



Correlation Between Pharyngeal Residue With Food Consistency In Neurogenic Dysphagia Patients Using FEES At RSMH Palembang

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ABSTRACT

Introduction. Disorders of swallowing process starting from preparation and bolus transportation called dysphagia. Supporting examination for dysphagia is Fiberoptic Endoscopic Examination of Swallowing (FEES). Aims to determine correlation between pharyngeal residues and food consistency in neurogenic dysphagia patients. **Methods.** Observational study using cross-sectional design. Data was collected from medical records of 32 patients with neurological disorders complaints swallowing who underwent FEES examination at RSMH from January 2021 to July 2022. Statistical analysis using SPSS 24.0. **Results.** Participants was 32 patients with neurogenic dysphagia with the most male sex, 19 patients (59.4%), the most age group ≥ 60 years, 17 patients (53.1%). 18 patients had comorbidities (56.2%) with the highest number hypertension 15 patients (46.9%). The highest leakage in the water group was 9 (37.5%) out of 24 experiments, while in the filtered porridge group was 12 (37.5%) out of 32 experiments. The highest penetration occurred in water 41.7% and filtered porridge 40.9. The highest aspiration in filtered porridge was 34.4%. Somers'd correlation test obtained p value 0.028, there was significant correlation between types of food and degree of residual valleculas, and the strength was very weak (ra value: 0.138). The piriform sinus region, obtained p value 0.014, there was significant correlation between type of food and degree of residual piriform sinus and the value of the strength also very weak (ra 0.153). **Conclusion.** There is significant correlation between types of food and degree of residual valleculas and piriform sinuses. As food resistance increases, the residual degree of valleculas and piriform sinuses will also increase.

1. Introduction

Swallow or deglutition is a complex neuromuscular process involving structures in the oral cavity, pharynx, larynx and esophagus. Every element plays a role in the swallowing process must work in an integrated and sustainable manner.¹ Good swallowing ability is very important to meet nutritional needs, hydration and quality of life.² Disturbances in the swallowing process start from the process of preparation for swallowing, bolus transportation from the oral cavity through the pharynx, esophagus and stomach called dysphagia.³ Dysphagia itself is not a disease but a symptom or disorder secondary to one or more pathological processes including complications related to age, structural factors, neurological and neuromuscular disorders, side effects of drugs, post-operative disorders, head trauma, infection, tumor mass or iatrogenic.¹ The prevalence of dysphagia in the general population varies, but it is estimated more than 8%.⁴ Recent research in the form of an

epidemiological study in China concluded that the prevalence of dysphagia was 39.4% of a total of 14 provinces in China.⁵ Previous studies in the United States concluded that dysphagia problems occur 1 in 25 adult population.⁶ In 2014, the prevalence of oropharyngeal dysphagia in the general population of the Netherlands was found to be more than 12.1%.⁷

One of the diagnostic methods for supporting dysphagia is to use a flexible endoscope called the Fiberoptic Endoscopic Examination of Swallowing (FEES).⁸ FEES is currently the first choice for the evaluation of patients with dysphagia because it is easy, can be performed anywhere, and is inexpensive.⁹ This procedure can assess the anatomy and physiology of swallowing, airway protection and its relationship to the function of swallowing solids and liquids, as well as the diagnosis and future treatment plans. The purpose of FEES is to establish swallowing disorders in the pharyngeal phase, determine the anatomical and physiological

abnormalities that cause dysphagia and determine a safer and more efficient position for swallowing in dysphagia patients.^{10,11} FEES has been shown to be more sensitive in identifying pharyngeal residues. Pharyngeal residue is a clinical marker of aspiration after swallowing because a bolus can enter the airway when the larynx is relaxed, so a scale that accurately describes the severity of the residue is needed. The Yale Pharyngeal Residue Severity Rating Scale meets all the necessary criteria for assessing pharyngeal residues, which are reliable, valid, and easy to work with.¹² The examination used is FEES to determine the severity of residual valleculas and piriform sinuses to be none, trace, mild, moderate & severe.^{13,14}

Information regarding the presence of swallowing disorders and risk factors for dysphagia is very important because it can be used for the management of oropharyngeal dysphagia in patients with neurological disorders. Seeing the high incidence of neurogenic dysphagia with pharyngeal residue which is a clinical marker of aspiration after the swallowing phase, as well as the management of dysphagia that has not been optimal, causing various complications, the researcher intends to conduct a study entitled Correlation of Pharyngeal Residues with Food Consistency in Neurogenic Dysphagia Patients Using FEES at RSMH Palembang.

