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Artigo de Revisão

Bedside swallowing assessment: associations between oromotor and laryngeal function and oropharyngeal dysphagia in hospital inpatients

Avaliação de deglutição à beira do leito: associações entre a função oromotora e laríngea e a disfagia orofaríngea em pacientes internados.

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ABSTRACT

Objective: to examine associations between the oromotor and laryngeal function and oropharyngeal dysphagia in hospital inpatients. **Methods**: a cross-sectional retrospective medical-record based study was performed, including 764 inpatients of a general public hospital, aged 18 to 99 years, who received clinical bedside swallowing examination from a speech-language pathologist during their hospital stay. Motor function of lips, tongue, jaw, soft palate and larynx was analysed dichotomously (normal vs reduced), and their association with oropharyngeal dysphagia diagnosis was analysed by Poisson regression model, with Prevalence Ratio (PR) and Odds Ratio (OR) estimators. **Results**: from all subjects, 63.5% had oropharyngeal dysphagia. Multivariate analysis showed that deficits on lip strength (PR = 1.24; CI95% 1.03-1.48) and motility (PR = 1.31; CI95% 1.07-1.60), and reduced laryngeal elevation (PR = 1.49; CI95% 1.31-1.69) were associated to higher occurrence of oropharyngeal dysphagia. Additionally, more severe dysphagia was marked by a higher number of structures with motor function deficits. **Final Considerations**: our study shows that motor function, mainly of lips and larynx, is associated to oropharyngeal dysphagia diagnosed during clinical bedside swallowing examination. Consequently, focus on the assessment of motor function might provide important information to conduct swallowing rehabilitation, particularly in facilities where instrumentals techniques are not available.

Keywords: Deglutition; Deglutition disorders; Hospital care; Health

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RESUMO

Objetivo: Examinar as associações entre a função oromotora e laríngea e a disfagia orofaríngea em pacientes internados. **Métodos**: Foi realizado um estudo transversal retrospectivo baseado em prontuários médicos, incluindo 764 pacientes internados em um hospital público geral, com idades entre 18 e 99 anos, que foram submetidos a exame clínico de deglutição à beira do leito por um fonoaudiólogo durante sua internação. A função motora dos lábios, língua, mandíbula, palato mole e laringe foi analisada dicotomicamente (normal vs. reduzida), e sua associação com o diagnóstico de disfagia orofaríngea foi analisada por meio de um modelo de regressão de Poisson, com estimadores de Razão de Prevalência (RP) e Razão de Chances (RC). **Resultados**: de todos os participantes, 63,5% apresentaram disfagia orofaríngea. A análise multivariada mostrou que déficits na força labial (RP = 1,24; IC95% 1,03-1,48) e na motilidade (RP = 1,31; IC95% 1,07-1,60), bem como a redução da elevação laríngea (RP = 1,49; IC95% 1,31-1,69), estiveram associados a uma maior ocorrência de disfagia orofaríngea. Além disso, a disfagia mais grave foi caracterizada por um maior número de estruturas com déficits na função motora. **Considerações finais**: nosso estudo demonstra que a função motora, principalmente dos lábios e da laringe, está associada à disfagia orofaríngea diagnosticada durante o exame clínico da deglutição à beira do leito. Consequentemente, o foco na avaliação da função motora pode fornecer informações importantes para a reabilitação da deglutição, especialmente em locais onde as técnicas instrumentais não estão disponíveis.

Palavras-chave: Deglutição; Transtornos de deglutição; Assistência hospitalar; Saúde

INTRODUCTION

The clinical bedside swallowing examination (BSE) is broadly described in the literature and established by different protocols as an integral part of oropharyngeal dysphagia diagnosis.[1–3] Compared to instrumental techniques and imaging studies, as the Fiberoptic Endoscopic Evaluation of Swallowing (FEES) and the Videofluoroscopic Swallowing Study (VFSS) (gold-standard), the BSE has sensibility between 70-90% and specificity of 50-90%, depending on the protocol and population studied.[4,5] The instrumental examination can bring higher reliability to the oropharyngeal dysphagia diagnosis and is recommended to be complementary to the BSE. Nevertheless, in less developed contexts, the availability of the necessary equipment for the instrumental evaluation is restricted to large medical centres and high complexity private hospitals, usually distant from regional hospitals and clinics which are deprived of proper investments from local governments.[6] In consequence, the BSE conducted by a speech-language pathologist is often the only strategy available to substantiate the dysphagia diagnosis of inpatients in a hospital facility.

