A experienced aspiration pneumonia.

[Conclusion]
Our results have shown that cough strength during RC in stroke patients at risk of aspiration is severely reduced, which indicates that decreased pharyngeal afferent activity in these patients may affect respiratory muscle recruitment and limit the output of RC. Weakened cough strength needs to be considered during the rehabilitation process and swallowing training of these patients. Future studies need to elucidate whether cough strength in RC testing could be an important component to assess in citric acid RC tests.

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초록순서 : **C52** 형식 : **Poster**

Clinical outcome of repeat injection therapy in patients with recurrent musculoskeletal pain

Dae Hee Lee[1*], Jong Min Kim[1†], Seung Beom Woo[1], Kwang Jae Yu[1], Ju Young Cho[1], Donghwi Park[1], Zee-Ihn Lee[1]

Daegu Fatima Hospital, Department of Rehabilitation Medicine[1]

Objective : To compare the effect of initial and repeat injection in patients with recurrent musculoskeletal pain using Visual Analog Scale(VAS)

Subjects and Methods: We retrospectively reviewed the medical records of 38 patients with recurrent musculoskeletal pain who received same injection therapy in rehabilitation outpatient clinic. A total 43 cases of 38 patients were enrolled include 4 cases of multiple diagnoses.
We reviewed medical and demographic factors as follows:
sex, age, affected side, diagnosis, number of recurrence and change of VAS.

Results: Males were 10 (23.3%), females 28 (76.7%). Mean age was 59.71±11.67 years. Right side affected cases were 21(48.8%), left were 22 (51.2%)
The diagnoses of musculoskeletal pain were as follows: 18 adhesive capsulitis (41.9%), 5 carpal tunnel syndrome (11.6%), 5 shoulder bursitis (11.6%), 3 Osteoarthritis of knee (7.0%), 3 rotator cuff tear (7.0%), 2 lateral epicondylitis (4.7%), 2 rheumatoid arthritis (4.7%), 1 biceps tendinitis (2.3%), 1 medial epicondylitis (2.3%), 1 myofascial pain syndrome (2.3%), 1 rotator cuff calcific tendinitis (2.3%) and 1 wrist arthritis (2.3%).
 Improvement of patient's pain was measured by VAS change(%). Mean VAS score improvement of initial therapy was 59.67±30.20 and repeat injection was 61.00±26.97.
 The results were statistically analyzed using independent t-test
 There was no statistically significant difference in VAS score improvement between initial therapy and repeat injection therapy.

Conclusion: In patients with recurrent musculoskeletal pain, repeat injection was as effective as initial injection therapy.

통증 및 근골격재활
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초록순서 : **100** 형식 : **Poster**

The usefulness of diagnosis of carpal tunnel syndrome at lunate bone by sonography

Myeong Hwan Bang[1*], Jong Moon Kim[2†], Hyoung Seop Kim[1†]

National Health Insurance Service Ilsan Hospital, Department of Physical Medicine and Rehabilitation[1], CHA Bundang Medical Center, Department of Rehabilitation Medicine[2]

Introduction
 Carpal tunnel syndrome (CTS) is characterized by typical anatomic changes that can be shown with high-resolution sonography. There have been lots of studies to determine whether these findings are reliable and can be used to establish the diagnosis. Most studies suggest cross sectional area (CSA) of median nerve in carpal tunnel as diagnostic criteria. The purpose of this study is to compare severity of CTS confirmed by electromyography (EMG) with measurements by sonography in different levels and which level is most useful.

Methods
 We collected 34 participants who were clinically diagnosed CTS. The severity of CTS was classified according to electrodiagnostic results by bland classification (Group 1 : bland 0 (normal), Group 2 : bland 1, 2, Group 3 : bland 3, 4, Group 4 : bland 5, 6). The CSAs of median nerve and carpal tunnel were measured at proximal lunate bone (lunate level), proximal and distal carpal levels by sonography. One way ANOVA was performed to compare depths at each level and the kruskal-wallis test was used for comparison with each group, and the Dunn procedure was used for post hoc comparison.

Results
 The CSA of median nerve at lunate and proximal carpal level revealed statistically significant. At lunate level, group 1 and other groups were significant, and at proximal carpal level, group 1 and group 4, group 2 and group 4 were significant. The CSA of the median nerve at lunate level was the only statistically significant when compared to normal (group 1). The depth from skin to median nerve measured at lunate level was statistically significantly lower than that measured at proximal and distal carpal levels.

Conclusion
 Many studies have used the CSA of median nerve at the proximal and distal carpal level as a method to diagnose CTS using sonography. However, since the carpal tunnel area is a limited space, it is difficult for the median nerve to swell due to inflammation. The median nerve at lunate level which is just proximal to carpal tunnel is not restricted by carpal tunnel, therefore, swelling can be occurred more easily. In this study, the CSA of median nerve in lunate level which was the only measurement can distinguish mild types of CTS (group 1 and 2 or group 1 and 3). And the lunate level is much easier to measure with sonography because it has a lower depth than the proximal and distal carpal tunnel. We recommend measuring the CSA of median nerve above proximal part of lunate bone for diagnosing early carpal tunnel syndrome.

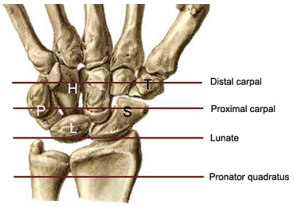

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Fig1. Location of sonographic measurement level and findings

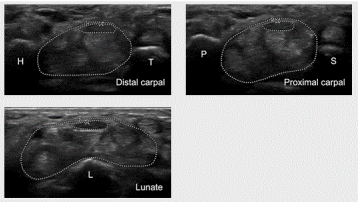

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Fig2. Distal carpal, Proximal carpal, Lunate level

Outcome Measurement (Cross sectional area)	Mean ± SD (mm²)	Depth from the skin (mm)	Group 1 (n = 6) (mm²)	Group 2 (n = 37) (mm²)	Group 3 (n = 15) (mm²)	Group 4 (n = 10) (mm²)	P value	P value (Between-Group Comp			
								Group 1 and 2	Group 1 and 3	Group 1 and 4	Group 2 and 3
Lunate level (median nerve)	14.65 ± 5.01	29.05 ± 5.17	9.65 (8.83, 11.58)	13.20 (11.20, 16.25)	14.90 (12.00, 22.50)	16.20 (12.63, 19.08)	< 0.006*	0.044*	0.012*	0.006*	1.000
Proximal carpal level (median nerve)	13.49 ± 4.14	51.90 ± 10.84	10.15 (9.08, 10.68)	12.10 (11.05, 14.15)	12.20 (10.40, 16.10)	16.05 (14.65, 21.30)	0.001*	0.127	0.086	< 0.001*	1.000
Proximal carpal level (carpal tunnel)	190.01 ± 26.96		171.00 (163.25, 196.50)	187.00 (170.05, 207.00)	182.00 (174.00, 197.00)	209.00 (174.25, 247.00)	0.280				
Distal carpal level (median nerve)	13.31 ± 3.46	78.95 ± 11.41	10.80 (9.98, 11.13)	13.00 (10.95, 14.10)	12.90 (10.80, 15.90)	14.55 (11.78, 19.43)	0.053				
Distal carpal level	167.29 ±		149.50 (138.5	158.00 (141.0	151.00	188.50					

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Table1. Outcome Measurements of sonography of carpal tunnel syndrome

통증 및 근골격재활
게시일시 및 장소 : **2017 년 4 월 21 일 13:00-18:30, 3 층 로비 / 질의응답 일시 및 장소 : 2017 년 4 월 21 일 18:00-18:30, 3 층 로비**
초록순서 : **C53** 형식 : **Poster**

Clinical outcomes of repeat injection in patients with recurrent adhesive capsulitis

Jong Min Kim[1†], Kwang Jae Yu[1*], Seung Beom Woo[1], Dae Hee Lee[1], Ju Young Cho[1], Zee-Ihn Lee[1], Donghwi Park[1]

Daegu Fatima Hospital, Department of Rehabilitation Medicine[1]

Objective : To evaluate clinical characteristics of recurrent adhesive capsulitis, and compare the effect of repeat injection therapy with that of initial and non-recurrent adhesive capsulitis using Visual Analog Scale(VAS).
Methods : We retrospectively reviewed the medical records of 101 patients with AC who received injection therapy in rehabilitation outpatient clinic. A total 106 cases of 101 patients (24 recurrent group and 77 non-recurrent group) were enrolled including 5 cases of bilateral involvement.
We reviewed medical and demographic factors for each group as follows : sex, age, affected side, concomitant ultrasonographic findings of the shoulder.
Results : In recurrent adhesive capsulitis cases, mean age was 62.42 ±9.53. Males were 7(29.2%), females 17(70.8%). Right side affected cases were 12(50%), left were 12(50%). Concomitant ultrasonographic findings were 6 Rotator cuff calcific tendinitis (25.0%), 5 Rotator cuff tear (20.8%). In non-recurrent adhesive capsulitis cases, mean age was 60.99±10.90. Males were 35(42.7%), females 47(57.3%). Right side affected cases were 47(57.3%), left were 35(42.7%). Concomitant ultrasonographic findings were 13 Rotator cuff tear(15.9%), 9 Rotator cuff calcific tendinitis(11.0%), 2 biceps tendinitis(2.4%), 1 AC joint arthritis(1.2%), 1 Shoulder bursitis(1.2%), 1 Shoulder osteoarthritis(1.2%). The number of recurrence was as follows: once(17), twice(6), three times(1). There showed more concomitant ultrasonographic findings in recurrent AC group.
Improvement of patient's pain was measured by VAS changes(%). The results were statistically analyzed using Mann-Whitney U test. Mean VAS score improvement(%) in recurrent AC group after initial therapy was 54.64±28.309 and repeat injection was 63.52±21.869. There was no statistically significant difference in VAS score improvement between initial and repeat injection therapy in recurrent AC group.
Mean VAS score improvement(%) of initial therapy in non-recurrent AC group was 49.98±24.642 and in recurrent AC group was 54.64±28.309.
There was no statistically significant difference in VAS score improvement between non-recurrent and recurrent AC group in initial injection therapy.
Conclusion: There was no difference in the effect of initial injection therapy between recurrent and non-recurrent AC group. And in recurrent AC group, repeat injection was as effective as initial injection therapy.

소아재활
게시일시 및 장소 : **2017 년 4 월 21 일 13:00-18:30, 3 층 로비 / 질의응답 일시 및 장소 : 2017 년 4 월 21 일 18:00-18:30, 3 층 로비**
초록순서 : **C24** 형식 : **Poster**

Interpretation of a novel SPAST variant : A case report

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Incheon St. Mary's Hospital, College of Medicine, The Catholic University of Korea, Department of Rehabilitation Medicine[1]

Introduction
With the advent of next-generation sequencing, novel variants discovered by clinicians are rapidly increasing. The American College of Medical Genetics and Genomics (ACMG) revised in 2015 provides a guideline for classification of the pathogenicity of the variants. This may help to correlate genotype-phenotype in the novel variants. Here, we describe a case with a novel variant on SPAST gene and interprete this variant according to ACMG guideline and discuss pros and cons of this guideline.

Case report
A 3-year-old male visited our rehabilitation clinic, complaining of toe walking. Onset time of symptoms was unclear and there was no familial history of hereditary disorders. On neurological examination, spasticity and weakness were on bilateral lower limbs. In imaging studies involving brain MRI and spinal MRI, no definite abnormality was identified.
In genetic testing, a novel missense variant (c.1159G>C/p.Gly387Arg) in SPAST gene associated with spastic paraplegia 4 (SGP4) was found. This variant was predicted likely to be deleterious in in-silico analysis.
Based on the ACMG guideline, this variant corresponded to two moderate evidence (absent from controls/de novo, without paternity and maternity confirmed) and one supporting evidence (computational evidence support a deleterious effect). This result corresponds to "uncertain significance".
We conducted an additional parental genetic testing and the variant was not found. Thus, this variant meets one strong evidence (de novo, paternity and maternity confirmed) and one moderate evidence (absent from controls). According to the result of the parental genetic testing, the classification of this variant was changed from "uncertain significance" to "likely pathogenic".

Discussion
We reported a novel SPAST variant in a patient with bilateral lower-limb gait spasticity. This variant was classified as "uncertain significance" at first. Because this variant was not found in additional parental genetic testing, the classification of this novel variant has changed to "likely pathogenic".
Nonetheless, if the patient's phenotype is not highly specific to genetic disorder associated with a novel variant, clinicians can not be certain whether the variant influences the patient's phenotype. In our case, we could not completely rule out the possibility of cerebral palsy because SPG4 and cerebral palsy are very difficult to distinguish with clinical symptoms.
Although ACMG guideline is a useful tool to classify whether a novel variant is pathogenic or benign, it is also necessary to follow up additional tests or patient's symptoms because of clinical limitations of this guideline.

통증 및 근골격재활
게시일시 및 장소 : **2017 년 4 월 21 일 13:00-18:30, 3 층 로비 / 질의응답 일시 및 장소 : 2017 년 4 월 21 일 15:00-15:40, 3 층 로비**
초록순서 : **101** 형식 : **Poster**

Feasibility of Acromion Index as the Reference of Severity in Supraspinatus Tendon Injury

Kun Hee Lee[1*], Jong Moon Kim[2], Seung Ho Joo[3], Da Sol Ha[1], Dong Jin Ko[4], Cheol Hoon Jang[4], Hyoung Seop Kim[1†]

National Health Insurance Service Ilsan Hospital, Department of Physical Medicine and Rehabilitation[1], CHA Bundang Medical Center, Department of Rehabilitation Medicine[2], National Health Insurance Service Ilsan Hospital, Department of Radiology[3], Yonsei University College of Medicine, Severance Hospital, Department and Research Institute of Rehabilitation Medicine[4]

Abstract
Objective
The purpose of this study was to validate the pathophysiology of supraspinatus tendon injury by confirming relationship between acromial index (AI), acromial lateral extension above the head of humerus and severity of supraspinatus tendon injury.

Methods
We divided 200 patients with shoulder pain and clinical diagnosis as impingement syndrome who had been taken shoulder simple x-ray and shoulder MRI into four categories by severity of supraspinatus tendon injury based on official reading of shoulder MRI (0 = no evidence of injury, 1 = partial tear, 2 = full thickness tear, 3 = complete rupture). AI, distance from glenoid plane to acromion / distance from glenoid plane to lateral aspect of humerus was measured in shoulder MRI and simple X-ray. To figure out the inter-rater reliability, two examiners who were blinded to official readings of MRIs had measured AI on both imaging modalities, and then correlation analysis was conducted for intra-class correlation coefficient (ICC). We identified the relationship between the severity of supraspinatus tendon injury and AI on shoulder MRI and simple X-ray.

Results
The two observers demonstrated excellent agreement for the AI on both imaging modalities. However, there was no statistical correlation between the AI and the severity of supraspinatus tendon injury. And the mean value of AIs on X-ray was greater than that on MRI.

Conclusion
The AI shows no statistical correlation with the severity of supraspinatus tendon injury. Therefore, AI could not be generally used as a predictive reference for supraspinatus tendon injury on the radiologic images.

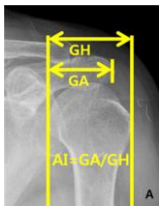

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Fig. 2. Acromion index (AI, distance from glenoid plane to acromion (GA) / distance from glenoid plane to lateral aspect of humerus (GH))

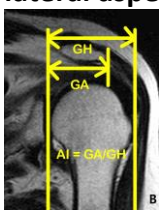

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Fig. 2. Acromion index (AI, distance from glenoid plane to acromion (GA) / distance from glenoid plane to lateral aspect of humerus (GH))

통증 및 근골격재활
게시일시 및 장소 : **2017 년 4 월 21 일 13:00-18:30, 3 층 로비 / 질의응답 일시 및 장소 : 2017 년 4 월 21 일 18:00-18:30, 3 층 로비**
초록순서 : **C54** 형식 : **Poster**

Seronegative Spondyloarthropathy without Clinical Features of Inflammatory Back Pain: 3 Case Reports

Junghoon Yu[1,2*], Kyunghoon Min[1,2†], Kiyoung Kim[1,2], Sang Hee Im[1,2], MinYoung Kim[1,2]

Bundang CHA, Department of Rehabilitation Medicine[1], CHA University, Rehabilitation and Regeneration Research Center[2]

Introduction
Seronegative spondyloarthropathy(SpA) is a chronic inflammatory disease, which refers to any joint of the vertebral column. SpA includes ankylosing spondylitis, psoriatic arthritis, enteropathic arthritis and Reiter syndrome, in which rheumatoid factors are negative. The major symptom of SpA is the inflammatory back pain, which resolves with exercise. However, patients do not complain of typical back pain sometimes. In these cases SpA would be easy to overlook, and misdiagnosis could be made. Therefore in this case series, we report 3 patients diagnosed with SpA without the inflammatory back pain.
Case reports
Case1. A 19 years-old man visited pain clinic for pain in low back, both pelvic area, knees toes and heel cords, which began 3 months ago. He was a hockey player, and his back pain was exacerbated when exercising. No abnormal findings were found on the L-spine, knee and foot X-ray. However, in the ultrasonography the abnormal vascularities were observed in both distal patellar tendons. In the bone scan, asymmetrically increased radioactive uptakes in right knee and ankle were observed. Cortical irregularities with subtle subchondral bone marrow edema at bilateral sacroiliac joints were observed in the sacral MRI. The HLA typing B27 was positive. The initial impression was sports-related overuse pain, but final diagnosis was SpA.
Case 2. A 21 years-old man visited pain clinic for pain in low back, both upper gluteal areas, sternum and right shoulder, which began 5 years ago. He continued to receive the manual therapy at another hospital. He complained of consistent pain regardless of exercise and time. No abnormal findings were found on the electrophysiological study. In the bone scan, increased radioactive uptake at the inferior portion of right S-I joint area was observed. Also in the sacral MRI there were bilateral symmetrical sacroiliac joints space narrowing with multiple erosions and subchondral bone marrow edema. The HLA typing B27 was positive. The initial impression was fibromyalgia, but final diagnosis was SpA.
Case 3. A 21 years-old man visited pain clinic for pain in right shoulder and upper extremity. He was a soldier, and his pain occurred after an unreasonable march. His pain was exacerbated when exercising. No abnormal findings were found on the C-spine MRI and electrophysiological study. However, in S-I joint X-ray the bilateral sacroiliitis were observed. Also in the sacral MRI there were bilateral symmetrical sacroiliac joints space narrowing with multiple erosions and subchondral bone marrow edema. The HLA typing B27 was negative. The initial impression was back-pack syndrome or cervical radiculopathy, but final diagnosis was SpA.
Conclusion
Early diagnosis of SpA is very important for the treatment. However, in the absence of the inflammatory back pain, it may be misdiagnosed. Therefore, in patients with nonspecific pain it is necessary to observe carefully without overlooking the possibility of SpA.

통증 및 근골격재활
게시일시 및 장소 : **2017 년 4 월 21 일 13:00-18:30, 3 층 로비 / 질의응답 일시 및 장소 : 2017 년 4 월 21 일 15:00-15:40, 3 층 로비**
초록순서 : **102** 형식 : **Poster**

Newly-Developed High Frequency Deep Heat Therapy in Patients with Shoulder Pain; A Preliminary Study

Hyung Nam Lee[1*], Yu Hui Won[1], Sung-Hee Park [1], Myoung-Hwan Ko[1], Jeong-Hwan Seo[1], Gi-Wook Kim [1†]

Chonbuk National University Hospital, Department of Rehabilitation Medicine[1]

Introduction: The deep heat therapy among physical agent modalities is widely used for the treatment of musculoskeletal pain. Newly-developed HIPER-500® is able to generate deep heat in a focal living tissue by using high frequency, thus it can be applied to treatment of musculoskeletal problems. The aim of this study is to evaluate and compare the effectiveness of pain modulation and shoulder function between ultrasound and HIPER-500® in patients with shoulder disease.
Methods: This prospective randomized control trial is designed to compare the treatment effect of HIPER-500® with another deep heat generator ultrasound (SONOSTIM®) in patients with shoulder pain and disability in non-inferiority manner. Both HIPER-500® and SONOSTIM® group were undergone a session of 10 minute-therapy, 5 days a week for 2 weeks (total 10 sessions). We evaluated shoulder pain and disability with Visual Analogue Scale (VAS), University of California Los Angeles score (UCLA score), Shoulder Pain and Disability Index (SPADI) in both HIPER-500® and SONOSTIM® group before and after the treatment. Statistics were executed for comparing the effects of treatment within and between the groups.
Results: Eight patients in HIPER-500® group and five patients in SONOSTIM® group were enrolled and completed a series of evaluations in a timely manner. In HIPER-500® group, we found the significant improvements for shoulder pain and functions in all evaluation forms when comparing within the group before and after the treatment (VAS from 3.75±0.94 to 1.88±0.59, UCLA score form 24.75±1.60 to 29.88±1.11, SPADI from 43.37±9.98 to 16.06±4.61). And also in SONOSTIM® group, results showed the significant improvements in all the indicators representing pain and function (VAS from 4.14±0.37 to 1.71±0.45, UCLA score from 27.43±1.96 to 30.14±1.04, SPADI from 41.20±7.14 to 15.97±4.51). However, we found out that effectiveness of treatment was not different from one another in both groups with statistical significance.
Conclusion: Newly-developed HIPER-500® for high frequency deep heat therapy showed similar effects to that of ultrasound (SONOSTIM®) for relieving pain and improving physical performance in the participants of this study. However, this study is still in progress, more participants will bolster the certainty of result that this equipment can be a useful modality for treating shoulder pain and improving physical activity in patients with shoulder disease.

Keywords : High frequency, deep heat, shoulder pain, shoulder disability.

