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Pharyngeal residue in neurogenic oropharyngeal dysphagia

Resíduos faríngeos nas disfagias orofaríngeas neurogênicas

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Keywords

Swallowing Disorders
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ABSTRACT

Purpose: To compare pharyngeal residues of different consistencies among groups of individuals with neurogenic oropharyngeal dysphagia. **Methods:** In a cross-sectional study, a fiberoptic endoscopic evaluation was performed in 30 swallowing exams of individuals diagnosed with neurological disease and oropharyngeal dysphagia, regardless of the time or stage of the disease. The individuals were divided into three groups according to etiology: group I, 10 post-stroke, 8 male and 2 female, aged 51 to 80 years (average age: 67 years); group II, 10 individuals with amyotrophic lateral sclerosis, 5 male and 5 female, aged 39 to 78 years (average age: 57 years); group III, 10 examinations of individuals with Parkinson's disease, 5 male and 5 female aged 65-88 years (average age: 74 years). The Yale Pharyngeal Residue Severity Rating Scale was applied by two independent raters in a blind manner for the analysis of pharyngeal residues in valleculae and pyriform sinuses based on the first swallowing of 5 mL of pureed and thickened liquid. **Results:** No statistically significant difference was observed among groups in the degree of pharyngeal residues of puree food or thickened liquid in the valleculae (p = 0.25/p = 0.18) or the pyriform sinuses (p = 1.41/0.49). **Conclusion:** The pharyngeal residue levels of pureed and thickened liquid were similar for the groups studied, with less severe levels being more frequent.

Descritores

Transtornos da Deglutição
Endoscopia
Acidente Vascular Cerebral
Esclerose Lateral Amiotrófica
Doença de Parkinson

RESUMO

Objetivo: Comparar os resíduos faríngeos por consistência de alimento entre indivíduos com disfagia orofaríngea neurogênica. **Método:** Estudo clínico transversal. Realizada análise de 30 exames de videoendoscopia de deglutição de indivíduos com diagnóstico de doenças neurológicas e disfagia orofaríngea, independentemente do tempo ou estágio das doenças. Os indivíduos foram divididos em três grupos: o grupo I composto por 10 indivíduos pós-Acidente Vascular Cerebral, 8 homens e 2 mulheres, faixa etária entre 51 e 80 anos (média 67 anos); o grupo II por 10 indivíduos com Esclerose Lateral Amiotrófica, 5 homens e 5 mulheres, faixa etária entre 39 e 78 anos (média 57 anos), e o grupo III por 10 indivíduos com Doença de Parkinson (DP), 5 homens e 5 mulheres, faixa etária entre 65 e 88 anos (média 74 anos). Para análise dos resíduos faríngeos em valéculas e seios piriformes, foi aplicada a *Yale Pharyngeal Residue Severity Rating Scale,* considerando a primeira deglutição de 5 mL nas consistências pastosa e líquida espessada, por dois juízes independentes e de forma cega. **Resultados:** Não houve diferença estatística significativa nos resíduos faríngeos, em valéculas (*p= 0,25/ p= 0,18*) e seios piriformes (*p= 1,41/ 0,49)*, respectivamente nas consistências pastosa e líquida espessada, nas diferentes doenças estudadas. **Conclusão:** Os níveis de resíduos faríngeos na consistência pastosa ou líquida espessada na população estudada foram semelhantes e mais frequentes nos níveis menos grave.

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INTRODUCTION

Orpharyngeal dysphagia is a symptom of many base diseases, involving difficulties in food bolus transport from the mouth to the stomach. The high incidence and prevalence of this symptom in different neurological diseases affecting adults and children are frequently associated with nutritional and pulmonary complications[1-4].

