

P-58 Surface Laryngeal Electromyography in Aspiration Pneumonia: A Case-Control Study



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Introduction

- **Dysphagia is major risk factor for aspiration pneumonia.**
- Dysphagia can be diagnosed with **video fluoroscopic swallowing study (VFSS)**, but it is limited by **accessibility, radiation exposure, and aspiration risk**, and primarily provides **qualitative assessment of swallowing mechanics.**
- **Surface laryngeal electromyography (sEMG)** offers a **non-invasive and quantitative method** for assessing **swallowing-related muscle activity without radiation exposure or aspiration risk.**
- This study aimed **to compare sEMG values** between patients with **aspiration pneumonia and normal swallowing individuals.**

Methods

Subjects

- 54 Korean adults who complained of **dysphagia**
- Performed **surface laryngeal EMG & video fluoroscopic swallowing study (VFSS)**
- Participants were divided into two groups, **matched 1:1 for age and sex.**
- : 27 dysphagia patients **with aspiration pneumonia** confirmed by **chest CT**
- : 27 dysphagia patients **with normal swallowing function** confirmed by **VFSS (DOSS 7)**

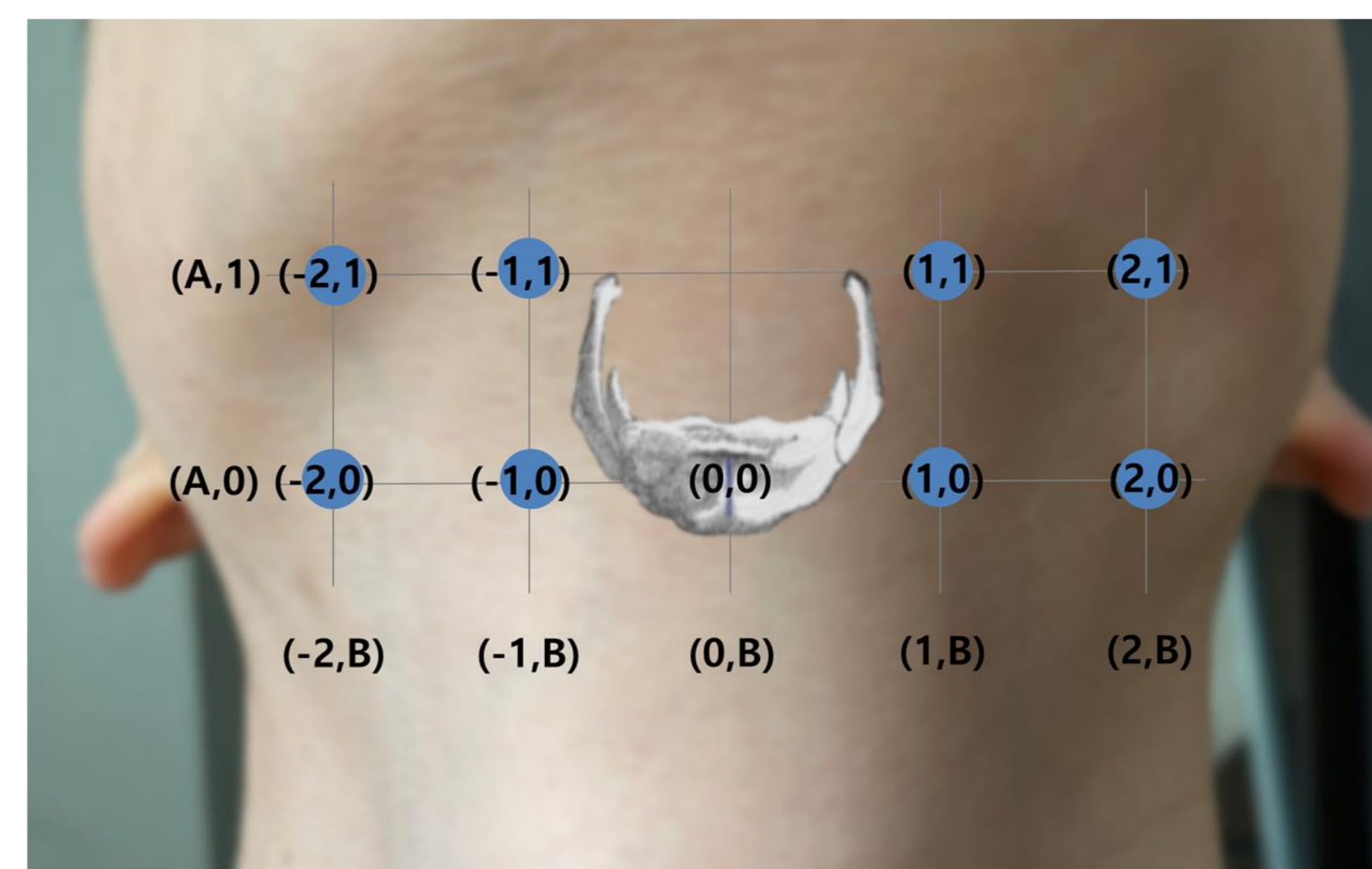


Figure 1. Location of electrodes over anterior neck. Electrodes were placed at 2-cm intervals around the hyoid (0,0): superior (0,1), inferior (0,-1), right (-1,0; -2,0), and left (1,0; 2,0).

Methods

- **Eight electrodes** were placed on the anterior neck at **2-cm intervals based on the hyoid (0,0)** (Fig. 1)