뇌신경재활
게시일시 및 장소 : **2017 년 4 월 21 일 13:00-18:30, 3 층 로비 / 질의응답 일시 및 장소 : 2017 년 4 월 21 일 18:00-18:30, 3 층 로비**
초록순서 : **C12** 형식 : **Poster**

Cerebral venous thrombosis with polyneuropathy following diabetic ketoacidosis: Case report

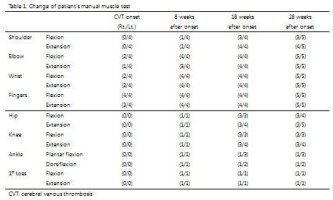
Seok Gyo Park[1*], Sang Won Min[1], Ho Joong Jeong[1], Young Joo Sim[1], Dong Kyu Kim[1], Ghi Chan Kim[1†]

Kosin University Gospel Hospital, Department of Rehabilitation Medicine[1]

Introduction
Cerebral venous thrombosis (CVT) is a rare cerebrovascular disease that accounts for 0.5% of strokes, occurring in 5 out of 1 million people. CVT can occur because of a variety of causes including infections, drugs, and hematologic abnormalities. This can lead to localized neurological deficits, convulsions, coma, and death. We report a case of CVT following diabetic ketoacidosis (DKA) in a 27-year-old man.

Case report
A 27-year-old man visited the emergency room with general weakness. He was diagnosed with type 2 diabetes mellitus before 1 year. Since 1 month before admission, he had been suffering from severe stress, drank 2 bottles of soju and only slept for three hours. The result of laboratory test showed a severe DKA with serum glucose level of 1424 mg/dl, arterial pH of 7.162, serum bicarbonate of 9.2mEq/L and urinary ketones of 2+. Sepsis due to mycoplasma infection occurred during treatment for DKA. Mechanical ventilation, extracorporeal membrane oxygenation (ECMO) and continuous renal replacement therapy (CRRT) were performed due to multi-organ failure.
Tracheal tube, ECMO, and CRRT were removed after 1 week. But he had incompelete quadriplegia and hypoesthesia on both lower limbs. (Table 1) High signal intensity lesions in both high fronto-paietal regions were seen on Magnetic resonance T2 Fluid-attenuated inversion-recovery (FLAIR) images and diffusion weighted images of brain. There were irregular linear filling defect, diffuse narrowing, and obliterations of both distal cortical venous structures in the superior sagittal sinus on MR venography. (Figure 1) We diagnosed him as a cerebral venous thrombosis with hemorrhagic transformation and started intravenous low molecular weight heparin injection.
At 10 weeks after admission, he was stabilized and transferred to the rehabilitation department. The incomplete quadriplegia was improved and hypoesthesia was limited to right calf and foot. (Table 1) A modified Barthel index (MBI) was 37 points. There were Bell's palsy and peripheral polyneuropathy (PPN) on electrophysiologic studies. (Table 2)
At 20 weeks after admission, he discharged. Incomplete quadriplegia was more improved. (Table 1) He was able to walk about 30 meters in donning state of Rt. ankle foot orthosis with walker. MBI was 67 points.
After 8 weeks, he visited outpatient department. The result of on electrophysiologic studies showed improved Bell's palsy but no interval changes on PPN.

Conclusion
The CVT of this patient followed DKA and multi-organ failure due to sepsis during treatment in intensive care unit. Rapid diagnosis and treatment have a great impact on the prognosis of CVT. So we must consider taking evaluations about cerebral venous system if the patients with severe uncontrolled diabetes mellitus have neurological deficits, seizures, and loss of consciousness.



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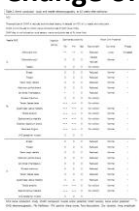
Change of patient's manual muscle test



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Nerve conduction study and needle electromyography at 10 weeks after admission , NCS: nerve conduction study, CMAP: compound muscle action potential, SNAP: sensory nerve action potential

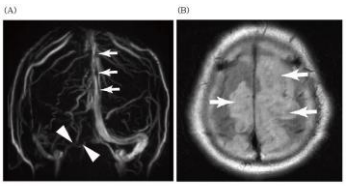

Figure 1.

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(A) Magnetic resonance venography Complete absence of the medial part of the left transverse sinus(arrow head), irregular linear filling defect along superior sagittal sinus(arrow)(B) Magnetic resonance T2 Fluid-attenuated inversion-recovery image High signal intensity lesions in both high fronto-parietal regions(arrow)

뇌신경재활

게시일시 및 장소 : **2017 년 4 월 21 일 13:00-18:30, 3 층 로비 / 질의응답 일시 및 장소 : 2017 년 4 월 21 일 15:00-15:40, 3 층 로비**

초록순서 : **37** 형식 : **Poster**

Effect of ipsi-lesional dorsolateral prefrontal rTMS on cognition in acute phase stroke patients

Youngsu Jung[1*], Jinkyoo Moon[1], Kye Hee Cho[1,1], Sang Hee Im[1,1], Min Young Kim[1,1†]

Bundang CHA, Department of Rehabilitation Medicine[1]

Introduction
Dorsolateral prefrontal cortex(DLPFC) is connected to the orbitofrontal cortex, and to various brain areas. The area plays important roles in working memory, cognitive flexibility, and abstract reasoning. Previous studies have shown that repetitive transcranial magnetic stimulation (rTMS) is effective for stroke patients in terms of motor, cognition and mood recovery. The mechanism of rTMS is suggested as regeneration of cortex and augmentation of the response to the stimulatory input. Even though several studies were conducted to reveal therapeutic effect of rTMS on DLPFC for mood or motor recovery, the efficacy on cognition is still unclear in acute stroke patients. This study aims to elucidate the therapeutic effect of rTMS applied on ipsi-lesional DLPFC in acute stroke patients.

Method
For this retrospective comparison study, patients with acute stroke (duration < 3 months) admitted to University hospital between March, 2014 and September, 2016 were included. Exclusion criteria were 1) previous stroke, 2) neurodegenerative disease such as Parkinson's disease, 3) severe cognitive impairment (minimally conscious state or vegetative state), and 4) intact cognitive function (MMSE > 26). Patients were categorized into rTMS group if they had received more than 4 rTMS sessions or control group without rTMS treatment. There was no difference between groups in the medications taken for dementia and number of occupational therapy sessions(1hour per day, 5days/week for 4weeks). rTMS was applied to ipsi-lesional DLPFC at 80% of motor threshold(10Hz, 5-second train duration and 55-second intertrain interval) for 20minutes (1000 pulses per session). The intervention group received 3 rTMS sessions per week for maximum 4 weeks, and mean number of sessions were 9.42 ± 1.64. Cognitive function was evaluated by MMSE at admission and after a month or immediately after last rTMS session. Statistical analysis was performed by SPSS(IBM, version 21).

Results
Data from 37 patients were collected (19 patients for rTMS group and 18 patients for control group). There were no inter-group difference including age, sex, laterality indices, type of stroke, Geriatric Depression Scale(GDS), and Functional Ambulation Category(FAC)(Table 1). In contrast to control group, rTMS group showed significantly increased total MMSE score(p=0.037) and the subscore of attention(p=0.005)(Figure 1). Improvement in orientation was also noted, but it was not statistically significant(Table 2).

Conclusion
The results of this study suggest that high frequency rTMS over ipsi-lesional DLPFC has beneficial effect on cognitive function, especially for attention in acute stroke patients. Together with previous studies, this finding suggests that rTMS over ipsi-lesional DLPFC may be a suitable add-on therapy for acute stroke patients. However, due to short follow-up period, the sustainability of the effect cannot be confirmed. Further study to address long term effect is necessary.

Characteristic	rTMS group (n = 19)	Control group (n = 18)	P value
Sex			
Male / Female, n	14/5	11/7	NS
Age			
Mean ± SD (range), years	53.9± 14 (26 ~ 78)	63.1±12 (34 ~ 78)	NS
Laterality of the lesion			
Right / Left / Both, n	8/9/2	9/8/1	NS
Type of stroke			
Cerebral infarction, n	7	8	NS
Intracerebral hemorrhage, n	6	9	NS
Subarachnoid hemorrhage, n	5	1	NS
GDS (0 ~ 30)			
Mean ± SD, score	12.4± 11	12.7± 9	NS
FAC (0 ~ 5)			
Mean ± SD, score	1.4± 1.3	1.7± 1.5	NS

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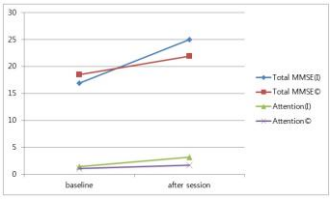
Baseline characteristics



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Changes in total MMSE and subscore – Attention scores after treatment

Characteristic	rTMS group - pre (*n* = 19)	Control group - pre (n = 18)	P value	rTMS group - post (*n* = 19)	Control group - post (n = 18)	P value
Total	16.9±6.8	18.5±7.0	0.19	25.0±3.9	21.9±5.5	0.037*
Orientation	5.7±2.4	6.7±3.1	0.19	9.1±1.1	7.9±2.4	0.08
Registration	2.5±1.1	2.8±0.7	0.19	2.8±0.7	2.9±0.2	0.51
Attention	1.4±1.2	1.1±1.2	0.15	3.1±1.6	1.7±1.5	0.005*
Recall	1.4±1.2	1.6±1.2	0.25	1.9±1.2	2.0±1.0	0.48
Language	5.7±2.4	6.1±2.0	0.44	7.4±1.1	6.9±1.5	0.12
Spatial perception	0.3±0.4	0.4±0.5	0.45	0.6±0.5	0.5±0.5	0.44

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Changes in MMSE and subscores after treatment

신경근육재활 및 전기진단
게시일시 및 장소 : **2017 년 4 월 21 일 13:00-18:30, 3 층 로비 / 질의응답 일시 및 장소 : 2017 년 4 월 21 일 15:00-15:40, 3 층 로비**
초록순서 : **58** 형식 : **Poster**

Compound muscle action potential of EDB can be helpful in diagnosis of L5 lumbosacral radiculopathy

Young-Bin Oh[1*], Gi-Wook Kim[1], Yu Hui Won[1], Sung-Hee Park[1], Myoung-Hwan Ko[1], Jeong-Hwan Seo[1†]

Chonbuk National University Hospital, Department of Physical Medicine and Rehabilitation[1]

Background and purpose: Lumbosacral radiculopathy is one of the most common problems seen in EMG consultation. L5 radiculopathy is the most common radiculopathy and shows mainly lower back pain radiating down to the lateral aspect of leg and weakness. It is well known that the needle EMG examination is more sensitive and provides better localizing information than NCS. It has been demonstrated that extensor digitorum brevis (EDB) F-wave parameters was found to be abnormal in 29.2% in the diagnosis of L5 radiculopathy and no significant relation was observed between the needle EMG and F-wave abnormalities. The aim of this study is to investigate the diagnostic efficacy of CMAP (compound muscle action potential) parameters of EDB in L5 radiculopathy.
Methods: 157 patients being diagnosed of lumbar radiculopathy by EMG studies were divided into two groups such as L5 radiculopathy group and mild lumbar radiculopathy group. L5 radiculopathy group, diagnosed with abnormal spontaneous activities (ASA) in paralumbar and appropriated distal muscles, was composed of 63 patients. Mild radiculopathy group, diagnosed with ASA in only paralumbar muscles, was composed of 94 patients. The exclusion criteria were: 1) sub-acute phase patient: less than 3weeks after onset; 2) direct muscle injury history of EDB; 3) deep peroneal nerve injury; 4) peripheral neuropathy; 5) Myopathy. We analyzed electrodiagnostic parameters such as latency, amplitude and conduction velocity of peroneal nerve at EDB recordings and maximal volitional activity of EDB muscle, and compared the two groups.
Results: : In our study, unilateral L5 radiculopathy was more common than bilateral (75.8% vs 24.2%), and bilateral mild radiculopathy was more common than unilateral (63.9% vs 36.1%). In L5 radiculopathy group, amplitude and conduction velocity at EDB recordings were significantly lower than mild radiculopathy group (P=0.0056, and 0.0015), but not motor latency (P=0.6164). And, maximal volitional activity of EDB in needle EMG was significantly lower in L5 radiculopathy than mild radiculopathy group (P=0.0003). CMAP amplitude of EDB muscle showed high specificity (87.07%), PPV (65.91%), NPV (74.82%), and accuracy (72.63%) in L5 radiculopathy group. Also, odds ratio (OR) was 5.74 and relative ratio (RR) was 2.62 in L5 radiculopathy group.
Conclusion: The EMG examination for lumbosacral radiculopathy is objective and highly reliable evaluation tool, and accurate diagnosis of L5 radiculopathy is important for optimal rehabilitation and treatment planning. Our results suggest that CMAP amplitude of EDB muscle in peroneal motor nerve conduction study for lumbosacral radiculopathy can be helpful in the diagnosis of L5 lumbar radiculopathy. So that, needle EMG of lower limb can be reduced in some patients. Further studies are also required for more accurate and easier diagnosis.

뇌신경재활
게시일시 및 장소 : **2017 년 4 월 21 일 13:00-18:30, 3 층 로비 / 질의응답 일시 및 장소 : 2017 년 4 월 21 일 18:00-18:30, 3 층 로비**
초록순서 : **C13** 형식 : **Poster**

The effect of solution volume on detection rate of salivagram in Patients with Brain-Lesion

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Objective: To evaluate the factors associated with the detection rate of radionuclide salivagram.
Subject and Methods: We retrospectively reviewed the medical records of 77 patients with brain lesion who had both positive findings on videofluoroscopic swallowing study and underwent radionuclide salivagram. We reviewed clinical data such as sex, age, Mini Mental State Examination(MMSE), Global Deterioration Scale(GDS), Modified Barthel Index(MBI), Penetration-Aspiration Scale(PAS), history of aspiration pneumonia, swallowed radionuclide volume in salivagram. Then we divided the subjects into two groups according to solution volume of radionuclide to investigate the effect of solution volume on detection rate of salivagram.
Results: Group A consists of 30 patients with low solution volume(0.1cc), Group B consist of 47 patients with high solution volume(0.5cc). Radioactivity was same between both groups(Tc99 DTPA, 3mCi). Detection rate of salivary aspiration in Group A was 3.3%(1/30) and Group B was 19.1%(9/47) respectively.
There was no significant difference between two groups in such as sex, age, MMSE, GDS, MBI, PAS and history of aspiration pneumonia. However there was statistically significant difference in detection rate of salivary aspiration between group A and group B.
Conclusion : Detection rate of salivary aspiration with radionuclide salivagram may be increased by depending on swallowed radionuclide volume in patients with brain-lesion. Further study with various solution volume is warranted to set optimal solution volume of radionuclide salivagram.

통증 및 근골격재활
게시일시 및 장소 : **2017 년 4 월 21 일 13:00-18:30, 3 층 로비 / 질의응답 일시 및 장소 : 2017 년 4 월 21 일 15:00-15:40, 3 층 로비**
초록순서 : **103** 형식 : **Poster**

Training effect of abdominal muscles using an assisted sit-up exercise device

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Korea University Anam Hospital, Department of Rehabilitation Medicine[1]

Background.
Decreased lumbar stability and core muscle strength has been suggested as a possible cause of nonspecific low back pain (NSLBP). Core stability exercises (CSE), therefore, have become popular in LBP rehabilitation.

Objective.
Hubex is a new training device which modified traditional sit-up exercise. The device can set up the exercise load, which can be adjusted on individual basis. Moreover, it provides assistance when starting back flexion which can reduce risk of low back injury and fatigue. The purpose of this study is to evaluate the training effect of the new training device on activating anterolateral abdominal muscles and improving LBP, compared to the general CSE.

Methods.
Fourty subjects with NSLBP of at least 3-month duration were enrolled to the study. Participants were assigned to 4 week-treatment program (3 times/week, 30 min/day), either a general CSE (posterior pelvic tilting, quadruped and hook lying stabilization) or a CSE using Hubex. Ultrasound measurement of the four transabdominal muscles' (IO, EO, TrA and RA) thickness was obtained just before and after the intervention. Pain and disability were analyzed as secondary outcome by using visual analogue scale (VAS), Oswestry disability index (ODI) and Roland-Morris disability questionnaire (RM). Measures were taken at baseline and just after the intervention.

Results.
After the intervention on participants, a significant increase in the thickness of RA and EO muscles ($p<0.05$) was noted in the Hubex group, but not in the general CSE group. The thickness of IO and TrA muscles showed no significant differences in both group. The pain and disability reduced in both group. In the Hubex group, the VAS fell from 3.00±2.33 to 1.67±2.29 scores, the ODI from 11.00±15.65 to 7.78±13.15 points, and the RM from 2.00±3.58 to 1.00±2.67 points. In the general CSE group, the VAS fell from 2.17±1.24 to 1.39±1.75 scores and the ODI from 3.89±7.94 to 2.44±6.29 points. The RMDQ showed no significant difference in this group.

Conclusions.
The present results suggested that both the general CSE and the exercise using new training device can significantly decrease pain and physical disability in patients with NSLBP. However, only the exercise program using the new training device effectively improved core muscle thickness. As muscular control to maintain the functional stability needs core strengthening, and as hypertrophy is one of characteristics of muscle strength, the results provide the evidence of usefulness of the new training device.

뇌신경재활
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초록순서 : **38** 형식 : **Poster**

Effectiveness of Virtual reality-combined with real instrument (Joystim) in stroke rehabilitation

Young-Bin Oh[1*], Ki-wook Kim[1], Yu Hui Won[1], Sung-Hee Park[1], Jeong-Hwan Seo[1], Myoung-Hwan Ko[1†]

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Purpose: Recenlty, many studies reported that virtual reality (VR), defined as computer hardware and software system which generates simulations of imagined environments can improve upper extremity function in patient after stroke. However, previous VR training had some limitations because patients underwent comprehensive rehabilitation by using visual information and interaction, not using real instruments. In our study, we developed VR-combined real instrument to interact real movements and environments. The aim of this study is to investigate VR-combined with real instrument training (Joystim) can be efficient translation intervention for improvement of functional ability in upper extremity after stroke.
 Methods: Twenty-five patients being diagnosed of stroke randomly divided two groups of subjects group by Joystim and traditional occupational therapy for upper extremity (control group). Each group underwent assessment of motor strength by manual muscle test (MMT) and hand grip power test, functional impairment scale of upper extremity by Fugl-meyer upper motor score (FMA), coordination by box and block test and 9-hole peg test, and spasticity by modified ashworth scale (MAS). The criteria for patients are included if they met all criteria below: 1) chronic stroke patient with unilateral disability >6 months after onset of stroke (first episode); 2) base FMA score > 18, Exclusion criteria were listed as follows: 1) recurrent or bilateral stroke; 2) base K-MMSE < 19, 3) history of other neurological disease and psychiatric disorder.
 Results: In grip power test (Kg), lateral pinch and tip pinch power showed significant increases in Joystim training group (3.81→5.25, P=0.027 and 1.86→3.57, P=0.024, respectively). Box and block test (N) was significantly increased in Joystim training group (22.00→26.90, P=0.025), moreover, 9-hole peg test (sec) was significantly attenuated (69.33→57.00, P=0.043). On the other hand, FMA score, especially sholder/elbow/forearm, and grip power (Kg) were significantly increased in both Joystim training and traditional occupational therapy groups (23.46→24.15, P=0.038 and 23.08→23.58, P=0.034, and 19.75→25.75, P=0.028 and 22.00→28.00, P=0.002, respectively).
Conclusion: VR-based training to improve functional ability of upper extremities after stroke provides the opportunity to encourage in motivating training with a variety of challenging tasks and purposeful, task-oriented exercises are regarded as most beneficial for upper extremities motor function. Our results suggested that VR-combined with real instrument training (Joystim) training has beneficial effect for recovery of functional ability in upper extremities and can be innovational translation intervention in comprehensive rehabilitation after stroke.

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Fig.1 Vitual reality-combined with real instrument (Joystim)

소아재활
게시일시 및 장소 : **2017 년 4 월 21 일 13:00-18:30, 3 층 로비 / 질의응답 일시 및 장소 : 2017 년 4 월 21 일 18:00-18:30, 3 층 로비**
초록순서 : **C25** 형식 : **Poster**

Molecular diagnostic testing for Neuromuscular disease; The next generation sequencing panel

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Next-generation sequencing (NGS), such as whole-genome sequencing, whole-exome sequencing, and targeted panel sequencing, has been applied to the diagnosis of many genetic diseases. Clinical exome sequencing (CES), which sequences the protein-cording region of the genome of known Mendelian genetic disease, is more cost effective and time saving than whole-genome sequencing. More recently, multigene disease-specific panels have been emerging as a molecular diagnostic tool. For example, Melanie et al., compared NGS panel covering 24 congenital disorders of glycosylation (CDG) and whole exome sequencing. They emphasized on that NGS panel testing is the best approach for syndrome in which the clinical suspicion is difficult and disorders implicating a lot of genes. Congenital muscular dystrophy and X-linked intellectual disability panels were also verified to improve the diagnostic yield. Therefore, we made a NGS panel targeting 293 genes – 5609 exons – associated with genetic neuromuscular disease by hybridization capture method. Custom oligo design and synthesis were done by Celemics (Korea). Massively parallel sequencing was performed using 2 x 150 bp in the paired end mode of MiSeq platform (Illumina, San Diego, CA). Sequence reads were aligned with the Burrow-Wheeler Aligner (version 0.7.12, MEM algorithm, MEM algorithm). After duplicated reads were removed with Picard, local realignment and recalibration were performed with the Genome Analysis Tool Kit (GATK, version 3.5). Here we report a case, which was diagnosed by NGS panel.
 A 16-months child was visited our physical medicine and rehabilitation clinic for evaluation for developmental delay especially in gross motor. He was born at 39 weeks of gestational age and immediately took care of neonatal intensive care unit, because of tachypnea. Developmental milestone was achieved, until he was 8 month of age. Thoracic lordosis developed at 10 month. He could sit without support, but crawling is only way of movement. GMFCS level III was checked, and GMFM total score was 30.24%. Creatine kinase, lactate dehydrogenase and creatine phosphokinase were increased. Clinically, neuromuscular disease was suspected. Gene sequencing and chromosome analyses, including chromosome microarray, did not show any abnormal findings. Electrodiagnostic studies also did not indicate any abnormality. The laboratory studies did not reveal any specific findings that could have suggested diseases presenting dysfunction of the central nervous system, such as Wilson's disease, autoimmune diseases, endocrine diseases, or metabolic diseases.
 NGS panel was identified substitution 249th arginine to trypophan at exon 4 in LMNA gene (table 1). This test is appropriate for a variety of exome sequencing indications, providing lower turnaround times, lower cost, and more comprehensive coverage of the target regions without the complexity of whole-exome analysis.

