



SCIENTIFIC RESEARCH

EVALUATION OF OROPHARYNGEAL DYSPHAGIA USING THE VIDEO-FLUOROSCOPIC SWALLOWING STUDY IN STROKE PATIENTS

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SUMMARY

Purpose: This study aimed to describe imaging characteristics of oropharyngeal dysphagia on a video-fluoroscopic swallowing study (VFSS) using an assessment questionnaire in post-stroke patients.

Materials and methods: We assessed the oropharyngeal dysphasia in post-stroke patients using an assessment questionnaire with the modified barium swallow impairment profile (MBSImP) and penetration aspiration scale (PAS) at Bach Mai Hospital from January 2020 to June 2023.

Results: The study was conducted on 26 post-stroke patients (17 men and 9 women), consisting of 12 patients who have oral phase dysphagia (46%), 6 patients with pharyngeal phase (23%), 3 patients with oral and pharyngeal phase dysphagia (12%), 5 patients without dysphagia. Twelve patients had penetration aspiration (46,2%), of which 4 patients had a risk of aspiration (15,4%) and 8 patients had positive aspiration (30,8%).

Conclusion: Swallowing disorders are common in patients with stroke. The VFSS is an examination method with tools that help assess the stage of swallowing disorders and aspiration, especially silent aspiration.

Keywords: *The video-fluorographic swallowing study (VFSS), the modified barium swallow impairment profile (MBSImP), and the penetration aspiration scale (PAS).*

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I. INTRODUCTION

Stroke is a group of common diseases in clinical practice, the incidence rate in the community is increasing, and the mortality rate is ranked third after cancer and cardiovascular diseases [1]. Pneumonia is one of the common complications in stroke patients, increasing the mortality rate to 70%, and is related to aspiration due to nerve damage causing pharyngeal paralysis and swallowing disorders [2]. Diagnosis of swallowing disorders must be based on screening, clinical examination (instrumented swallowing assessment), and functional testing (instrumental swallowing assessment). In particular, video-fluoroscopic swallowing (VFS) study is considered the gold standard in evaluating swallowing disorders [3].

This study aimed to evaluate oropharyngeal dysphagia using the VFS in post-stroke patients. In this study, we used the modified contrast swallowing impairment profile (MBSImP) by author Dr Martin-Harris and the Penetration-Aspiration Scale (PAS) by Rosenbek and colleagues to score and classify components of swallowing disorders on VFS[4], [5].

I. MATERIALS AND METHODS

Subjects

A cross-sectional study was conducted at Bach Mai Radiology Center from January 2022 to June 2023. Twenty-six patients were recruited consecutively by physician referral for a VFS due to concerns of swallowing impairment during the patient’s medical management. The only exclusion criterion of this study was the absence of a physician order for a VFS.

Imaging protocol

All subjects were imaged in an upright position. The patients were initially positioned in the lateral view, and regions of visualization included the oral cavity, pharyngeal cavity, larynx, and cervical esophagus. The fluoroscopic angle was 70° and the visualization field included the lips anteriorly, nasal cavity superiorly, cervical spinal column posteriorly, and the entire pharyngoesophageal segment (PES) inferiorly. The fluoroscope was activated by the radiologist for a few seconds before and after the

administration of the barium substances by the SLP. The fluoroscope was deactivated shortly after the bolus tail had exited the cervical esophageal region. Following the swallow barium with views in the lateral plane, patients were turned and viewed from the anterior-posterior plane. The total radiation exposure averaged 3–5 min, an amount typically encountered in an upper gastrointestinal series.

The video was evaluated by two physicians using the MBSImP and the PAS tool to score and classify components of swallowing disorders on VFS. The data collected was entered and analyzed using descriptive statistical methods using IBM SPSS Statistics version 20.

II. RESULTS

Study of 26 patients, including 21 patients with swallowing disorders and 5 patients without swallowing disorders on X-ray recordings. The patients had a mean age of 63.77 ± 11.21 years.

Table 1. Summary of patient’s characteristics

Characteristic		Value (%)
Age		
<70		20 (76,9)
≥70		6 (23,1)
Sex		
Male		17 (65,4)
Female		9 (34,6)
Stroke	Stroke	
	Cerebral infarction	22 (84,6)
	Cerebral hemorrhage	4 (15,4)
The Standardized Swallowing Assessment	Dysphagia	
	Yes	23 (88,5)
	No	3 (11,5)
	Aspiration	
	Yes	7 (26,9)
	No	19 (73,1)

VFSS	Dysphagia	
	Yes	21 (80,8)
	No	5 (19,2)
	Phases of swallowing	6 (28,6)
	Oral phase	12 (57,1)
Pharyngeal phase	3 (14,3)	
Oral phase and pharyngeal phase		
Penetration-Aspiration Scale	14 (53,8)	
No risk	4 (15,4)	
Risk of aspiration	8 (30,8)	
Positive aspiration		
Complications	Pneumonia	
	Yes	3 (11,5)
	No	23 (88,5)

