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Clinical swallowing evaluation in multiple sclerosis at a reference center in the center-west of Brazil

Avaliação clínica da deglutição em esclerose múltipla em um centro de referência no centro oeste do Brasil

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ABSTRACT
Background: In Multiple Sclerosis (MS), the physiology of deglutition can be compomised due the demyelination relapses, afecting both oral and pharyngeal stages. Symptoms control is an important part of the treatment of patients with MS, however, signs and symptoms of dysphagia may not be easily recognized by patients and caregivers. The management of swallowing reduces the risks of dehydration, malnutrition, pulmonary alterations and death. Objective: assess swallowing changes through a clinical evaluation in patients with MS ina reference and research center in a university hospital in the center west of Brazil Method: Cross-sectional study was carried out between November 2015 and August 2016, with 73 adult and elderly patients. The study included the oral motor system and vocal evaluation, and the functional evaluation of swallowing, using liquid-pasty, liquid, pasty and solid food consistencies. Results: Dysphagia was found in 30.14% of the patients, with significant alterations in the qualification and propulsion of the food bolus, featuring important impairment of the oral and pharyngeal phases of swallowing. Conclusion: This results was similar in the researched

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literature. Showing that dysphagia can appear in early stages of MS, compromising all stages of deglutition process.

KeyWords: Multiple Sclerosis, Deglutition, Dysphagia, Deglutition Disorders, Evaluation Methodology.

RESUMO

Background: Na Esclerose Múltipla (EM), a fisiologia da deglutição pode ser comprometida durante os surtos de desmielinização, podendo afetar tanto a fase oral quanto faríngea desta. O controle dos sintomas é uma parte importante do tratamento dos pacienets com EM, no entanto, sinais e sintomas de disfagia podem não ser tão facilmente reconhecidos por pacientes e cuidadores. O manejo da deglutição reduz os riscos de desidratação, desnutrição, alterações pulmonares e óbito. Objetivo: levantar as alterações da deglutição através de uma avaliação clínica em pacientes de um centro de referência e pesquisa em EM em um hospital universitário do centro-oeste do Brasil. Método: Estudo transversal, realizado entre Novembro de 2015 e Agosto de 2016, com 73 pacientes adultos e idosos. Foram avaliados o sistema motor oral e voz, e realizada a avaliação funcional da deglutição utilizando as consistências líquido pastoso, líquido, pastoso e sólido. Resultados: Foi encontrada disfagia em 30,14% dos pacientes, com alterações significativas na qualificação e propulsão do bolo alimentar, caracterizando importante comprometimento das fases oral e faríngea da deglutição. Conclusão: Esse estudo apresentou resultados semelhantes à literatura pesquisada. Mostrando que a disfagia pode aparecer nos estágios iniciais da EM, comprometendo todas as fases do processo de deglutição.

 Palavras-Chave: Esclerose Múltipla, Deglutição, Disfagia, Transtornos da Deglutição, Metodologia de Avaliação

1 INTRODUCTION

In Multiple Sclerosis (MS), the demyelination of the structures of the cortico-bulbar tract, cerebellum, brain stem and cranial nerve can seriously compromise the physiology of deglutition. Symptom control is an important part of the treatment of patients with MS, however, signs and symptoms of dysphagia are frequently neglected by patients and caregivers.[1-5]

Swallowing disorders, or dysphagia, is related to any change in the swallowing process that hinders safe, efficient and comfortable oral ingestion of food or liquids and is due to neurological or structural impairments. The signs and symptoms are characterized according to phase and/ or between the phases of its dynamics. Oropharyngeal dysphagia reflects problems involving both voluntary and involuntary movements of oral cavity, lips, tongue, floor of the mouth, soft palate, pharynx and esophagus, causing food penetration in the airway, resulting in lung problems, aspiration, pneumonia, and death. In addition, there may be changes in the individual's nutrition, hydration and social integration aspects.[6-10]

Motor and sensory dysfunctions can compromise the oral phase, presenting imprecision or lack of coordination of movements, causing inefficiency in the transit of food through the oral cavity. These changes are common due to injuries to the cranial nerves or in the central nervous system and

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can directly influence the pharyngeal phase. Problems in the events related to propulsion of the bolus or protection of the airways, may increase the risk of choking and aspiration. Deficits at this stage are common in diseases that affect large, multiple and diffuse regions of the brain, causing changes in muscle strength and coordination.[6-9]

The swallowing evaluation represents a challenge in the clinical practice of the multidisciplinary team due to the wide variety of assessment protocols ranging from screenings to clinical and instrumental evaluations. Moreover, there is a lack of consensus between those methods, differences in the severity classification of the disease and the results obtained.[1,4-5]

Therefore, recognize the patients with swallowing abnormalities in early stages of MS is essential in the prevention of pneumonias, laryngeal aspiration, malnutrition, dehydration, and its complications that can result in death. As well as the appropriate elaboration of the therapeutic treatment of the differents stages and difficulties in swallowing.[2-5,11] The present study aimed to perform the clinical evaluation of swallowing in patients with MS at the Reference Center for Research and Treatment in Multiple Sclerosis (CRIEM) on the University Hospital (HC) of the Federal University of Goiás (UFG) in central-western Brazil.