Thus, an early evaluation of oropharyngeal swallowing in these populations is of fundamental importance in order to minimize the clinical consequences of this symptom. An objective method for the assessment of dysphagia is Fiberoptic endoscopic swallowing evaluation (FEES), considered to be diagnostically equivalent to the videofluoroscopy gold standard for the identification of posterior oral spillage, the presence of pharyngeal residues, pharyngeal penetration, and laryngotracheal aspiration[5-8]. In addition, VES is a method of easy and rapid execution by the bedside without patient exposure to radiation, permitting the evaluation of laryngeal sensitivity and the observation of the anatomical structure of determined regions[9-11].

A highly relevant finding in the investigation of swallowing biomechanics is the presence of pharyngeal residues in the valleculae and pyriform sinuses after each swallow, which may suggest impaired and reduced efficiency of oropharyngeal swallowing[12], and may also represent a signal predictive of laryngotracheal aspiration[13]. FEES has been found to be more sensitive than swallowing videofluoroscopy for the evaluation of the degree of pharyngeal residue involvement since it permits the observation of the dimensional characteristic of the quantity of residues in the pharyngeal region[12,14].

The current literature emphasizes the importance of scales for the classification of the severity of pharyngeal residues for diagnostic purposes, and also for the definition of the therapeutic conduct regarding oropharyngeal dysphagia. The Yale Pharyngeal Residue Severity Rating Scale (YPRSRS) has been developed, standardized, validated and defined by means of images of FEES. It is an ordinal scale involving up to five points for the quantity and location of pharyngeal residues[15]. A recent systematic review has analyzed the various proposals of different scales for the classification of pharyngeal residues and has concluded that only the YPRSRS satisfies the criteria of validity and applicability[16].

Since the presence of pharyngeal residues among individuals with oropharyngeal dysphagia is considered to be a risk marker for the efficiency and safety of swallowing. Individuals with different neurological diseases exhibit different aspects of the physiopathology of swallowing, it is of fundamental importance to compare the performance of these populations in the absence or presence of pharyngeal results in order to guide conduct protocols.

In general, the presence of pharyngeal residues is one of the findings in neurogenic dysphagia, possibly due to the many impairments in the physiopathological mechanisms of oropharyngeal swallowing. Among victims of cerebrovascular accidents (CVA), the impairments in the oral phase, with a reduction of the pharyngeal response, affect the elevation of the larynx and the mechanism of pharyngeal cleaning and of protection of the lower airway, possibly producing pharyngeal residues[11,17,18]. In various neurodegenerative diseases such as Parkinson's disease (PD) and lateral amyotrophic sclerosis (LAS), the presence of pharygeal residues, in addition to being related to impairment of the oral phase, is closely related to the neuromuscular deficits present in the different phases of swallowing in each disease, which affect the oropharynx in distinct ways[19-24].

Thus. if we consider that the presence of pharyngeal residues is one of the impairments of oropharyngeal swallowing used as a parameter for the conduct to be followed and that this finding is present in the different types of swallowing disorders, its investigation become essential in order to avoid generalization in the diagnostic and conduct process. On this basis, the objective of the present study was to compare the pharyngeal residues of groups of individuals with neurogenic oropharyngeal dysphagia according to the food consistency offered to them.

METHODS

The study was approved by the Research Ethics Committee of the institution (protocol no. 2.040.305/2017). All subjects or their legal representatives gave written informed consent to participate in the study. We emphasize that all rules of resolutions 466/2012, 510/2016 were respected.

Patients

Thirty FEES exams of individuals with a medical diagnosis of neurological diseases were analyzed regardless of disease duration or stage. Oropharyngeal dysphagia was confirmed by a diagnosis determined in the Dysphagia Laboratory-LADIS of the São Paulo State University "Júlio de Mesquita Filho" – UNESP, Marília Campus, SP, during the period from 2015 to 2018. Exams with images showing technical problems regarding the intended analysis were excluded. The individuals were divided into three groups according to disease etiology. Group I (GI) consisted of 10 post-CVA subjects, 8 male and 2 female aged 51 to 80 years (mean: 67 years); group II (GII) consisted of 10 subjects with LAS, 5 male and 5 female aged 39 to 78 years (mean: 57 years); and group III (GIII) consisted of 10 subjects with PD, 5 male and 5 female aged 65 to 88 years (mean: 74 years) (Appendix 1).