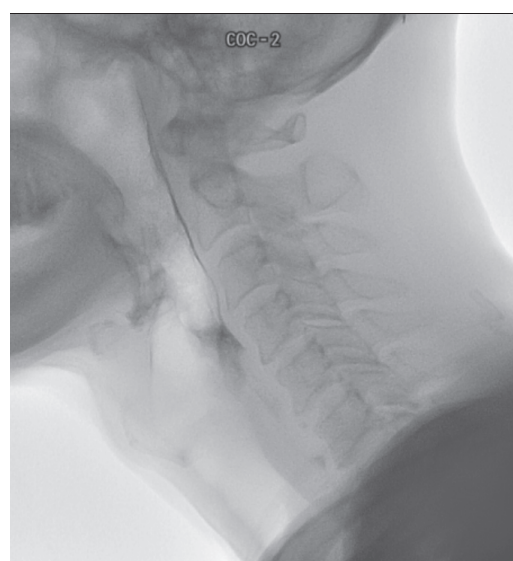
Patients in the study group were mainly under 70 years old, accounting for 76.9%. Patients in the study group mainly had stroke and ischemic stroke, accounting for 84.6%. Swallowing disorders in the pharyngeal phase account for the majority of patients evaluated on imaging.

Table 2. The 16 components of the MBSImp.

<i>The components</i>		N (%)
Oral phase	1. Lip Closure	1 (3,8)
	2. Tongue Control During Bolus Hold	4 (15,4)
	3. Bolus Preparation/ Mastication	0 (0)
	4. Bolus Transport/ Lingual Motion	3 (11,5)
	5. Oral Residue	3 (11,5)
	6. Initiation of the Pharyngeal Swallow	12 (46,2)

Pharyngeal phase	7. Soft Palate Elevation	2 (7,6)
	8. Laryngeal Elevation	1 (3,8)
	9. Anterior Hyoid Excursion	1 (3,8)
	10. Epiglottic Movement	3 (11,5)
	11. Laryngeal Vestibular Closure	4 (15,4)
	12. Pharyngeal Stripping Wave	0 (0)
	13. Pharyngeal Contraction	1 (3,8)
	14. Pharyngoesophageal Segment Opening	1 (3,8)
	15. Tongue Base Retraction	2 (7,7)
	16. Pharyngeal Residue	14 (50)

The most common cases were 14 patients with residue in the pharynx, accounting for 50%; the second most common is 12 patients with abnormalities that Initiation of the Pharyngeal Swallow, accounting for 46.2%; followed by disorders of Tongue Control During Bolus Hold and Laryngeal Vestibular Closure, both accounting for 15.4%.



CVM, 69T, G81/620.

Figure 1. Pharyngeal Residue

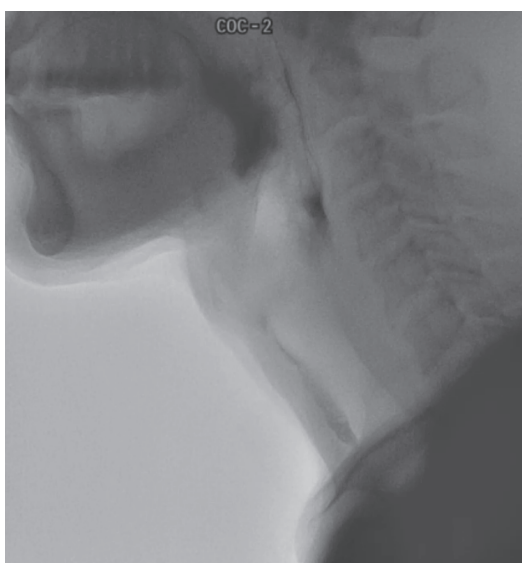


CVM, 69T, G81/620.

Figure 2. Escape of bolus to nasopharynx and Positive aspiration

Table 3. Penetration-Aspiration Scale

Penetration-Aspiration Scale	N (%)
No risk	14 (53,8)
Risk of aspiration	4 (15,4)
Positive aspiration	8 (30,8)



CVM, 69T, G81/620

Figure 3. Positive aspiration

Table 4. Correlation between penetration and aspiration on VFS and clinical aspiration

Penetration-aspiration on VFS	Clinical aspiration	
	Yes N (%)	No N (%)
No risk	1 (14,3)	13 (68,4)
Risk of aspiration	2 (28,6)	2 (10,5)
Positive aspiration	4 (57,1)	4 (21,1)
P= 0,042		

Table 5. Correlation between the stage of swallowing disorders and aspiration on VFS

Penetration-aspiration on VFS	Stage of swallowing disorders on VFS			
	Oral N (%)	Pharyngeal N (%)	Oral and pharyngeal N (%)	No N (%)
Yes	5 (83,3)	3 (25)	1 (33,3)	5 (100)
No	1 (16,7)	9 (75)	2 (66,7)	0 (0)
P= 0,008				

Penetration-aspiration occurs most often in patients with pharyngeal phase swallowing disorders.

