Clinical and functional impact of post-stroke oropharyngeal dysphagia: a retrospective study

Original Article

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Abstract

Objectives: To assess the impact of post-stroke oropharyngeal dysphagia (OPD) on clinical and functional outcomes.
Study Design: Observational, retrospective, single-center study.
Materials and Methods: A total of 137 patients hospitalized due to stroke who underwent fiberoptic endoscopic evaluation of swallowing (FEES) between January 2018 and December 2023 were included. The incidence of aspiration pneumonia (AP), need for percutaneous endoscopic gastrostomy (PEG), length of hospital stay, discharge destination and changes in the Modified Rankin Scale (mRS) were evaluated.
Results: OPD prevalence was 69.34%. Dysphagic patients showed higher incidence of AP ($p<0.05$) and PEG placement ($p<0.05$), greater likelihood of institutionalization or death ($p<0.05$), and a 0.5-point greater worsening in mRS ($p<0.05$). Median hospital stay was 15 days longer in the OPD group ($p<0.05$).
Conclusions: Post-stroke OPD is associated with longer hospital stays and worse functional outcomes. FEES plays a key role as a diagnostic and interventional tool with potential cost-effectiveness.

Keywords: Oropharyngeal dysphagia; stroke; Flexible endoscopic evaluation of swallowing; aspiration pneumonia

Introduction

Oropharyngeal dysphagia (OD) is defined as the inability to safely and effectively transport a food bolus from the oral cavity to the esophagus. Although this disorder can affect healthy older adults, OD is strongly associated with neurological diseases, such as stroke[1], which is one of the leading causes of morbidity and mortality worldwide. OD is the most common complication of stroke, with a prevalence of approximately 46.6% in ischemic events and 43.6% in hemorrhagic events[2]. Moreover, OD may persist beyond the acute

phase in up to 50% of patients with stoke[2,3].
The presence of OD is associated with an increased risk of malnutrition[4] and dehydration[5], as well as a higher incidence of respiratory complications, particularly aspiration pneumonia (AP)[4,6,7]. These conditions may lead to poor functional outcomes and a higher reliance on enteral nutrition[8], with approximately 5% of patients with stroke requiring prolonged gastrostomy[9].
The complications of OD may contribute to prolonged hospitalization, higher likelihood of institutionalization, and increase mortality rates[5,10,11], with significant socio-economic implications. The early identification and management of post-stroke OD can help in reducing these complications. However, post-stroke OD remains underdiagnosed and undertreated worldwide, and most patients do not receive comprehensive care[11].
Instrumental swallowing assessment in patients at high risk of post-stroke OD enables the identification of individuals most susceptible to complications. This assessment facilitates the implementation of timely preventive and rehabilitative interventions, ultimately reducing medical complications and their socio-economic burden[12]. Fiberoptic endoscopic evaluation of swallowing (FEES) can be performed at the bedside, offering a practical advantage in these cases. It allows direct visualization of the pharynx and larynx, thus enabling a more precise assessment of vallecular and piriform sinus residue, premature initiation of the oropharyngeal swallowing reflex, and presence of penetration or aspiration events.

Objectives

To analyze the impact of post-stroke OD on clinical and functional outcomes, including the incidence of arterial hypertension, need for percutaneous endoscopic gastrostomy (PEG), *National Institutes of Health Stroke Scale* (NIHSS) scores at hospital discharge, length of hospital stay, progression on the Modified Rankin Scale (mRS), and post-discharge outcomes.

Materials and Methods

This retrospective, single-center study was based on data from a tertiary care hospital. It included all hospitalized patients diagnosed with stroke who were referred by a rehabilitation nurse or speech therapist for an FEES evaluation due to suspected OD between January 2018 and December 2023.
The exclusion criteria were a history of previous stroke, diagnosis of neuromuscular or neurodegenerative disease, documented obstructive sleep apnea, diagnosis of dementia, history of lower respiratory tract infection in the previous month, or recurrent respiratory tract infections. One patient was excluded due to a pre-existing diagnosis of OD prior to hospitalization. Demographic parameters, including sex, age, and prior mRS were analyzed. Stroke-related parameters included event etiology, NIHSS on admission and at discharge, AP, length of hospital stay, destination after discharge, and mRS at discharge. Parameters related to the FEES evaluation included the presence or absence of OD; in patients with dysphagia, the severity was classified as penetration, aspiration with preserved protective reflex, or silent aspiration. Additional parameters assessed were delayed initiation of the oropharyngeal swallowing reflex, indication for PEG placement, and whether PEG use was temporary or permanent. The clinical outcomes evaluated included the occurrence of AP, PEG placement, NIHSS at discharge, length of hospital stay, change in mRS, and destination after discharge.
Statistical analysis was conducted using the SPSS® software, version 30 (IBM Corp., Armonk, NY, USA).
Initially, descriptive statistics were used to characterize the sample, including means and standard deviations, medians and interquartile ranges, and proportions of the evaluated variables.
Subsequently, univariate analysis was performed. Categorical variables were analyzed using either the Chi-square test or Fisher's exact test, depending on the sample size. All continuous variables had a non-