2 METHODOLOGY

Cross-sectional study conducted at the Reference Center for Research and Treatment in Multiple Sclerosis (CRIEM) of the university hospital (HC) of the Federal University of Goiás (UFG), central-western Brazil in the period from Novembro 2015 to August 2016. Data collection started after approval by the Ethics Committee of the university hospital (CAAE 44421315.0.0000.5078).

2.1 PATIENT SELECTION

During the study period, all patients enrolled in the CRIEM database were considered and, after applying the inclusion and exclusion criteria, 94 patients were eligible. The sample size was defined in 73 patients.The inclusion criteria were: individuals over 18 years of age, both sexes, with definitive diagnosis of MS, in attendance to the referred Center and that agreed to participate signing the Informed Consent Term, according to the resolution n. 466/2012 of the Brazil´s Ministry of Health. Exclusion criteria were: patients from other health units, out of the study period, in disease relapse at the time of evaluation, with other neurological, degenerative, progressive or incapacitating diseases, dementia, in speech-language therapy and/ or inconclusive diagnosis.

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2.2 DATA COLLECTION

Data collection occurred at CRIEM on the same day of the medical appointment. Patient clinical data, such as type of MS and Expanded Disability Status Scale (EDSS) scores were collected in the medical records. The demographic data were collected by an instrument specifically developed for this study, including gender, age, race, diagnostic time and comorbidities. The Functional Evaluation of Swallowing (*Avaliação Funcional da Deglutição* - AFD) was elaborated for this study, with the contribution of four judges speech-language therapists specialists in dysphagia. The aim of the instrument was to evaluate swallowing using various volumes and food consistencies.

The protocol included the analysis of the Oral Motor System, vocal evaluation, the presence of oral or digestive disorders and the functional evaluation of swallowing. The patient was placed in a seated position, with the column at 90 degrees, facing the researcher, aiming at a better visualization of the oral and laryngeal movements. Oxygen saturation, heart rate and suggestive signs of fatigue were also monitored during the evaluation, as well as cervical auscultation (performed before, during and after food offering).[12,13]

The Oral Motor System was evaluated by the observation of the Orofacial Complex (OFC) both at rest position and voluntary activity, considering symmetry between hemifaces, and the morphology, posture, mobility and tonicity of the musculature.[14]

The oral cavity inspection was performed: with the observation of mouth opening capacity, tongue to larynx size according to Mallampati scale[15], the aspect of the hard and soft palate, presence of alterations in Temporal Mandibular Articulation, dental aspects, presence of intraoral changes or lesions, and the use of dental prostheses[16]. Patients were questioned about digestive disorders such as gastroesophageal reflux, gastritis, heartburn and others.

For vocal evaluation, it was requested: the emission of sustained phonemes (/a/, /s/, and /z/), syllables (PA, TA, KA), sequence of syllables (PA-TA-KA), and natural production of the spoken voice. For this was considered the maximum phonation time, articulation pattern, pneumo-phono-articulation coordination and the presence or absence of speech disorders (such as dysarthria).[17] The vocal parameters were classified according to the RASATI scale, (observing the presence of hoarseness, roughness, soprosity, astenia, tension or instability).[18]

For the AFD, the consistencies were measured with syringe measured in milliliters, disposable cups and tablespoon, in order to facilitate the handling. All material were left on the table in an attempt to simulate daily eating habits, without any interference from the evaluator.

The evaluation began with liquid pasty food consistency (nectar consistency), offered a total of 30ml. For the liquid it was offered 90 ml of final volume. For pasty consistency (cream/pudding

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consistency) a total volume of 30ml. For solid food was offered a cream cracker. The individual was instructed to withdraw the food according to the normal volume of their feeding habits.

