

Prevalence of penetration and aspiration in Parkinson's disease in rehabilitation center

Prevalência de penetração e/ou aspiração laringotraqueal na Doença de Parkinson em centro especializado de reabilitação

Prevalencia de penetración y aspiración en la Enfermedad de Parkinson en centro especializado de rehabilitación

*Renata Rodrigues Silva**
*Paula Cristina Cola***
*Suely Mayumi Motonaga**
*Evellyn Spazzapan**
*Beatriz Novais Merola**
*Roberta Gonçalves da Silva**

Abstract

Introduction: Laryngotracheal penetration and/or aspiration are clinical findings that are an important parameter in the measurement of the risk for swallowing safety due to possible pulmonary complications. **Objective:** To identify the prevalence of penetration and/or aspiration in Parkinson's disease (PD) in a Specialized Rehabilitation Center. **Method:** Retrospective observational clinical study. We analyzed 39 reports of fiberoptic endoscopy swallowing test performed at the Dysphagia Rehabilitation Center "University of São Paulo-UNESP/Marília" from 2006 to 2016. Of the 39 (100%) individuals, 19 (48.71%) were female and 20 (51.28%), ranging from 43 to 85 years old (mean age of 71 years), and only 29 (74.35%) of these individuals presented a classification of Hoehn & Yahr (1967) ranging from one to

* Universidade Estadual Paulista - UNESP/Campus de Marília, SP, Brazil.

** Universidade de Marília-UNIMAR, SP, Brazil

Authors' contributions:

RRS, ES and BNM: participated in the data collection, analysis and interpretation, and article writing. PCC, SMM and RGS: participated in the study design, data analysis and interpretation, manuscript writing correction and manuscript final review.

Correspondence address: Roberta Gonçalves da Silva rg.silva@unesp.br

Received: 01/06/2018

Accepted: 05/01/2019

five. The analysis of the penetration and aspiration was performed in paste, liquid, thickened and liquid consistencies, with a volume varying from 5 to 10 ml according to the definition proposed by Rosenbek et al., 1996. For the statistical analysis Fisher's test was used. **Results:** It was verified that 28 (71.79%) individuals presented no laryngotracheal penetration and/or aspiration and 11 (28.21%) presented. Of these 11 (28.21%), four (10.25%) presented penetration / aspiration in paste consistency ($p = 0.05$), nine (23.07%) in the thickened liquid ($p = 0.07$) and nine (23.07%) in the thin liquid ($p = 0.02$). **Conclusion:** In the population studied in this setting, the absence of penetration and/or aspiration was more frequent and the presence was significant only of the liquid.

Keywords: Deglutition; Deglutition Disorders; Parkinson Disease; Prevalence; Aspiration Pneumonia.

Resumo

Introdução: Penetração e/ou aspiração laringotraqueal (PA) são achados clínicos que constituem importante parâmetro na mensuração do risco para a segurança da deglutição devido às possíveis complicações pulmonares. **Objetivo:** Identificar a prevalência de penetração e/ou aspiração na Doença de Parkinson (DP) em Centro Especializado de Reabilitação (CER). **Método:** Estudo clínico observacional retrospectivo. Foram analisados 39 laudos de exames de videoendoscopia da deglutição realizadas em Centro Especializado de Reabilitação "Universidade Estadual Paulista-UNESP/Marília", no período de 2006 a 2016. Dos 39 (100%) indivíduos, 19 (48,71%) eram do gênero feminino e 20 (51,28%) do gênero masculino, com idade que variou de 43 a 85 anos (média de idade de 71 anos) e somente 29 (74,35%) desses indivíduos apresentavam classificação de Hoehn & Yahr (1967) variando de um a cinco. Realizada análise da PA nas consistências pastosa, líquida espessada e líquida e com volume que variou de 5 a 10 ml segundo a definição proposta por Rosenbek et al, 1996. Para análise estatística foi utilizado o Teste de Fisher. **Resultados:** Constatou-se que 28 (71,79%) indivíduos não apresentaram penetração e/ou aspiração laringotraqueal e 11 (28,21%) apresentaram. Desses 11 (28,21%), quatro (10,25%) apresentaram penetração/aspiração na consistência pastosa ($p=0,05$), nove (23,07%) no líquido espessado ($p=0,07$) e nove (23,07%) no líquido ralo ($p=0,02$). **Conclusão:** Na população estudada nesse setting a ausência de PA foi mais frequente e a presença significativa apenas no líquido ralo.

