ORIGINAL

Oral Function, Handgrip Strength and Aspiration Pneumonia in Dysphagic Older Adult Inpatients in Vietnam

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ABSTRACT *Background/objective.* The Vietnamese older adult population has increased rapidly on an annual basis and dysphagia has become a common issue. Dysphagia and factors related to dysphagia will effect treatment in general and dietary treatment in particular. This study aimed to find out the relationship between dysphagia and oral function, handgrip strength and pneumonia in older adult inpatients in Vietnam. *Method.* The study was designed as a cross sectional study and was conducted from August 2018 to January 2019. There were more than one thousand older adult patients who met the inclusion criteria. The data about dysphagia status, oral function, muscle strength and pneumonia were collected by dietitians. *Results.* The proportions of older adult inpatients with the ability to open the mouth more than three fingers, move the tongue forward, move the tongue to the left and right, push the buccal mucosa with the tongue, inflate both cheeks and with no atrophy of the tongue and no tongue-surface dryness in the non-dysphagia group were more than dysphagia group ($p<0.001$). No difference was observed between those with and without dentures in the two groups. The dysphagic older adult inpatients had lower muscle strength than the non-dysphagics in both genders ($p<0.001$). There were 13.5% older adult inpatients who suffered from pneumonia. The pneumonia rate (39.2%) in the dysphagia group was higher than in the non-dysphagia group (8.4%). *Conclusion.* Dysphagia has a positive relationship with poor oral function, low handgrip strength and a high rate of pneumonia. Dietitians need to have an overview of dysphagia patients in order to supply a suitable texture-modified diet.

Key Words: elderly, patients, hospital, dysphagia, oral function, pneumonia, muscle strength

INTRODUCTION

Population aging is now a worldwide unavoidable trend. Dysphagia has become a common issue in older adult populations (1). Swallowing is a complex neuromuscular activity that consists of oral, pharyngeal, and esophageal phases, and involves the coordinated function of many muscles. Thus, many adverse health conditions can influence swallowing function. Neurological diseases, head/neck and esophageal cancer, and metabolic deficits are broad categories of diseases that might contribute to dysphagia.

The number of Vietnamese aged 65 and older is projected to increase rapidly from 7.8% in 2015 to 17.8% in 2050 (2). In previously published data, more than one thousand older adult inpatients in three large Vietnamese hospitals were screened for dysphagia through the use of quick and simple tools. The results showed that the rate of dysphagia was quite high, about 16.5% (3). This result is similar to other studies in Japanese and US older adult populations (4, 5). Therefore, dysphagia also is a main issue in older adult inpatients in Vietnam.

In clinical practice, dysphagia patients who suffer from neurological conditions such as stroke disease, Parkinson's disease may have limited oral function because of their neurological disorder. These abnormal oral functions, such as open mouth, tongue motion, inflated cheeks, dentures, atrophy of the tongue papilla and drying of the tongue surface may affect dysphagia status. These are simple tests but based on the dysfunction of each part of the oral cavity, the dietitian can decide which kind of texture-modified diet is suitable for each patient.

Muscle weakness may reflect a global effect of aging. The tongue is a key component in safe swallowing. Poor performance of the tongue leads to high risk of aspiration. There was a significant positive association between posterior tongue strength and handgrip strength (6). Checking handgrip strength may be supply information which reflects tongue strength and muscle of the body. On the basis of these data, a dietitian can design suitable menus for patients.

Dysphagia patients who aspirate are at an increased risk of acquiring pneumonia. A recent large-scale cross-sectional study of Japanese older adults showed that the risk factors for aspiration pneumonia were sputum suctioning, dysphagia, dehydration, and dementia; pneumonia is the third leading cause of death in this country (7, 8). Pneumonia is a serious consequence of dysphagia and a major cause of morbidity and mortality in the older adult; therefore, improving understanding of the prevalence of dysphagia in people with pneumonia is also important to highlight the necessary for better management of dysphagia to prevent development of this serious condition.

In this study, dietitians would directly collect the oral function indicators and muscle strength and pneumonia status of subjects. We thought that by understanding oral function, muscle strength, and pneumonia status, the dietitian can provide dysphagia patients suitable food choices. The aim of this study was to find the relationship between dysphagia and oral function, muscle strength and pneumonia status in dysphagic older adult inpatients in Vietnamese hospitals.

METHOD

Settings and Sample

The study was designed as a cross-sectional study and was conducted for 6 months, from August 2018 through January 2019. This research was conducted in accordance with Declaration of Helsinki and approved by the Hanoi Medical University's ethical committee, number 1318. The study population consisted of older adult inpatients being treated in three large general hospitals in Vietnam: Hanoi Medical University Hospital (500 beds), Dong Da General Hospital (800 beds) and National Geriatric Hospital (500 beds).