For all consistencies were observed: the capture of food in both the spoon and the cup, chewing and lip sealing, oral transit time, presence of nasal reflux, number of swallows for each supply, laryngeal elevation and anteriorization, vocal quality, presence of suggestive signs of penetration and/or laryngeal aspiration (coughing or gagging), breath-swallowing coordination, presence of food residues in oral cavity and signs of fatigue.[16,19-22] Swallowing was classified according to the American Speech-Language Hearing Association – National Outcome Measuremente System (ASHA NOMS). This scale is divided into seven levels ranging from one to seven. The lower score indicates a greater impairment in the functionality of swallowing.[23]

At the end of the evaluation, after determination of the absence or presence of changes in the swallowing process, the evaluator was able to define the conduct for each case.

2.3 DATA ANALYSIS

Data analysis was performed with an Intel Core I7 3537-U (2.50GHz), Minitab 17.3 software. Statistics were created in the presentation of the frequency distribution between variables of patient identification data using Spearman's Correlation. For the analysis of the existence of dependence between the type of MS and the presence of dysphagia, the Fischer's exact test was used. As for the variables time of diagnosis and EDSS scores, taking the abnormal distribution and ordinal character of those, the analysis of the relation with the presence of dysphagia was performed using the Kruskal-Wallis test. For all the tests, a conficence level of 95% was set, being considered p<0.05.

3 RESULTS

The study consisted of 73 patients, 62 (84.93%) females and 11 (15.07%) males, ranging in age from 21 to 75 years, according to Table 1. Non-white races presented higher prevalence: 38 individuals (52.05%). Most of the patients had more than nine years of regular education (61.65%). Type of multiple sclerosis by sex was statistically significant (p=0.035). More specifically, we observed a higher concentration of female patients with Relapsing Remitting MS (RRMS) (79.45%). There was no significant difference of type of multiple sclerosis by age, race and schooling (p>0.05).

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Table 1 – Demografic data distribution related to type of Multiple Sclerosis. CRIEM, Goiânia, Goiás – Brazil 2016 (N=73)

Variables	Frequency n (%)	Type of Multiple Sclerosis			p-value*
		SP n (%)	RR n (%)	PP n (%)	
Sex					0.035
Female	62 (84.93)	4 (5.48)	58 (79.45)	--	
Male	11 (15.07)	2 (2.74)	8 (10.96)	1 (1.37)	
Total	73 (100)	6 (8.22)	66 (90.41)	1 (1.37)	
Age (years)					0.263
21 – 30	8 (19.96)	1 (1.37)	7 (9.59)	-	
31 – 40	11 (15.07)	-	11 (15.07)	-	
41 – 50	18 (24.66)	2 (2.74)	16 (21.92)	-	
51 – 60	23 (31.51)	3 (4.11)	19 (26.03)	1 (1.37)	
61 – 75	13 (17.81)	-	13 (17.81)	-	
Total	73 (100)	6 (8.22)	66 (90.41)	1 (1.37)	
Race					0.463
White	35 (47.95)	2 (2.74)	33 (45.20)	-	
Non white	38 (52.05)	4 (5.48)	33 (45.20)	1 (1.37)	
Total	73 (100)	6 (8.22)	66 (90.40)	1 (1.37)	
Schooling					0.326
Unlettered	2 (2.74)	-	2 (2.74)	-	
1 – 4 years	5 (6.85)	1 (1.37)	4 (5.48)	-	
5 – 8 years	21 (28.77)	2 (2.74)	19 (26.03)	-	
9 – 11 years	22 (30.14)	3 (4.11)	19 (26.03)	-	
12 years or more	23 (31.51)	-	22 (30.13)	1 (1.37)	
Total	73 (100)	5 (6.85)	66 (90.41)	1 (1.37)	

*Spearman correlation. SP: Secundary Progressive; RR: Relapsing Remitting; PP: Primary Progressive.

Regarding EDSS, 50 (68.49%) individuals presented scores between 0 and 3.5, as ilustrated by Table 2. RRMS was the most present in the sample: 66 (90.41%) of participants. Time of diagnosis ranged from five to ten years in 28 individuals (38.36%) and more than ten years in 25 individuals (34.25%). In this study, 22 (30.14%) patients had dysphagia. When we distributed patients by these variables (EDSS, type of MS and time of diagnosis) and dysphagia, differences were not statistically significant (p>0.05).