2. Methods

This research is a cross sectional study regarding correlation between pharyngeal residue with food consistency in neurogenic dysphagia patients using FEES at RSMH Palembang. The data was collected from patient's medical records with swallowing difficulty that was examined with FEES at RSMH Palembang from January 2021 until January 2022. This study include patient demographic data including age, sex, comorbidities, abnormalities in filtered porridge and water group (leakage, penetration, aspiration, pharyngeal residue).

The purpose of this study is to determine correlation between pharyngeal residues and food consistency in neurogenic dysphagia patients. It would be expected that the results can become references for future research. The research results are presented descriptively in form of table and description. The place of research was conducted in the ear, nose, throat head and neck surgery department of RSMH Palembang. The research was carried out from January 2021 until January 2022.

The population of this study were medical records of patient that complaints swallowing difficulty that was examined by FEES at RSMH Palembang from January 2021 until January 2022. The sample of this study included the criteria for all patients diagnosed with neurogenic dysphagia and inclusion criteria fulfilled. The inclusion criteria of this study are patient's medical record

that was examined by FEES and found to be neurogenic dysphagia at RSMH Palembang. Exclusion criteria are incomplete medical record. The number of samples obtained was 32 patients.

Ethical clearance is carried out in accordance with applicable procedures and rules. Research ethics are assessed based on scientific foundations, benefits, risks and burdens, fair and honest aspects, and the confidentiality of the identities of research subjects. This research has been considered ethically feasible and approved by the Health Research Ethics Committee of RSUP Dr. Mohammad Hoesin Palembang.

3. Results

In this study, data were collected on patients with complaints of swallowing who underwent a FEES examination at RSMH Palembang with the conclusion of the examination was neurogenic dysphagia in a total of 32 patients. Data analysis was carried out in this study using the SPSS 24.0 application. The analysis consisted of univariate and bivariate analysis. Univariate analysis was carried out to see the characteristics of the research subjects and the distribution of frequencies. Bivariate analysis to see the correlation between pharyngeal residue and food consistency in patients with neurogenic dysphagia based on the findings of FEES. The results of data analysis are presented in tabular form accompanied by narration.

Based on distribution of subjects by demographic characteristics, the number of patients who took part in this study were 32 people with the majority being male 19 patients (59.4%). In this study, the most groups were aged ≥ 60 years with 17 (53.1%) from 32 patients. There were 18 patients who had comorbidities (56.2%) and the most were patients with hypertension, 15 (46.9%) from 32 patients. In subsequent analysis, samples were counted based on the number of FEES trials. Not all patients are given a trial with 6 types of food (Table 1).

In total there were 144 experiments that found vallecula residues in this study. In the water group, no residue was found in the valleculas, which was the highest in 10 trials (41.7%). The least found was the severe degree, in 1 (4.2%) from 24 trials in water group. In the milk group, most of them found no residue in the valleculas, 11 experiments (45.8%). On moderate and severe degrees is 1 (4.2%) from 15 trials in this group. It was different in filtered porridge group, mostly none and mild degrees each in 9 trials (28.1%). On the severe degree there are 1 (3.1%) from 32 trial in this group. Furthermore, in the rice porridge group, the most commonly found was trace degree in the valleculas of 9 trials (36%). On the severe degree there are 2 (8%) from 25 trials in this group. Then in the oatmeal group, the trace degree was the most in 7 trials (33.3%). There were 2 trials (9.5%) each

with moderate and severe degrees in this trial from 21 trials. Lastly, in the biscuit group, the most were found with trace degrees in 6 trials (33.3%). There were 3 trials (16.7%) with severe degree from 18 trials (Table 2).