Gene	mutation	Mutation effect	Hetero/Homo	HGMD/OMIM	Inheritanc
LMNA	NM_005572.3;c745C>T (p.Arg249Trp)	Missense	Het	MDCL	AD

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Abbreviations: MDCL (Muscular dystrophy, congenital), AD (autosomal dominant)

뇌신경재활
게시일시 및 장소 : **2017 년 4 월 21 일 13:00-18:30, 3 층 로비 / 질의응답 일시 및 장소 : 2017 년 4 월 21 일 15:00-15:40, 3 층 로비**
초록순서 : **39** 형식 : **Poster**

Prediction of Aspiration Using Pharyngeal Width: Preliminary Report

Il Hwan Jung[1*], Ho Young Lee[1], Kwang-Ik Jung[1], Woo-Kyoung Yoo[1], Suk Hoon Ohn[1†]

Hallym University College of Medicine, Department of Physical Medicine and Rehabilitation[1]

Objective: The weak contraction of pharyngeal muscle is a risk factor of aspiration and influences on the size of laryngeal valley and the amount of vallecular residue. The pharyngeal width determined by the strength of pharyngeal contraction muscle might be an indicator of aspiration. The purpose of this research is to investigate the pharyngeal width as a new and easy index indicating aspiration.
Methods: Fifty patients suffering from dysphagia by stroke and Parkinson disease were recruited. All patients were divided by diagnosis (Stroke or Parkinson disease) and the duration of dysphagia (Acute: less than one month OR Chronic: more than one month). We measured the pharyngeal width on the lateral cervical spine x-ray and the patients were instructed not to move their jaw and swallow saliva. A video fluoroscopic swallowing study (VFSS) was performed and the Penetration-Aspiration scale (PAS) and The Dysphagia Outcome and Severity Scale (DOSS) were determined as objective parameters of dysphagia. The correlation between the individual pharyngeal width and the scores of PAS and DOSS was analyzed in the whole patients and in each four groups (two diagnoses * two durations) using the Wilcoxon signed rank test. All statistical analyzes were performed using IBM SPSS 22.0 for windows and statistical significance was defined as CI >95% and p value <0.05.
Results: Of the fifty patients, thirty-one patients had stroke (ten acute dysphagia and twenty-one chronic dysphagia) and nineteen patients had Parkinson disease (seven acute dysphagia and twelve chronic dysphagia). Statistical significance of pharyngeal width and PAS was confirmed in the acute stroke patients (p value =0.034).
Conclusion: We investigated the relationship between pharyngeal width and aspiration. The authors thought that the aspiration can be predicted using the pharyngeal width in the acute stroke patients. In the acute stage of stroke, the proper nutrition and the prevention of aspiration pneumonia are very important for the rehabilitation and neurologic recovery. For these goals, the use of pharyngeal width is thought to be easy indicator for the early decision of diet method. Currently, this study has limitation due to the small number of participants, therefore, the authors will continue this research to prove the pharyngeal width as a dysphagia indicator.

통증 및 근골격재활
게시일시 및 장소 : **2017 년 4 월 21 일 13:00-18:30, 3 층 로비 / 질의응답 일시 및 장소 : 2017 년 4 월 21 일 15:00-15:40, 3 층 로비**
초록순서 : **104** 형식 : **Poster**

3-Dimensional Quantification of enhancing portion in CE-MRI correlates with Adhesive Capsulitis

Jung-sang Lee[1*], Kyung Jae Yoon[1], Jong Geol Do[1], Chul-Hyun Park[1], Kunwoo Kim[1], Yong-Taek Lee[1†]

Kangbuk Samsung Medical Center, Department of Rehabilitation Medicine[1]

Introduction and Purposes:
There were several studies that the enhancing portion in contrast-enhanced magnetic resonance (CE-MRI) assessed at axillary recess or rotator interval would be helpful for diagnosing adhesive capsulitis. The aim of this study is investigate the relationship between 3-dimensional (3D) quantification of enhancing portion in CE-MRI and the glenohumeral joint (GHJ) volume or passive range of motion (ROM), which has been considered standard reference of diagnosis and clinical hallmarks of this condition.

Subjects and Methods:
In this study, CE-MRIs of 40 patients who were diagnosed with clinical adhesive capsulitis were included. A free open source imaging software (Fiji, http://imagej.net) was used to import Digital Imaging and Communication in Medicine (DICOM) images of oblique coronal and sagittal T1 fat saturated images with gadolinium enhancement. In Fiji environment, the amounts of enhancing portions of CE-MRIs were semi-automatically calculated and illustrated (Fig. 1). The GHJ volume was measured during sono-guided intra-articular injection. We analyzed the relationship between this value of 3D quantification in oblique coronal and sagittal views and GHJ volume or passive ROM of shoulder.

Results
The value of 3D quantification of enhancing portion in oblique coronal view was well correlated with oblique sagittal view (rho = 0.724, P < 0.001) (Fig. 2). In both oblique coronal and sagittal views, the values were inversely correlated with GHJ volume (rho = -0.572, P < 0.001; rho = -0.504, P < 0.001, respectively). In terms of passive ROM of shoulder, the values of 3D quantification of enhancing portion in oblique coronal and sagittal views were also negatively correlated with forward elevation (rho = -0.409, P = 0.009; rho = -0.407, P = 0.009, respectively) and abduction (rho = -0.390, P = 0.012; rho = -0.518, P = 0.002, respectively) (Fig. 3).

Conclusions:
3D quantification of enhancing portion in CE-MRI appears to be helpful to diagnose adhesive capsulitis by demonstrating decreased GHJ volume and limited ROM of shoulder.

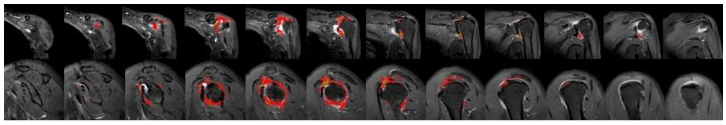

Fig. 1. Semi-automated 3D quantification images of enhancing portion at oblique coronal (first row) and oblique sagittal (second row) view of shoulder CE-MRI using an image processing software (Fiji, http://imagej.net)

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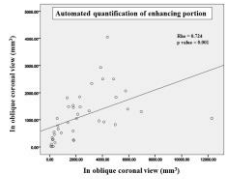

Fig. 2. Automatically 3-D quantified values of enhancing portion were positively correlated in both oblique coronal and oblique sagittal view

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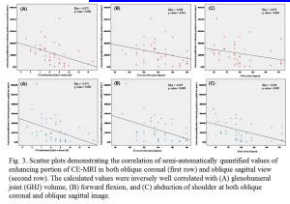

Fig. 3. Scatter plots demonstrating the correlation of semi-automatically quantified values of enhancing portion of CE-MRI in both oblique coronal (first row) and oblique sagittal view (second row). The calculated values were inversely well correlated with (A) glenohumeral joint (GHJ) volume, (B) forward flexion, and (C) abduction of shoulder at both oblique coronal and oblique sagittal image.

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척수재활
게시일시 및 장소 : **2017 년 4 월 21 일 13:00-18:30, 3 층 로비 / 질의응답 일시 및 장소 : 2017 년 4 월 21 일 18:00-18:30, 3 층 로비**
초록순서 : **C42** 형식 : **Poster**

Bilateral Foot Drop caused by T12 infectious Spondylitis after Vertebroplasty

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Pusan National University Hospital, Department of Rehabilitation Medicine[1], Pusan National University Hospital, Department of Neurosurgery[2]

Introduction
The most common cause of the foot drop is lumbar degenerative disc herniation, particularly at L4/5. Foot drop resulting from thoracolumbar lesions is rare, and T12 lesion is quite rare cause associated with foot drop. Infectious spondylitis after vertebroplasty also has been reported in rare instances, and severe neurological deficit is not common in the spondylitis-induced spine fractures, reported to be 3%. We report a very rare case of bilateral foot drop caused by T12 vertebral compression fracture accompanied with infectious spondylitis after vertebroplasty and suggest a possible mechanism.
Case Report
 A 69-year old man presented sudden onset severe bilateral leg pain and bilateral foot drop. He underwent vertebroplasty for T12 compression fracture 6 months before (Fig. 1). On admission, he had no signs to suspect infection such as fever, malaise or weight loss. Computed tomography and magnetic resonance imaging revealed infectious spondylitis with abscess formation and bony destruction at the T12 vertebral body, resulting in severe compression to conus medullaris (Fig. 2). Bilateral ankle clonus was found on physical examination, and spinal cord lesion was suspected based on neurogenic bladder and neurogenic bowel symptom. However, considering that the muscle strength of bilateral lower extremities was overall fair grade, while only ankle dorsiflexor and great toe extensor were particularly weak as trace grade. Also, because bilateral plantar flexors, the S1 key muscles were fair grade, which was more favorable than this, it was difficult to determine those as the symptoms caused by spinal cord injury. Bilateral L5 root lesion as well as conus medullaris lesion were found on electromyography (EMG).
 Surgical procedure was done for decompression and reconstruction in reference of T12, at which a fracture occurred. After operation the muscle strength of lower extremities recovered to good grade, and foot drop also improved immediately after surgery, T12 fracture-induced bilateral L5 root lesion was verified. The radiating pain was much improved Visual analogue scale : 3 points. On day 53, the patient was discharged with motor good grade in both lower extremities, without bladder and bowel symptoms..
Conclusion
 Based on the axial cross section of T12-L1, spinal cord is surrounded by L5 root at L1, and among these, L5 ventral root is medially and L1 ventral root is laterally located (Fig.3)1. Through this, it was verified how the compression fracture at T12 level caused L5 root lesion. The current case is very rare report to our knowledge of bilateral foot drop associated T12 infectious spondylitis after vertebroplasty. It is essential to keep it mind that fracture can occur at the site of vertebroplasty, and to understand about T12-L1 lesion anatomy in addition to performing EMG in case of the manifestation of atypical neurological deficit such as this case, bilateral L5 root lesion due to T12 compression fracture.

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Fig. 1. Plain radiograph reveals a compression fracture at T12 , at the level of previous vertebroplasty.

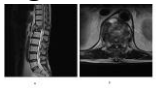

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Fig. 2.T2-weighted sagittal (A) and axial (B) magnetic resonance imaging (MRI) reveal compression fracture in T12 with spinal cord compression. L5-S1 disc is relatively reserved on the patient's MRI.

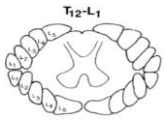

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Fig. 3. Axial cross section of T12-L1 showed spinal cord is surrounded by L5 root at L1, and among these, L5 ventral root is medially and L1 ventral root is laterally located. This explains how the compression on the T12 level compresses both of the L5 roots and leads to bilateral foot-drop.

16p11.2 Microduplication Syndrome with Developmental Delay in a multicultural family : A Case study

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Introduction
Chromosome 16p11.2 duplications syndrome have extra genetic material consisting of DNA including 32 known genes, in which 3 of Developmental Disorders Genotype-Phenotype Database(DDG2P) genes were related. The phenotype is associated with several neurodevelopmental impairments including developmental delay and intellectual disability, psychiatric disorders as well as some medical conditions. We present the first report of 16p11.2 duplication syndrome in Korea with global developmental delay.
Case report
A 3-years-old girl visited our rehabilitation clinic to make more accurate diagnosis for development delay. She was born at full terms by caesarean section with a birth weight of 3.4kg. She was born in a multicultural family, whose mother was Vietnamese and father was Korean. Her mother's age was 27 years old, while her father was 54. She presented with delayed motor milestones with turning from supine to prone position at 6 months and pulling up standing at 25months. She started to walk independently at 30 months, but had persistent gait instability with tibia internal rotation and hip and knee flexion posture. She had epilepsy since the second year of life characterized by generalized tonic–clonic seizures with fever, and she started medication since her age of 42 months.
In Bayley Scales of Infant Development at 27 months, it was assessed that she had 11 months of gross motor, 10 months of fine motor, 12 months of cognitive functions and 6 months of receptive communication expressive communication. Total score of Gross Motor Function Measure at 32 months was 56.84%. In speech evaluation at 26 months, receptive and expressive language was rated at 2 months.In addition to language disability, she showed prominent intellectual disability; her IQ and SQ results were 23.
Brain magnetic resonance imaging revealed enlarged both lateral ventricles. Diffusion tensor tractography demonstrated that corticospinal and cortico-ponto-cerebeallar tracts were reduced in bilateral hemisphere, especially left side. Reduced bilateral uncinate fasciculus, inferior longitudinal fasciculus and cingulum were also observed (figure 1). There was no abnormality in standard high resolution chromosome analysis, but microduplication sized 523kb was detected by array CGH study(figure 2).
Conclusion
Among 3 genes in DDG2P, KIF22 gene which commonly affects Koreans and PRRT2 gene are related with our patient symptoms, muscular hypotonia and seizure. This is the first case of 16p11.2 duplication reported in Korea. It is significant to evaluate the CGH microarray in children with delayed development in multicultural families.

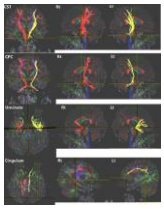

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Fig 1 Diffusion tensor tractography of the patient. Corticospinal and cortico-ponto-cerebeallar tracts were reduced in bilateral hemisphere, especially left side. Reduced bilateral uncinate fasciculus, inferior longitudinal fasciculus and cingulum.

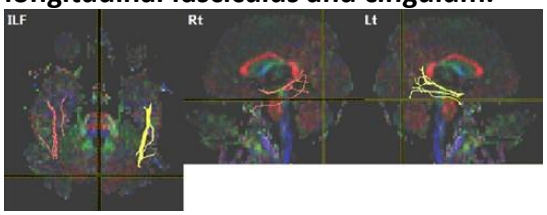

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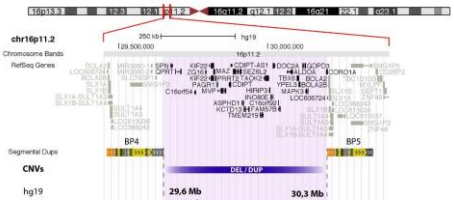
Fig 1 Diffusion tensor tractography of the patient. Corticospinal and cortico-ponto-cerebeallar tracts were reduced in bilateral hemisphere, especially left side. Reduced bilateral uncinate fasciculus, inferior longitudinal fasciculus and cingulum.



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The Microduplication sized 523kb was detected by array CGH study and it included 32 known genes, in which 3 of Developmental Disorders Genotype-Phenotype Database(DDG2P) genes were related.

뇌신경재활
게시일시 및 장소 : **2017 년 4 월 21 일 13:00-18:30, 3 층 로비 / 질의응답 일시 및 장소 : 2017 년 4 월 21 일 18:00-18:30, 3 층 로비**
초록순서 : **C14** 형식 : **Poster**

Management of Transient Postictal Urinary Retention

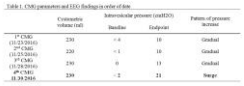
Tae Wan Kim[1*], Ho Eun Park[1], Da Hwi Jung[1], Je-Sang Lee[1], Sang Hun Kim[1], Yong Beom Shin[1†]

Pusan National University Hospital, Department of Rehabilitation Medicine[1]

Introduction
Voiding is controlled by supraspinal center including pontine micturition center which decides when to empty bladder. Acute loss of the role of pontine micturition center by all reasons can cause bladder dysfunction. We report a patient who suffered from transient urinary retention caused by interruption of supraspinal center associated with frontal lobe epilepsy especially the patient who has cognitive dysfunction so could not communicate.

Case report
A 10-year-old girl diagnosed as dystonic cerebral palsy was admitted for abdominal distension. She had a history of seizure, particularly Lennox-Gastaut syndrome without intractable epilepsy. She had stopped anti epilepsy medication because there had been no more seizure event since 2015. On April, 2016, the seizure recurred so she admitted to other medical center to evaluate causes of seizures. On electroencephalogram, findings showed that there were frequent medium amplitude spike-wave complexes or polyspike-wave complexes over both frontal area at F3 and F4, synchronously or independently. She diagnosed as urinary tract infection (UTI) which was caused by urinary retention, also. She recovered from UTI but urinary retention of 750ml was found after removal of Foley catheter. After 1 week, she was referred to our rehabilitation clinic for the evaluation and management of voiding difficulty. We focused on the fact that the epileptiform discharge was shown at the frontal area of brain which can regulate micturition with supraspinal control. We performed four times of manual CMG until her bladder function got recovered (Table 1.). The 4th f/u CMG was performed which showed surge to 21cmH2O with bladder filled 230ml. After this study, we removed Foley catheter from and self-voided volume of 120ml with 18ml of post voided residue volume was notified.

Discussion
The presented patient developed urinary retention after event of seizure. The transient urinary retention as a phenomenon of postictal neurologic deficits was suggestive of the consequence of epileptiform discharge of the region adjacent to frontal micturition center. There was no guideline for evaluating and guessing when the transient dysfunction of frontal micturition center would be recovered and which point is appropriate for the removal of the Foley catheter. So we followed up 4 times of CMGs at the bedside, until the cystometric pressure at the point of maximal volume showed sudden increase like surge. We suggest the effectiveness of CMG to find out the recovery of bladder function enough to remove Foley catheter.
This study revealed if sudden increase of intravesicular pressure known as surge was observed, Foley catheter could be removed from the patient, and the patient could void well with tolerable post voided residue volume.



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CMG parameters and EEG findings in order of date

재활보조기구
게시일시 및 장소 : **2017 년 4 월 21 일 13:00-18:30, 3 층 로비 / 질의응답 일시 및 장소 : 2017 년 4 월 21 일 15:00-15:40, 3 층 로비**
초록순서 : **71** 형식 : **Poster**

Gait analysis using smart insole after degenerative scoliosis surgery

Ji Won Hong[1*], Ra Yu Yun[1], Hye Rin Kim[1], Byeong Ju Lee[1], Myung Hun Jang[1], Min-seok Seo[3], Kyoung Hyup Nam[2,4], Myung-Jun Shin[1,4†]

Pusan National University Hospital, Department of Rehabilitation Medicine[1], Pusan National University Hospital, Department of Neurosurgery[2], Pusan National University School of Medicine, Medicine part[3], Pusan National University Hospital, Biomedical Researchi Institute[4]

Objective
To report the successful gait analysis with a wearable smart insole for accurate diagnosis and validation of medical interventions

Summary of Background Data
Gait analysis is important for accurate diagnosis and validation of medical interventions for several diseases. However, as the gait test done by examiner can yield limited information and has low reliability, more advanced methods using image processing, floor sensors and sensors placed on the body have been introduced. Of these, the last one is most promising as it has less restrictive experimental environment, thus it can reflects patient's real condition.

Method
The patient took 3-Minute Walk Test 3 times (the day before surgery, 8-days after surgery, 16-days after surgery) with a smart insole in her shoes (Fig. 1). The insole has 8-pressure sensors, 3-axis accelerometer and gyroscope. The measured values of each sensor were stored in a storage server. With these collected data, we performed noise filtering and swing / stance phase dividing. Then the gait parameters were calculated, and the analysis comparing the gait characteristics of pre- and post-surgery was performed.

Results
By this gait analysis, we could evaluate quantitatively and objectively how much the patient's gait were improved. After surgery, the patient had increased stride-length and speed while cadence was reduced. Gait cycle duration was longer than that of pre-surgery and its fluctuation decreased a lot (Fig. 2). In pre-operation, the swing duration of right side had been shorter than that of the left side continuously and the gap had increased as the number of steps had increased. However, after the operation, left and right swing durations were almost identical, and the deterioration did not occur (Fig. 3). In addition, the symmetry of the X-, Z-axis acceleration and Y-axis angular-velocity was improved (Table 1.). From these, we can assure that the support force of left leg is strengthened after surgery.

Conclusion
These kinds of gait analysis can be helpful to observe the progress of disease more objectively and to evaluate the effect of medical interventions by collecting and analyzing data serially. As kinetic as well as spatial-temporal analysis of each foot are possible, these kinds of gait analysis can be used to define and distinguish the gait patterns characteristic of certain diseases, which may be helpful in determining appropriate medical interventions.

Table 1. Average difference distance of Acceleration and Angular-Velocity of each axis
 Average orthogonal difference
 of Acceleration (z-score) Average orthogonal difference
 of Angular-Velocity (z-score)
 X-axis Y-axis Z-axis X-axis Y-axis Z-axis
Pre-operation 0.25 0.26 0.20 0.29 0.16 0.32
Post-operation 0.18 0.28 0.17 0.30 0.12 0.31
p-value* < 2.2e-16 0.03 2.26E-08 0.45 1.16E-12 0.67
* H1: Average orthogonal difference of Post-operation is different from that of Pre-operation

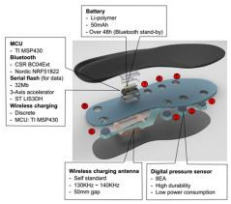

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Figure 1: Design of the insole sensor module

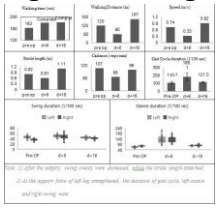

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Figure 2: Spatial-temporal gait parameters

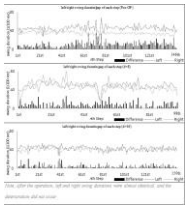

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Figure 3: Left/right swing duration gap of each step

척수재활

게시일시 및 장소 : **2017 년 4 월 21 일 13:00-18:30, 3 층 로비 / 질의응답 일시 및 장소 : 2017 년 4 월 21 일 15:00-15:40, 3 층 로비**

초록순서 : **83** 형식 : **Poster**

Continuous cardiovascular monitoring during video urodynamic studies in patients with cord injury

Tae Wan Kim[1*], Eun Gyeom Cha[1], Ra Yu Yun[1], Jae Hyeok Chang[1], Myung Hun Jang[1], Jin A Yoon[1†]

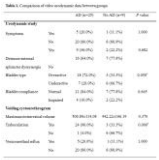
Pusan National University Hospital, Department of Rehabilitation Medicine[1]

Objective: To observe continuous cardiovascular response during video urodynamic studies and to identify correlations between events of autonomic dysreflexia (AD) and findings of video urodynamic study in patients with spinal cord injury (SCI) above T6.