There is an important variability among BSE protocols, which might include or not: review of medical history, nutritional status, mental status, posture, respiratory status, oromotor examination, voice quality, and supervised oral intake. However, oromotor function assessment is usually evaluated as a core examination on this routine.[1]

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The oromotor examination is closely related to the deglutition physiology. It comprises the motor response, defined as strength and motility, of swallowing-related structures in each phase of deglutition. Therefore, the examination of lip or tongue function, for example, enables to understand aspects about intraoral bolus control and bolus ejection, on oral phase of swallowing.[7] Further, analysis of laryngeal elevation brings important information regarding hyolaryngeal excursion and epiglottic inversion.[8]

Previous studies have attempted to examine associations between oromotor function and swallowing performance, especially focusing on aspiration risk and general swallowing impairment.[9,10] However few studies analyse the importance of each specific structure when operating together. Some investigations have approached the interaction of multiple structures, such as the combination of oral sensorimotor alterations or pressure patterns during swallowing, and their cumulative impact on dysphagia risk.[11,12] However, most of these studies either target specific populations (e.g., community-dwelling older adults, stroke survivors) or do not differentiate the relative contribution of each structure when functioning jointly.

Therefore, the aim of this study was to examine associations between the oromotor and laryngeal function and oropharyngeal dysphagia on clinical bedside swallowing examination of hospital inpatients. We hypothesize that impairments in specific oromotor structures will vary across the severity degrees of oropharyngeal dysphagia, revealing that the function of some structures might be of higher importance for the safety of swallowing, and therefore dictate the focus of swallowing assessment and intervention.

MATERIALS AND METHODS

Ethics approval

This study was performed in line with the principles of the Declaration of Helsinki. Approval was granted by the Ethics Committee of the Federal University of the Triângulo Mineiro. (number 1.604.565/2016) and registered on the National Committee for Research Involving Humans (Brazil) under number CAAE: 53672316.8.0000.5154.

Participants

A cross-sectional retrospective medical-record based study was performed of consecutive inpatients of a general public hospital in Brazil. Records from all participants aged 18-99 years, from any gender, who received BSE from a speech-language pathologist during their hospital stay were retrieved during a running period of two and a half years.

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Participants were excluded if the BSE was not conducted and registered accordingly with the institutional protocol of swallowing examination, or if their evaluation was incomplete. For inpatients who received repeated swallowing examinations in the described period, only the first evaluation that included oral trials were analysed.

The medium-sized hospital, where this study was conducted, is covered by speech-language pathologists in all its units – emergency unit, intensive care units and wards (medical, surgical, and neurological). In this institutional practice, the BSE is requested directly from the medical staff to the speech-language pathology team or performed after daily active search for cases with risk factors for dysphagia. During the period this study comprises, three speech-language pathologists who specialised on dysphagia or motricity, and had expertise on hospital care, performed BSE.

A post hoc power analysis was performed based on the adjusted Poisson regression estimates. Considering the final sample of 764 participants and a dysphagia prevalence of 63.5%, the statistical power was estimated at 64.3% for reduced lip strength (PR=1.24), 74.9% for reduced lip motility (PR=1.31), and greater than 99.9% for reduced laryngeal elevation (PR=1.49). The large number of outcome events (n=485) also ensured an adequate events-per-variable ratio, supporting the stability and reliability of the multivariable regression model. To ensure adequacy a second power analysis was performed using G*Power (version 3.1), employing the Poisson regression module under the Z-test family. Considering the observed prevalence ratio, exposure prevalence, overall outcome prevalence, sample size (n=764), and α=0.05, the study demonstrated adequate statistical power for the main associations observed in the adjusted model.

BSE protocol

For clinical oropharyngeal function examination, all the patients were evaluated using the institutional protocol, developed in line with national and international protocols.[1–3]four databases (CINAHL, Embase, PsycINFO, and PubMed The institutional protocol of swallowing examination includes initially: (a) patients' global examination: vital data, positioning, cognitive abilities (attention, orientation, oral language abilities), presence of teeth, etc.; (b) oromotor and laryngeal examination (described below); (c) sensitivity and reflexes examination; (d) assessment of voice quality. Whenever possible and judged as safe by the professional, the protocol is complemented by oral trials of different textures and volumes.