Table 2 – Relationship between the presence of dysphagia and the variables time of diagnosis, Multiple Sclerosis type and Expanded Disability Status Scale (EDSS) scores. CRIEM, Goiânia, Goiás - Brazil 2016. (N=73)

Variables	Frequency n (%)	Dysphagia		p-value
		Absent n (%)	Present n (%)	
EDSS (scores)				0.312*
0 – 3.5	50 (68.49)	34 (46.57)	16 (21.96)	
4 – 5.5	21 (28.77)	15 (20.55)	6 (8.22)	
6 – 7.5	2 (2.74)	2 (2.74)	-	
Total	73 (100)	51 (69.86)	22 (30.14)	
Multiple Sclerosis type				0.574**
RR	66 (90.41)	44 (60.27)	22 (30.14)	
SP	6 (8.22)	6 (8.22)	-	
PP	1 (1.37)	1 (1.37)	-	
Total	73 (100)	51 (69.86)	22 (30.14)	
Time of diagnosis (years)				0.688*
0 – 5	20 (27.40)	15 (20.55)	5 (6.85)	
5 – 10	28 (38.36)	21 (28.77)	7 (9.59)	

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11 – 15	18 (24.66)	11 (15.07)	7 (9.59)
16 – 20	5 (6.85)	4 (5.48)	1 (1.37)
21 or more	2 (2.74)	-	2 (2.74)
Total	73 (100)	51 (69.86)	22 (30.14)

*Kruskal-Wallis; **Fisher's exact test. RR: Relapsing Remitting; SP: Secundary Progressive; PP: Primary Progressive.

Based on the American Speech-language Hearing Association (ASHA NOMS) rating, EDSS scores from 0 to 3.5 showed more swallowing disorders (Table 3). Of these individuals, ten (13.96%) were classified at level 5, five (6.85%) in level 4 and one (1.37%) level 3. Individuals with EDSS scores above 6 did not have dysphagia. However, the distribution of patients by EDSS scores and ASHA NOMS rating was not statistically significant (p>0.05).

Table 3 – Correlation between Expanded Disability Status Scale scores(EDSS) e American Speech-language Hearing Association National Outcome Measurement System rating (ASHA NOMS). CRIEM, Goiânia, Goiás - Brazil 2016. (N=73)

Variables	Freq n (%)	ASHA NOMS rating					p-value*
		3 n (%)	4 n (%)	5 n (%)	6 n (%)	7 n (%)	
EDSS							0.458
0 – 3.5	50 (68.49)	1 (1.37)	5 (6.85)	10 (13.69)	18 (24.66)	16 (21.92)	
4 – 5.5	21 (28.77)	-	1 (1.37)	5 (6.85)	7 (9.59)	8 (10.96)	
6 – 7.5	2 (2.74)	-	-	-	-	2 (2.74)	
Total	73 (100)	1 (1.37)	6 (8.22)	15 (20.54)	25 (34.25)	26 (35.62)	

*Spearman correlation.

According to the AFD, the most frequent alterations were related to oral transit time, present in 17 (23.29%) cases for liquid-party consistency and 11 (15.07%) for liquid and pasty food consistencies (Table 4). Laryngeal elevation and anteriorization were considered altered in six (8.22%) individuals considering liquid-pasty consistency, in four (5.48%) for liquid consistency and in three (4.11%) individuals for pasty consistency.

Table 4 – Distribution of patiens according to food consistencies and changes in the Functional Deglutition Evaluation (AFD). CRIEM, Goiânia, Goiás - Brasil 2016. (N=73)

Variables	Frequency for food consistency		
	Liquid pasty n (%)	Liquid n (%)	Pasty n (%)
Oral Transit Time			

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Appropriate	56 (76.71)	62 (84.93)	69 (80.82)
Altered	17 (23.29)	11 (15.07)	11 (15.07)
No information	-	-	3 (4.11)
Total	73 (100)	73 (100)	73 (100)
Laryngeal elevation and anterioration			
Appropriate	67 (91.78)	69 (94.52)	67 (91.78)
Altered	6 (8.22)	4 (5.48)	3 (4.11)
No information	-	-	3 (4.11)
Total	73 (100)	73 (100)	73 (100)

Considering solid consistency, chewing alterations were observed in 19 (26.02%) of cases, alterations in oral transit time in 18 (24.66%) individuals, and presence of food residues in the oral cavity in four cases (5.48%), according to Table 5.

Table 5 – Distribution of patients according to solid consistency evaluation. CRIEM, Goiânia, Goiás - Brasil 2016. (N=73)

Variables	Patient distribution by solid food consistency evaluation		
	Frequency (n)	Percent (%)	Adjusted percentage (%)
Chewing			
Appropriate	50	68.49	72.46
Altered	19	26.02	27.54
No information	4	5.48	-
Total	73	100	100
Oral transit time			
Appropriate	51	69.86	73.91
Altered	18	24.66	26.09
No information	4	5.48	-
Total	73	100	100
Residue in oral cavity			
Absent	65	89.04	94.20
Present	4	5.48	5.80
No information	4	5.48	-
Total	73	100	100