Methods and methods: Thirty-four patients (24 males, 10 females; average age 53.38 ± 11.72 years) with SCI above T6 were enrolled, and parameters of continuous cardiovascular monitoring were recorded 'beat to beat' using Finometer ProTM (Finapres Medical Systems, Amsterdam, The Netherlands) during video urodynamic studies. Associations between cardiovascular responses and variables of video urodynamic study were analyzed (Figure 1).

Results: The incidence of overactive detrusor during urodynamic study and bladder trabeculation on voiding cystourethrogram were significantly higher in the AD group than in the group without AD ($p<0.05$) (Table 1). Changes of systolic blood pressure showed moderate negative correlation ($r = -0.402$, $p = 0.020$) with bladder compliance and high positive correlation ($r = 0.810$, $p = 0.000$) with maximum detrusor pressure. Patients with AD had a statistically significant increase in diastolic blood pressure and mean arterial pressure as well as systolic blood pressure ($p<0.05$) compared to patients without AD. However, there was no significant difference between clinical findings: neurological level of injury, completeness of injury, symptoms of AD, and voiding type. There was an initial rise in systolic blood pressure over 20 mmHg at 241 ± 126 ml (54 ± 25 % of the maximum vesical volume) in the overactive detrusors and 442 ± 123 ml (84 ± 10 % of the maximum vesical volume) in the underactive detrusors. Increase of systolic blood pressure after initial rise was persistent in both groups (Figure 2) Significant bradycardia or tachycardia correlated with AD during urodynamic studies was not observed.

Conclusion: We observed bladder type-specific cardiovascular responses by continuous cardiovascular monitoring during video urodynamic study in patients with SCI above T6. There was no correlation between presenting clinical symptoms related with AD and the rise in systolic blood pressure by continuous cardiovascular monitoring during urodynamic studies in this study. Incidence of overactive detrusor type, bladder trabeculation were significantly higher in the AD group. I recommend continuous monitoring of cardiovascular responses during urodynamic study to prevent unpredictable or not-detectable cardiovascular reactions in patients with SCI above T6.



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Comparison of video urodynamic data between groups

소아재활

게시일시 및 장소 : **2017 년 4 월 21 일 13:00-18:30, 3 층 로비 / 질의응답 일시 및 장소 : 2017 년 4 월 21 일 15:00-15:40, 3 층 로비**

초록순서 : **52** 형식 : **Poster**

Anthropometric Caliper Versus 3-Dimensional Scanner for Measuring Skull Deformation in Infants

Bomi Sul[1*], Joon-Sung Kim[1], Seong Hoon Lim[1], Hyehoon Choi[1], Bo Young Hong[1†]

The Catholic University of Korea St. Vincent[1]

Objective
Positional deformities of the calvarium such as plagiocephaly or brachycephaly are not uncommon in infants after release of “Back to Sleep” campaign by the American Academy of Pediatrics in 1992. Orthotic helmet therapy has grown in popularity in clinical practices, and head shape measurement is necessary for candidate selection. This study compared the accuracy and reliability of anthropometric caliper to computerized three-dimensional (3D) scanner in measuring the deformation.

Materials and Methods
One hundred infants between 2 to 19 months old with either brachycephaly or plagiocephaly at 10 different pediatric or pediatric rehabilitation centers were assessed between July and December in 2016. Measurements of anterior-posterior (AP), medial-lateral (ML), left lateral (LL), and right lateral (RL) lengths were made both using an anthropometric caliper and a 3D scanner. Cephalic index (CI) was calculated using the formula, CI = width (ML) ÷ length (AP) x 100, and cranial vault asymmetry (CVA), with CVA = l left lateral length (LL) – right lateral length (RL) l.

Results
The AP, ML, LL, and RL lengths measured with the caliper were 140.06 ± 8.72 mm, 129.08 ± 7.95 mm, 133.88 ± 10.66 mm, and 137.13 ± 9.59 mm, respectively. The corresponding measures with the 3D scanner were 142.27 ± 7.88 mm, 132.10 ± 7.29 mm, 131.16 ± 11.81 mm, and 134.10 ± 9.42 mm. The Spearman correlation shown in Figure 1 and 2 demonstrates a strong linear correlation between the results of the two methods (CI: r=0.813, p<0.001; CVA: r=0.836, p<0.001). The paired t test established significant difference between the CVA values from the two methods (p<0.001), however, no significant difference between the CI values (p=0.073). The chi-square test showed 94.2% of participants (n=81) whose CVA was equal to or larger than 10mm in 3D scan also had CVA equal to or larger than 10mm by caliper, and 92.9% of participants (n=13) whose CVA was less than 10mm in 3D scan also had CVA less than 10mm by caliper.

Conclusion
The anthropometric caliper was found to be equivalent to 3D computerized scan for measuring anterior-posterior, medial-lateral, left lateral, and right lateral lengths in infants with positional skull deformation such as plagiocephaly or brachycephaly. Given the convenience and potential for lower cost compared with 3D scan, this technique can be considered for screening and determining candidates for orthotic helmet therapy when the equipment is available.

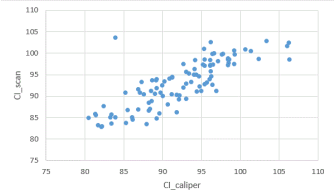

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Figure 1. Spearman correlation between anthropometric caliper versus 3D scanner in measuring CI.

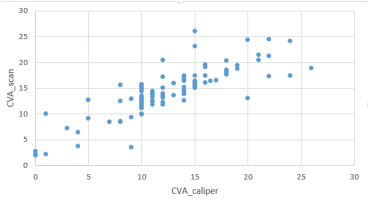

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Figure 2. Spearman correlation between antrhopometric caliper versus 3D scanner in measuring CVA.

뇌신경재활
게시일시 및 장소 : **2017 년 4 월 21 일 13:00-18:30, 3 층 로비 / 질의응답 일시 및 장소 : 2017 년 4 월 21 일 15:00-15:40, 3 층 로비**
초록순서 : **40** 형식 : **Poster**

Factors associated with improvement or decline in cognitive function after an ischemic stroke; KOSCO

Eun Gyeom Cha[1*], Jin A Yoon[1†], Deog Young Kim[2], Min Kyun Sohn[3], Jongmin Lee[4], Sam-Gyu Lee[5], Yang-Soo Lee[6], Eun Young Han[7], Min Cheol Joo[8], Gyung-Jae Oh[8], Junhee Han[9], Minsu Park[1], Kyung Pil Park[10], Kyung-Ha Noh[10], Won Hyuk Chang[11], Yong-Il Shin[1], Yun-Hee Kim[11]

Pusan National University Hospital, Department of Rehabilitation Medicine[1], Yonsei University Hospital, Department of Rehabilitation Medicine[2], Chungnam National University Hospital, Department of Rehabilitation Medicine[3], Konkuk University Medical Center, Department of Rehabilitation Medicine[4], Chonnam National University Hospital, Department of Rehabilitation Medicine[5], Kyungpook National University Hospital, Department of Rehabilitation Medicine[6], Jeju College of Medicine, Department of Rehabilitation Medicine[7], Wonkwang University School of Medicine & Hospital, Department of Rehabilitation Medicine[8], Research Institute of Convergence for Biomedical Science and Technology, Research And Statistical Support[9], Pusan National University Hospital, Department of Neurology[10], Samsung Medical Center, Department of Rehabilitation Medicine[11]

Background
We conducted a prospective cohort study to investigate prevalence of poststroke cognitive impairment at 3 and 12 months after stroke onset and identify clinical and demographic factors associated with improvement or decline in cognitive function between 3 months and 12 months.
Methods
We analyzed the cognitive assessments of total patients and patients older than 65 years separately. All patients with an ischemic stroke were divided into normal cognitive group (NCG) and impaired cognition group (ICG) by using a cutoff score on the Korean Mini-Mental State Examination (K-MMSE). Patients were additionally classified into 3 subgroups according to the changes in their K-MMSE scores between 3 and 12 months: Stable group with K-MMSE scores changes ranging from −2 to +2 points (−2 ≤ △MMSE ≤ +2); converter group with increase more than 3 points (3 ≤ △MMSE); and reverter group with decrease more than 3 points (−3 ≤ △MMSE). We also analyzed factors affecting cognitive change from 3 months to 12 months among the 3 groups including baseline medical record, stroke and treatment characteristics, and various functional assessments after 3 months (Figure 1).
Results
A total of 2,625 patients (older patients = 1,431) with first time ischemic stroke were included in this study. Among these patients, 1,735 (66.1%) (older patients = 835 (58.4%)) were classified as NCG, while 890 patients (33.9%) (older patients = 596 (41.6%)) were the ICG at 3 month K-MMSE assessment. Among NCG, 1,460 (82.4%) were stable group, 93 patients (5.4%) were converter group, and 212 patients (12.2%) were reverter group at 12 months onset. Among ICG, 472 patients (53.0%) were stable group, 321 patients (36.1%) were converter group, and 97 patients (10.9%) were reverter group (Figure 2,3).
Among NCG of total patients, hypertension, and cortical or multiple level involvement was dominant in reverter group, male sex, lower onset age, higher education level were dominant in stable group. In addition, functional assessments in stable group including NIHSS, mRS, FIM, K-MBI, FAC, GDS, and EQ-5D at 3 months were significantly better in scores compared to other groups. For the tendency of ICG of total patients, onset age, hypertension history was higher , education level was lower in reverter group. All functional assessments at 3 months showed better scores in converter groups and worse scores in reverter group (Table 1).
Conclusions
The prevalence of cognitive impairment showed difference between 3,12 months. To analyze the cognitive change from 3 month to 12 month, the proportion stable group was dominant in NCG and converter group was higher in ICG. By investigating the influencing factors from each group, we were able to identify the predictors including the age factor.

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Table 1. Factors affecting cognitive change from 3 months to 12 months in total patients

암재활

게시일시 및 장소 : **2017 년 4 월 21 일 13:00-18:30, 3 층 로비 / 질의응답 일시 및 장소 : 2017 년 4 월 21 일 18:00-18:30, 3 층 로비**

초록순서 : **C38** 형식 : **Poster**

Upper Extremity Lymphedema after Brachial Vessel Injection

Jung Hyun Yang[1*], Ji Won Hong[1], Da Hwi Jung[1], Jae Hyeok Chang[1], Sang Hun Kim[1], Jin A Yoon[1†]

Pusan National University Hospital, Department of Rehabilitation Medicine[1]

Introduction
Lymphedema is the result of accumulation of fluid and other elements (eg protein) in the tissue. This leads to chronic inflammation, infection, and hardening of the skin, and changes in body shape resulting in damage to the lymphatic system. The lymphedema is divided into primary lymphedema caused by congenital malformations of the lymphatic system and secondary lymphedema caused by damage of the lymphatic vessels and/or lymph nodes. In most cases, it is a secondary lymphedema. Surgery or radiotherapy for Cancer and infection from insect bites, serious wounds, burn and trauma can cause lymphedema. Here, we report an unusual case of secondary lymphedema on upper extremity after brachial vessel injection.
Case report
A 70-year old female patient visited to rehabilitation clinic due to the right forearm swelling. She had hypertension, diabetes, but no cancer, trauma or infection history. Five months ago, she had right brachial vessel injection at the local medical center. Since then, forearm swelling and heating sensation have deteriorated. On her first visit our clinic, the arm circumferences were as the follow: above elbow 26/26cm, below elbow 23.5/20cm. During the initial visit, normal neutrophil count, C-reactive protein tilter and D-dimer were confirmed on the blood test and the possibility of infection was very small. On ultrasonography, there is diffuse subcutaneous edema at the right forearm, distal to elbow joint and no deep vein thrombosis. Lymphoscintigraphy was performed, and the right axillary lymph node activity was not observed and obstruction of lymphatic vessels was identified. (Fig. 1) Because the patient did not have the major cause of lymphedema, accurate identification of the obstruction site of the lymphatic vessel was necessary. Therefore, we additionally performed indocyanine green (ICG) lymphography. ICG lymphography can clearly visualize superficial or deep lymph flows in real time without radiation exposure. ICG lymphography revealed focal hypoperfusion around cubital fossa and dermal backflow patterns consist of splash, stardust, and diffuse patterns at the right forearm area.(Fig. 2) After diagnosis, we continues to perform complex decongestive physiotherapy (CDPT) including manual lymph drainage and bandage apply.

Conclusion
This is a rare case of secondary lymphedema diagnosed after the injection. We considered that an acute inflammatory reaction may have induced the development of secondary lymphedema. Because careful investigation of the medical history by interview, we can find the reason of lymphedema and make a subsequent treatment plan with lymphedema of the limb.

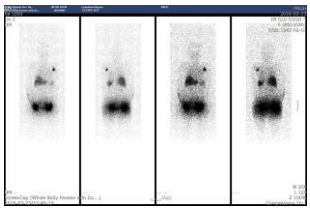

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Fig. 1. No lymphatic flow at the right axillary lymph node in Lymphoscintigraphy.

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Fig. 2. ICG inj. 1 일 후의 ICG lymphography

심폐재활

게시일시 및 장소 : **2017 년 4 월 21 일 13:00-18:30, 3 층 로비 / 질의응답 일시 및 장소 : 2017 년 4 월 21 일 18:00-18:30, 3 층 로비**

초록순서 : **C58** 형식 : **Poster + Video**

Cardiac Rehabilitation after Heart Transplantation on a Patient with Limb-Girdle Muscular Dystrophy

Ji Won Hong[1*], Ho Eun Park[1], Hye Rin Kim[1], Jae Hyeok Chang[1], Myung Jun Shin[1], Hye Won Lee[2], Seung Hwan Song[3], Byeong Ju Lee[1†]

Pusan National University Hospital, Department of Rehabilitation Medicine[1], Pusan National University Hospital, Department of Internal Medicine-Cardiology[2], Pusan National University Hospital, Department of Thoracic and Cardiovascular Surgery[3]

Introduction
Cardiac rehabilitation after heart transplantation (HT) is special and distinct from other cardiovascular diseases. Transplanted heart does not connect to autonomic nervous system. Therefore, rating of perceived exertion (RPE) was used to determine the exercise intensity instead of heart rate (HR). Median sternotomy is predominantly associated with cardiac surgery and the patients should be careful not to use their upper extremity excessively for several months. Here, we report a complicated cardiac rehabilitation program after HT on a patient with limb-girdle muscular dystrophy (LGMD).
Case report
A 39-year-old male was hospitalized at department of cardiology on December 2016 due to dyspnea. He had been Taekwondo player until high school student. When he was 21 year-old, he could not run or stair up because of muscle weakness and diagnosed as LGMD. Since 2005, he has walked with cane. He was diagnosed as dilated cardiomyopathy accompanied by LGMD on 2012. He was admitted due to aggravation of heart failure, eight times in last five years. Eventually, he had HT in February 1st, 2017.
On the first day after surgery (POD 1), we had consultation and started rehabilitation. He was alert and could obey 3-step verbal command. Muscle strength was as follow; 4 grade on upper extremities, 2 grade on hip flexor, extensor and abductor, 2+ grade on knee flexor and extensor, 3 grade on ankle dorsiflexor and plantarflexor. He had breathing therapy including mechanical insufflator-exsufflator, incentive spirometer and splinted coughing for 2 weeks in intensive care unit. On POD 14, he was transferred to general ward and in protective isolation. His muscle power of lower extremities was too weak to perform isokinetic strengthening exercise. And he could not stand or walk with arm support because he had midline sternotomy. So we used portable half-automated ergometer named “MOTOMED” and portable hand-held ergometer named “Burn machine” for aerobic exercise (Fig. 1.). The resting HR was 102 beat per minute (BPM) and did not change during exercise. We used RPE that he felt between 11(fairly light) to 13(somewhat hard). Exercise duration was 10 minutes. On POD 21, he could exercise in isolated rehabilitation room with protecting gown, glove and mask. He stood on tilt table and used burn machine together (Fig. 2.). HR response was still blunted and exercise duration was increased to 25 minutes. Eventually, on POD 28, he could stand and walk with walker. Though muscle power of knee extensor was still 2+ grade, he stood with hyperextended knee as he has done so far (Fig. 3 .).
Conclusion
Cardiac rehabilitation program after heart surgery is consist of aerobic exercise using lower extremity. Also early rehabilitation is safe and essential to reduce chronic complications. In this patient, aerobic exercise without using upper extremities in a single room was challenging. We suggest that this rehabilitation program for special populations.

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Fig. 1. Exercise in a single room with portable ergometers

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Fig. 2. Exercise in an isolated rehabilitation room with tilt table with arm ergometer

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Fig. 3. Walker gait on 28th day after surgery

노인재활

게시일시 및 장소 : **2017 년 4 월 21 일 13:00-18:30, 3 층 로비 / 질의응답 일시 및 장소 : 2017 년 4 월 21 일 15:00-15:40, 3 층 로비**

초록순서 : **5** 형식 : **Poster**

Cross-sectional study of physical functions in community-dwelling older adults

Jung Hyun Yang[1*], Ra Yu Yun[1], Da Hwi Jung[1], Byeong Ju Lee[1], Myung Hun Jang[1], Da Som Chae[1], Eun Lee Lee[1], Myung Jun Shin[1†]

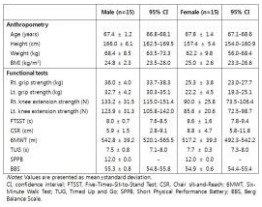
Pusan National University Hospital, Department of Rehabilitation Medicine[1]

Objective: As an aging society, maintaining the functional capacity of the body is important for QOL. Maintaining physical function also helps prevent falls and osteoporosis, sarcopenia that can lead to serious damage such as cerebral hemorrhage or fracture. Although there are many functional assessments of the elderly, there were few studies of reference values for the elderly in Korea. The aim of this study was to determine the reference values in healthy Korean aged 65~69.

Methods: A cross-sectional study was conducted on healthy elderly people aged 65 to 69 years (male, 67.4±1.2, female 67.8±1.4) without musculoskeletal or neurological diseases. A total of 30 volunteers were recruited (15 males and 15 females). Grip strength (kg), knee extension strength (N), Five-Times-Sit-to-Stand Test (FTSST), Chair Sit-and-Reach (CSR) test, Six-Minute Walk Test (6MWT), Timed Up and Go (TUG) test, Short Physical Performance Battery (SPPB), Berg Balance Scale (BBS) were performed for functional assessment.

Results: Normative data for age, anthropometry and the various functional tests are presented in all participants (Table 1). The dominant hand of all participants was the right hand. Mean body height, body weight and BMI were 166.0±6.1cm, 68.4±8.5kg, 24.8±2.3 in the men and 157.4±5.4cm, 62.2±9.8kg, 25.0±2.6 in the women. In the maximal handgrip and knee extensor mean strength in men were 36.0±4.0kg, 133.2±31.5N in the right and 32.7±4.2kg, 123.9±31.3N in the left. In the maximal handgrip and knee extensor mean strength in women were 25.3±3.8kg, 90.0±25.8N in the right and 22.2±4.5kg, 85.6±20.6N in the left. The measured grip strength was confirmed to be within 1SD of the mean of both sexes. The FTSST (male, 8.0±0.7, female, 8.6±1.6) and the TUG (male, 7.5±0.8, female, 7.7±0.3) tests were better than the average of the same age group. The CSR (male, 5.9±1.5, female, 8.8±4.7), a test of flexibility, was recorded within the mean values. The walking distance at 6MWT (male, 542.8±39.2, female, 517.2±39.3) recorded 84.7±27.8% and 93.4±53.6% of the predicted age, respectively. The SPPB scored 12 in total 12 points in both sexes. The BBS scores were 55.3±0.8 and 54.9±0.6 for men and women, respectively. The scores of all functional assessments show within normal or better results when compared to the normal values of previous studies that conducted in other countries (Table 2).

Conclusions: Reference values of the functional assessments identified in this study may serve as the basis for other studies and may be used clinical practice. It is important to identify and evaluate the declining physical function of the elderly and to develop customized rehabilitation strategies. Therefore based on this study, it is expected that it can be used to develop a rehabilitation program suitable for the elderly population. To obtain more reliable reference values, a further study should be made.



	Male (n=15)	95% CI	Female (n=15)	95% CI
Anthropometry				
Age (years)	67.4 ± 1.2	66.8-68.1	67.8 ± 1.4	67.1-68.6
Height (cm)	166.0 ± 6.1	162.5-169.5	157.4 ± 5.4	154.0-160.9
Weight (kg)	68.4 ± 8.5	63.5-73.3	62.2 ± 9.8	56.0-68.4
BMI (kg/m²)	24.8 ± 2.3	23.5-26.0	25.0 ± 2.6	23.3-26.6
Functional tests				
Rt. grip strength (kg)	36.0 ± 4.0	33.7-38.3	25.3 ± 3.8	23.0-27.7
Lt. grip strength (kg)	32.7 ± 4.2	30.3-35.1	22.2 ± 4.5	19.3-25.1
Rt. knee extension strength (N)	133.2 ± 31.5	115.0-151.4	90.0 ± 25.8	73.5-106.4
Lt. knee extension strength (N)	123.9 ± 31.3	105.8-142.0	85.6 ± 20.6	72.5-98.7
FTSST (s)	8.0 ± 0.7	7.6-8.5	8.6 ± 1.6	7.8-9.4
CSR (cm)	5.9 ± 1.5	2.8-9.1	8.8 ± 4.7	5.8-11.8
6MWT (m)	542.8 ± 39.2	520.1-565.5	517.2 ± 39.3	492.3-542.2
TUG (s)	7.5 ± 0.8	7.1-8.0	7.7 ± 0.3	7.3-8.0
SPPB	12.0 ± 0.0	-	12.0 ± 0.0	-
BBS	55.3 ± 0.8	54.8-55.8	54.9 ± 0.6	54.4-55.4

Notes: Values are presented as mean±standard deviation.
CI, confidence interval; FTSST, Five-Times-Sit-to-Stand Test; CSR, Chair sit-and-Reach; 6MWT, Six-Minute Walk Test; TUG, Timed Up and Go; SPPB, Short Physical Performance Battery; BBS, Berg Balance Scale.