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Oromotor and laryngeal examination

Oromotor and laryngeal examination followed a specific clinical procedure described on Table 1, according to the institutional protocol. Each aspect is evaluated dichotomously as normal or altered/reduced, relative to the professional judgment.

Table 1 – Oromotor and Laryngeal Function Examination.

Structure	Aspect	Evaluation
Lips	Strength	Resistance against a spatula or the attempt to stretch from the evaluator, during protrusion
	Motility	Protrusion-retraction movement
Tongue	Strength	Tip resistance against a spatula during protrusion
	Motility	Protrusion-retraction, lateralization, tip lift-depression movements
Jaw	Motility	Mouth opening and jaw lateralization
Soft Palate	Motility	Elevation during oral phoneme production (/a/) or in reflex response to touch
Larynx	Motility	Laryngeal elevation during phonation and saliva swallowing

Fonte: autoria própria

Clinical diagnose of oropharyngeal dysphagia.

After conclusion of the examination protocol and oral trials, swallowing ability was classified accordingly to clinical manifestations as follows:

(I) Normal/Functional Swallowing: no signs of oropharyngeal dysphagia during oral trials.

(II) Mild Dysphagia: mild oral stasis after swallowing, masticatory deficits, anterior loss of bolus; without multiple swallows or signs of aspiration.

(III) Moderate Dysphagia: moderate bolus stasis after swallowing, multiple swallows, throat clearing/cough or altered cervical auscultation for thin liquids with no alterations for other textures and no signs of respiratory distress.

(IV) Severe Dysphagia: severe saliva stasis, inefficient or incapacity for bolus propulsion, signs of aspiration or respiratory distress for more than one texture.

All bedside swallowing examinations were performed by three speech-language pathologists experienced in hospital dysphagia management. The professionals had previously completed institutional training and professional development modules regarding the standardized application of the swallowing assessment protocol. Throughout the study

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period, the same assessment procedures, clinical criteria, and examination instruments were used, aiming to ensure consistency and harmonization of evaluations across examiners.

Covariates

Demographic data with documented influence on swallowing function were registered,[13] namely: age (continuous years); sex (male or female); cause of admission; and occurrence of orotracheal intubation (OI), during hospital stay and previous to swallowing examination (yes or no).

The cause for hospital admission was classified in four categories for statistical analysis, as follows: (a) neurological: stroke, traumatic brain injury, neurodegenerative diseases, neuroinfection, neurosurgery; (b) infectious; (c) surgical: fracture, lesions, tumours; (d) medical: acute coronary syndrome, endocrine and metabolic disorders, psychiatric disorders, unspecific diagnose.

Statistical analysis

The database was constructed using EpiData Entry software, version 3.1b (The EpiData Association, Odense, Denmark). SPSS Statistics 23.0 software (IBM Corporation, Armonk, NY, USA) was used for all statistical analyses. For the variable age, data normality was verified by Kolmogorov-Smirnov test.

Descriptive analysis included frequency (absolute and relative), central tendency and variability measures (mean, median, standard deviation, interquartile range). Differences between subjects with and without dysphagia were analysed using the chi-squared test for categorical variables and the Mann–Whitney U test for continuous variables.

To identify factors associated with oropharyngeal dysphagia, univariate and multivariate analysis via Poisson Regression with robust variance, with prevalence ratio (PR) estimated and 95% confidence intervals (95%CI), was conducted. Multinomial logistic regression with Odds Ratio (OR) estimates and 95%CI was used to analyse associations between oromotor and laryngeal function and dysphagia severity, being subjects without dysphagia the comparison group.

All models were adjusted by age, sex, OI and cause of admission, they were included because their p-value was less than 0.20. Multicollinearity among independent variables was assessed prior to multivariable modelling using tolerance and variance inflation factor

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(VIF) statistics, indicating adequate independence among predictors included in the adjusted Poisson regression model. A *p* value <0.05 was regarded as statistically significant.

RESULTS

A total of 764 inpatients, aged 18 to 99 years (mean 62.2; SD: 18.0), were included. Table 2 displays participant's characteristics by presence or absence of dysphagia. From all subjects, 485 (63.5%) were diagnosed with oropharyngeal dysphagia by a speech-language pathologist during BSE; of these, the majority were men and people whose cause of admission were neurologic or infectious.