4 DISCUSSION

Deglutition disorders are life-threatening factors and often underestimated or neglected by patients with MS.[1,2,5,10] This population presents a high risk of dehydration, malnutrition and pulmonary alterations, which can lead to death.[1,2] The management of swallowing with functional

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assessments allows the development of attention, care and rehabilitation programs in the early stages of the disease, reducing these risks and promoting a better quality of life.[2,4]

According to the literature, MS affects mostly female patients, aged between 30 and 40 years.[24-26] In this study, women were the majority of the population evaluated, with significant results between the sexes. Although the studies report the prevalence of the disease in the age group of 30 to 40 years, in this study were observed different results, with patients between 41 and 60 years old.[24-26] Probably this data is related to the fact that most of the participants were already in treatment in the CRIEM, and presented diagnosis and time of disease greater than five years. In these cases, when motor alterations began, the pursuit of treatment is more consistent.

The predominant race was non white, followed by caucasians, however, it had no statistical significance between them. Considering that Brazil covers areas of equatorial, tropical and temperate climate, the population presents a unique ethnic identity, therefore the results are diferent from other studies, which determine the caucasian race the most affected by the disease.[25,26] Even so, the prevalence of the disease depends on the region of Brazil and its predominant climate, and the influence of immingration (between regions and other countries) on racial miscegenation.[27] This is noted in other study that consider that rates and prevalence can vary between regions and populations, implicating environmental risk as well.[28]

The educational level of the individuals evaluated was higher than nine years, corresponding to secondary and higher education. In the references consulted, no studies were found that address this data. Individuals with higher education tend to understand better their clinical condition, being able to identify early symptoms of specific disabilities of the disease (fatigue, walking difficulties, orofacial changes, etc.).

Considering the type of MS, 30.14% of individuals had dysphagia, all of them with the Relapsing Remitting Multiple Sclerosis (RRMS) type. According to Fernandes et al. (2013)[3], the progressive forms of the disease – Primary progressive (PP) and secondary progressive (SP) – are most often susceptible to have severe swallowing changes. But this study agrees with Alali, Ballard and Bogaardt (2018)[29] that considered difficult to correlate the MS type and dysphagia due the low numbers of PP and SP types in the sample. Furthermore, there was no statistical significance between EDSS scores and ASHA NOMS levels.

Patients with mild disabilities are most likely to have complaints about swallowing changes, considering the scores of EDSS according to Bergamaschi et al. (2008)[1] and Beckmann et al. (2015)[10]. In this study, the presence of dysphagia was more common in the individuals withs EDSS scores between 0 and 3.5, with mild to moderate changes in the swallowing process through functional evaluation.

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In MS there is no standard characteristic for dysphagia, since the signs and symptoms of dysphagia will depends of the affected functional systems and the combination of impairments[29,30]. However, in this study it was not possible to determine the location of demyelination. It was possible to observe that swallowing disorders occurred for all consistencies, with impairment in the oral and pharyngeal phases of swallowing, suggesting that this is due to motor and sensory intraoral changes.[10] Changes in cerebellar and brainstem functions modulate deglutition depending on the characteristics of the food bolus (quantity, consistency and temperature) and individuals's ability to handle food.[31] Regarding the evaluated consistencies (pasty liquid, liquid, pasty and solid), there were greater changes in qualification (oral transit time) and cake propulsion (need for multiple swallows).

4.1 LIMITATIONS

The sample of patients who agreed to participate in the research was limited, even though the necessary statistical tests were carried out. Despite being a reference center for patients with MS, the frequency and consistency in maintaining the treatment was variable. Several individuals lived in other cities, and their mobility was a limitation. However, we consider that the sample showed the profile of patients who are seen at the center, and we believe that the continuation of the survey and attendance would improve the knowledge about swallowing disorders.

Accurate diagnosis of dysphagia should be an important part of symptom management as it can lead to social isolation or health problems such as dehydration or malnutrition. In the research for the study, there were no protocols for outpatient evaluation aimed to clinically evaluate the swallowing process.

However, instrumental evaluations are not a reality in Brazilian hospitals in general, being procedures with high cost, risk with radiation exposure and / or difficulty access to the researched population.[10] Also, self-evaluation questionnaires are used only to identify the frequency and the risk of dysphagia in MS, requiring more specific evaluations.[29]

It seems important to determine the signs and symptoms of dysphagia in this population, considering a clinical evaluation, and its correlation with the systems affected by diseases relapses.

5 CONCLUSION

In this study it was possible to observe commom dysphagic symptoms in MS patients, considering several food consistencies and the phases of swallowing. However, further research is needed to better define these changes.

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