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Table 1. Normative data in Korean elderly aged 65-69 years (n=30)

	Male		Female	
Functional tests	Predictive values	Reference values	Predictive values	Reference values
Rt. grip strength (kg)	101.5±0.11%	35.7±5.9	102.4±0.1%	25.0±5.5
Lt. grip strength (kg)	94.9±0.12%	34.8±6.9	98.7±0.2%	23.0±4.8
FTSST (s)	-3.3±0.7s	11.4	-3.2±1.2s	11.4
CSR (cm)	within average	-7.6-7.6*	within average	-1.3-11.4*
6MWT (m)	84.7±27.8%	572±92	93.4±53.6%	538±92
TUG (s)	-0.6±0.7s	8.0±2.0	-0.5±0.5s	8.0±2.0
BBS	100±0.0%	55-56	99.6±0.02%	54-56

Notes: Values are presented as mean±standard deviation or mean value.
*values mean normal range.

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Table 2. The predictive values based on the previously studies of functional assessments.

통증 및 근골격재활
게시일시 및 장소 : **2017 년 4 월 21 일 13:00-18:30, 3 층 로비 / 질의응답 일시 및 장소 : 2017 년 4 월 21 일 18:00-18:30, 3 층 로비**
초록순서 : **C55** 형식 : **Poster**

US guided Hyaluronic acid injection in TMJ fibrous ankylosis patient.

Jung Hyun Cha[1*], Yong Kyun Kim[1†]

MyongJi Hospital, Department of Rehabilitation Medicine[1]

Introduction
 Temporomandibular joint is a unique, complex, bilateral diarthrodial synovial joint which provides both hinging (giglymoid joint) and gliding movement (arthroidial joint). Inside the joint is filled with synovia which enables gyration, gliding movement and other various movements.
Fibrous ankylosis refers to partial or wide range of joint is conglutinated to connective tissue. Arthrodial cartilage in conglutinated part is generally degenerated, or substituted to cicatricial connective tissue from necrosis. The degree of conglutination varies, which some might have joint movability while the hard conglutination cause total loss of movability.
TMJ fibrous ankylosis is one of the types of temperomandibular joint disorder that leads to restriction of the mouth opening from partial reduction to complete immobility of the jaw. If the mouth cannot be opened, oral intake of food is disabled. There are various treatments that can be attempted, and in this case, a non-surgical therapy was tried.

Case presentation
A 60 year-old female patient who had HSV encephalitis, lateral medulla, Rt. occurred in November 18, 2015 was hospitalized from October 4 to November 22, 2016 for comprehensive rehabilitation treatment. She had no medical history of hypertension, diabetes, tuberculosis or hepatitis.
At the initial occurrence, the patient had difficulty opening mouth, and showed signs of swollen right jaw on July 19, 2016, and TMJ fibrous ankylosis was observed on MRI. On September 28, 2016, arthrocentesis was done on TMJ but it was insufficient, and only 0.7cm of mouth opening was possible. The dentist recommended surgical treatment such as TMJ arthroplasty or total replacement, but due to the patient's anxiety about surgery, she was hospitalized for observation.
On October 19, 2016, RT. TMJ's arthrocentesis and hyaluronic acid injection using US-guided was conducted with cooperation with dentist and the mouth opening was improved from 0.7cm to 1.3cm.

Conclusion
The patient was unable to open mouth due to TMJ fibrous ankylosis, and had blind arthrocentesis on September 2016. However, as the accurate location of TMJ was difficult to be found because of destruction of joint space. So we tried confirmed her TMJ structure through ultrasound, and conducted intra-articular injection of hyaluronic acid on synovial joint cavity by cooperating with dentist. Hyaluronic acid injection in the right place helped lubrication of joint and improve and restore inflammatory & degenerative processes. So the treatment improved temporomandibular movement of the patient.

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Fig1. Before hyaluronic acid injection : 0.7cm

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Fig1. After hyaluronic acid injection : 1.3cm

심폐재활

게시일시 및 장소 : **2017 년 4 월 21 일 13:00-18:30, 3 층 로비 / 질의응답 일시 및 장소 : 2017 년 4 월 21 일 15:00-15:40, 3 층 로비**

초록순서 : **65** 형식 : **Poster**

Relationship between Skeletal Muscle Mass and Lung Function in Healthy Adults

Chul-Hyun Park[1*], Yong-Taek Lee[1], Youbin Yi[1], Jong Geol Do[1], Jung-Sang Lee[1], Kunwoo Kim[1], Kyung Jae Yoon[1†]

Kangbuk Samsung Hospital, Sungkyunkwan University School of Medicine, Department of Physical Medicine and Rehabilitation[1]

Introduction: Sarcopenia, characterized by generalized loss of skeletal muscle, is a growing health problem in an aging society. Sarcopenia has known to be related to several conditions such as chronic kidney disease, cardiovascular diseases, and metabolic disorders. Recently, several studies reported that decreased muscle mass was associated with decreased pulmonary function in patients with chronic obstructive pulmonary disease. However, there are few studies that explored relationship between skeletal muscle mass and lung function in healthy adults. Therefore, we aimed to investigate associations between skeletal muscle mass and lung function in healthy adults without lung disease.

Method: A total of 240,562, aged from 18 to 89, were included South Korean healthy adults without lung disease undergone a medical check-up at Health Promotion Center of Kangbuk Samsung Hospital, Seoul between January 2012 and December 2014. We included subjects who completed a self-reported questionnaire of medical history, clinical symptoms, and lifestyle factors including smoking. Moreover, all study subjects performed pulmonary function test (PFT) and bioelectric impedance analyzer to measure skeletal muscle mass (kg). Skeletal muscle mass index (SMI, %) was calculated as SMI=skeletal muscle mass [kg]/body weight [kg] x 100 to adjust the effect of weight. Subjects were divided into four groups according to quartiles (Qs) of SMI as followings: Q1 (SMI range, 14.4%-38.0%), Q2 (38.1%-40.9%), Q3 (41.0%-43.4%) and Q4 (43.5-63.4%) We assessed the relationship between SMI and PFT using multinomial logistic regression models.

Results: Of the 240,562 study subjects, the demographics are shown on Table 1. Parameters of PFT including forced vital capacity (FVC), forced expiratory volume in 1 sec (FEV1), FEV1/FVC, peak expiratory flow (PEF) were compared according to Qs of SMI (Table 2). The parameters of FVC, FEV1, and PEF were significantly increased across Qs of increasing SMI (p for trend <0.01), but there was no difference in FEV1/FVC between the groups (Table 2). At multivariable-adjusted analysis for confounding factors including age, sex, fasting glucose, hypertension, body mass index, smoking, alcohol, calorie intake, and regular exercise, adjusted odd ratio (OR) of subjects with FVC(%) below 80% for Q1, Q2, and Q3 compared with Q4 were 3.67 (3.39-3.98), 2.33 (2.17-2.50), and 1.65 (1.55-1.76), respectively (Table 3). Moreover, adjusted OR of subjects with FEV1(%) <80% for Q1, Q2, and Q3 compared with Q4 were 3.01 (2.79-3.25), 2.01 (1.88-2.15), and 1.47 (1.38-1.56). Lastly, adjusted OR with PEF (%) <80% for Q1, Q2, and Q3 compared with Q4 were 1.72 (1.58-1.87), 1.41 (1.31-1.50), and 1.24 (1.16-1.32), individually (Table 3).

Conclusion: Skeletal muscle mass was associated with the parameters of lung function, suggesting that decreased relative skeletal muscle mass is an independent risk factor for decreased lung function in healthy adults without lung disease.

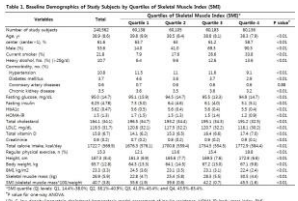

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Table 1. Baseline Demographics of Study Subjects by Quartiles of Skeletal Muscle Index (SMI)

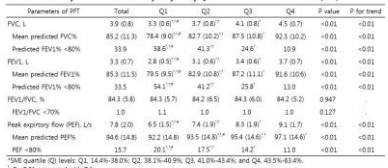

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Table 2. Pulmonary Function Test of Study Subjects by Quartiles of Skeletal Muscle Index (SMI)

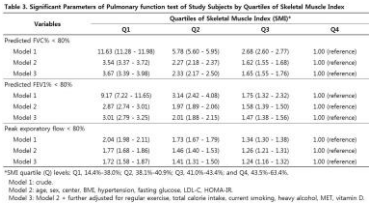

Table 3. Significant Parameters of Pulmonary function test of Study Subjects by Quartiles of Skeletal Muscle Index

Variables	Quartiles of Skeletal Muscle Index (SMI)*			
	Q1	Q2	Q3	Q4
Predicted FVC% < 80%				
Model 1	11.63 (11.28 - 11.98)	5.78 (5.60 - 5.95)	2.68 (2.60 - 2.77)	1.00 (reference)
Model 2	3.54 (3.37 - 3.72)	2.27 (2.18 - 2.37)	1.62 (1.55 - 1.68)	1.00 (reference)
Model 3	3.67 (3.39 - 3.98)	2.33 (2.17 - 2.50)	1.65 (1.55 - 1.76)	1.00 (reference)
Predicted FEV1% < 80%				
Model 1	9.17 (7.22 - 11.65)	3.14 (2.42 - 4.08)	1.75 (1.32 - 2.32)	1.00 (reference)
Model 2	2.87 (2.74 - 3.01)	1.97 (1.89 - 2.06)	1.58 (1.39 - 1.50)	1.00 (reference)
Model 3	3.01 (2.79 - 3.25)	2.01 (1.88 - 2.13)	1.47 (1.38 - 1.56)	1.00 (reference)
Peak exporatory flow < 80%				
Model 1	2.04 (1.98 - 2.11)	1.73 (1.67 - 1.79)	1.34 (1.30 - 1.38)	1.00 (reference)
Model 2	1.77 (1.68 - 1.86)	1.46 (1.40 - 1.53)	1.26 (1.21 - 1.31)	1.00 (reference)
Model 3	1.72 (1.58 - 1.87)	1.41 (1.31 - 1.50)	1.24 (1.16 - 1.32)	1.00 (reference)

*SMI quartile (Q) levels: Q1, 14.4%-38.0%; Q2, 38.1%-40.9%; Q3, 41.0%-43.4%; and Q4, 43.5%-63.4%.
Model 1: crude.
Model 2: age, sex, center, BMI, hypertension, fasting glucose, LDL-C, HOMA-IR.
Model 3: Model 2 + further adjusted for regular exercise, total calorie intake, current smoking, heavy alcohol, MET, vitamin D.

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Table 3. Significant Parameters of Pulmonary Function Test of Study Subjects by Quartiles of Skeletal Muscle Index

노인재활

게시일시 및 장소 : **2017 년 4 월 21 일 13:00-18:30, 3 층 로비 / 질의응답 일시 및 장소 : 2017 년 4 월 21 일 15:00-15:40, 3 층 로비**

초록순서 : **6** 형식 : **Poster**

Factors associated with Spine fractures in Parkinson's disease

Eun-Suk Kim[1*], Chang-Hwan Kim[1†]

Inha University Hospital, Department of Rehabilitation Medicine[1]

Objective
 Parkinson's disease (PD) and osteoporosis are two conditions affecting a substantial portion of the elderly population. Furthermore, osteoporosis and osteopenia are very common findings in patients with PD. Osteoporosis is a pathology with multi-factorial etiopathogenesis which becomes fragile and more exposed to the risk of fractures. The risk of fall-related fracture is also five-fold higher in patients with PD than in age- and sex-matched controls.
 A better understanding of the associated factors with fracture would be needed to prevent or treat PD patients who will require treatment. So, we want to study the patient with/without fall; 1. Different characteristics of patients, 2. Type, location of spine fracture and the degree of bone loss according to the fall, 3. Relation between the types of vertebral fracture and the degree of bone loss, the body mass index. Therefore, the aim of this study was to analyze the characteristics of vertebral fractures in elderly patients with PD.

Subjects and Methods
 This study was conducted in a single institution where they receive 311 inpatients. Data on patients with PD was collected from Jan, 2002 to Jan, 2017 at a single institution. The data used KCD-6 (Korean Standard Classification of Diseases) for its diagnostic code and it was obtained using G20 for PD. We excluded those individuals who were diagnosed with secondary PD (except previous stroke) and previous history of fracture before diagnosed with PD.

Results
 The patient demographics are summarized in Table 1. The differences between faller/non-fallers are not significant in age, age of onset of PD, duration of PD, sex ratio, pharmacologic treatment and body mass index. Characteristics of vertebral fracture (type, location) and the degree of bone loss according to the fall summarized in Table 2. The rate of osteoporosis in BMD was higher than that of osteopenia in patients with T-L spine fracture regardless of fall. The rate of burst fracture was higher in fall group than non-fall group. In the single level of spine fracture, T12 level was the highest in the non-fall group, and L1 level was the highest in fall group. Type of vertebral fracture with BMD and BMI are summarized in Table 3. Between the types of vertebral fractures, the proportion of osteoporosis was high in both compression and burst fracture and the proportion of osteoporosis was relatively higher in compression fracture. Also, the proportion of compression and burst fracture were not inverse proportional to degree of body mass index.

Conclusion
 We investigated the characteristics of vertebral fractures depending on the fall and relationship between factors(BMD, BMI) and vertebral fractures in PD. Further research would be needed to prevent vertebral fractures in patients with PD by analyzing the characteristics of patients with PD associated with falls.

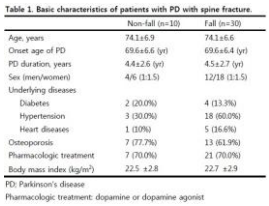

Table 1. Basic characteristics of patients with PD with spine fracture.

	Non-fall (n=10)	Fall (n=30)
Age, years	74.1±6.9	74.1±6.6
Onset age of PD	69.6±6.6 (yr)	69.6±6.4 (yr)
PD duration, years	4.4±2.6 (yr)	4.5±2.7 (yr)
Sex (men/women)	4/6 (1:1.5)	12/18 (1:1.5)
Underlying diseases		
Diabetes	2 (20.0%)	4 (13.3%)
Hypertension	3 (30.0%)	18 (60.0%)
Heart diseases	1 (10%)	5 (16.6%)
Osteoporosis	7 (77.7%)	13 (61.9%)
Pharmacologic treatment	7 (70.0%)	21 (70.0%)
Body mass index (kg/m^2)	22.5 ±2.8	22.7 ±2.9

PD: Parkinson's disease
Pharmacologic treatment: dopamine or dopamine agonist

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Table 1. Basic characteristics of patients with PD with spine fracture

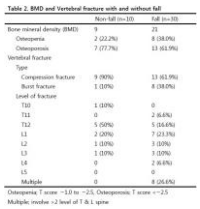

Table 2. BMD and Vertebral fracture with and without fall

	Non-fall (n=10)	Fall (n=30)
Bone mineral density (BMD)	9	21
Osteopenia	2 (22.2%)	8 (38.0%)
Osteoporosis	7 (77.7%)	13 (61.9%)
Vertebral fracture		
Type		
Compression fracture	9 (90%)	13 (61.9%)
Burst fracture	1 (10%)	8 (38.0%)
Level of fracture		
T10	1 (10%)	0
T11	0	2 (6.6%)
T12	5 (50%)	5 (16.6%)
L1	2 (20%)	7 (23.3%)
L2	1 (10%)	3 (10%)
L3	1 (10%)	3 (10%)
L4	0	2 (6.6%)
L5	0	0
Multiple	0	8 (26.6%)

Osteopenia: T score −1.0 to −2.5, Osteoporosis: T score <−2.5
Multiple: involve >2 level of T & L spine

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Table 2. BMD and Vertebral fracture with and without fall

Table 3. Type of Vertebral fracture with BMD and BMI

	Vertebral fracture (T-L spine)	
Bone mineral density (BMD)	Compression fracture	Burst fracture
Osteopenia	7 (30.4%)	3 (42.8%)
Osteoporosis	16 (69.5%)	4 (57.1%)
Body mass index (kg/m²)(BMI)		
< 18.5 (underweight)	2 (6.6%)	1 (11.1%)
18.5–22.9 (normal)	14 (46.6%)	3 (33.3%)
23.0–24.9 (overweight)	8 (26.6%)	3 (33.3%)
25.0–29.9 (obesity I)	6 (20%)	2 (22.2%)
≥ 30.0 (obesity II)	0	0

Osteopenia ; T score −1.0 to −2.5, Osteoporosis; T score <−2.5

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Table 3. Type of Vertebral fracture with BMD and BMI

뇌신경재활
게시일시 및 장소 : **2017 년 4 월 21 일 13:00-18:30, 3 층 로비 / 질의응답 일시 및 장소 : 2017 년 4 월 21 일 15:00-15:40, 3 층 로비**
초록순서 : **41** 형식 : **Poster**

Comparison of Upper Esophageal Sphincter Relaxation duration in VFSS vs. HRM in swallowing function

Yong-Taek Lee[1], Jong Geol Do[1], Chul-Hyun Park[1], Jung-sang Lee[1], Kunwoo Kim[1*], Kyung Jae Yoon[1†]

Kangbuk Samsung Hospital, Sungkyunkwan University, School of Medicine, Department of Physical and Rehabilitation Medicine[1]

Introduction
Upper esophageal sphincter (UES) relaxation dysfunction is one of the factors affecting dysphagia, and there are several methods measuring UES relaxation time such as videofluoroscopic swallowing study (VFSS) and high resolution manometry (HRM). However, there was no trial to compare them. The purpose of this study is to compare the effectiveness of UES relaxation duration on swallowing function obtained using VFSS vs. HRM in patients with dysphagia.

Material and method
UES relaxation duration (URD) was evaluated in two exam: VFSS and HRM in dysphagia patients. (N=109) In VFSS, URD was measured from the moment the UES opens until the UES closes in video clips from VFSS examinations (URDV). In HRM, URD was defined as from the time when UES pressure starts to decline until UES pressure restore into resting pressure (URDH). Relationship between URDV/URSD and Dysphagia Outcome and Severity Scale (DOSS) was analyzed. Each method's sensitivity and specificity for oral feeding or non-oral feeding was calculated by receiver operating characteristic (ROC) curve analysis.

Results
Both URDV and URDH were positively correlated with DOSS (URDV : rho : 0.333, p<0.001 ; URDH : rho : 0.239, p=0.012). For URDV, optimal threshold value was 0.42 second, sensitivity for oral feeding was 84.3% and specificity was 50.0% (area under curve : 0.712±0.64). For URDH at optimal threshold value of 0.44 second, sensitivity and specificity for oral feeding was 74.7%, 53.8%, respectively (area under curve : 0.639±0.64). Positive predictive value and negative predictive value for URDV was 0.835, 0.433 and for URDH, 0.838, 0.400.

Conclusion
UES relaxation duration measured by VFSS and HRM have similar capability in predicting swallowing function.

통증 및 근골격재활
게시일시 및 장소 : **2017 년 4 월 21 일 13:00-18:30, 3 층 로비 / 질의응답 일시 및 장소 : 2017 년 4 월 21 일 15:00-15:40, 3 층 로비**
초록순서 : **105** 형식 : **Poster**

Agreement Between Telerehabilitation and In-Person Clinical Assessments for Back Pain

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Kangwon National Univeristy Hospital, Department of Rehabilitation Medicine[1], Kangwon National University Hospital, Center for Farmers's Safety and Health[2]

Objective: Back pain is a common musculoskeletal problem. Many patients suffer from recurrent back pain. The incidence of back pain is closely related physical burden during occupational activity and increases with age. For back pain management, back rehabilitation program is important which is a non-surgical multi-disciplinary treatment and usually consists of education, exercise and physical therapy. Telerehabilitation for back pain could be useful for people living in rural area distant from Hospital. Because the key interventions included in back rehabilitation program are strengthening and retraining of back muscles, agreement between in-person and tele-assessment including back muscle strength is needed. There have been no published studies on the reliability of a telerehabilitation system to assess back pain including back muscle strength.
Method: Nineteen individuals (6 males) with chronic low back pain (mean age, 66 years) were enrolled in this study. In-person and telerehabilitation evaluations included visual analogue scale, Oswestry Disability Index, isometric back extensor strength, pain pressure threshold of lumbar paraspinal muscles, and anterior straight leg rise tests. Pain pressure thresholds for L2 and L4 paraspinal muscles were assessed using pressure algometry in kPa or in Newtons (N). Isometric back extensor strength was measured using portable dynamometer when subjects were asked to push the dynamometer and the back of the chair while seated. The agreement between in-person and telerehabilitation assessments was analyzed by using the Bland-Altman plots and Cronbach α.
Results: The α reliability between in-person and telerehabilitation evaluations was more than 0.80 for Oswestry Disability Index and pain pressure threshold on right L2 paraspinal muscle, more than 0.70 for visual analogue scale, and more than 0.60 for isometric back extensor strength, pain pressure threshold on left L2 paraspinal muscle and right L4 paraspinal muscle, right anterior straight leg rise test. In 7 of 9 items, reliability between in-person and telerehabilitation evaluations was good. Bland-Altman plots demonstrated acceptable agreement for visual analogue scale, Oswestry Disability Index, and pain pressure threshold of L2 paraspainl muscles. The 95% limit of agreement for in-person and telerehabilitation was -20.96 to 26.72 for Oswestry Disability Index.
Conclusion: This study suggests that this telerehabilitation system including isometric back extensor strength may be useful to assess individuals with back pain.

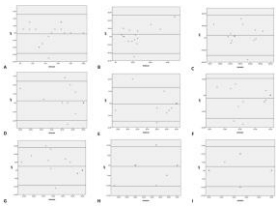

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Fig. 1. Bland-Altman Plot for visual analogue scale (A), Oswestry Disability Index (B), isometric back extensor strength (C), pain pressure threshold on right L2 paraspinal muscle (D), left L2 paraspinal muscle (E), right L4 paraspinal muscle (F), and left L4 paraspinal muscle (G), and anterior straight leg rise test for right (H) and left (I) between telerehabilitation and in-person systems

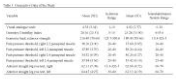

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Table 1. Descriptive Data of the Study

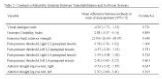

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Table 2. Cronbach α Reliability Estimate Between Telerehabilitation and In-Person Systems

통증 및 근골격재활
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초록순서 : **C56** 형식 : **Poster**

Acute unilateral C5 palsy caused by developmental vertebral artery anomaly : a case report

In-Sik Lee[1†], Seunghwan Lee[1*]

Konkuk University Medical Center and Konkuk University School of Medicine, Department of Rehabilitation Medicine[1]

Introduction: Unilateral C5 palsy infrequently occurs by diverse reasons and most of the cases are caused by cervical disc herniation or neural foramina stenosis. However it also can be developed by uncommon causes such as tumor, cysts, and vascular malformation. Herein, we report a rare case in which the patient had upper extremity muscle weakness due to C5 nerve palsy caused by a developmental vertebral artery anomaly.