Table 2 – Characteristics of subjects accordingly to oropharyngeal dysphagia diagnose.

	Normal/ Functional		**Dysphagia**		
	n	**%**	*n*	**%**	*p*
Sex					0.025
Male	140	33.0	284	67.0	
Female	139	40.9	201	59.1	
Cause of admission					0.009
Neurologic	148	32.3	312	67.8	
Infectious	58	38.2	94	61.8	
Surgical	22	43.1	29	56.9	
Medical	44	50.6	43	49.9	
OI					0.188
No	174	38.3	280	61.7	
Yes	104	33.7	205	66.3	
	Median	IQR	Median	IQR	
Age (years)	63.0	26.0	66.0	24.0	0.068

IQR=Interquartile Range. OI= Orotracheal Intubation

Fonte: autoria própria

The swallowing examination was conducted after a mean of 10.0 (SD: 11.0) days from admission. Inpatients unit location was 417 (54.6%) at emergency unit, 45 (5.9%) at ICU and 302 (39.5%) at non-critical wards. A quarter of the inpatients had been hospitalised for more than 14 days by the time of swallowing examination.

Table 3 shows the associations between oromotor and laryngeal function examination and oropharyngeal dysphagia. On univariate analysis, subjects presenting deficits on lip

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strength and motility, tongue strength and motility, or jaw, soft palate and larynx motility had higher prevalence ratio of dysphagia. On multivariate analysis, adjusted by age, sex, OI and cause of admission, subjects with reduced lip strength (PR=1.24; 95%CI=1.03-1.48) and motility (PR=1.31; 95%CI=1.07-1.60), and diminished laryngeal elevation (PR=1.49; 95%CI=1.31-1.69) exhibited higher prevalence of oropharyngeal dysphagia in comparison to those without deficits. Other variables included in the model were not associated with the outcome.

Table 3 – Univariate and multivariate analysis of oropharyngeal dysphagia related factors.

		Univariate		Multivariate	
	%	PR (95%CI)	*p*	PR (95%CI)	*p*
Lip					
Strength			<0.001		0.020
Reduced	36.5	2.03 (1.82 - 2.26)		1.24 (1.03 - 1.48)	
Motility			<0.001		0.007
Reduced	44.1	1.93 (1.71 - 2.18)		1.31 (1.07 - 1.60)	
Tongue					
Strength			<0.001		0.538
Reduced	48.5	1.79 (1.58 - 2.03)		1.05 (0.88 - 1.26)	
Motility			<0.001		0.069
Reduced	38.3	1.95 (1.74 - 2.17)		1.18 (0.98 - 1.42)	
Jaw					
Motility			<0.001		0.723
Reduced	21.0	1.77 (1.62 - 1.93)		1.02 (0.90 - 1.16)	
Soft palate					
Motility			<0.001		0.802
Reduced	31.3	1.62 (1.44 - 1.82)		1.01 (0.88 - 1.17)	
Larynx					
Motility			<0.001		<0.001
Reduced	28.1	1.93 (1.77 - 2.11)		1.49 (1.31 - 1.69)	

PR: Prevalence ratio; CI: Confidence interval; Adjusted by age, sex, orotracheal intubation and cause of admission.

Fonte: autoria própria

Subjects presenting normal/functional swallowing during oral trials evaluation also exhibited some alteration on oromotor function, registering here deficits on tongue strength (25.4%), lips and soft palate motility (14.3% and 17.7%, respectively). Only seven (2.3%) inpatients without dysphagia had reduced laryngeal elevation. The oromotor deficits on those with normal/functional swallowing had

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statistically inferior prevalence compared to subjects with oropharyngeal dysphagia, for all analysed variables (p<0.001).

Table 4 displays OR accordingly to dysphagia severity, when compared to subjects with normal/functional swallowing. On multivariate analysis, adjusted by age, sex, OI and cause of admission, inpatients with reduced lip motility (OR= 2.49; 95%CI= 1.36-4.56) and laryngeal elevation (OR= 6.17; 95%CI= 2.27-16.74) had higher odds-ratio of presenting mild dysphagia. For moderate dysphagia, associations were seen for tongue motility (OR= 3.54; 95%CI= 1.52-8.25), lip strength (OR= 3.71; 95%CI=1.47-9.38) and laryngeal motility (OR= 24.63; 95%CI= 8.45-71.72). For the severe dysphagia, associations were found with deficits on lip strength (OR= 5.34; 95%CI= 1.88-15.19), and motility of tongue (OR= 3.89; 95%CI= 1.47-10.28), jaw (OR= 5.03; 95%CI= 1.56-16.13), soft palate (OR= 3.39; 95%CI= 1.44-7.95) and larynx (OR= 96.90; 95%CI= 37.87-285.61).