Palavras-chave: Deglutição; Transtornos de Deglutição; Doença de Parkinson; Prevalência; Pneumonia Aspirativa.

Resumen

Introducción: Penetración y/o aspiración laringotraqueal (PA) son hallazgos clínicos que constituyen un importante parámetro en la medición del riesgo para la seguridad de la deglución debido a las posibles complicaciones pulmonares. **Objetivo:** Identificar la prevalencia de penetración y / o aspiración en la Enfermedad de Parkinson (DP) en Centro Especializado de Rehabilitación (CER). **Método:** Estudio clínico observacional retrospectivo. Se analizaron 39 casos de exámenes de videoendoscopia de la deglución realizados en Centro Especializado de Rehabilitación "Universidade Estadual Paulista-UNESP/Marília", del período de 2006 a 2016. De los 39 (100%) individuos, 19 (48,71%) eran del género femenino y 20 (51,28%) del género masculino, con edad que varía de 43 a 85 años (mediana de edad de 71 años) y solamente 29 (74,35%) de estos individuos presentaban clasificación de Hoehn & Yahr (1967) variando de uno a cinco años. Se realizó un análisis de la PA en las consistencias pastosa, líquida espesa y líquida y con volumen que varía de 5 a 10 ml según la definición propuesta por Rosenbek et al, 1996. Para el análisis estadístico se utilizó el test de Fisher. **Resultados:** Se constató que 28 (71,79%) individuos no presentaron penetración y / o aspiración laringotraqueal y 11 (28,21%) presentaron. En la mayoría de los casos, se observó una disminución de la producción de leche en la leche materna, (23,07%) en el líquido ralo ($p = 0,02$). **Conclusión:** En la población estudiada en ese ajuste la ausencia de PA fue más frecuente y la presencia significativa sólo en el líquido.

Palabras claves: Deglución; Trastornos de Deglución; Enfermedad de Parkinson; Prevalencia; Neumonía por Aspiración.

Introduction

The oropharyngeal dysphagia (OD) is a common symptom in neurological diseases and it is frequently considered as an aspect that enhances the risk of aspiration pneumonia and death¹⁻⁴. In some of these diseases, such as Parkinson Disease (PD), the OD symptoms are not initially remarkable for feeding safety and efficiency, and end up being lately screened and evaluated, compromising the early diagnostic with generalized practices. At PD, the disease progress can exacerbate the oropharyngeal dysphagia and increase the frequency of laryngeal penetration and/or laryngotracheal aspiration (AP)⁵⁻⁹.

The incidence and prevalence of oropharyngeal dysphagia in neurological diseases were studied from the 1980's viewing at contributing to the screening, diagnostic and early rehabilitation, enhancing the life quality of these populations. On the other hand, to identify the oropharyngeal dysphagia does not necessarily mean to include the AP presence, once in many OD this finding can either be present at the beginning, such as in the case of some neurodegenerative diseases, or appear only in the course of the disease progression. Thus, to study the specific AP prevalence can contribute to practices that are more significant in the face of these dysphagia populations, not permitting generalizations.

At PD, for example, although oropharyngeal dysphagia is also a frequent symptom, we do not exactly know the AP prevalence; despite some studies about dysphagia and PD have reported among their results, the presence of this finding in thickened and thin liquids^{10,11}. Other studies about oropharyngeal dysphagia at PD have investigated the saliva silent aspiration frequency in this population with the FESS¹²; the frequency of silent laryngeal penetration or silent aspiration at PD in patients with diurnal sialorrhea¹³; or have investigated the effects of food consistency at the scores of the penetration and aspiration scale and deglutition time¹⁴.