normal distribution and were analyzed using the Mann–Whitney test. Finally, a multivariate analysis using binary logistic regression was conducted to identify the independent predictors of a poor functional prognosis in patients with OD. Results were reported as odds ratios (OR), with the Haldane–Anscombe correction applied when necessary, along with 95% confidence intervals (95% CI). Significance level was set as $p < 0.05$.

Results

A total of 137 hospitalized patients diagnosed with stroke were evaluated using FEES.

For the FEES procedure, three consistencies were tested in accordance with the International Dysphagia Diet Standardisation Initiative (IDDSI)[13]: thin (colored water), slightly thick (level 1), and moderately thick (level 3)**.** OD was diagnosed when the patient exhibited signs of penetration and/or aspiration or a delayed oropharyngeal swallowing reflex followed by posterior spillage. All evaluations were performed by the same operator. The findings are shown in Table 1.

Based on the FEES results, the sample was divided into two groups: patients with OD (n = 95, 69.34%) and patients without OD (n = 42, 30.66%), as shown in Table 2. The mean age was 74.74 ± 18.61 years in the OD group and 74.02 ± 18.64 years in the non-OD group. Men accounted for 66.32% of the OD group and 57.14% of the non-OD group. There were no statistically significant differences between the groups in terms of age ($p = 0.553$) or sex ($p = 0.304$). Regarding the basal functional status, the distribution of mRS scores in the OD group was as follows: 63 patients scored 0–1, 22 scored 2–3, and 10 scored ≥ 4. In the non-OD group, 29 patients scored 0–1, 12 scored 2–3, and only one scored ≥ 4.

The stroke etiology was ischemic in 71 patients in the OD group and 34 patients in the non-OD group; hemorrhagic in 17 patients in the OD group and six patients in the non-OD group; and hemorrhagic transformation after an ischemic event in six patients in the OD group and two patients in the non-OD group. The average initial NIHSS score was 12 in the OD group and 11 in the non-OD group. No significant association was found between OD and the stroke etiology ($p = 0.518$) or initial NIHSS score ($p=0.145$).

AP occurred at least once in 40 patients (42.31%) in the OD group, while no cases were recorded in the non-OD group.

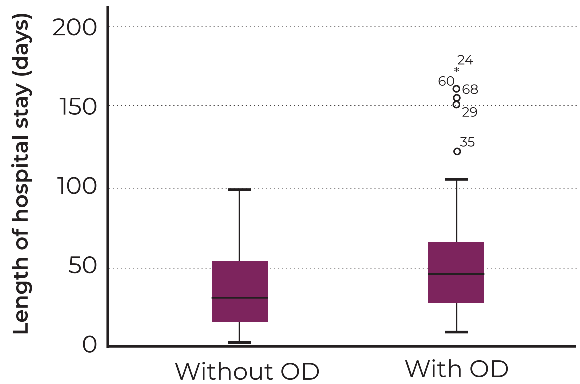
Univariate analysis revealed a significant association between OD and AP. Patients with OD had an approximately 62-fold increased risk of developing AP compared to those without OD (adjusted OR = 62.03, 95% CI = 1.08–3558.16, $p < 0.05$). PEG was required in 20 patients with OD, and 12 of them required permanent placement. No PEG placements were needed in the non-OD group. A statistically significant association was observed between OD and PEG requirement, with patients with OD having an approximately 23-fold increased likelihood of requiring PEG (adjusted OR = 23.10, 95% CI = 1.36–393.07, $p < 0.05$) compared to patients without OD. The mean length of hospital stay was 46 ± 36 days in the OD group and 31 ± 38 days in the non-OD group (Figure 1). This difference was statistically significant

Table 1
Fiberoptic Endoscopic Evaluation of Swallowing (FEES) findings in patients with oropharyngeal dysphagia (OD)

No penetration or aspiration (PAS 1–3[a]), n = (%)	26 (27,37)
Penetration (PAS 4–5[a]), n = (%)	34 (35,79)
Aspiration with preserved cough reflex (PAS 6–7[a]), n = (%)	16 (16,84)
Silent aspiration (PAS 8[a]), n = (%)	29 (30,53)
Delayed oropharyngeal swallowing reflex, n = (%)	49 (51,58)

PAS, Penetration-Aspiration Scale
[a]Three consistencies were tested in accordance with the International Dysphagia Diet Standardisation Initiative (IDDSI)14: thin (level 0), slightly thick (level 1), and extremely thick (level 4).