Table 4 – Univariate and multivariate analysis of oropharyngeal dysphagia severity related factors.

	Mild Multivariate OR (95%CI)	**Moderate Multivariate OR (95%CI)**	**Severe Multivariate OR (95%CI)**
Lip Strength			
Reduced	2.12 (0.99 - 4.52)	3.71 (1.47 - 9.38)#	5.34 (1.88 - 15.19)#
Motility			
Reduced	2.49 (1.36 - 4.56)#	1.92 (0.78 - 4.73)	2.34 (0.82 - 6.64)
Tongue Strength			
Reduced	0.95 (0.53 - 1.68)	1.77 (0.78 - 3.99)	1.38 (0.55 - 3.46)
Motility			
Reduced	1.16 (0.59 - 2.26)	3.54 (1.52 - 8.25)#	3.89 (1.47 - 10.28)#
Jaw Motility			
Reduced	2.22 (0.84 - 5.86)	2.47 (0.81 - 7.56)	5.03 (1.56 - 16.13)#
Soft palate Motility			
Reduced	0.85 (0.44 - 1.65)	1.87 (0.86 - 4.06)	3.39 (1.44 - 7.95)#
Larynx Motility			
Reduced	6.17 (2.27 - 16.74)*	24.63 (8.45 - 71.72)*	96.90 (32.87 - 285.61)*

OR: Odds Ratio; CI: Confidence interval; Adjusted by age, sex, orotracheal intubation and cause of admission; Compared to normal/functional swallowing; *p <0.001; #p <0.005.

Fonte: autoria própria

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DISCUSSION

The BSE fundamentally includes the review of patient's medical history and examining the function of structures involved on all phases of swallowing process. This study aimed to investigate how the motor function of these structures is associated to oropharyngeal dysphagia diagnosis in hospital inpatients.

The results suggest that the functionality of each structure required for the swallowing process was independently important for safe swallowing, being associated on univariate analysis to oropharyngeal dysphagia diagnose in all severities; these results are in accordance to different studies on literature on diverse clinical situations in non-hospital locations.[9,10]

When analysing the structures together, on adjusted model via Poisson Regression, lip strength and motility, and larynx motility were associated to oropharyngeal dysphagia. In conjunction, both structures represent the different phases of swallowing. Lips are required on preparatory and oral phases, facilitating oral bolus control and preventing anterior bolus loss, besides promoting maintenance of oral pressure during posterior bolus ejection.14 Moreover, laryngeal elevation is a core movement during pharyngeal phase, enabling epiglottic inversion, opening of the pharyngeal-esophageal transition and the protection of lower airway.[8,15]

Few studies emphasize lip function as a main factor on oropharyngeal dysphagia examination. Deficits on this structure are regularly neglected in videofluroscopic studies and cannot be visualised during FEES, hence being almost an exclusively clinical feature.[16] Nonetheless, researches including objective measurement of lip force found that it is associated to lip occlusion during swallowing and to premature bolus loss.[17] Reduced lip strength has been also related to sarcopenic dysphagia in older adults.[18]

On the other hand, a greater number of studies are devoted to understand how tongue function deficits influence oropharyngeal dysphagia.[17,19] Despite the extensive literature on this topic, systematic-reviews concluded there is not enough evidence for tracing a clear relation between tongue function and aspiration events, or for recommending lingual strength-training as a therapy to improve swallowing.[20] In our study, although tongue strength and motility were associated to oropharyngeal dysphagia on univariate analysis, it was not significant on multivariate model. It is important to notice that there is an interdependent action of the structures requested on oral phase of swallowing, in order to promote a safe transition to pharyngeal phase.[21] There are some evidence that anterior and posterior hard palate-to-tongue pressure is associated to the adequacy of lip closure during swallowing,[22] which could justify the alternate relation observed by different studies between lips versus

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tongue function and swallowing disorders.