- Measurements were taken at **the hyoid level and 2 cm above**, where **correlations with PAS scores** have been reported
- **Amplitude** and **swallowing duration** were measured using **surface laryngeal EMG**
- **Amplitude** was defined as **peak-to-peak voltage**, and **duration** as **time from onset to baseline**

Statistical analysis

- **Paired t-tests**
- : Evaluated **significant difference in each value** of sEMG between the **aspiration pneumonia group and the normal swallowing group** according to each anterior neck electrode location

Results

Table 1. Baseline Characteristics of Study Participants

Characteristics	Total (N = 54)	Aspiration pneumonia (N = 27)	Normal swallowing individual (N = 27)	p-value*
Age (yr)	58.96±6.71	56.57±5.63	63.58±8.02	0.853
Sex (male) (%)	42 (77.78)	21 (38.89)	21 (38.89)	>0.999
Sex (female) (%)	12 (22.22)	6 (11.11)	6 (11.11)	
Height (cm)	163.24±8.30	163.66±6.79	162.81±9.70	0.615
Body weight (kg)	58.9±11.59	56.44±10.57	61.37±11.85	0.089
BMI (kg/m ²)	22.02±3.51	21.00±3.51	23.03±3.27	0.044*
Comorbidities				
Hypertension (%)	32 (59.26)	18 (33.33)	14 (25.93)	0.453
Diabetes (%)	24 (44.44)	17 (31.48)	7 (12.96)	0.024*
Dyslipidemia (%)	23 (42.59)	14 (25.93)	9 (16.67)	0.228
CHF ^a (%)	4 (7.41)	1 (1.85)	3 (5.56)	0.617
CAD ^b (%)	5 (9.26)	2 (3.70)	3 (5.56)	>0.999
A-fib ^c (%)	5 (9.26)	2 (3.70)	3 (5.56)	>0.999
COPD ^d (%)	5 (9.26)	2 (3.70)	3 (5.56)	>0.999
Etiology				0.637
Without any stroke	35 (64.81)	17 (62.96)	18 (66.67)	
Lateralization in stroke : Right (%)	6 (11.11)	3 (5.56)	3 (5.56)	
Lateralization in stroke : Left (%)	13 (24.07)	7 (12.96)	6 (11.11)	