Subjects were recruited for the study from all newly admitted patients, i.e., patients in the first 48 hours after admission, by random selection (using a random number table) from admission registers.

The sample size was about one thousand subjects who met the inclusion criteria: (1) hospitalized older adults in the above three hospitals, (2) age 65 or over. The exclusion criteria included: (1) refusal to participate in this study, (2) mute, deaf or psychotic and (3) suffering from ventilator, coma, trauma or injury. All potential subjects completed questionnaires and were screened using swallowing tests.

Data collection

All the questionnaires were carried out by investigators. The investigators were dietitians who were trained to collect the study data. Before carrying out the actual study, we conducted a pilot study on 50 patients to revise the instruments.

Below is the information that we obtained.

Demographic data

Data such as age, gender, diagnosed diseases were collected from medical records.

Dysphagia screening

Repetitive saliva swallowing test (RSST)

Patients were asked to swallow their own saliva as many times as possible in 30 seconds; the examiner determined the absence of laryngeal elevation during swallowing by observing and/or feeling laryngeal movement. If a patient was unable to perform three consecutive swallows with two retests, he/she suffered from dysphagia. If a patient was able to swallow 3 times or more, then the Water Swallowing Test would be administered (9).

Water Swallowing Test (WST)

The examiner would offer 3ml water for the subject to drink; if patients choked or their voice changed, patients suffered from dysphagia. If there was no choking or voice change, subjects continued to drink 30 ml water. Subjects who had choking or voice change were dysphagic. If there was no choking or voice change, patients were normal (9).

Oral functional test

In order to check oral function, a tongue depressor was used. Some indicators such as opening degree, tongue motion, inflating cheeks, dentures, atrophy of the tongue papilla and lingual surface drying were collected.

Muscle strength

Muscle strength was assessed using hand grip strength. A hand dynamometer (MP-HDM03-BK, China) was used. The mean of three measurements from each hand was recorded. In cases of parenteral nutrition or paralysis, a mean of three measurements was used from the dominant hand. Missing data could be accepted.

Pneumonia

Information was collected from the medical record.

Statistical analysis

P-values of less than 0.05 were considered statistically significant for all the analyses is the plural. The above statistical procedures were performed using Stata version 12.0.

RESULTS

Table 1 shows the characteristics of 1007 older adult inpatients (420 males and 587 females, mean age 75.5±7.3 years). Dysphagia occurs more in older patients with no difference between genders. There were 24% of subjects who suffered from neurologic disorders or esophageal disorders or respiratory & latrogenic disorders.

Table 2 shows the comparison about oral function between dysphagia group and non-dysphagia group. The proportions of older adult inpatients with the ability to open the mouth more than three fingers, move the tongue forward, move the tongue to the left and right, push the buccal mucosa with the tongue, inflate both cheeks in non-dysphagia group were higher in the non-dysphagia group than in the dysphagia group and have a significant difference with $p<0.001$. There was no observed difference in having or not having dentures between the two groups. The dysphagia group had rates of tongue atrophy and tongue surface dryness higher than the non-dysphagia group and the difference was statistically significant with $p<0.001$.

Table 3 indicated the comparison about muscle strength between dysphagia group and non-dysphagia group. The dysphagia older adult inpatients had lower muscle strength than non-dysphagia patients in both genders with a significant difference of $p<0.001$.

Table 4 show the comparison about aspiration pneumonia between dysphagia group and non-dysphagia group. There were 13.5% older adult inpatients who suffered from pneumonia. The pneumonia rate (39.2%) in the dysphagia group was higher than in the non-dysphagia group (8.4%). It had a significant difference of $p<0.0001$.

Table 1. Characteristics of subjects enrolled in this study (n=1007)

Characteristics	Overall (n=1007)	Dysphagia (n=166)	Non-dysphagia (n=841)	P-value
Age, years	75.5±7.3	78.0±7.7	75.0±7.1	<0.05#
Female, n (%)	587 (58.3)	104 (62.7)	483 (57.4)	0.21*
Male, n (%)	420 (41.7)	62 (37.3)	358 (42.6)	
Disease groups				
• Neurologic disorders, n (%)	113 (11.2)	45 (27.1)	68 (8.0)	
• Esophageal disorders, n (%)	63 (6.3)	32 (19.3)	31 (3.7)	
• Respiratory & latrogenic disorders, n (%)	65 (6.5)	19 (11.4)	46 (5.5)	
• Other, n (%)	766 (76)	70 (42.2)	696 (82.8)	

Data presented as mean ± standard deviation or n (%)
*Chi-square test # Student t-test

Table 2: The comparison about oral function between dysphagia group and non-dysphagia group