In total there were 144 trials in this study. In water group, majority no residue in piriform sinuses, namely 13 trials (54.2%). The least found were moderate and severe degrees, each in 1 trial (4.2%) from 24 trials in water group. In the milk group, majority found no residue in piriform sinus (none) in 12 trials (50%). On moderate and severe degrees there are 1 (4.2%) from 24 trials in this group. In contrast to the filtered porridge, the majority were in the trace degree, namely 10 trials (31.3%). On severe degree there are 1 (3.1%) from 32 trials in this group. Furthermore, in rice porridge group, the most frequently found were no residues (none) and trace degrees in the piriform sinuses in 8 trials (32%). On severe degree there are 1 (4%) from 25 trials in this group. Then in oatmeal group, the most were trace degrees, namely 7 trials (33.3%). No severe degree was found in this trial with a total of 21 trials. Lastly, in biscuit group, most were found with trace degrees, namely 7 trials (38.9%). At least, moderate and severe degrees were found in each of 2 trials (11.1%) from 18 trials (Table 3).

In this study, each trial was also seen whether there was leakage, penetration or aspiration. Leakage with the highest percentage was in the experimental group with water and filter porridge. In the water group there was leakage in 9 trials (37.5%) from 24 experiments while in the filter porridge group there were 12 trials (37.5%) from 32 trials. The highest percentage of penetration and aspiration findings was in the filter porridge group

with penetration in 15 trials (46.9%) and aspiration in 11 trials (34.4%) from 32 trials (Table 4).

The milk group was the most numerous in no vallecule residue with a total of 11 trials (7.6%). The most trace group was in rice porridge group with 9 trials (6.3%). In mild degree group the highest was in filtered porridge group with 9 trials (6.3%). In the moderate degree group, the most was in the filter porridge group with 6 trials (4.2%). In the severe degree group, the highest number was in the biscuit group with 3 trials (2.1%). In the Somers'd correlation test, a significant correlation was found between the types of food with degree of vallecule residue, with correlation that was in the same direction as food consistency increased, but with a very weak correlation strength value. In this study, as food consistency increases, the degree of residual vallecules will also increase (Table 5).

Experiments with none degrees were the most numerous in water group with 13 trials (9%). In the trace degree group the highest was in the filter porridge with 10 trials (6.9%). In the mild degree group, the most was in the filter porridge group with a total of 7 trials (4.9%). In moderate degree, the most was in filter porridge group with a total of 6 trials (4.2%). The highest degree of severe group was in biscuit group with 2 trials (1.5%). In the Somers'd correlation test, a significant correlation was found between the type of food and degree of piriform sinus residue, with a correlation in the direction of increasing consistency and with very weak correlation strength. In this study, as food consistency increases, the degree of piriform sinus residue will also increase and vice versa (Table 6).

Table 1. Distribution Of Subjects By Demographic Characteristics (N = 32)

Variable	Total (n)	Percentage (%)
Gender		
Men	19	59,4
Women	13	40,6
Age group		
< 60 years old	15	46,9
≥ 60 years old	17	53,1
Comorbidities		
Hypertension	15	50
Diabetes Mellitus	2	6.3
Hypertension + DM	1	3.1

Table 2. Distribution Of Subjects By Valleculeas Residue Based On Type Of Food

Type of food	Valleculea residue										Total	
	none		trace		mild		moderate		severe			
	n	%	n	%	n	%	n	%	n	%	n	%
Water	10	41,7	7	29,2	3	12,5	3	12,5	1	4,2	24	100
Milk	11	45,8	7	29,2	2	8,3	3	12,5	1	4,2	24	100
Filtered porridge	9	28,1	7	21,9	9	28,1	6	18,8	1	3,1	32	100
Rice porridge	6	24,0	9	36,0	5	20,0	3	12,0	2	8,0	25	100
Oatmeal	5	23,8	7	33,3	5	23,8	2	9,5	2	9,5	21	100
Biscuit	3	16,7	6	33,3	5	27,8	1	5,6	3	16,7	18	100

Table 3. Distribution of subjects by piriform sinus residue based on type of food

Type of food	Piriform sinus residue										Total	
	none		trace		mild		moderate		severe			
	n	%	n	%	n	%	n	%	n	%	n	%
Water	13	54,2	5	20,8	4	16,7	1	4,2	1	4,2	24	100
Milk	12	50,0	8	33,3	2	8,3	1	4,2	1	4,2	24	100
Filtered porridge	8	25,0	10	31,3	7	21,9	6	18,8	1	3,1	32	100
Rice porridge	8	32,0	8	32,0	5	20,0	3	12,0	1	4,0	25	100
Oatmeal	6	28,6	7	33,3	4	19,0	4	19,0	0	0,0	21	100
Biscuit	4	22,2	7	38,9	3	16,7	2	11,1	2	11,1	18	100