IV. DISCUSSION

Our study is the first study in Vietnam using VFS to evaluate swallowing disorders in stroke patients. By directly observing the patient's swallowing process on video and evaluating the results based on the MBSImp and the PAS tools, we found that aspiration occurred. The pharyngeal phase is also the most common phase of swallowing disorders in post-stroke patients. Among patients with aspiration, up to half of patients have silent aspiration, a condition in which food penetrates the airway but the patient does not have any cough reflex, which cannot be detected and evaluated on bedside clinical examination.

Using the MBSImp tool, we observed 50% of patients with the presence of residual bolus in the pharynx, followed by 46.2% of patients with reduced swallowing response. The phase of swallowing disorders mainly occurs in the pharyngeal stage. This is consistent with the majority of patients in the study with bilateral paraventricular brain

damage, and damage to the subcortical brain parenchyma, which is the pathway for motor nerve transmission from the cerebral cortex and sensory transmission to the cortex; leading to reduced swallowing response in the pharynx and neuromuscular function of the muscles in the pharynx, causing food residue after swallowing [6].

Using the PAS tool, we founded that penetration-aspiration occurred in 46.2% of patients after stroke. Silent aspiration occurs in half of patients with aspiration and accounts for 19% of patients with swallowing disorders after stroke. In Paolo Falsetti's study, the rate of silent aspiration was 12.2% in patients with swallowing disorders after stroke⁷. Therefore, we recommend that patients with clinically assessed swallowing disorders should undergo VFS, especially patients with pharyngeal phase swallowing disorders.

Aspiration in the group of patients with pharyngeal phase swallowing disorders is higher than in the group of patients with oral phase swallowing disorders. During the oral phase, aspiration may occur due to a delay in the onset of the pharyngeal swallowing response, resulting in food entering the larynx, and entering the airway before the airway protective reflexes occur. In the pharyngeal phase, aspiration occurs due to direct functional impairment of the structures that protect the airway during swallowing, food entering the airway due to incomplete laryngeal closure, or reflux of residual food. in the pharynx after swallowing.

REFERENCES

1. Lidetu T, Muluneh EK, Wassie GT. Incidence and Predictors of Aspiration Pneumonia Among Stroke Patients in Western Amhara Region, North-West Ethiopia: A Retrospective Follow-Up Study.: *Int J Gen Med*; 2023 Apr 15.
2. Costa MM. Videofluoroscopy: the gold standard exam for studying swallowing and its dysfunction: *Arq Gastroenterol*; 2010.
3. Martin-Harris B, Brodsky MB, Michel Y, et al. MBS measurement tool for swallow impairment--MBSImp: establishing a standard: *Dysphagia*; 2008.
4. Rosenbek JC, Robbins JA, Roecker EB, Coyle JL, Wood JL. A penetration-aspiration scale: *Dysphagia*; 1996.
5. Mo SJ, Jeong HJ, Han YH, Hwang K, Choi JK. Association of Brain Lesions and Videofluoroscopic Dysphagia Scale Parameters on Patients With Acute Cerebral Infarctions: *Ann Rehabil Med*; 2018.
6. Falsetti P, Acciai C, Palilla R, et al. Oropharyngeal dysphagia after stroke: incidence, diagnosis, and clinical predictors in patients admitted to a neurorehabilitation unit: *J Stroke Cerebrovasc Dis*; 2009.

Aspiration status according to clinical assessment is correlated with the results of penetration-aspiration assessment on imaging. However, 4 patients who were clinically evaluated for swallowing disorders had normal VFS results and no correlation was observed between the clinical evaluation of swallowing disorders and VFS recordings. This might be explained by the fact that older patients undergoing swallowing rehabilitation treatment use nasogastric feeding tubes, leading to difficulties in clinical assessment; and interval time of VFS in both the subacute and chronic stages after stroke.

There is no correlation between swallowing disorders and pneumonia. This result is similar to Bonnie Martin-Harris's research [4]. Patients with swallowing disorders after stroke are clinically evaluated at the bedside and receive timely intervention and rehabilitation treatment, choosing appropriate nutrition and diet to help significantly reduce the risk of aspiration and pneumonia, especially in patients with persistent swallowing disorders.

III. CONCLUSION

The rate of swallowing disorders on VFS in stroke patients is 80.8%. Aspiration occurred in 30.8% of patients after stroke, of which half of the patients had silent aspiration. Aspiration is more common in patients with pharyngeal swallowing disorders. There is a correlation in the assessment of aspiration between bedside clinical assessment and VFS.

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