Case Report: A 50-year-old female, otherwise healthy, visited rehabilitation outpatient clinic presented with a left shoulder flexion and abduction motion difficulties due to weakness. Symptoms started two months ago and aggravated 11 days ago without any trauma history. The initial physical examination, which was performed in the outpatient clinic, revealed weakness at the shoulder joint, with both shoulder flexion and abduction graded as poor grade and elbow flexion and extension as fair grade. The decreased tendon reflex of left biceps brachii was observed. Therefore the patient was admitted for evaluation of progressive left shoulder flexion and abduction muscle weakness. A NCS, which was performed 12 days after the onset of weakness, CMAP amplitude was decreased about 60% on the left axillary nerve, musculocutaneous nerve, and suprascapular nerve compared with the contralateral side. In needle EMG study, abnormal spontaneous activities were observed in the left deltoid, biceps brachii, and C5 paraspinalis muscles, which was appropriate for C5 radiculopathy. Subsequently, a MRI was performed to figure out the cause of C5 radiculopathy. MRI showed mild neural foraminal stenosis and uncovertebral hypertrophy at the left C5-6, C6-7 levels and swelling of C5 nerve root.(Fig.1) Moreover, a tortuous left vertebral artery due to developmental anomaly was found to encircle the left C5 nerve root and prominent epidural venous engorgement was identified at its periphery.(Fig.2) The presumed cause of left C5 nerve root irritation can be attributed to epidural venous engorgement. Therefore considering patient EMG, NCS study results and clinical manifestations, anomaly of VA is thought to be the main cause of left proximal upper extremity muscle weakness. As an initial treatment for the left C5 palsy, oral steroid pulse therapy was started with consideration of surgical treatment in case of no improvement. However, the patient exhibited a drastic improvement in motor power after a week of steroid therapy, at which point she was discharged. When reevaluated at the outpatient clinic after a month, her left upper limb muscle strength recovered to nearly normal.

Conclusion: In this case, we report a rare case of left C5 nerve palsy caused by developmental anomaly of vertebral artery, encircling the left C5 nerve root, and epidural venous engorgement irritating the left C5 nerve root. Therefore, clinicians should consider other uncommon etiologies such as vertebral artery anomaly in making a diagnosis of cervical radiculopathy.

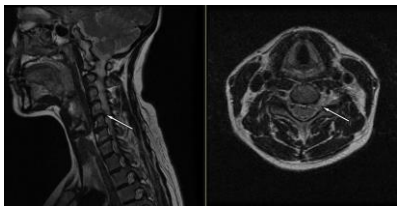

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Figure 1. MRI of C-spine(T2 weighted) : Swelling of left C5 nerve root and epidural venous engorgement of its periphery. (white arrows)

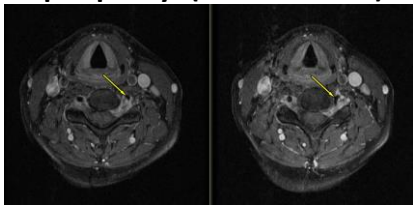

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Figure 2. MRI of C-spine(T1 weighted) : A tortuous left vertebral artery encircling the left C5 nerve root. (yellow arrows)

통증 및 근골격재활
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초록순서 : **106** 형식 : **Poster**

High-energy Extracorporeal Shock-wave Therapy for Myofascial Pain Syndrome of Upper Trapezius

Min-ho Park[1*†], Yong Bum Park[1†]

Inje University Sanggye Paik Hospital, Department of Rehabilitation Medicine[1]

[Objective]
To compare the effect of extracorporeal shock wave therapy (ESWT) in myofascial pain syndrome of upper trapezius by energy intensity.

[Method]
Thirty patients who were diagnosed as myofascial pain syndrome in upper trapezius were selected. They were randomly assigned to low-energy ESWT group and high-energy ESWT group, so that there were 15 patients in each group. The patients in both groups received ESWT for 1,500 pulses once a week for 2 weeks. We defined high energy intensity as 0.210 mJ/mm2 and low energy intensity as 0.068 mJ/mm2. We evaluated verbal numeric pain scale (VNS), neck disability index (NDI), neck range of motion (ROM) (flexion, extension, rotation, lateral bending), and pain threshold (PT).

[Results]
The sex, age, bilaterality, duration, and site (right or left) were not significantly different by groups. Both groups showed significant changes in VNS, NDI, ROM, and PT between pre-intervention and post-intervention. There were no significant difference of almost all outcome measures between groups, but neck flexion ROM was significantly different between groups.

[Conclusion]
ESWT is effective in treating myofascial pain syndrome of upper trapezius, but the effectiveness is not different by energy intensity. But this study has very small number of subjects and this study was done during a short period of time. So further study with a large number of patients for a long time would be required for investigating the effect of different energy intensity.

[Key words]
ESWT, energy level, upper trapezius, myofascial pain syndrome

뇌신경재활

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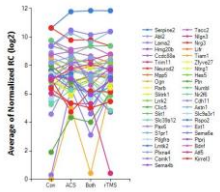
초록순서 : **42** 형식 : **Poster**

The Gene Expression after Alternative Current and Electro-Magnetic Stimulation on scalp in MCAO mice

Min-Keun Song[1*], Wang-In Kim[1], Hyung-Kyu Park[1], In-Sung Choi[1], Jae-Young Han[1†]

Chonnam National University Medical School & Hospital, Department of Physical & Rehabilitation Medicine[1]

Introduction: The effect of combined stimulation of repetitive transcranial magnetic stimulation (rTMS) and alternative current stimulation with scalp acupuncture (sACS) has not been reported yet, and the regulation of gene expression after combined stimulation has not proven. The aim of this study was to investigate biomolecular mechanism of the combined stimulation of sACS and rTMS in middle cerebral artery occlusion (MCAO) mice by analyzing the gene expression with RNA sequencing technology.
Method: Thirty-six C57BL/6J male mice of 8-week-old, weighing 50~60 grams, were used for this experiment. MCAO mouse was established with 60-min occlusion and subsequent reperfusion of middle cerebral artery by Koizumi method. None of mice died after induction of MCAO. Experimental mice were randomly assigned to four groups of nine mice each; control group (no treatment), alternative current stimulation group (10 minutes sACS), rTMS group (1Hz rTMS), and combined group (1Hz rTMS with sACS). The neurological deficit score (NDS) was measured at 2nd day after indunction to determine whether the cerebral ischemic stroke was induced by MCAO. There was no excluded mouse after NDS was checked. The stimulation intervention was performed from 3rd day to 7th day after induction of MCAO. The rTMS was delivered on contralesional primary motor cortex (M1) (intensity, 50%; 1Hz/10 sec; wait time/50 sec; 1 min/set, 10 sets/session, 1 session/day, for 5 days). sACS was performed on ipsilesional M1 (start acupoint, Qianding, GV21; end acupoint, Xuanli, GB6; 10 min/session, 1 session/day, for 5 days). At the last day of treatment, ten mice were survived (coutrol group; 2, sACS group; 3, rTMS group; 2 and combined group; 3 mice). All mice were sacrificed and brain tissues in motor area of MCAO lesion were taken. We analyzed their gene expression by RNA sequencing technology.
Results: We found out the significant fold changes in 43 genes related to neurogenesis.
1. The most highly-upregulated genes compared with control group showed below (p<0.05, fold change>2 times, average of normalized read count (RC)>6 times).
1) Hes5, Camk1, Nr2f6 and Cdh11 in sACS group
2) Serpine2, Lama2, Hmg20b, Trim11, Mpp5, Ogn, Rarb, Clic5, Slc39a12, Pax6, S1pr1, Pdgfra and Camk1 in rTMS group
3) Atf5 in combined group
2. The most highly-downregulated genes compared with control group showed below (p<0.05, fold change>2 times, average of normalized RC>6 times).
 1) Nrg3, Lifr, Tiam1, Slit1, Zfyve27, Ntng1, Ptn and Numbl in sACS group
 2) Abl2, Ccdc88a, neurod2, Slitrk1, Lrrk2, Slit1, Lmtk2, Plxna4, Sema4b, Tacc2 and Nlgn3 in rTMS group
 3) Abl2, Astn1, Slc9a3r1, Rspo2, Ext1, Sema6a, Ptprj, Bdnf, Lmtk2 and Kirrel3 in combined group
3. There was no overlapped up-regulated or down-regulated gene between three groups.
Conclusions: Gene expressions in each group showed different patterns. Each stimulation method may be affected by different biomolecular mechanisms in neurogenesis.



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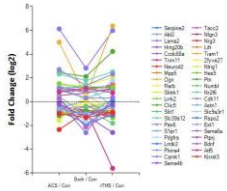
This graph shows the average of normalized RC of gene expression in each group.



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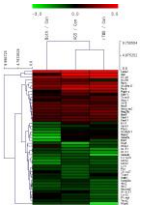
This graph presents the fold change of gene expression in each group compared with control group.



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The clustering tree for RNAs related to neurogenesis is shown. The expression values are represented in shades of red and green, indicating expression above and below the median value across all samples (from −3.00 to +3.00).

뇌신경재활
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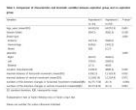
초록순서 : **43** 형식 : **Poster**

Abnormal Hyoid Bone Movement Associated with Aspiration in Stroke Survivors with Dysphagia

Hyowon Im[1*], Han Gil Seo[1], Byung-Mo Oh [1], Nam Hyung Seok[3], Tai Ryoon Han[2†]

Seoul National University Hospital, Department of Rehabilitation Medicine[1], Gangwon-Do Rehabilitation Hospital, Department of Rehabilitation Medicine[2], Seoul National University College of Medicine, Department of Biomedical Engineering[3]

Objectives]
There have been several studies on the relationship between hyoid bone movement and aspiration in stroke patients, but no significant results were reported in most studies. Hyoid movement during swallow in the most of normal population is ovoid or triangular motion pathway. In stroke patients with dysphagia may have abnormal hyoid movement different from the movement of normal population, but had not been objectively assessed. The objective of this study is to demonstrate the correlation between risk of aspiration and the hyoid bone parameters including abnormal movement of hyoid bone using motion analysis.
Materials and method]
We performed two-dimensional motion analysis of the hyoid bone during swallowing using videofluoroscopic images in seventy-three patients with stroke. Main outcome measures were: (1) horizontal and vertical excursion of the hyoid bone and (2) the number of the direction changes in horizontal and vertical movement of the hyoid bone (i.e., the number of points through which the velocity graph passes through the x axis in horizontal and vertical movement of the hyoid bone). The increased numbers in the direction changes of horizontal and vertical movement of the hyoid bone were considered as irregular hyoid bone movement during swallowing. The multivariable logistic regression was performed with these main outcomes to demonstrate their relationship with aspiration.
Results]
A total 73 patients (male 46, age 63.33 ± 13.42 years) who diagnosed as stroke by MRI or CT were enrolled in this study. The numbers in the direction changes of both vertical and horizontal movement of the hyoid bone were more in the aspiration group than in the non-aspiration group (Table 1). Multiple logistic regression analysis demonstrated that increased numbers in the direction changes of vertical movement of the hyoid bone (OR 1.815, 95% CI = 1.167 – 2.824, P value 0.008) and maximal distance of horizontal hyoid movement (OR 0.724, 95% CI = 0.564 – 0.928, P value 0.011) were independently and significantly associated with aspiration (Table 2).
Conclusion]
This study suggests that hyoid movement parameters during swallowing could be useful tools to evaluate aspiration risks in stroke patients. Irregular vertical movement and decreased horizontal movement of the hyoid bone may be related with aspiration risk. Because the movement of the hyoid bone is relatively easy to identify in videofluoroscopic images, further study is warranted to confirm abnormal hyoid bone movement which may increases the risk of aspiration in stroke patients.



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Comparison of characteristics and kinematic variables between aspiration group and no aspiration group

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Factors associated with aspiration

스포츠재활
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초록순서 : **53** 형식 : **Poster**

The effect of evening primrose and chicory massage gel in muscular function and blood supply.

Young Hee Lee[1†], Sung Hoon Kim[1], Ji Hyun Kim[1], Ji Yoon Jang[1*], Hi Chan Lee[1], Jun Young Park[1]

, Yonsei University Wonju College of Medicine, Wonju, Korea, Department of Rehabilitation[1]

This study was designed to dertermine the effect of massage gel containing ingredients extracted from evening primrose and chicory, in improving muscular function and blood supply when applied to the surface of the skin.

This study was designed to include healthy adults who exercise daily. The participants were asked to apply massage gel at their right calf area for 4 times a day for 4weeks. To evaluate the improvement of muscular function and blood supply, Digital Infrared Thermal Imaging(DITI), Quantitative Electromyography(QEMG) was done before the study and after 4weeks of applying the gel. Ultrasound study was done to measure the square area and the velocity of blood flow of both popliteal arteries.

As a result, there was no significant difference of QEMG between before and after applying the massage gel. In the DITI test, there was significant correlation of elevation of temperature in right calf area after the 4weeks of applying the gel ($p=0.031$) when there was no significant difference in evaluation before the study. The square area of right popliteal artery after the study was increased compared with evaluation before the study with significant correlation ($p=0.043$). Also the velocity of blood supply of right popliteal artery was faster after the study with significant correlation ($p<0.001$).

In conclusion, the massage gel contained with ingredients extracted from evening primrose and chicory, has promising effects of improving blood supply of muscles when applied to the surface, in healthy adults.

신경근육재활 및 전기진단
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초록순서 : **59** 형식 : **Poster**

OPTIMAL PLACEMENT OF NEEDLE EMG FOR EXTENSOR INDICIS : A CADAVERIC STUDY

Jin Young Im[1*], Hong Beom Park[1], Seok Jun Lee[1], Ki Hoon Kim[1], Dasom Kim[2], Im Joo Rhyu[2], Byung Kyu Park[1], Dong Hwee Kim[1†]

Korea University Ansan Hospital, Department of Rehabilitation Medicine[1], Korea university college of medicine, Department of Anatomy[2]

OBJECTIVE: Extensor indicis (EI) muscle is the most distal muscle innervated by the radial nerve. It is used when evaluating radial nerve lesion or cervical radiculopathy by needle electromyographic study. This study is designed to identify the mid-point of EI muscle as the optimal site for needle electromyography and compare the accuracy of three needle insertion techniques widely used as dissecting fresh cadavers.

METHODS: 18 upper limbs of 10 adult cadavers were dissected. The midpoint (MP) of EI was marked at the middle of the musculotendinous junction and proximal origin of EI. The forearm length (FL) was measured from radial head to ulnar styloid process (USP). The forearm width (FW) at the level of EI was measured. Three different needle insertion techniques were cited from three different textbooks: M1, 2.5cm above USP, lateral aspect of the ulnar bone; M2, 2 finger breadth (FB) proximal to USP, just radial to ulnar bone; M3, distal fourth of the forearm, lateral to the radial side of the ulna bone. The distance from USP to MP (USP_MP) as parallel to the line between radial head to USP, and from medial border of ulnar bone to MP (UMB_MP) were measured. The distance between 3 different points (M1-3) and MP were measured (marked as D1, D2, and D3, respectively). The angle between ulnar bone and the line connecting the proximal origin of EI and MP was measured.

RESULTS: The median value of FL and FW was 23.0 cm and 47.6mm, respectively. The median value of USP_MP was 49.6mm and UMB_MP was 16.1mm. The percentage of USP_MP to FL, UMB_MP to FW were 21.3% and 32.9%, respectively. The median values of D1, D2 and D3 were 24.6 mm, 14.6 mm and 8.7 mm respectively. The median value of the angle between ulnar bone and the line connecting the origin of EI and MP was 11.5 degree.

CONCLUSION: The MP of EI is approximately 5cm proximal to USP level, about distal 20% of forearm length and 16.1mm lateral to medial border of ulnar bone, about 30% of forearm width. Among the three techniques, the technique placing the needle at distal fourth of the forearm, lateral to the radial side of the ulna bone is the most accurate as closest to mid-point of the extensor indicis muscle.

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Fig. 1. Parameters measured in the cadaver. O, proximal origin of EI muscle; Angle, angle between ulnar bone and the line connecting the proximal origin of EI and MP; MP, midpoint of EI muscle; USP, ulnar styloid process; MP_X, distance between USP and MP; MP_Y, distance from medial border of ulnar bone to MP.

	Median	Minimum	Maximum
FL (mm)	232	210	252
FW (mm)	57	52	63.5
USP_MP (mm)	49.6	37.9	61.8
UMB_MP (mm)	16.1	13.0	20.6
D1 (mm)	24.6	12.9	36.8
D2 (mm)	14.6	2.9	26.8
D3 (mm)	8.7	0.9	17.4
Angle (degree)	11.5	4.0	17.0

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Table 1. Anatomical parameters of extensor indicis and distance from point marked by three different techniques. FL, forearm length; FW, forearm width; USP_MP, distance from USP to MP; UMB_MP, distance from medial border of ulnar bone to MP; D1, distance between M1 and MP; D2, distance between M2 and MP; D3, distance between M3 and MP; Angle, angle between ulnar bone and the line connecting the proximal origin of EI and MP.

재활정책
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초록순서 : **75** 형식 : **Poster**

Relationship between Socioeconomic Status and the Utilization of Post Stroke Rehabilitation in Korea

Chan Woong Jang[1*], Jong Moon Kim[2], Hyun Sun Lim[3], Hyoung Seop Kim[1†]

National Health Insurance Corporation Ilsan Hospital, Department of Physical Medicine and Rehabilitation[1], CHA Bundang Medical Center, Department of Rehabilitation Medicine[2], National Health Insurance Service Ilsan Hospital, Department of Policy Research Affairs[3]

Objective: The aims of this study were to define the relationship between socioeconomic status and the rehabilitation utilization, to find the factors that influence the pattern of stroke rehabilitation in Korea.

Method: We analyzed the National Sample Cohort from 2008 to 2013 with regards to the relationship between socioeconomic status and the pattern of using the rehabilitation resources after stroke. We divided the population into two groups according to the types of insurance premium payment. We also divided the rehabilitation treatment period into acute and chronic stages by six months after the onset. We confirmed the pattern of rehabilitation facility utilization and the mean of hospitalization days between insurance holder and beneficiary groups in acute and chronic stages and in each health insurance premium payment group.

Results: The highest income group had been hospitalized in a general hospital in both acute and chronic stages and both types of premium payment. The difference of socioeconomic status and demographics influenced the pattern of utilization of rehabilitation and the mean hospitalization days.

Conclusion: The pattern of rehabilitation utilization after stroke was the closely related to the socioeconomic status and the demographics.

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Table 1. The Relationship between Hospital Grade and Income Grade of Each Insured Group in Acute Stage

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Table 2. The Relationship between Hospital Grade and Income Grade of Each Insured Group in Chronic Stage

뇌신경재활
게시일시 및 장소 : **2017 년 4 월 21 일 13:00-18:30, 3 층 로비 /** 질의응답 일시 및 장소 : **2017 년 4 월 21 일 18:00-18:30, 3 층 로비**
초록순서 : **C15** 형식 : **Poster**

A Rare Case of Primary Angiitis of the Central Nervous System Mimicking Tumor

Seung Don Yoo[1†], Dong Hwan Kim[1†], Seung Ah Lee[1†], Kwang Min Choi[1*]

Kyung Hee University Hospital at Gangdong, Department of Rehabilitation Medicine [1]

Primary angiitis of the central nervous system (PACNS) is rare and poorly understood form of vascular inflammatory disease restricted to the CNS with no systemic involvement. The annual incidence of PACNS has been reported to be 2.4 cases per 1 million person-years and there is a 2:1 male predominance. The most common symptom of PACNS is headache occurring in about 60 percent of patients followed by cognitive impairment. Usually PACNS has a long prodromal period with few cases presenting acutely. we report a case of PACNS mimicking tumor in 62-year-old male whose initial symptom was sudden onset of balance loss without headache or any previous symptom and whose additional symptoms were neurogenic bladder, dysphagia and steroid-induced myopathy after treatment.
 A 62-year-old male, with hypertension, DM and history of stent placement for STEMI, who had suddenly started leaning to the right was referred to the department of neurology. Brain magnetic resonance imaging (MRI) T2 FLAIR on admission revealed high signal intensity (SI) at left precentral gyrus, midbrain that was suggestive of metabolic or viral or autoimmune encephalopathy. However, the lab results for serum ESR, CRP, antibody study (ANA, ANCA, antiphospholipid Ab, anticardiolipin Ab, Lupus anticoagulant, paraneoplastic Ab) and virus study were within normal limits. Also CSF analysis including glucose, cell count, ADA, cryptococcus Ag, india ink, bacterial PCR, viral PCR, fungus culture, VDRL, parasite Ab, IgG index, oligoclonal band and cytology were normal except for mild elevation in protein. Transesophageal echocardiogram (TEE) results showed no visible intracardiac source of embolism and EEG showed normal findings. The patient was prescribed antiplatelet medication then discharged. After discharge, Loss of balance became worse and he showed signs of cognitive impairment. After readmission, neurogenic bladder and dysphagia occurred additionally and follow-up MRI revealed that high SI previously shown at left precentral gyrus and midbrain had expanded and high SI had newly appeared at left insula. Whole-body PET and tumor marker tests were done to exclude possibility of malignancy but the results were not significant. Perfusion-weighted imaging (PWI) was also normal, so possibility of primary CNS vasculitis, lymphoma and autoimmune demyelinating disease was finally suggested. Brain biopsy was done and histopathologic findings showed perivascular lymphocytic infiltration with a few macrophage concluding PACNS as our final diagnosis.
 As the symptoms of PACNS are nonspecific and specific diagnostic test is yet available, excluding other disorders should be performed for diagnosis of PACNS. If unexplained neurologic deficits persist or worsen with tumor-like image findings despite negative results in diagnostic workup, tumor-mimicking PACNS should be suspected and brain biopsy that is gold standard for the diagnosis of PACNS should be performed for diagnosis and proper treatment.