Methods

This was an observational cross-sectional clinical study conducted on patients whose oropharyngeal swallowing was evaluated by FEES. The FEES procedure was performed by the responsible physician according to the protocol of the institution using a Machida®/Pentax® nasofibroscope coupled to a Pentax® microcamera and a Pentax® light source model LH-150 PC. The images were stored in a computer using the Zscan 6.0® image capture syatem. For the exam, each patient was instructed to remain seated while the device was introduced into the more pervious nasal fossa without the use of a topical anesthetic.

For the study, 5 ml volumes of standardized pureed food and thickened liquid consistencies were collected from the institutional protocol of dynamic study of swallowing with FEES as recommended by the International Dysphagia Diet Standartisation Initiative (IDDSI). The consistencies of the liquid foods were prepared with a peach-flavored diet juice and with an instant food thickener consisting of modified cornstarch and maltodextrin. An artificial food dye with a blue pigment was added to the food in order to facilitate its visualization in the pharyngeal region.

The first swallow of each consistency was considered for the analysis and classification of pharyngeal residues, with 30 exams being analyzed for the pureed samples and 27 for the thickened liquid samples. This was due to the interruption performed in the exam for each consistency and volume by means of substantial aspiration. The YPRSRS[15] was applied after inter-research group translation since there is no translation or validation of the scale for Brazilian Portuguese. The YPRSRS classifies the residues in the vallecula and pyriform sinus regions into five levels: absence of residues and vestigial residue or mild, moderate and severe degree.

The pharyngeal residues were classified by two independent raters in a blind manner. The first rater, with 20 years of experience in FEES execution and analysis, was considered to be the gold standard rater for this analysis, and the second had been trained for one year for these specific analyses.

Statistical analysis

The Kappa agreement coefficient was applied in order to determine the agreement between the two raters in the ordinal evaluation of pharyngeal residues. The Kappa value obtained was 0.75, which indicates strong agreement between raters, and the remaining statistical analyses were performed only after this analysis. The Kruskal-Wallis test was used to study the relationship between residue location and food consistency in the three study groups (Post-CVA, LAS and PD). This test is used to compare multiple independent groups using the STATISTICA software version 7.0. The level of significance was set at ≤ 0.05 in all analyses.

RESULTS

Table 1 shows the frequency of pharyngeal residues of pureed food and thickened liquid in neurogenic oropharyngeal dysphagia.

Tables 2 and 3 respectively show the classification of pharyngeal residues of pureed food and thickened liquid in the valleculae and pyriform sinuses between groups.

The occurrence of pharyngeal residues was more frequent for the pureed consistency in both the valleculae and pyriform sunuses, at levels considered to be absent or mild (YPRSRS 0-2) rather than moderate or severe l (YPRSRS 3-4) in all groups, with no significant difference between them.

Tables 4 and 5 respectively show the classification of pharyngeal residues of thickened liquid consistency in the valleculae and pyriform sinuses for the various study groups.

For the intake of thickened liquid, there was also a more frequent occurrence of pharyngeal residues in the valleculae and pyriform sinuses at levels ranging from absent to mild (YPRSRS 0-2) than at moderate or severe levels (YPRSRS 3-4) in all groups, with no significant difference among them.

Table 1. Frequency of pharyngeal residues of pureed food and of thickened liquid in neurogenic oropharyngeal dysphagia

	Presence	Absence
Pureed food N=30	19 (63.33%)	11 (36.67%)
Thickened liquid N=27	16 (59.26%)	11 (40.74%)

N: number of patients

Table 2. Classification degree of pharyngeal residues of pureed food in the vallecula region of the different groups

	YPRSRS 0-2	YPRSRS 3-4
GI	9 (90%)	1 (10%)
GII	9 (90%)	1 (10%)
GIII	9 (90%)	1 (10%)
H 2 (N=30) p = 0,25		

N: number of patients; YPRSRS: Yale Pharyngeal Residue Severity Rating Scale

Table 3. Classification degree of pharyngeal residues of pureed food in the piryform sinus region of the different groups