It is also known that the deglutition oral phase in PD is marked by the oral incoordination with impairments at the tongue mobility, with bradykinesia and rigidity, what can compromise the oral transit time (OTT)^{1,15}. At the swallowing pharyngeal phase, there is the reduction of pharyngeal response, reduction of the laryngeal elevation and

finally, the esophageal phase that is presented with increased transit time¹⁶⁻²⁰. The findings of the oropharyngeal swallowing, specifically the ones of the pharyngeal phase such as laryngotracheal penetration and aspiration, can be investigated either with videofluoroscopy swallowing exams, exam known as gold-standard, or with FESS due to the matching between these methods at AP investigation^{21,22}.

A relevant issue in the studies that include neurodegenerative diseases, and that have as objective to characterize the oropharyngeal deglutition, relates to the setting where the population was studied. Individuals followed up at Rehabilitation Centers, hospitals or household environments have their functional independence marked by distinct levels and, consequently, present different performances from the global motor point of view. Regarding individuals with PD followed up in the specific sector of the Rehabilitation Centre, it is verified that the motor profile allows either independent movement or dependent in wheelchair. This global motor performance has frequent relation with the orofacial and oropharyngeal motor condition that can vary between light and moderate, and more rarely, severe. This way, without a specific AP study in each disease and settings, the practices with oropharyngeal dysphagia could be generalized.

Therefore, this study aims at identifying the prevalence of penetration and/or laryngotracheal aspiration in individuals with Parkinson's disease served at a specialized rehabilitation center.

Method

Study approved by the Research Ethics Committee under n° 0997/2014.

For this retrospective observational study were analyzed 39 FESS reports of individuals with PD forwarded to the Research and Rehabilitation Center of Oropharyngeal Dysphagia-UNESP-Campus de Marília. These individuals were diagnosed with PD by different neurologic centers of the city and region, confirmed by medical records. The oropharyngeal dysphagia diagnostic was performed by means of clinical and instrumental examination, in this specialized center, within the period from 2006 to 2016.

There were included 39 (100%) individuals in this study, being 19 (48.71%) female and 20 (51.28%) male, with age varying from 43 to 85

years old (average of 71 years old). Only 29 of these individuals presented Hoehn & Yahr (1967) classification, varying from one to five, among them 4 (13.79%) belonged to the first level, 8 (27.58%) to the second and third levels, 7 (24.13%) to the fourth level, and 2 (6.89%) to the fifth level.

For the investigation of the swallowing of individuals with PD it was performed FEES by an Otolaryngologist doctor, following the protocol of the center. The laryngotracheal penetration and aspiration finding was collected from FEES protocol of the referred service.

Regarding the FEES instrumental procedure, it was used the equipment of Machida® brand, connected to the micro camera system, Pentax® brand, and light source of Pentax® brand, model LH-150 PC. The entire exam was followed by image visualization on the monitor using image capturing *Zscan 6.0* software.

For performing the examination, the patient was guided to remain seated, and then the instrument was introduced through the clean nostril, not using any topical anesthetic, to avoid alterations on the sensibility of the local. The nasal, pharyngeal and laryngeal cavities were evaluated with the observation of vocal folds mobility during the noise emission of /i/.

The laryngeal sensibility was tested by the touch of the distal end of the nasofibroscopy instru-

ment at the bilateral aryepiglottic and arytenoids folds. It was considered presence of laryngeal sensibility when occurred cough reflex or adduction movement of the vocal fold on the tested side.

On the FEES study were used the pure, thickened liquid (nectar) and liquid consistencies in the volume of 5 and 10 ml each, offered with a spoon. The thickened consistencies of these foods were prepared with liquid in the format of dietary juice, peach flavor, instantaneous nutrition thickening and it was added artificial food coloring with blue color pigment in order to make it easier the food visualization at the pharyngeal region.

