통증 및 근골격재활

발표일시 및 장소 : 10 월 18 일(금) 15:05-15:15 Room A(5F)

OP1-2-6

Relationship between femoral muscle volume and function using MRI in unilateral transfemoral amputee

HANBIT KO[1*], IL-YOUNG JUNG[1,2], CHANG WON MOON[1], KANG HEE CHO[1,2†]

Department of Rehabilitation Medicine, School of Medicine, Chungnam National University, Daejeon, South Korea[1], Biomedical Engineering Center, Chungnam National University College of Medicine, Daejeon, South Korea [2]

Objective

To evaluate the femoral muscle volume of normal and affected side by using 3D modeling based on the MR images in the trans-femoral amputee and confirm the relationship between the lower limb function and the change in muscle volume of amputation limb.

Methods

Total seven subjects with trans-femoral amputation using prosthesis were enrolled. They were checked for gait and balance function using clinical tests, such as 10 m walk test(10MWT), 6 minute walk test(6MWT), respiratory gas analysis during treadmill gait, Berg balance scale and automatic balance test. Five subjects were evaluated for bilateral femoral muscle volume by MR imaging, and the volume of the femoral muscles was reconstructed by 3D remodeling software. According to the anatomical function, muslces were classified into 4 groups; hip flexor, hip adductor, hip extensor and knee flexor, and knee extensor. The functional muscle groups with more volume reduction rate on the amputation side were identified and compared with the volume reduction rate and function.

Results

The mean age of the subjects was 50.3 years and the mean duration of walking after the amputation was 41.6 months. The mean walking speed was 1.98m/s with a 10MWT, and the mean walking distance was 305.73m by 6MWT The gait and balance functions were lower than normal values reported previously. There were statistically differences between normal and amputation side in femur length, total muscle volume and muscle volume by function except the hip adductor group ($p<0.05$). Hip extensor and knee flexor volume reduction (%) and VO2/kg, O2 Cost, and metabolic equivalent of task during gait were negatively correlated ($rs=-0.9$, $p=0.037$) in respiratory gas analysis.

Conclusions

In unilateral femoral amputee using prosthesis for gait, residual muscle mass changes at the amputated limb are associated with gait and balance functions. The muscle volume

reduction of the stump is prominent in knee extensors, hip extensors and knee flexors. Further research is needed to determine if training in maintaining the muscle mass of amputated limb can help in functional changes.

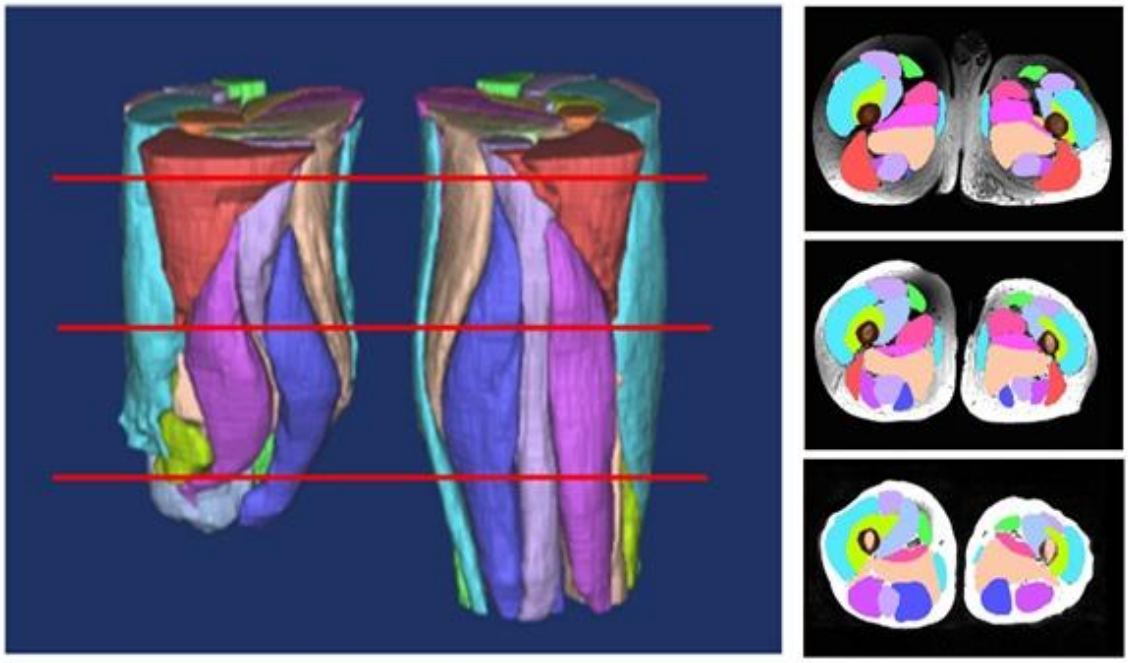

Fig. 1 A three dimensional modeling case of bilateral femoral MRI

Table 1. Femur length and muscle volume differences

	Normal length (n=5)	Amputation length (n=5)	Reduction rate (%)
Femur length (cm) *	48.98±3.44	32.82±6.41	31.69±5.83
Muscle groups	Normal average volume (n=5)	Amputation average volume (n=5)	Reduction rate (%)
Total (cm^3) *	3633.21±496.93	1943.76±607.46	47.20±11.55
Hip adductors	1022.57±102.38	732.13±229.09	29.26±17.70
Hip extensors and knee flexors*	647.96±187.30	308.15±153.93	52.88±24.39
Knee extensors*	1562.83±260.56	637.86±254.19	59.96±11.70

* P<0.05