	YPRSRS 0-2	YPRSRS 3-4
GI	10 (100%)	0 (0%)
GII	9 (90%)	1 (10%)
GIII	10 (100%)	0 (0%)
H 2 (N=30) p = 1,41		

N: number of patients; YPRSRS: Yale Pharyngeal Residue Severity Rating Scale

Table 4. Classification degree of pharyngeal residues of thickened liquid in the vallecula region of the different groups

	YPRSRS 0-2	YPRSRS 3-4
GI	9 (100%)	0 (0%)
GII	8 (89%)	1 (11%)
GIII	9 (100%)	0 (0%)
H 2 (N=27) p = 0,18		

N: number of patients; YPRSRS: Yale Pharyngeal Residue Severity Rating Scale

Table 5. Classification degree of pharyngeal residues of thickened liquid in the pyriform sinus of the different groups

	YPRSRS 0-2	YPRSRS 3-4
GI	9 (100%)	0 (0%)
GII	8 (89%)	1 (11%)
GIII	9 (100%)	0 (0%)
H 2 (N=27) p = 0,49		

N: number of patients; YPRSRS: Yale Pharyngeal Residue Severity Rating Scale

DISCUSSION

Several studies have identified and characterized the presence of pharyngeal residues in neurogenic oropharyngeal dysphagia, relating them to the presence of laryngotracheal aspiration[18,19,21,24,25]. In agreement with these studies, although without identifying the quantity and location of pharyngeal residues or the differences among the various dysphagic groups, the present study observed that the frequency of occurrence of pharyngeal residues of the food consistencies studied in neurogenic oropharyngeal dysphagia was higher than the absence of such event. Considering that the presence of pharyngeal residues is related to distinct types of impairment of various biomechanical actions of oropharyngeal swallowing that depend both on oral propulsion and on mechanisms of pharyngeal contraction and the opening of the pharyngoesophageal transition, the possibility of this being a frequent finding in dysphagic symptomatology is considerable and agrees with the literature[18,19,22].

Thus, even though there is consensus in the literature about the frequent presence of pharyngeal residues among subjects with neurogenic oropharyngeal dysphagia, little is known about the quantity or site of occurrence of this event in different populations. On this basis, this classification may contribute to the understanding of the physiopathology involved or to the elaboration of consensual conduct protocols for each base disease.

Thus, the level of severity of the pharyngeal residues of the food consistencies tested was found to be similar in the different groups of neurological diseases studied. Variation in the levels of involvement of pharyngeal residues can be explained according to the physiopathology of swallowing in each base disease. Among post-CVA patients, the pharyngeal residues are associated with the performance of the oral phase and of the pharyngeal response, with the laryngeal elevation and the opening of the pharyngoesophageal transition[11,17,18]. In neurodegenerative diseases such as ALS and PD, the physiopathology of pharyngeal swallowing residues is associated with the neuromuscular deficit present in the oral and pharyngeal phases of swallowing[19-24].

In the current study, the presence of pharyngeal residues of the food consistencies studied in both the valleculae and pyrifirm sinuses was of less severe degree according to the classification scale used, with no difference between the diseases studied. This result agrees with previous investigations of pharyngeal residues in neurogenic oropharyngeal dysphagias which used swallowing videofluoroscopy, also reporting that residue classification as mild was more frequent than classification as severe[19,26]. On the other hand, a study conducted on a heterogeneous population detected a similar percentage of the presence of pharyngeal residues at mild and severe levels[27]. Thus, the discussion of this aspect becomes complex due to the absence of consensus about the method used in these studies in order to measure pharyngeal residues. There is wide variation among studies of pharyngeal residues regarding the method used for the measurement of this parameter[23,26-28].