For this study, it was considered as laryngeal penetration the food entry in laryngeal region above the vocal fold and for laryngotracheal aspiration the food entry below the vocal fold, according to the proposal of Rosenbek et al. (1996).

The statistical analysis was performed by using the Fischer test with significance level of $p < 0.05$.

Results

The absence of laryngotracheal aspiration and/or penetration in individuals with Parkinson's disease in the studied setting was more frequent than the presence, and in 28 (71.80%) of the individuals it was absent, and 11 (28.20%) present, regardless the food consistency.

Table 1. Frequency of laryngotracheal aspiration and/or penetration in individual with Parkinson's disease and oropharyngeal dysphagia by food consistency and in specific setting.

	Laryngotracheal Penetration/Aspiration								
	Pure			Thickened liquid			Thin liquid		
	N	%	p	N	%	P	N	%	P
Present	4	10.2	0.05	10	25.6	0.07	11	28.2	0.02*
Absent	35	89.7		29	74.3		28	71.7	

p = p value

At table 1 it is possible to observe the frequency of laryngotracheal aspiration and/or penetration in individuals with Parkinson's disease and oropharyngeal dysphagia by food consistency. It was also observed that in the analysis by consistency pre-

vailed the lack of pure consistency aspiration and/or penetration. It was also found that when there was AP presence, this was statistically significant at the liquid consistency.

Discussion

The prevalence and incidence of oropharyngeal dysphagia at the different populations with neurologic etiology have already been studied and characterized as a common symptom, with variable frequency among the populations with neurological diseases²³. However, the prevalence of oropharyngeal dysphagia does not necessarily mean prevalence of laryngotracheal aspiration and penetration, and this analysis is necessary so that the procedures before oropharyngeal dysphagia diagnose are not generalized^{1,2,10,13}. The laryngotracheal aspiration and the safety of swallowing is one of the strong concerns in oropharyngeal dysphagia, however, many times the loss at swallowing biomechanics is more centralized at the efficiency and to identify the prevailing of AP can contribute with less restrictive procedures and more assertive ones at the feeding of the individual with dysphagia.

The present study has found that the absence of penetration and/or aspiration in the follow up of PD individual, in the rehabilitation setting, was more frequent than the presence, independently of the food consistency. Other studies about dysphagia in PD has also shown that despite the AP presence among the clinical findings, this is not frequent^{5,7-9}. This discussion is extremely relevant because it suggests that despite the oropharyngeal dysphagia presence in PD, this can present lower level of commitment regarding the risk for swallowing safety. The studies with PD that value the AP presence due to its impact on pulmonary condition, but do not discuss the fact that the percentage is low, in the end, do not contribute to individualized actions stimulating generical practices^{11,13,15,16,19}.

In other neurological diseases, such as cerebrovascular accident (CVA), the studies on AP prevalence found that the presence was more relevant than the absence²⁴⁻²⁷. It is perfectly understandable that the presence of a risk signal for the individual's health is valued, however, it is important to reflect that being the AP presence and absence so variable, and according to the distinct diseases, stages and other factors, it is the interdisciplinary team's role to investigate with accuracy before adopting any practice.

It was also found, considering the variable food consistency, that when there was AP presence in a PD individual, this one was statistically significant on the liquid consistency. Other studies about PD

and oropharyngeal dysphagia have also reported this signal in the same food consistency^{5,11}. Yet, the lack of AP prevailed at the pure consistency, finding which corroborates with other studies that consider this consistency the safest in several other diseases with neurological involvement²⁸.

Studies with retrospective designs have some limitations that should be considered during the results analysis and discussion. Specifically in this study, there were losses on the collection on the functional classification of the individuals with PD, what we tried to discuss highlighting the type of setting where the study was performed, which by itself characterizes this population as independent or semi-dependent. On the other hand, it is important to highlight the care that the present study had on analyzing its findings separating them by food consistency, once in the literature the AP findings in PD are always diluted in a generalized analysis on the different food consistencies^{2,5,9,11}.