Table 4. Distribution of subjects by incidence of leakage, penetration and aspiration each type of food

Variable	Leakage n (%)	Penetration n (%)	Aspiration n (%)
Water			
Yes	9 (37,5)	10 (41,7)	7 (29,2)
No	15 (62,5)	14 (58,3)	17 (70,8)
Total	24 (100)	24 (100)	24 (100)
Milk			
Yes	7 (29,2)	9 (37,5)	5 (29,2)
No	17 (70,8)	15 (62,5)	17 (70,8)
Total	24 (100)	24 (100)	24 (100)
Filtered porridge			
Yes	12 (37,5)	15 (46,9)	11 (34,4)
No	20 (62,5)	17 (53,1)	21 (65,6)
Total	32 (100)	32 (100)	32 (100)
Rice porridge			
Yes	6 (24,0)	10 (46,9)	7 (28,0)
No	19 (76,0)	15 (60,0)	18 (65,6)
Total	25 (100)	25 (100)	25 (100)
Oatmeal			
Yes	3 (14,3)	8 (38,1)	4 (19,0)
No	18 (85,7)	13 (61,9)	17 (81,0)
Total	21 (100)	21 (100)	21 (100)
Biscuit			
Yes	3 (16,7)	3 (16,7)	2 (11,1)
No	15 (83,3)	15 (83,3)	16 (88,9)
Total	18 (100)	18 (100)	18 (100)

Table 5. Correlation Type Of Food With Degrees Of Valleculas Residue (N = 144)

Type of food	Vallecula residue										P Value ^a	r ^a
	none		trace		mild		moderate		severe			
	n	%	n	%	N	%	n	%	n	%		
Water	10	6,9	7	4,9	3	2,1	3	2,1	1	0,7	0,028	0,138
Milk	11	7,6	7	4,9	2	1,4	3	2,1	1	0,7		
Filter porridge	9	6,3	7	4,9	9	6,3	6	4,2	1	0,7		
Rice porridge	6	4,2	9	6,3	5	3,5	3	2,1	2	1,4		
Oatmeal	5	3,5	7	4,9	5	3,5	2	1,4	2	1,4		
Biscuit	3	2,1	6	4,2	5	3,5	1	0,7	3	2,1		
Total	44	30,6	43	29,9	29	20,1	18	12,5	10	6,9		

^aSomers'd Correlation test

Table 6. Correlation Type Of Food With Degrees Of Piriform Sinuses Residue (N = 144)

Type of food	Piriform sinuses residue										P Value ^a	r ^a
	none		trace		mild		moderate		severe			
	n	%	n	%	N	%	n	%	n	%		
Water	13	9,0	5	3,5	4	2,8	1	0,7	1	0,7	0,014	0,153
Milk	12	8,3	8	5,6	2	1,4	1	0,7	1	0,7		
Filter porridge	8	5,6	10	6,9	7	4,9	6	4,2	1	0,7		
Rice porridge	8	5,6	8	5,6	5	3,5	3	2,1	1	0,7		
Oatmeal	6	4,2	7	4,9	4	2,8	4	2,8	0	0,0		
Biscuit	4	2,8	7	4,9	3	2,1	2	1,4	2	1,4		
Total	51	35,4	45	31,3	25	17,4	17	11,8	6	4,2		

^aSomers'd Correlation test

4. Discussion

Patient in this study was 32 patients with neurogenic dysphagia and neurological disorders, with the most sex being male, 19 patients (59.4%). According to research conducted by Tamin, the ration between men and women is 2:1.¹⁵ Meanwhile, based on Iqbal's research, it was found that there were more women than men with a proportion of 52% in women compared to 48% in men.¹⁶ Wandira et al, Ganz et al, and Poorthuis et al stated that stroke is more common in men than women.¹⁷⁻¹⁹ This is related to multiple factors such as genetics, the protective effect of estrogen on female cerebral circulation, and the high prevalence of hypertension, ischemic heart disease, and smoking in men which are risk factors for vascular disorders.^{2,3,9}