뇌신경재활
게시일시 및 장소 : **2017 년 4 월 21 일 13:00-18:30, 3 층 로비 / 질의응답 일시 및 장소 : 2017 년 4 월 21 일 18:00-18:30, 3 층 로비**
초록순서 : **C16** 형식 : **Poster**

Measuring Cervical Range of Motion in Hemiplegic Patients with Stroke: a Case-Series of 9 Patients

Shinyoung Kwon[1*], Jinkyu Moon[1], Sang Hee Im[1,2], Kye Hee Cho[1,2], Jong Moon Kim[1,2], MinYoung Kim[1,2†]

CHA Bundang Medical Center, Department of Rehabilitation Medicine[1], CHA University, Rehabilitation and Regeneration Research Center[2]

Introduction
In stroke patients the use of affected side maybe reduced due to hemiplegia, cognitive impairment and neglect. Specifically, limited cervical range of motion (ROM) may cause difficulty in activities of daily living. Neglect is more frequent in left hemiplegia than right hemiplegia; which may have more detrimental effect on left hemiplegic patient with limited cervical motion. There is little published research on the limitation of cervical ROM in hemiplegic patients. This study was conducted to determine whether there is difference in ROM between patients with left or right hemiplegia.

Methods
The patients who were admitted to University hospital from December, 2016 to February, 2017 were enrolled for the study. Inclusion criteria were as follows: 1) hemiplegia due to stroke, 2) age ≥ 20 year-old, 3) onset ≥ 6 months, 4) Capable of one step verbal command obey. Patients were excluded for 1) previous brain lesion, 2) any neck complaints (severe diseases, neck surgery in the history). Passive and active ROM were measured with a gravity goniometer (flexion, extension and lateral flexion), and a universal goniometer (rotation) with the subject in the seated position. The goniometer was positioned at the side of the head, above the ear for estimation of flexion and extension, while the goniometer was positioned on the external occipital protuberance for lateral flexion. For measuring of rotation, the goniometer axis was positioned at the top of the head, the fixed arm was positioned at the midline of the head in the sagittal plane, and the moving arm was aligned with the nose. Wilcoxon signed-rank test was used to compare the difference between groups. Statistical significance was calculated with SPSS (ver. 21.1, IBM., USA).

Result
Nine patients (five left hemiplegia and four right hemiplegia) were finally included for this study (Table 1). In patients with left hemiplegia, the differences between passive neck ROM of left and right side were not significant (Figure 1), while active ROM (lateral flexion p=0.041; rotation p=0.041) significantly different between each side (Figure 2). In patients with right hemiplegia, there was no significant difference in passive ROM (lateral flexion p=0.180; rotation p=0.564) and active ROM (lateral flexion p=0.102; rotation p=0.785) between each side.

Conclusion
This study suggests that there are more limitations of active ROM in left hemiplegia than right hemiplegia. The rehabilitative strategy for stroke patient with left hemiplegia should include the cervical ROM exercises. Future studies with more number of participants are required to reveal for differences of cervical ROM in patients with left or right hemiplegia.

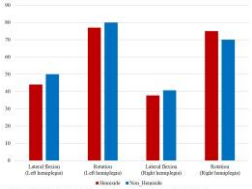

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Figure 1. Mean lateral flexion and rotation passive range of motion

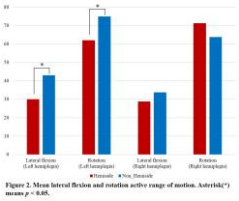

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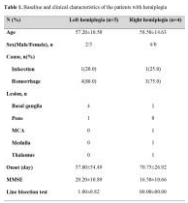
Figure 2. Mean lateral flexion and rotation active range of motion



N (%)	Left hemiplegia (n=5)	Right hemiplegia (n=4)
Age	57.20±10.58	58.50±13.63
Sex(Male/Female), n	2/3	4/0
Cause, n(%)		
Infarction	1(20.0)	1(25.0)
Hemorrhage	4(80.0)	3(75.0)
Lesion, n		
Basal ganglia	4	3
Pons	1	0
MCA	0	3
Medulla	0	1
Thalamus	0	1
Onset (day)	57.80±14.49	70.75±20.92
MMSE	20.20±18.89	16.50±10.66
Line bisection test	1.00±0.82	00.00±00.00

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Table 1. Baseline and clinical characteristics of the patients with hemiplegia

뇌신경재활
게시일시 및 장소 : **2017 년 4 월 21 일 13:00-18:30, 3 층 로비 / 질의응답 일시 및 장소 : 2017 년 4 월 21 일 18:00-18:30, 3 층 로비**
초록순서 : **C17** 형식 : **Poster**

Post-Stroke Aphasia Improvement with Use of Zolpidem: A report of Two Cases

Ho Joong Jung[1*], Bo-Ram Kim[1], Jongmin Lee[1†]

Konkuk University Medical Center, Department of Rehabilitation Medicine[1]

Introduction: Aphasia, defined as the loss of language function after brain damage is one of the most devastating cognitive deficits produced by stroke lesions. Recently, several studies reported a paradoxical arousing effect of zolpidem, a non-benzodiazepine hypnotic, in persistent vegetative state (PVS) patients due to brain injury or hypoxic brain damage. It was also reported that zolpidem anecdotally showed transient improvement of aphasia in a chronic stroke patient. We report two cases of post-stroke aphasia patients improved with zolpidem combined with speech therapy.
Case 1: A 25-year-old female visited emergency room presenting sudden onset of aphasia with brain MRI images showing left supramarginal gyrus, angular gyrus, supratemporal gyrus and inferior parietal lobe infarction due to suspicious Moyamoya's disease. After initial treatment in neurology, the patient was transferred to the rehabilitation ward for aphasia treatment at 12 days from the onset. The initial Korean version of the Western Aphasia Battery (K-WAB) score showed global aphasia with aphasia quotient (AQ) of 6.4. After 3 weeks of intensive speech therapies, the patient showed little progression in speech. As a short-term trial to enhance the effect of speech therapy, the patient was started with zolpidem 6.25mg once a day before speech therapy session. The ingestion of the first dose was followed by a dramatic improvement in speech, especially in spontaneous speech performance. She often expressed full sentences unintentionally when she felt drowsiness. One week after zolpidem treatment combined with speech therapy, the follow-up K-WAB score showed improvement with AQ of 27.2, especially in the improvement of spontaneous speech performance.
Case 2: A 34-year-old female visited emergency room with sudden onset of confused mentality and aphasia. Brain MRI showed venous infarction in the left temporal operculum, angular gyrus, supramarginal gyrus and occipital lobe. After interventional thrombectomy, the patient was transferred to the rehabilitation ward for aphasia treatment at 18 days from the onset. The initial K-WAB score showed transcortical sensory aphasia with AQ of 41.8. After 2 weeks of conventional speech therapies, the patient showed little progression. As a short-term trial to increase the effect of speech therapy, the patient was started with zolpidem 6.25mg once a day. After zolpidem treatment, the patient showed dramatic improvement in all domains of speech. The follow-up K-WAB score at discharge showed AQ of 87 with improvement of all subcategories of K-WAB. Aphasia type was also changed to anomic type from transcortical sensory aphasia.
Conclusion: We report two cases of post-stroke aphasia improved with zolpidem combined with speech treatment. In these cases, we found the possibility that zolpidem may enhance the effect of speech therapy in aphasia patients. Further studies to show the benefit of zolpidem treatment in post-stroke aphasia are needed.

노인재활
게시일시 및 장소 : **2017 년 4 월 21 일 13:00-18:30, 3 층 로비 / 질의응답 일시 및 장소 : 2017 년 4 월 21 일 15:00-15:40, 3 층 로비**
초록순서 : **7** 형식 : **Poster**

Functional Mobility Screening of the Elderly in Acute Hospital Setting

Kyeong Eun Uhm[1*], Jong Won Lee[1], Hyuntae Kim[1], Yoon-Sook Kim[2], Jae-Min Park[3], Jaekyung Choi[3], Yeonsil Moon[4], Seol-Heui Han[4], Jongmin Lee[1†]

Konkuk University School of Medicine and Konkuk University Medical Center, Department of Rehabilitation Medicine[1], Konkuk University Medical Center, Department of Quality Improvement[2], Konkuk University School of Medicine, Department of Family Medicine[3], Konkuk University School of Medicine, Department of Neurology[4]

Purpose
It is known that acute hospitalization of the elderly can result in a significant decline in functional mobility. This functional decline is not related with their presenting illness and early mobilization tailored to their functional mobility may prevent it. We developed a screening questionnaire and investigated the status of functional mobility of the elderly patients at the time of admission and discharge in acute hospital setting.
Methods
Questionnaire is composed of 3 questions: Question 1. “Can you transfer from a bed to a chair/wheelchair?” Question 2. “Can you walk to a toilet?” Question 3. “Can you climb up stairs?” Possible answers were independent, need assistance, or impossible. Mobility level (A-D) was determined by following categories : A. independently climb up the stairs; A’. can climb up the stairs with assistance; B. can walk to the toilet but cannot climb up stairs; C. can transfer from a bed to a chair/wheelchair but cannot walk to the toilet; D. cannot transfer from a bed to a chair/wheelchair. All patients with age 65 or older were screened at the time of admission in the acute hospital by nursing staffs. At discharge, follow-up evaluation was carried out with informed consent.
Results
A total of 3,116 (1600 males, 51.3%) elderly patients who were admitted from October 2016 to February 2017 were included in this study. Mean age was 74.1±6.4 (range 65-98). 2,408 (77.3%), 409 (13.1%), 91 (2.9%), 32 (1.0%), 173 (5.6%) patients were classified into mobility level A, A', B, C, and D. (in order of function, climbs up stairs independently to bed-ridden) Female showed significantly more impaired functional mobility compared with male subjects. With increasing age, proportion of mobility level A decreased and D increased. Among the 447 patients with follow-up evaluation, 34 patients showed significant functional decline during admission. Patients with impaired mobility (mobility level A’-D) were increased from 20.8% to 32.2% ($p<0.05$).
Conclusion
These data suggest that this simple 3 questions are useful for screening of functional mobility. Elderly patients in acute hospital setting showed functional decline during admission and early mobilization program during hospitalization is required.

통증 및 근골격재활
게시일시 및 장소 : **2017 년 4 월 21 일 13:00-18:30, 3 층 로비 / 질의응답 일시 및 장소 : 2017 년 4 월 21 일 15:00-15:40, 3 층 로비**
초록순서 : **107** 형식 : **Poster**

The Effect of Extracorporeal Shock Wave Therapy on Superior Cluneal Nerve Entrapment Neuropathy

Bong Yeon Lee[1*], June Kyung Lee[1], Woo Yong Shin[1], Min ji Ahn[1], Yu Ri Choi[1], Seo Ra Yoon[1†], Kwang Ik Jung[1]

Gwangju Veterans Hospital, Department of Rehabilitation Medicine[1]

Objective: The aim of this study is to investigate whether extracorporeal shock wave therapy (ESWT) improve symptoms and functions in superior cluneal nerve entrapment neuropathy (SCN-EN) with low back pain.

Patients and Method: We enrolled 30 patients who were diagnosed with SCN-EN based on the clinical symptoms and physical exams. Patients had unilateral low-back pain involving the iliac crest and buttock, a trigger point over the posterior iliac crest located 7cm from the midline and numbness and radiating in the superior cluneal nerve area on compression of the trigger point. Symptom relief of more than 75% has been obtained within 2hours after inducing lidocaine nerve block, and a 75% pain reduction confirmed diagnosis. We included patients with pain relief by first block but recurred pain after analgesic effect of the injection wore off. The patients were classified into 2 groups by randomization: Group I patients (n=15) received ESWT on the trigger point 4 times with a week interval. ESWT was performed with 1000 shock wave and with energy level of 0.04 mJ/mm2 (Dornier AR2®). Group II patients (n=15) had local nerve block by injecting 2ml of 1% lidocaine at trigger point 4 times with a week interval. Visual analogue scale (VAS) and Roland-Morris Disability Questionnaire (RMDQ) scores were used to evaluate severity of symptoms and functions. These measurements were taken baseline and at 1week, 4weeks after treatment.

Result: There were no significant differences in the baseline characteristics between two groups. Both treatment groups showed significant improvement in VAS and RMDQ scores after treatment. There were no significant differences between two groups at 1 week and 4weeks after treatment.

Conclusion: Our result suggest that ESWT improve symptoms and functions in SCN-EN with low back pain. Further long-term follow-up will be needed to compare the long-term result of both groups.

신경근육재활 및 전기진단
게시일시 및 장소 : **2017 년 4 월 21 일 13:00-18:30, 3 층 로비 / 질의응답 일시 및 장소 : 2017 년 4 월 21 일 15:00-15:40, 3 층 로비**
초록순서 : **60** 형식 : **Poster**

Localization of Ulnar Neuropathy at the Wrist using Short Segment Incremental Study

Min Je Kim[1*], Dong Hwee Kim[1†], Byung Kyu Park[1], Ki Hoon Kim[1]

Korea University College of Medicine, Department of Physical Medicine & Rehabilitation[1]

Introduction: Ulnar neuropathy at the wrist (UNW) is not common disease compared with ulnar neuropathy at the elbow (UNE) and it is not easy to discriminate UNW from UNE. The ulnar nerve enters Guyon's canal at the level of the pisiform. The ulnar nerve divide into superficial and deep braches in the canal. This study is designed to demonstrate the usefulness of short segment incremental study (SSIS) of ulnar nerve for diagnosing and localizing UNW.

Materials and Methods: Eighteen ulnar nerves of 17 patients (male, 11; female, 5) with UNW who had typical symptoms and signs of ulnar neuropathy were retrospectively enrolled. Routine electrodiagnostic tests including ulnar motor nerve conduction studies with abductor digiti minimi and first dorsal interosseous muscle recordings and ulnar sensory and dorsal ulnar cutaneous sensory nerve conduction studies were performed. The UNW was classified by Oh's method: Type I, involvement of deep and superficial branches; Type II, involvement of entire deep branch; Type III, involvement of deep palmar branch; Type IV, involvement of superficial branch. Ulnar motor and sensory SSISs at wrist were performed for the lesion localization around wrist. Ulnar motor SSIS at wrist was performed with FDI muscle recording, and ulnar sensory SSIS at wrist, 5th fingers recording. The ulnar nerve was stimulated at 3 points: 3cm distal to the pisiform, just lateral to the pisiform, and 2cm proximal to the pisiform. In 1 patient, additional stimulation was performed at 5cm distal to pisiform. According to the results of ulnar motor and sensory SSISs at the wrist, lesion localization was grouped into proximal and distal lesion to pisiform (P and D groups, respectively)

Results: The median age of the participants was 44.9 years (range 28~62), and median symptom duration, 3 months (range 1~24). Based on routine nerve conduction studies, Type I was 10 (55.6%); Type II, 7 (38.9); Type IV, 1 (5.6%). Lesion localization according to Oh's classification of UNW demonstrated that Type I had 7 proximal and 3 distal lesion; Type II, 1 proximal and 6 distal lesion; and Type IV, 1 distal lesion. Among Type II, one case showed lesion site was between 3 cm and 5 cm distal to pisiform with additional 4th stimulation.

Conclusion: Motor and sensory SSIS of ulnar nerve around wrist is very useful for diagnosing UNW and localizing its lesion. Also, using motor and sensory SSIS around wrist, it could be helpful to discriminate the involved branch of ulnar nerve around pisiform.

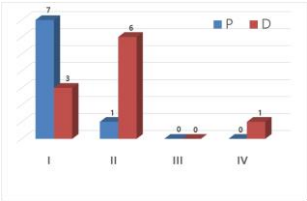

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Fig 1. Lesion localization according to Oh's classification of ulnar neuropathy at the wrist. Type I, involvement of deep and superficial branches; Type II, involvement of entire deep branch; Type III, involvement of deep palmar branch; Type IV, involvement of superficial branch; P, proximal lesion to pisiform; D, distal lesion to pisiform.

Case report of People who Return to Work after Calcaenal Fracture

Ga Eun Lee[1,1*†], Jae Hyun Yu[1], Sang Hee Kim[1]

Daegu hospital, Korea Workers' Compensation & Welfare Service, Department of Physical Medicine and Rehabilitation[1]

Objective : The purpose of this study was to describe the epidemiology about people who return to work after calcaneal fracture and suggest directions and guidelines for successful returning-to-work (RTW).
Method : Medical records of patients with calcaneal fracture who participated in RTW program with work conditioning and hardening and returned to work were reviewed for this study.
Results : Subjects were 3 men with calcaneal fracture. Age of those was between 38-54 years old. Mechanisms of injury are falling down (2) or crushing by forklift truck (1). 2 persons with intra-articular fracture of calcaneus were treated by surgical fixation. And 1 person were treated by conservative method. 1 person had traumatic extradural hemorrhage which were removed surgically through craniotomy. He experienced mild cognitive impairment. 1 person had bilateral calcaneal fracture fixed with instrumentations. 1 person was diagnosed left calncaneal fracture accompanied with fractures of left medial malleolus and great toe treated conservatively. Physiatrist checked their x-ray film regularly and serially to observe the degree of bone union. After Physiatrist confirmed proper bone union of fracture site in calcaneus and allowed the patients to bear theit weight on the feet gradually. We examined their work capacity with Evaltech® after 7-9 months from injury. 2 of 3 people did not meet their job demands and 1 person lacked the ability to consider job conversion. They were trained with program of work conditioning and hardening according to each job demands to their ability for 8-12weeks. Following it they were evaluated with Evaltech® again. Final evaluations revealed that 2 person fulfiled their job demands and 1 men still lacked the ability to consider job conversion. 2 patients returned to pre-injury job. And 1 patient was employed at a new firm. It took 9-12 monoths from onset of injury to RTW.
Conclusion : Despite adequate reduction and treatment, calcalneal fractures might be severly disabling injuries, with variable prognoses and degree of functional debilitation with chronic pain problem. We have to make effort for people with troublesome fractures of calcaneus to return to work through mulidisciplinary team approach : individualized treatment plan, detailed interview with employer and employee, accurate analysis of work environment, and early intervention of RTW program in time.

뇌신경재활
게시일시 및 장소 : **2017 년 4 월 21 일 13:00-18:30, 3 층 로비 / 질의응답 일시 및 장소 : 2017 년 4 월 21 일 15:00-15:40, 3 층 로비**
초록순서 : **44** 형식 : **Poster**

Relationship between Impairment and Disability in Chronic Stroke Patients: the KOSCO Study

Hyun Woo Rho[1*], Min Kyun Sohn[2], Jongmin Lee[3], Deog Young Kim[4], Sam-Gyu Lee[5], Yong-Il Shin[6], Gyung-Jae Oh[7], Yang-Soo Lee[8], Min Cheol Joo[9], Eun Young Han[10], Jeong Hyun Kim[1], Won Hyuk Chang[1], Yun-Hee Kim[1,11†]

Samsung Medical Center, Sungkyunkwan University School of Medicine, Department of Physical and Rehabilitation Medicine, Center for Prevention and Rehabilitation, Heart Vascular and Stroke Institute[1], School of Medicine, Chungnam National University, Department of Rehabilitation Medicine[2], Konkuk University School of Medicine, Department of Rehabilitation Medicine[3], Yonsei University College of Medicine, Department and Research Institute of Rehabilitation Medicine[4], Chonnam National University Medical School, Department of Physical and Rehabilitation Medicine[5], Pusan National University School of Medicine, Department of Rehabilitation Medicine[6], Wonkwang University, College of Medicine, Department of Public Health and Preventive Medicine[7], Kyung-pook National University College of Medicine, Department of Rehabilitation Medicine[8], Wonkwang University School of Medicine, Department of Rehabilitation Medicine[9], Jeju University Hospital, University of Jeju College of Medicine, Department of Rehabilitation Medicine[10], SAIHST, Sungkyunkwan University, Department of Health Science and Technology, Department of Medical Device Management & Research[11]

Objectives: Impairment can result in disability that is manifested by the reduced ability for functional activities. However, the nature of the relation between impairment and disability remains unclear in patients with chronic stroke. The Korean-National Institute of Health Stroke Scale (K-NIHSS) is a 15-item neurological examination scale for impairment, and the Korean Version of Modified Barthel Index (K-MBI) is a standardized disability scale in stroke patients. The objective of this study is to investigate the association between impairment with K-NIHSS and disability with K-MBI in patients with chronic stroke.

Materials and Methods: This study is the interim results of the Korean Stroke Cohort for Functioning and Rehabilitation (KOSCO) designed as 10 years long-term follow-up study of stroke patients. All patients who admitted to the representative hospitals in 9 distinct areas of Korea with their acute first-ever stroke were recruited. We analyzed data of total 5,384 stroke patients who completed functional assessment (K-NIHSS and K-MBI) at 6 months after stroke onset. The impairment severity was assessed with K-NIHSS and the disability severity was assessed with K-MBI using face-to-face assessments at 6 months after stroke onset. To assess the relating impairment on the functional disability, linear regression analysis with stepwise method was performed with K-MBI and each item in K-NIHSS

Results: Of the patients in this study, 79.6% suffered from ischemic stroke and 20.4% experienced hemorrhagic stroke. The mean patient age was 64.3 years, and the ratio of males to females was 1.42:1. The mean K-MBI at 6 months was 85.1 (0-100). The independently significant relating factor to K-MBI were motor leg, level of consciousness, facial palsy, motor arm, limb ataxia, dysarthria, and sensory item in K-NIHSS ($p<0.05$). The most influencing impairment domain on the functional level was motor leg item and followings were level of conscious, limb ataxia, facial palsy, motor arm, dysarthria, and sensory item in order.

Conclusion: These results demonstrated that there were different influencing levels of each impairment domain on the functional disability in patients with chronic stroke. These results could provide useful information to plan the rehabilitation strategy of stroke patients to improve the functional independency.