This way, despite the presence of AP in liquid is one of the signals of oropharyngeal dysphagia of individuals with PD in the rehabilitation setting and should be rehabilitated and managed, there are other aspects. One of them is the swallowing efficiency performance that can impact the nutritional condition of this population, and they should also be the present focus at the interdisciplinary team decisions, once the lack of AP was more frequent and there was less risk for the deglutition safety.

Conclusion

On the population studied in this setting, the AP absence was more frequent, and the presence was significant only with the thin liquid.

References

1. Robbins JA, Logemann JA, Kirshner HS. Swallowing and speech production in Parkinson's disease. *Ann Neurol*. 1986; 19(3): 283-7.
2. Miller N, Allcock L, Hildreth AJ, Jones D, Noble E, Burn DJ. Swallowing problems in Parkinson disease: frequency and clinical correlates. *J Neurol Neurosurg Psychiatry*. 2009 Sep; 80(9): 1047-9.
3. Paranjli S, Paranjli N, Wright S, Chandra S. A Nationwide Study of the Impact of Dysphagia on Hospital Outcomes Among Patients With Dementia. *Am J Alzheimers Dis Other Demen*. 2017 Feb; 32(1): 5-11.

4. Al-Khaled M, Matthis C, Binder A, Mudter J, Schattschneider J, Pulkowski U, Strohmaier T, Niehoff T, Zybur R, Eggers J, Valdueza JM, Royl G; for QugSS II Group. Dysphagia in Patients with Acute Ischemic Stroke: Early Dysphagia Screening May Reduce Stroke-Related Pneumonia and Improve Stroke Outcomes. *Cerebrovasc Dis*. 2016; 42(1-2): 81-9.
5. Potulska A, Friedman A, Królicki L, Spychala A. Swallowing disorders in Parkinson's disease. *Parkinsonism Relat Disord*. 2003 Aug; 9(6): 349-53.
6. Sung HY, Kim JS, Lee KS, Kim YI, Song IU, Chung SW, Yang DW, Cho YK, Park JM, Lee IS, Kim SW, Chung IS, Choi MG. The prevalence and patterns of pharyngoesophageal dysmotility in patients with early stage Parkinson's disease. *Mov Disord*. 2010 Oct 30; 25(14): 2361-8.
7. Gasparim Aretuza Zaupa, Jurkiewicz Ari Leon, Marques Jair Mendes, Santos Rosane Sampaio, Marcelino Paulo Cesar Otero, Herrero Junior Francisco. Deglutição e tosse nos diferentes graus da doença de Parkinson. *Arquivos Int. Otorrinolaringol*. 2011 Jun 15(2): 181-8. Disponível em: http://www.scielo.br/scielo.php?script=sci_arttext&pid=S1809-48722011000200010&lng=pt.
8. Fontana GA, Pantaleo T, Lavorini F, Benvenuti F, Gangemi S. Defective motor control of coughing in Parkinson's disease. *Am J Respir Crit Care Med*. 1998 Aug; 158(2): 458-64.
9. Ebihara S, Saito H, Kanda A, Nakajoh M, Takahashi H, Arai H, Sasaki H. Impaired efficacy of cough in patients with Parkinson disease. *Chest*. 2003 Sep; 124(3): 1009-15.
10. Kalf JG, de Swart BJ, Bloem BR, Munneke M. Prevalence of oropharyngeal dysphagia in Parkinson's disease: a meta-analysis. *Parkinsonism Relat Disord*. 2012 May; 18(4): 311-5.
11. Argolo N, Sampaio M, Pinho P, Melo A, Nóbrega AC. Videofluoroscopic Predictors of Penetration-Aspiration in Parkinson's Disease Patients. *Dysphagia*. 2015 Dec; 30(6): 751-8.