Nayoan's study reported on medical record data from dysphagia patient who underwent FEES examination at dr. Kariadi Hospital Semarang from 2015-2016 it was found that the most frequent occurrence of dysphagia was the oropharyngeal phase with the most etiology of dysphagia being neuromuscular disorders.²⁰ According to Sasegbon

et al, the incidence of neurogenic dysphagia reaches 29% to 80%.²¹ Several factors such as the high worldwide incidence of stroke and other neurodegenerative diseases may explain why the percentages are so high. In the pre-swallowing evaluation, 32% of patients showed disturbances and 79% found abnormalities in the swallowing evaluation. Assessment with FEES in patients with dysphagia is important because it can find the risk of aspiration both before and during the swallowing process and can recommend the use of an NGT and the right type of consistency and swallowing technique.^{13,22}

In this study, the most age group was aged ≥ 60 years with 17 (53.1%) from 32 patients. Based on the literature, it is estimated that 35-68% of persons aged 65 years and over have some degree of swallowing dysfunction.²³ Dysphagia in people aged over 60 years is found 15% to 40%.²⁴ The population with dysphagia increases in older people over 50 years which can be caused by cerebrovascular disease or age factors that cause changes in physiology and anatomical structure that play a role in the swallowing process.^{3,25}

There were 18 patients who had comorbidities (56.2%) and the most were patients with hypertension, 14 (43.8%) from 32 patients with neurological disorders. Hypertension is a major risk factor for ischemic stroke where at higher blood pressure the risk of stroke is greater. Blood pressure, especially systolic blood pressure increases with age. High blood pressure is caused by a disruption in blood flow where the diameter of the blood vessels will decrease, so that blood flow to the brain will decrease and can cause ischemia or bleeding in the brain.^{3,9}

In this study, a significant correlation was found between the type of food and the degree of residual vallecula and residues in the piriform sinus. In the Somers'd correlation test, a significant correlation was found between the types of food and the degree of residual vallecula. In this study, as food consistency increases, the degree of residual vallecula will also increase, as well as in the piriform sinus region. It can be seen that the correlation is in the same direction with a very weak strength. Pharyngeal residues may occur in the vallecula or piriform sinuses. This occurs due to disturbances in the oral phase in the form of decreased elevation of the hyoid and missing or decreased elevation of the epiglottis, as well as weakness in the contraction of the pharyngeal muscles, causing difficulty in bolus clearance with the nerves involved, n.X, n.V and n.VII.²

According to a study by Puspa et al, the findings of the FEES examination in the form of flour slurry residue were 20.6 times more likely to experience a neurogenic type than non-neurogenic dysphagia.²³ The findings of the FEES examination in the form of biscuit penetration are 27.1 times more likely to experience neurogenic type of dysphagia than non-neurogenic dysphagia. Meanwhile, the findings of the FEES examination, residue of flour porridge and leakage of biscuits, have the opportunity to experience non-neurogenic dysphagia compared to neurogenic ones. This occurs due to disturbances in the oral phase in the form of decreased elevation of the hyoid and missing or decreased elevation of the epiglottis, as well as weakness in the contractions of the pharyngeal muscles, causing difficulty in bolus clearance.²

Pharyngeal residue is a clinical marker of aspiration after swallowing because the bolus can enter the airway when the larynx is relaxed.⁹ The higher the viscosity of the bolus, the higher the possibility of residue occurring. Raihana's research examined the description of the swallowing process of people with neurogenic dysphagia, residue after swallowing water (85.5%), milk (85.0%), strained porridge (87.5%), plain porridge (85.5%), and biscuits. (82.5%).¹⁶ Tamin 10's study found 76% residue in the vallecula and 70% residue in the piriformis fossa.¹⁵

5. Conclusions

There is a significant correlation between the type of food and the degree of vallecula residue and piriform sinus residue, with a unidirectional correlation and with very weak strength. Pharyngeal residues can occur in the valleculas or piriform sinuses. The higher the bolus viscosity, the higher the possibility of residue occurring. There is a significant correlation between the types of food and the leakage findings with very weak correlation strength. Further research suggestions is effect of food type consistency on the findings of residues, leakage, penetration and aspiration in FEES examinations with different research designs such as case control and the best interventions to reduce pharyngeal residues, as well as investigate morbidity and mortality in relation to the severity of pharyngeal residues.

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