뇌신경재활
게시일시 및 장소 : **2017 년 4 월 21 일 13:00-18:30, 3 층 로비 / 질의응답 일시 및 장소 : 2017 년 4 월 21 일 15:00-15:40, 3 층 로비**
초록순서 : **45** 형식 : **Poster**

BODY REGIONAL DIMORPHISM IN ASSOCIATION BETWEEN QEEG AND MOTOR RECOVERY IN POST-STROKE PATIENTS

Eun Kyoung Kang[1*†], Wanjoo Park[2], Young Kee Min[1], Laehyun Kim[2]

Kangwon National University School of Medicine, Kangwon National University Hospital, Department of Rehabilitation Medicine[1], Korea Institute of Science and Technology, Center for Bionics[2]

Purpose: This study aimed to elucidate the association between qEEG indices and motor recovery based on body regional differences.
Methods: In total, 19 patients with right middle cerebral territory infarction (15 male subjects; mean age, 66.1±9.7 years) were recruited. Resting, 32-channel EEG and a 19-channel subset (recorded for up to 12 min total), and Motricity Index of the affected side (MI; upper and lower limbs) were acquired at 13.7±9.0 post-onset day, and MI was re-evaluated at 28.6±12.6 day after the first evaluation. After data filtering (high pass 0.1 Hz, low pass 55 Hz) and visual artifact rejection, 128 s of EEG were analyzed. Power spectral density was estimated for delta (1–4 Hz), theta (5–7 Hz), alpha (8–12 Hz), and beta (13–30 Hz) frequency bands using Welch's method. The association between qEEG indices and MI was analyzed using partial correlation analysis adjusted with initial severity (K-NIHSS), and durations of post-onset and between evaluations.
Results: Partial correlation showed that the absolute/relative initial theta power showed positive correlations with the differences between MI1Upper and MI2Upper in the overall brain areas, while there was no significant association between the qEEG indices and follow-up MI2Upper. There were negative associations between the absolute/relative beta power in the ipsilesional hemisphere and MI2Lower. Additionally, the absolute delta and beta power showed negative correlation with the differences between MI1Lower and MI2Lower in one EEG channel respectively, while the relative delta power showed positive correlation in one EEG channel.
Conclusion: There were close associations between the theta power and motor function in the affected upper limb and between the alpha and beta power and motor function in the affected lower limb. This suggests that body regional dimorphism should be considered in assessing the association between qEEG indices and functional recovery as a part of neurorehabilitation.

qEEG		EEG Channel	MI^1_{Upper}	MI^1_{Lower}
Absolute	Theta	Fp1, Fp2, F3, F7, F8, Cz, Pz, T3, T4, T5	-0.56, -0.54, -0.54, -0.57, -0.50, -0.53, -0.57, -0.54, -0.53, -0.49	n.s.
	Alpha	**Pz**, Cz, O1	n.s.	**0.63**, 0.49, 0.49
	Beta	F8, C4	n.s.	-0.50, -0.53
Relative	Delta	F3, Fz, Pz	n.s.	-0.50, -0.52, -0.49
	Theta	Fp2, P3, F7 Pz, T4	-0.50, -0.54, -0.48, -0.50, -0.52	n.s.
	Alpha	F3, O1	n.s.	0.49
	Beta	**F4**, **F8**, C4 P4, O2, Cz	n.s.	**-0.62**, **-0.64**, -0.59, -0.52, -0.52, -0.55

MI^1_{Upper}, affected upper limb Motricity Index at the first evaluation; MI^1_{Lower}, affected upper limb Motricity Index at the first evaluation; Values in bold for significance, $p<0.01$; other values indicate correlation coefficient, $p<0.05$.

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Significant partial correlations after controlling for the initial severity, and post-onset days

qEEG		EEG Channel	MI^2_{Upper}	MI^D_{Upper}	MI^2_{Lower}	MI^D_{Lower}
Absolute	Delta	C4	n.s.	n.s.	n.s.	-0.54
	Theta	**Fp1**,Fp2,F3, F4,**F7**, F8, Fz,Cz,P3, P4,**Pz**,T3, T4,T5,O1	n.s.	**0.65**, 0.62, 0.62, 0.53, **0.63**, 0.56, 0.54, 0.56, 0.53, 0.51, **0.63**, 0.61, 0.58, 0.60, 0.51	n.s.	n.s.
	Beta	Fp2, F8, **C4**	n.s.	n.s.	-0.73, **-0.67**	-0.50
Relative	Delta	Fp1				0.50
	Theta	Fp1, **Fp2**, F3, F4, **F7**, **F8**, Fz, C3, C4, Cz, **P3**, **P4**, **Pz**, T3, **T4**, T6, O1, O2,	n.s.	0.59, **0.65**, 0.57, 0.57, **0.66**, **0.65**, 0.51, 0.59, 0.54, 0.55, **0.67**, **0.63**, **0.66**, 0.62, **0.63**, 0.44, 0.58, 0.57,	n.s.	n.s.
	Beta	F4, F8, C4,			-0.51, -0.58, -0.59,	

MI^2_{Upper}, affected upper limb Motricity Index at the second evaluation; MI^2_{Lower}, affected upper limb Motricity Index at the second evaluation; MI^D_{Upper}, difference between MI^1_{Upper} and MI^2_{Upper}; MI^D_{Lower}, difference between MI^1_{Lower} and MI^2_{Lower}; Values in bold for significance, $p<0.01$; other values indicate correlation coefficient, $p<0.05$.

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Significant partial correlations after controlling for the initial severity, post-onset days, and re-evaluation duration

재활정책
게시일시 및 장소 : **2017 년 4 월 21 일 13:00-18:30, 3 층 로비 / 질의응답 일시 및 장소 : 2017 년 4 월 21 일 15:00-15:40, 3 층 로비**
초록순서 : **76** 형식 : **Poster**

Relationship between Rehabilitation Treatment and Survival Rate: National Sample Cohort Study

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Introduction
Stroke is one of the major causes of death worldwide, with a high incidence of comorbidities. Also, survivors are often accompanied by permanent neurological damage. When neurological injury is accompanied, rehabilitation is performed to improve symptoms and reduce mortality. Previous studies have reported that rehabilitation improves quality of life and increases life expectancy when rehabilitation is performed, but the studies were limited to patients.
The purpose of this study was to investigate the relationship between treatment cost, length of hospital stay, number of rehabilitation treatments and survival rate after stroke, using National Sample Cohort(NSC) data to help establish proper stroke rehabilitation medical care system.

Methods
We used the NSC data from 2008 to 2013 to analyze patients diagnosed with stroke by defining acute phase from onset to 6 months and chronic phase from 6 months to 2 years. In order to confirm the severity of the patient, the degree of disability was used. We divided them into normal, moderate, and severe. The cost of treatment included all costs of treatment, including rehabilitation, and the length of hospital stay included all hospital stays, including hospitalization for rehabilitation. The number of rehabilitation treatments was measured by counting the physical therapy or occupational therapy. The relationship between treatment cost, length of hospital stay, and the number of rehabilitation treatment was analyzed according to disability grade. The Kaplan-Meier estimator and Cox's regression were used for the analysis.

Results
In the acute phase, the higher the treatment cost, the longer the hospital stay and less frequent the rehabilitation treatment the higher the mortality rate of rehabilitation treatment. (Table 1).
However, in the chronic phase, the treatment cost and the length of hospital stay tended to be opposite, and the number of rehabilitation treatments showed the same result. (Table 2).

Conclusion
The treatment cost and the length of hospital stay do not reflect the effectiveness of direct rehabilitation, but provide indirect information. In acute phase, the longer the hospital stay was, the higher the mortality rate was. However, in chronic phase, the opposite result was obtained. This is due to the high incidence of complications during the acute phase, and other factors other than rehabilitation therapy, such as pneumonia and urinary tract infection, require a great deal of cost and financial resources, while the proportion of rehabilitation treatment and hospitalization. In the case of the number of rehabilitation treatments, the survival rate tended to increase as the number of treatments increased in both the acute phase and the chronic phase.
In conclusion, not only the acute phase but also the chronic period, the greater the cost of treatment, the more hospitalized rehabilitation treatment, the more effective it is to reduce the mortality rate.

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Table.1. The relationship between treatment cost, length of hospital stay, number of rehabilitation treatment, and mortality rate in the acute phase

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Table.1. The relationship between treatment cost, length of hospital stay, number of rehabilitation treatment, and mortality rate in the acute phase

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Table 2. The relationship between treatment cost, length of hospital stay, number of rehabilitation treatment, and mortality rate in the chronic phase

신경근육재활 및 전기진단
게시일시 및 장소 : **2017** 년 **4** 월 **21** 일 **13:00-18:30, 3** 층 로비 / 질의응답 일시 및 장소 : **2017** 년 **4** 월 **21** 일 **15:00-15:40, 3** 층 로비
초록순서 : **61** 형식 : **Poster**

The Impact of diabetes on Gait Speed and Peripheral Nerve Function in Chronic Kidney Disease Patients: A Prospective study

Jaesam Seo[1*], Young Sook Park [1†], Hyun Jung Chang[1], Yun Hee Park[1], You Hong Song [1], Eunsol Cho[1]

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Objective: To investigate the impact of diabetes on physical function, including gait speed and peripheral nerve function in chronic kidney disease (CKD) patients.
Methods: A prospective study was carried out from june 2015 to December 2016. Patients who received maintenance hemodialysis (HD) under the care of the renal unit were enrolled in the study after fulfilling the inclusion and exclusion criteria. Patients were evaluated demographic data and functional data—usual gait speed, vibration perception threshold for the index finger (VPT-F) and the great toe (VPT-T), and peripheral neuropathy (PN) along with the degree of its severity—were collected.
Results: We screened a total of 276 adult CKD patients (over the age of 18) and sixty patients(35 with and 25 without diabetes) who met the inclusion criteria were evaluated. After follow up, only 27 patients(14 with and 13 without diabetes) were included. When compared with 18 months ago, Diabetic CKD patients showed significantly impaired sensory function (VPT-T, 2.80±4.9->13.33±6.1, p=0.020) and severe PN (3.0±1.2 -> 3.29±0.9, p=0.001) as compared to those without diabetes(VPT-T, 8.38±1.4 -> 10.48±4.0, severe PN, 1.15±1.4 -> 1.23 ± 1.5) . There was association between the severity of peripheral neuropathy and usual gait speed(r=0.956, p=0.000).
Conclusion: Diabetes increased the severity of peripheral neuropathy and impaired sensory function in chronic kidney disease patients and impacted on the gait speed of these patients.
Keywords Chronic kidney disease, Diabetes, Peripheral neuropathy

신경근육재활 및 전기진단
게시일시 및 장소 : **2017 년 4 월 21 일 13:00-18:30, 3 층 로비 / 질의응답 일시 및 장소 : 2017 년 4 월 21 일 18:00-18:30, 3 층 로비**
초록순서 : **C35** 형식 : **Poster**

Diffuse denervation potentials on EMG at paraspinal muscles after prolotherapy for low back pain.

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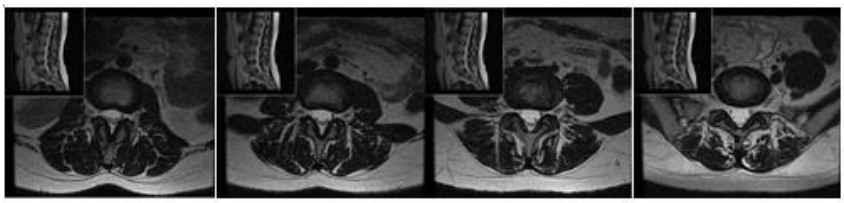
Incheon Nanoori hospital, Incheon, Republic of Korea., Department of Rehabilitation Medicine[1]

41-year-old female patient who complaint low back pain was visited. There was no radiating leg pain and no evidence of neurologic deficts. Howerver she showed upper motor neuron(UMN) signs including positive Hoffman's reflex, briskdeep tendon reflex on both bicpes and patellar tendons. We conducted needle electromyography(EMG) and nerve conduction study(NCS). NCS results was all within normal limit, however, on EMG exam, there were diffuse denervation potentials at lower thoracic to lower lumbar paraspinal muscles bilaterally. No abnormal sign was detected on both upper and lower extremities and bulbar area. Brain and whole spine magnetic resonance imaging(MRI) was done. MRI shower no definite abnormal sign. After detailed history taking, we could find out that the patient have got prolotherapy for low back pain at other medical center, 3 month before visiting. The injection was so painful that she could not endure and give up further prolotherapy. She described that 30 to 50 times she was stabbed with injection needle. We concluded that diffuse denervation potentials might be due to prolotherapy which can induce fibrosis and traumatic damage on muscles after procedure. The equivocal UMN signs on physical examination can be seen in normal person, especially in women. It made diagnosis more confusing. After life style modification and lumbar medial branch block, symptoms was improved gradually. This case examplifies that prolotherapy can cause denervation potentials on EMG at muscles near the targeted area and reminds us that detailed history taking should be performed.



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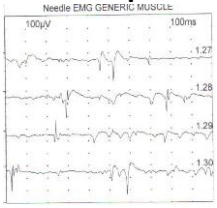
Lumbar Spine MRI Images



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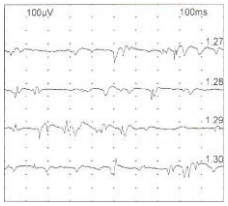
Active denervation potentials on Lt. mid-lumbar paraspinal muscle



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Active denervation potentials on Lt. lower thoracic paraspinal muscle

뇌신경재활
게시일시 및 장소 : **2017 년 4 월 21 일 13:00-18:30, 3 층 로비 / 질의응답 일시 및 장소 : 2017 년 4 월 21 일 15:00-15:40, 3 층 로비**
초록순서 : **46** 형식 : **Poster**

Balloon swallowing treatment for post-stroke patients with dysphagia: a randomized controlled trial

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Myongji Hospital, Seonam University College of Medicine, Department of Physical Medicine and Rehabilitation[1]

Objective
It is known that patients with PSD(post-stroke dysphagia), the dysfunction of the pharyngeal muscle and a lack of coordination of its actions are associated with arising from loss of control of central nervous system. We have proceeded a 4-week post-stroke dysphagia(PSD) rehabilitation protocol where conventional swallowing rehabilitation program is combined with pyriform sinus ballooning. In this study, we assessed its efficacy, safety and tolerability in patients with PSD.
Method
The current single-center, prospective, randomized, controlled study was conducted in a total of 45 patients with PSD who had been admitted to our medical institution between May of 2014 and October of 2016. Depending on whether our patients would additionally receive pyriform sinus ballooning, they were equally divided into 2 groups: the combination treatment group (n=15) and the control group (n=15). Then, we compared outcome measures between the 2 groups at baseline, 2 weeks and 4 weeks. At 4 weeks, the patient underwent evaluation for the width amount of pharyngeal remnant on the VFSS, penetration- aspiration scale (PAS) scores.
Results
In both group showed significant pharyngeal remnant and . Pharyngeal remnant is significant decreased at treatment group compare with conventional group in 2 week (27.22±15.74 vs 36.01 ±10.82 , p=0.045), 4 week (22.45±13.26 vs 33.82±11.63, p=0.03).
Conclusion
Pyriform sinus ballooning is a method based on voluntary or swallowing reflex. It is known that patients with severe dysphagia complain of swallowing difficulty due to sensory and motor dysfunctions due to a tube feeding. In these patients, attempts were made to recover the sensory and motor functions for normal swallowing functions using ballooning. In conclusion, pyriform sinus ballooning could be better choice to treat with dysphagia in PSD considering effectiveness and the possible complication of dysphagia treatment.

뇌신경재활

게시일시 및 장소 : **2017 년 4 월 21 일 13:00-18:30, 3 층 로비 / 질의응답 일시 및 장소 : 2017 년 4 월 21 일 15:00-15:40, 3 층 로비**

초록순서 : **47** 형식 : **Poster**

Structural Changes of the Contralesional Hemisphere in Patients with Chronic Hemorrhagic Stroke

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Ulsan University Hospital, Department of Rehabilitation Medicine[1], Ulsan University Hospital, Department of Neurosurgery[2]

Background: Whether hemorrhagic stroke over time may cause structural changes of white matter on contralesional hemisphere as well as on lesional hemisphere. Prior studies reported that after ischemic stroke, white matter integrity on the both hemispheres can be contributed to functional impairment. However, there is no study about structural changes after hemorrhagic stroke not only on the lesional hemisphere and but also on the contralesional hemisphere.
Objective: Present study using diffusion tensor tractography (DTT) are whether structural changes of the fornix and cingulum are on the both hemispheres. And whether the structural integrity of the fornix or the cingulum is correlated to cognitive functions using IQ.
Method: Six patients (mean age : 50.17 male: 4) with right putaminal hemorrhage more than 6 months previously and 6 healthy volunteers (mean age : 50.17 male: 4) were enrolled. Using DTT, we compared parameters of the fornix and cingulum between patient and control groups. Additionally, we analyzed the relation between the parameters of the neural tracts and cognitive function.
Results: Table 1 and 2 shown summarized main results. Only the right ADC was significantly lower than the left AD within patient group. We found that the right fornix FA and ADC of the patient group were significant difference at the lesional hemisphere compared with those of the control group (FA, p = .009/ ADC, p = 0.041). Interestingly, the fornix FA of the patient group was also significantly lower than that of the control group on the contralesional hemisphere (p=0.015). Only the right cingulum ADC was significantly higher than that of the control group on the lesional hemisphere (p=0.009). However, there is no significance between parameters of the neural tracts and IQ (fornix FA, p= 0.337; fornix ADC, p= 0.180; cingulum FA, p= 0.148; cingulum ADC p=0.939). .
Conclusion: In this study, we elucidated that white matter integrity after ICH influenced on the contralesional hemisphere as well as on the lesional hemisphere over time. This finding might contribute to the pathophysiologic mechanism for the brain degeneration and therapeutics after ICH.
This research was supported by Basic Science Research Program through the National Research
Foundation of Korea funded by the Ministry of Education (grant no. 2013R1A1A4A01013178).

Table1. In the patient group, Rt. And Lt. Difference comparison

		Rt.	Lt.	p-value
		Mean±SD	Mean±SD	
Fornix	FA	0.34±0.03	0.35±0.03	0.394
	ADC	1.81±0.29	1.68±0.32	0.485
	FN	268.83±143.20	429.50±257.08	0.310
Cingulum	FA	0.38±0.04	0.40±0.03	0.394
	ADC	0.87±0.04	0.81±0.03	0.015
	FN	1624.67±732.74	1835.33±754.17	0.699

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Table1. In the patient group, Rt. And Lt. Difference comparison

Table2. Difference between FA and ADC in two groups (patient group vs normal group)

		환자군(n=6)	정상군(n=6)	p-value
		Mean±SD	Mean±SD	
Fornix	FA Rt.	0.34±0.03	0.39±0.03	0.009
	FA Lt.	0.35±0.03	0.42±0.04	0.015
	ADC Rt.	1.81±0.29	1.45±0.21	0.041
	ADC Lt.	1.68±0.32	1.42±0.19	0.132
Cingulum	FA Rt.	0.38±0.04	0.41±0.03	0.093
	FA Lt.	0.40±0.03	0.42±0.03	0.310
	ADC Rt.	0.87±0.04	0.79±0.02	0.009
	ADC Lt.	0.81±0.03	0.79±0.03	0.240

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Table2. Difference between FA and ADC in two groups (patient group vs normal group)

통증 및 근골격재활
게시일시 및 장소 : **2017 년 4 월 21 일 13:00-18:30, 3 층 로비 / 질의응답 일시 및 장소 : 2017 년 4 월 21 일 15:00-15:40, 3 층 로비**
초록순서 : **108** 형식 : **Poster**

The efficacy of Platelet-rich plasma on plantar fasciitis: meta-analysis

Jihye Park[1*], Young Jin Ko[1†], Sae Rom Kang [1]

The Catholic University of Korea Seoul St. Mary[1]

Objectives : Plantar fasciitis(PF) is common cause of heel pain, but effective treatement is still unknown. The purpose of this research was to compare the effectiveness of platelet rich plasma(PRP) versus steroid in reducing pain and improving function in the treatment of PF.
Methods : We searched the Pubmed, EMBASE, and the Cochrane library databases for studies, published to December 2016. All randomized controlled studies that compared PRP with steroid injection on plantar fascia were included. Main outcomes were collected and analyzed by the Review Manager 5.3.
Results : Four RCTs (230 patients) of 58 identified studies were eligible. This meta-analysis showed that there was no significant difference in pain visual analog scale(VAS) in the short-term(~1month: SMD -0.04, 95% CI [-1.29, 1.21]). However, PRP was superior to steroid for pain relief in the intermediate-term (3month: SMD -0.90, 95% CI [-1.79, -0.01]) and long-term(6-12month: SMD -0.90, 95% CI [-1.59, -0.21]). And there was no significant difference in functional improvement in the intermediate-term(3month: SMD 0.44, 95% CI [-0.41, 1.29]).
Conclusion: PRP appears to be more effective in relieving pain in the intermediate-term(3month) and long-term(6-12month). Considering long-term effectiveness of PRP, we recommend PRP as the preferred option for PF.

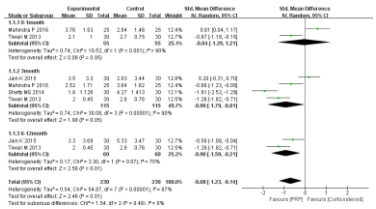

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Fig 1. Forest plot of standardized mean difference for the assessment of pain relief.

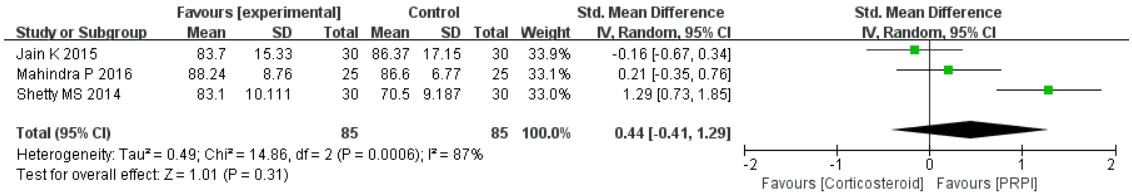

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Fig 2. Forest plot of standardized mean difference for the assessment of functional improvement.