Figure 1
Length of hospital stay in patients with and without oropharyngeal dysphagia (OD)



($p < 0.05$). Multivariate analysis, adjusted for age and stroke etiology, revealed that patients with OD had a hospital stay 15 ± 5 days longer than those without OD ($p < 0.05$).
On discharge, the mean NIHSS score was 10 in the OD group and 6 in the non-OD group, and the difference was statistically significant ($p < 0.05$). Multiple linear regression analysis showed that OD was associated with a 4-point higher NIHSS score at discharge, after adjusting for age, prior mRS, stroke etiology, and site (B = 4.3, 95% CI = 1.98–6.52, $p < 0.05$).

Table 2
Sociodemographic and clinical characteristics

	Patients with OD (n=95)	Patients without OD (n=42)	p
Sociodemographic variables			
Age, mean (± standard deviation)	74,74 (± 18,61)	74,02 (± 18,64)	0,553
Male sex, n = (%)	63 (66,32)	24 (57,14)	0,304
Clinical variables			
Previous mRS			
0-1, n= (%)	63 (66,32)	29 (69,05)	
2-3, n= (%)	22 (23,16)	12 (28,57)	
≥ 4, n= (%)	10 (10,53)	1 (2,38)	
mRS at discharge			
0-1, n= (%)	1 (1,00)	7 (16,67)	
2-3, n= (%)	14 (18,18)	10 (23,81)	
≥ 4, n= (%)	62 (80,52)	25 (59,52)	
mRS range, mean (± standard deviation)	2,77 (±1,41)	2,17 (±1,55)	<0,05
Stroke etiology			0,518
Ischemic, n = (%)	71 (74,74)	34 (80,95)	
Hemorrhagic, n = (%)	17 (17,89)	6 (14,29)	
Hemorrhagic transformation after an ischemic event, n = (%)	6 (6,32)	2 (4,76)	
NIHSS on admission, mean (± standard deviation)	12 (±6)	11 (±7)	0,145
NIHSS at discharge, mean (± standard deviation)	10 (±6)	6 (±5)	<0,05
Aspiration pneumonia, n = (%)	40 (42,31)	0 (0)	<0,05
PEG placement, n = (%)	20 (21,10)	0 (0)	<0,05
Temporary, n = (%)	3 (20)	NA	
Permanent, n = (%)	12 (80)	NA	
Length of hospital stay, median (± interquartile range)	46 (± 36)	31 (± 38)	<0,05
Destination after discharge			<0,05
Home, n = (%)	4 (4,20)	12 (28,60)	
Short-stay unit, n= (%)	11 (11,60)	7 (16,70)	
Medium-stay unit, n = (%)	53 (55,80)	22 (52,40)	
Long-term care facility, n = (%)	10 (10,5)	1 (2,40)	
Death, n = (%)	17 (17,9)	0 (0)	

NA, not applicable; mRS, modified Rankin Scale; OD, oropharyngeal dysphagia; NIHSS, National Institutes of Health Stroke Scale; PEG, percutaneous endoscopic gastrostomy.

Assessment of the functional status at discharge using the mRS revealed that only one patient in the OD group and seven patients in the non-OD group had a score of 0–1; 14 patients in the OD group and 10 patients in the non-OD group had scores of 2–3; and 62 patients in the OD group and 25 patients in the non-OD group had scores ≥ 4.

Multivariate analysis, adjusted for age and stroke etiology, showed that OD was associated with a mean worsening of the mRS score by 0.5 ± 0.3 points compared to the non-OD group ($p < 0.05$).

Regarding the discharge destination, four patients with OD and 12 patients without OD were discharged home; 11 patients with OD and seven patients without OD were transferred to a short-stay unit; 53 patients with OD and 22 patients without OD were referred to a medium-stay unit; and 10 patients with OD and one patient without OD were institutionalized in a long-term care facility. Notably, 17 patients in the OD group died during hospitalization, whereas no deaths were recorded in the non-OD group.