Oral function indicators		Overall (n=1007)	Dysphagia (n=166)	Non-dysphagia (n=841)	P-value
Mouth opening degree	Higher three fingers	943 (93.6%)	133 (80.1%)	810 (96.3%)	P<0.001
	Lower three finger	64 (6.4%)	33 (19.9%)	31 (3.7%)	
Move your tongue forward	Can	981 (97.4%)	149 (89.8%)	832 (98.9%)	P<0.001
	Can not	26 (2.6%)	17 (10.2%)	9 (1.1%)	
Move your tongue left and right	Can	946 (93.9%)	130 (78.3%)	816 (97.0%)	P<0.001
	Can not	61 (6.1%)	36 (21.7%)	25 (3.0%)	
Push the buccal mucosa with your tongue	Can	941 (93.4%)	127 (76.5%)	814 (96.8%)	P<0.001
	Can not	66 (6.6%)	39 (23.5%)	27 (3.2%)	
Inflating both cheeks	Can	941 (93.4%)	124 (74.7%)	817 (97.1%)	P<0.001
	Can not	66 (6.6%)	42 (25.3%)	24 (2.8%)	
Dentures	Yes	302 (30.0%)	48 (28.9%)	254 (30.2%)	P<0.5
	No	705 (70.0%)	118 (71.1%)	587 (69.8%)	
Atrophy of the tongue papilla	Yes	83 (8.2%)	32 (19.3%)	51 (6.0%)	P<0.001
	No	924 (91.8%)	134 (80.7)	790 (94.0%)	
Tongue surface drying	Little saliva	112 (11.1%)	48 (28.9%)	64 (7.6%)	P<0.001
	Enough saliva	895 (88.9%)	118 (71.1%)	777 (92.4%)	

Fisher's exact test

Table 3: The comparison about muscle strength between dysphagia group and non-dysphagia group

Muscle strength (kg)	Overall	Dysphagia	Non-dysphagia	P-value
Male	(n=384) 18.6±8.0	(n=53) 12.6±7.4	(n=331) 19.6±7.7	
Female	(n=532) 11.2±5.0	(n=87) 9.0±4.7	(n=445) 11.6±4.9	
All	(n=916) 14.3±7.4	(n=140) 10.3±6.1	(n=776) 15.0±7.4	P<0.001

Mann-Whitney U test

Table 4: The comparison about aspiration pneumonia between dysphagia group and non-dysphagia group

Pneumonia status	Overall (n=1007)	Dysphagia (n=166)	Non-dysphagia (n=841)	P-value
Yes	13.5% (136)	39.2% (56)	8.4% (71)	P<0.0001
No	86.5% (871)	60.8% (101)	91.6% (770)	

Fisher's exact test

DISCUSSION

The aging population in Vietnam is increasing rapidly and dysphagia is becoming an issue of concern related directly to quality of life and mortality of older adults. Oral function indexes also provide results regarding dysphagia. Limited mouth opening, tongue movement are related strongly to dysphagia. Based on these examinations, dietitians were able to adjust the texture of food and the liquid feeding position of dysphagia patients. For example, dysphagia patients cannot open the mouth easily to chew so pureed food will be the priority of choice. In cases of paralysis on one side where the patient cannot sit to eat, the patient's position can be adjusted so that he/she lies on the healthy side and can turn the head to the paralyzed side; then food can be given on the healthy side of the mouth.

A decline in isometric tongue strength with aging has been previously reported (10). There was a significant positive association between posterior tongue strength and handgrip strength (6). It is suggested that lower isometric tongue strength might represent diminished functional reserve, which may increase risk for dysphagia and cause dysphagia omit (11). In this study we found handgrip strength of the dysphagia group was lower than in the non-dysphagia. Malnutrition also leads to reduced muscle (sarcopenia disease) which has a high risk of dysphagia. Hand grip

strength uses simple equipment to detect low muscle strength and its relation to dysphagia. A diet should have not only suitable texture but also sufficient energy and protein should be considered with dysphagia patients with low muscle strength.

Pneumonia was found at a higher rate in the dysphagia group. Aspiration leading to pneumonia is common in dysphagia patients. Besides pneumonia status, the body temperature also needs to be considered in determining inflammation status. Energy and water requirements will need to be increased to speed recovery and reduce risk of mortality. Aspiration pneumonia usually occurs in dysphagia patients in general and in dysphagia patients with Gastroesophageal reflux disease (GERD) in particular. Dysphagia patients with tube feeding usually have GERD and consideration of a nutrition liquid with high viscosity such as a semi-solid can be effective in reducing symptoms of GERD (12).

Therefore, oral function, muscle strength and pneumonia have a strong relationship with dysphagia status. From these observations, the dietitian can make suitable adjustments to diet from texture to nutrients to improve the nutrition status of patients.

In conclusion, dysphagia has a positive relationship with poor oral function, low handgrip strength and a high rate of pneumonia. Dietitians need to have an overview of dysphagia patients in order to supply a suitable texture-modified diet.

DISCLOSURE OF STATE OF COI

No conflicts of interest to be declared.

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