In the present study, comparison of pureed and liquid consistency revealed the same degree of residue classification. A previous study of dysphagic subjects with distinct neurological etiologies, brain lesions and neurodegenerative diseases observed that an increased viscosity of the food bolus did not affect the accumulation of pharyngeal residues in the group with brain damage. On the other hand, the authors detected that increased food viscosity led to greater residue accumulation in the group of patients with neurodegenerative diseases[28]. These should rethinking that the stage of neurodegenerative diseases affects the neuromuscular performance and may affect the formation of pharyngeal residues and that the understanding of this question was limited.in the cited study. Finally, the accumulation of pharyngeal residues according to the food consistency should be a criterion to be considered in multiprofessional conducts. However, it is difficult to compare the present results to those of other studies, since many investigations did not consider the food consistencies in a separate manner or according to degree of residue involvement[24]. Most studies have analyzed the presence of pharyngeal residues with different methods, without actually considering the site of residue[18], or greatly emphasizing the offer of food of liquid consistency compromising the safety of swallowing[19]. In addition, it is important to point out that in the present study the pharyngeal residues were analyzed according to region, in a blind manner and by two raters.

Another relevant aspect of this discussion, which may compromise the comparison of different studies, is that comparison of the various scientific studies investigating oropharyngeal dysphagia should consider the setting of the study group. Different settings often involve subjects with acute or chronic signs and symptoms, with a greater or lower evolution of progressive situations, a fact that necessarily affects the degree of dysphagia present in a patient series. In the present study, the sample was recruited at a Rehabilitation Center, thus suggesting that the safety and efficacy profile of swallowing among patients receiving this modality of care may show lower impairment.

Finally, in order to potentialize new research hypotheses by considering the limitations of the present study, we point out that the lack of information about the disease stage of the subjects with neurodegenerative diseases studied here and the reduced number of individuals in each group may have compromised the comparative analysis of differences between them. In addition, an analysis of all swallows performed during each food offer might have contributed to a better understanding of the mechanism of pharyngeal residues in neurogenic oropharyngeal dysphagia. However, this initial study using a specific method and blind raters can contribute to future reflections about this topic.

CONCLUSION

The levels of pharyngeal residues of pureed food and thickened liquid were similar for all groups studied, with a higher frequency of less than severe levels.

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Author contributions

GADS: data collection, paper writing and editing; RGS: study design, critical review, orientation; PCC: contribution to paper writing and editing; SMMO: data collection, study design, critical review and orientation.

APPENDIX 1. Characterization of the sample

Patient	Gender	Age	Neurological diagnosis	Date of VES	Use of an alternative feeding route
1	Male	60	CVA	03/05/2017	No
2	Male	67	CVA	23/03/2016	Yes
3	Male	66	CVA	25/05/2016	No
4	Male	62	CVA	20/08/2015	No
5	Male	76	CVA	26/08/2015	No
6	Female	80	CVA	17/12/2014	No
7	Male	71	CVA	11/03/2015	No
8	Male	51	CVA	19/08/2015	No
9	Male	66	CVA	30/08/2017	Yes
10	Female	73	CVA	01/11/2017	No
11	Female	46	LAS	08/04/2015	No
12	Male	43	LAS	24/08/2016	No
13	Male	70	LAS	12/11/2014	No
14	Female	61	LAS	19/02/2014	Yes
15	Female	39	LAS	10/04/2014	No
16	Female	44	LAS	20/05/2015	No
17	Male	59	LAS	02/10/2013	No
18	Female	59	LAS	04/11/2015	No
19	Male	78	LAS	12/11/2014	No
20	Male	68	LAS	16/10/2013	No
21	Male	77	PD	18/05/2016	No
22	Female	77	PD	14/06/2017	No
23	Female	79	PD	12/04/2017	No
24	Female	67	PD	24/05/2017	No
25	Female	67	PD	04/02/2015	No
26	Male	75	PD	30/10/2014	No
27	Male	69	PD	10/09/2014	No
28	Male	75	PD	18/03/2015	No
29	Male	88	PD	15/05/2013	No
30	Female	65	PD	04/11/2015	No