Laryngeal motility alteration, evaluated here by assessment laryngeal elevation, was associated to oropharyngeal dysphagia in all severities, both on univariate and multivariate model. Only a small percentage of inpatients with normal/functional swallowing had laryngeal elevation judged as reduced during clinical examination. Laryngeal motility measured by cervical palpation reflects image studies' findings regarding epiglottic inversion,[23] which when inadequate has been associated to food aspiration in patients with diverse pathologies.[24]

Even though aspiration is considered the most serious sign of oropharyngeal dysphagia,[25] it is important to realise that swallowing comprises multiple phases which can be impaired in different degrees of severity, generating disorders during feeding and swallowing process even in the absence of aspiration events. Our results suggest that subjects with more severe oropharyngeal dysphagia have a higher number of structures of which deficit is significant in the analysis. A previous study, with community-dwelling older people, pointed that subjects with four or more oral sensorimotor alterations, on clinical swallowing examination, had higher prevalence of oropharyngeal dysphagia, suggesting that normal oral sensorimotor functions are crucial for swallowing efficiency.[10]

Conversely, normal/functional swallowing on BSE oral trials was not strictly associated with the preservation of the motor function for all structures. It is important to highlight that both oromotor function and global swallowing process embrace a broad spectrum of manifestations that can be considered as normal, and varies considering sex, age, food texture, patients positioning, and evaluation method.[26,27] Hence, the variability on "normal" swallowing physiology is difficult to be perceived during clinical examination, and is also influenced by context and educational training.[28] Moreover, the development of voluntary and involuntary compensations to motor deficits naturally occurs in order to promote safe and efficient swallowing, for instance reducing bolus volume or changing body position,[29] which can produce good and functional performance on oral trials. Additionally, the motor function depends not exclusively on muscle strength, but can be interpreted as a combination of motor planning and execution that might produce different manifestations from similar impairments.[30]

One limitation of this study is it used subjective measurement of oromotor and laryngeal function, by the dichotomous judgment of a speech-language pathologist. Even considering the expertise from the professionals on swallowing assessment and the use of a standardised protocol during examinations, variability in judgments is expected. This study did not use specific instruments, apart from low-cost equipment easily available on

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any hospital facility, which could promote more precision on research results. Nevertheless, the BSE is in many places the only resource to guide speech-language pathologist decisions and therapeutics for dysphagic patients, and has its clinical usage widely documented.[5,10,24]

Another possible limitation is the analysis of the participants as a group, independently of the risk factors for oropharyngeal dysphagia. The sample size attempts to compensate the specificities and vast number of variables that correlate do oropharyngeal dysphagia on a hospital setting, by including a great number of subjects with each specific feature. The intention was to evaluate comprehensively how oromotor and laryngeal function deficits conduct to swallowing disorders, without specific concern with the cause of those deficits. However, we understand that additional impairments on sensibility, awareness, or positioning might negatively influence swallowing physiology and dysphagia severity.[10,24]

Another limitation of this study is the broad age range of the participants. Although age was included as a covariate in all adjusted analyses, age-related physiological changes in swallowing function, commonly described as presbyphagia, may influence oromotor performance and swallowing outcomes. Therefore, future studies specifically designed to compare different age groups may provide additional insights into the impact of aging on the relationship between oromotor function and oropharyngeal dysphagia.

Our study has several strengths. First, the large sample size overcomes some methodological limitations. Second, the sample includes hospitalized patients. Third, the study includes robust analyses and information from participants' medical records.

CONCLUSION

At the end of the study, a greater occurrence of dysphagia associated with deficits in lip strength, motility and reduced laryngeal elevation was observed. The oromotor and laryngeal function examination is a critical part of clinical diagnosis of oropharyngeal dysphagia, and each of its components is individually related to swallowing function. The laryngeal elevation is one of the most important aspects to preserve normal/functional swallowing, which deficits of function are rarely present among subjects without dysphagia and is associated with this dysphagia diagnosis in all severities.

Simultaneous deficits on motor function in multiple structures of swallowing process were related to increasing on oropharyngeal dysphagia severity, and alterations on lip function are present since mild dysphagia diagnosis.

In conclusion, the oromotor and laryngeal function examination as part of BSE is an important tool, able to provide crucial information for decisions regarding safe feeding of hospital inpatients, particularly on places where instrumentals techniques are difficult to access or are unavailable.

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