There was a statistically significant association between OD and discharge outcomes ($p < 0.05$). Patients in the OD group had a higher likelihood of institutionalization or death (OR = 16.28, 95% CI = 2.13–124.35, $p < 0.05$), while patients in the non-OD group had a greater probability of being discharged to their homes ($p < 0.05$).

Discussion

In our study, no statistically significant difference was observed in the incidence of post-stroke OD between the sexes, consistent with the findings of previous studies[14].

Furthermore, no association was identified between OD and stroke severity, specifically the stroke etiology or the NIHSS score on admission. A recent meta-analysis revealed that patients with hemorrhagic stroke have an approximately 1.52-fold higher risk of developing OD compared to those with ischemic stroke. Additionally, patients with a higher NIHSS score have a 1.38-fold increased risk of developing OD[3]. However, beyond the stroke etiology and initial NIHSS scores, other factors such as the lesion volume and site, which were not analyzed in the present study, also influence the risk of OD. Therefore, further studies are needed to clarify these associations. As expected, patients with OD in our study had a higher incidence of AP and greater need for PEG, in line with the findings of previous studies[3,15,16]. The absence of AP or PEG placement in the non-OD group, as assessed by FEES, supports the use of this test to detect post-stroke OD.

In this study, the presence of OD was associated with a delay in hospital discharge by 15 ± 5 days, slightly longer than the durations reported in the literature. In a study by Patel et al., dysphagia of all causes was associated with prolongation of hospital stay by approximately 2.8 days[17]. However, their study did not focus specifically on post-stroke OD. In contrast, another study comparing patients with and without post-stroke OD found that the presence of OD doubled the length of hospital stay from 4.3 days to 9.1 days[18]. Both studies were based on data from the United States. A study by Attrill et al. reported a statistically significant geographic variation in the length of hospital related to OD. In Europe, OD was associated with an average increase of 8.42 days (95% CI: 4.3–12.5), whereas in North America, the increase was 3.91 days (95% CI: 3.3–4.5)[19]. Similarly, Muehlemann et al. compared the length of hospital stay between patients with and without post-stroke OD in France and Switzerland, reporting an average of 23.7 vs. 11.8 days and 14.9 vs. 8.9 days, respectively[20]. According to the literature, occurrence of post-stroke OD in Portugal is estimated to incur an additional average cost of EUR 3,915 per patient[21]. Muehlemann et al. also estimated additional costs of approximately EU 3,000 and EUR 16,000 per patient with post-stroke OD in France and Switzerland, respectively[20]. These estimates include both direct costs, such as hospital stays, diagnostic procedures, treatments, and use of human and material resources, and indirect costs, particularly those related to reduced productivity of patients and their caregivers. In addition to the economic burden, patients with OD exhibit poorer functional outcomes at discharge, including higher rates of institutionalization and mortality, as confirmed by previous studies[22]. A meta-analysis by Banda et al. reported that post-stroke OD more than doubles the rate of in-hospital mortality[2].

These findings underscore the importance of training multidisciplinary teams to screen for OD, confirmation through instrumental swallowing assessment, particularly FEES, and providing targeted care as a measure to reduce morbidity, which is likely to be cost-effective. This study has some limitations. Firstly, the study included only patients referred for FEES, which may have introduced selection bias. This could partially explain the longer hospital stay observed in our study compared to previous studies. Furthermore, several potential confounding factors were not evaluated in our study, potentially leading to an overestimation of certain associations. These include prior stroke events[23], lesion site (e.g., cerebral hemispheres, brainstem, cerebellum)[24], and a history of diabetes mellitus[25]. Therefore, the study results should be interpreted with caution, particularly for clinical decision-making.

Conclusion

Post-stroke OD increases the risk of respiratory complications and need for artificial nutritional support, leading to prolonged hospital stays, higher healthcare costs, and reduced quality of life.

Instrumental swallowing assessment, particularly FEES, is essential for the early identification and management of post-stroke OD, in addition to the continuous training of multidisciplinary teams involved in daily care.

Conflicts of interest

The authors declare that there is no conflict of interest regarding the publication of this paper.

Data Confidentiality

The authors declare having followed the protocols used at their working center regarding patient data publication.

Protection of humans and animals

The authors declare that the procedures were followed according to the regulations established by the Clinical Research and Ethics Committee and the 2013 Helsinki Declaration of The World Medical Association.

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Availability of scientific data

There are no datasets available, or publicity related to this work.

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