Table 2. Etiology of Study Participants

Etiology	Total	Aspiration pneumonia	Normal swallowing individual
Ischemic stroke (%)	11 (20.37%)	5 (9.26%)	6 (11.11%)
Lateralization : Right (%)	4 (7.41%)	2 (3.70%)	2 (3.70%)
Lateralization : Left (%)	7 (12.96%)	3 (5.56%)	4 (7.41%)
Hemorrhagic stroke (%)	8 (14.81%)	5 (9.26%)	3 (5.56%)
Lateralization : Right (%)	2 (3.70%)	1 (1.85%)	1 (1.85%)
Lateralization : Left (%)	6 (11.11%)	4 (7.41%)	2 (3.70%)
Lateralization in stroke : Right (%)	6 (11.11%)	3 (5.56%)	3 (5.56%)
Lateralization in stroke : Left (%)	13 (24.07%)	7 (12.96%)	6 (11.11%)
Neurodegenerative (%)	10 (18.52%)	10 (18.52%)	0 (0.00%)
Others (%)	10 (18.52%)	4 (7.41%)	6 (11.11%)
Unknown (%)	15 (27.78%)	3 (5.56%)	12 (22.22%)

Values are mean (SD), or N (percentage)

^aCHF, congestive heart failure

^bCAD, coronary artery disease

^cA-fib, atrial fibrillation

^dCOPD, chronic obstructive pulmonary disease

*Continuous variables were analyzed using the paired t-test. Categorical variables were compared using McNemar's test, while the Stuart-Maxwell test was applied for the etiology variable

^eOther etiologies included oropharyngeal cancer, diffuse idiopathic skeletal hyperostosis (DISH), vocal fold paresis, brain tumor, chronic obstructive pulmonary disease (COPD), and dermatomyositis.

Table 3. Surface laryngeal EMG amplitude: aspiration pneumonia vs normal swallowing group

Location	AMP ^a		p value
	Aspiration pneumonia (N=27)	Normal swallowing individual (N=27)	
(-2,1)	405.20 (150.29)	569.67 (299.78)	0.018*
(-2,0)	307.43 (91.02)	463.26 (280.33)	0.007*
(-1,1)	495.07 (256.50)	504.89 (179.66)	0.869
(-1,0)	357.00 (132.27)	410.52 (109.43)	0.170
(1,1)	533.30 (256.00)	507.48 (220.98)	0.717
(1,0)	380.88 (157.77)	419.89 (130.58)	0.356
(2,1)	443.37 (179.92)	471.63 (192.69)	0.583
(2,0)	340.02 (127.37)	388.00 (105.94)	0.136

Table 4. Surface laryngeal EMG duration: aspiration pneumonia vs normal swallowing group

Location	Duration		p value
	Aspiration pneumonia (N=27)	Normal swallowing individual (N=27)	
(-2,1)	3340.78 (1355.21)	2244.78 (699.90)	0.001*
(-2,0)	3340.78 (1355.21)	2244.04 (700.42)	0.001*
(-1,1)	3333.37 (1293.51)	2192.93 (676.56)	<0.001*
(-1,0)	3333.37 (1293.51)	2189.96 (680.24)	<0.001*
(1,1)	3231.15 (1382.42)	2176.63 (625.64)	0.002*
(1,0)	3231.15 (1382.42)	2178.11 (624.42)	0.002*
(2,1)	3273.37 (1203.11)	2152.19 (631.39)	<0.001*
(2,0)	3273.37 (1203.11)	2153.67 (629.21)	<0.001*

Values are mean (SD)

^aAMP, amplitude

Conclusion

- Patients with **aspiration pneumonia** exhibited **prolonged swallowing duration on sEMG** compared with healthy controls, along with **reduced amplitudes** at selected sites.
- These findings suggest that **sEMG parameters, particularly swallowing duration, were associated with aspiration pneumonia.**
- **sEMG** may serve as an **objective, non-invasive adjunct and screening tool** for **dysphagia**, especially in **patients unable to undergo VFSS** (e.g., ICU or deconditioned states).