12. Rodrigues B, Nóbrega AC, Sampaio M, Argolo N, Melo A. Silent saliva aspiration in Parkinson's disease. *Mov Disord*. 2011 Jan; 26(1): 138-41.
13. Nóbrega AC, Rodrigues B, Melo A. Silent aspiration in Parkinson's disease patients with diurnal sialorrhea. *Clin Neurol Neurosurg*. 2008 Feb; 110(2): 117-9.
14. Troche MS, Sapienza CM, Rosenbek JC. Effects of bolus consistency on timing and safety of swallow in patients with Parkinson's disease. *Dysphagia*. 2008 Mar; 23(1): 26-32.
15. Bigal A, Harumi D, Luz M, Luccia G, Bilton T. Disfagia do idoso: estudo videofluoroscópico de idosos com e sem doença de Parkinson. *Dist. da Com*. 2007 v.19, p.213-23.
16. Fuh JL, Lee RC, Wang SJ, Lin CH, Wang PN, Chiang JH, Liu HC. Swallowing difficulty in Parkinson's disease. *Clin Neurol Neurosurg*. 1997 May; 99(2): 106-12.
17. Leopold NA, Kagel MC. Pharyngo-esophageal dysphagia in Parkinson's disease. *Dysphagia*. 1997 Winter; 12(1): 11-8; discussion 19-20.
18. Castell JA, Johnston BT, Colcher A, Li Q, Gideon RM, Castell DO. Manometric abnormalities of the oesophagus in patients with Parkinson's disease. *Neurogastroenterol Motil*. 2001 Aug; 13(4): 361-4.
19. Bakke M, Larsen SL, Lautrup C, Karlsborg M. Orofacial function and oral health in patients with Parkinson's disease. *Eur J Oral Sci*. 2011 Feb; 119(1): 27-32.
20. Mu L, Sobotka S, Chen J, Su H, Sanders I, Nyirenda T, Adler CH, Shill HA, Caviness JN, Samanta JE, Sue LI, Beach TG; Arizona Parkinson's Disease Consortium. Parkinson disease affects peripheral sensory nerves in the pharynx. *J Neuropathol Exp Neurol*. 2013 Jul; 72(7): 614-23.
21. Leder SB, Sasaki CT, Burrell MI. Fiberoptic endoscopic evaluation of dysphagia to identify silent aspiration. *Dysphagia*. 1998 Winter; 13(1):19-21.
22. Morley JE. Dysphagia and Aspiration. *J Am Med Dir Assoc*. 2015 Aug 1;16(8): 631-4.
23. Kuhlemeier KV. Epidemiology and dysphagia. *Dysphagia*. 1994 Fall; 9(4): 209-17.Review.
24. Chen SY, Chie WC, Lin YN, Chang YC, Wang TG, Lien IN. Can the aspiration detected by videofluoroscopic swallowing studies predict long-term survival in stroke patients with dysphagia? *Disabil Rehabil*. 2004 Dec 2; 26(23): 1347-53.
25. Paranjli S, Paranjli N, Wright S, Chandra S. A Nationwide Study of the Impact of Dysphagia on Hospital Outcomes Among Patients With Dementia. *Am J Alzheimers Dis Other Demen*. 2017 Feb; 32(1): 5-11.
26. Ehsaan F, Ghayas Khan MS, Malik SN, Kanwal S. Frequency of post-stroke dysphagia in Pakistan: a hospital based study. *J Pak Med Assoc*. 2016 Oct; 66(10): 1281-5.
27. Mourão AM, Lemos SMA, Almeida EO, Vicente LCC, Teixeira ALI. Frequência e fatores associado à disfagia após acidente vascular cerebral. *Codas*, 2016, v.28, p.66-70.
28. Cola PC, Gatto AR, Gonçalves RG, Spadotto AA, Ribeiro PW, Schelp AO, Carvalho LR, Henry MACA. Taste and temperature in swallowing transit time after stroke. *Cerebrovascular Diseases Extra*, 2012, V.2, p.45-51.