Translation, adaptation and validation of the Portuguese version of the secretion severity rating scale

Original Article

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Abstract

The accumulation of secretions in the hypopharynx, glottis, and/or trachea is a cardinal sign of dysphagia and is of great clinical and therapeutic relevance. To evaluate the residual accumulation of secretions, Murray et al. created the Secretion Severity Rating Scale in 1996. The aim of this study was the translation, adaptation and validation of this scale into European Portuguese through intra- and inter-judge validity and reliability. The translation-retranslation method was used to obtain the Portuguese version of the scale. For validity and reliability, 80 videos were blindly evaluated by 2 experienced clinicians and 40 videos were randomly selected, 10 for each of the severity levels. These 40 videos were subsequently blindly evaluated and re-evaluated 4 weeks apart by 6 ENT physicians, with no previous experience in applying the scale, and by the swallowing evaluation team, with previous experience in applying this scale. Inter and intra-judge agreement ranged from moderate to very good were, with statistical significance. The scale proved to be a reliable and valid instrument for rating the severity of one of the main symptoms of oropharyngeal dysphagia. Notwithstanding the above, its application requires a learning curve.
Keywords: Secretion accumulation, Dysphagia, Aspiration, Assessment, Validation, Videoendoscopy of swallowing

Introduction

Dysphagia is a common and costly clinical entity associated with significant morbidity and mortality[1,2,3]. In a healthy person, spontaneous and regular swallows occur at rest throughout the day and ensure the clearing of secretions from the hypopharynx[1,8]. In a person with dysphagia, the accumulation of these secretions at the level of the hypopharynx, glottis, and/or trachea is an important sign for the prediction of orotracheal aspiration of foods or liquid and appears

to be associated with impaired efficiency of laryngopharyngeal clearing, which is of considerable clinical and therapeutic relevance[1,5]. Some studies have reported factors that contribute to the accumulation of secretions in the laryngeal vestibule, including the following: a reduction in spontaneous swallows[8], weak pharyngeal response during swallowing, or a combination of both[1]; reduced larynx elevation during swallowing; delayed opening of the upper esophagic sphincter; absence of contact between the base of the tongue and the posterior wall of the pharynx[9]. The accumulation of secretions in the laryngeal vestibule as a variable predictive of aspiration has been observed in the pediatric[1,4] and adult[3,6,15] populations, as well as in specific clinical conditions such as Parkinson's disease[9] and stroke[7].

To assess the residual accumulation of secretions, Murray et al. established the Secretion Severity Rating Scale in 1996[1,4]. This is a 4-point scale (0–3): 0 corresponds to a normal rating with no visible secretions or only transient secretions; 1 corresponds to the presence of secretions in the laryngeal vestibule bilaterally; 2 corresponds to any secretions that changed from an initial 1 rating to a 3 rating or vice-versa during the observation period; 3 corresponds to a more severe accumulation of secretions at the level of the laryngeal vestibule. This scale is used to evaluate the specific location of the secretions and describes the volume of the laryngopharyngeal secretions through direct visualization during videolaryngoscopy. The sensitivity and specificity for predicting the risk of aspiration in patients with ratings of 2 and 3 in the Murray et al. scale are 74% and 90%, respectively[3]. In the literature, the Secretion Severity Rating Scale has been shown to be a robust scale for identification of the risk of aspiration in distinct clinical populations[2,3,6,7]. Patients with a rating of 2 or 3 in the Murray et al. scale are 13.6 times more susceptible to aspiration of food or liquid than those with lower ratings[3].

Thus, the systematic use of the scale for residual accumulation of secretions provides important information in clinical practice and plays a key role in the early identification of the risk of aspiration. Therefore, its consistent implementation in endoscopic exams is strongly recommended[2].

Additionally, its specific application in the endoscopic evaluation of swallowing provides important information when deciding on the safety of the oral route for feeding versus alternative routes and about the need to manipulate the rheological characteristics and properties of the foods allowed in the diet plan of individuals with dysphagia.

This study was conducted considering the absence of instruments validated to European Portuguese that measure the accumulation of secretions in the laryngeal vestibule.

Objectives

The objectives include the translation, adaptation, and validation to European Portuguese of the Secretion Severity Rating Scale of Murray *et al*., along with assessment of its validity and intra- and inter-evaluator reliability.

Materials and Methods

The original scale was translated by two independent bilingual speech therapists. Subsequently, a focus-group was held, which included another speech therapist with 15 years of experience in endoscopic evaluation of swallowing. The first version of the adapted and translated scale was obtained by consensus, which was then subjected to blind backtranslation by a third bilingual speech therapist. With no changes required, the scale presented in Table 2 was accepted (Tables 1 and 2).

To analyze the scale's validity and reliability, 80 videos of endoscopic examination of swallowing performed by fiberoptic nasopharyngolaryngoscopy (Pentax medical video) with 3-mm diameter were blindly analyzed by two members of the swallowing evaluation team (one otolaryngologist [ORL] and one speech therapist [ST] with at

Table 1
Original scale (Murray *et al*.) of secretion classification

Level 0	**Most normal rating. No visible secretions anywhere in the hypopharynx or some transient bubbles visible in the valleculae and pyriform sinuses. These secretions were not bilateral or deeply pooled**
Level 1	Any secretions evident upon entry or following a dry swallow in the channels surrounding the laryngeal vestibule that were bilaterally represented or deeply pooled. This rating would include cases where there is a transition in the accumulation of secretions during the observation segment. A subject could start with no visible secretions but accumulate secretions in an amount great enough to be bilaterally represented or deeply pooled. Likewise, a subject would be rated as a "1" if initially presenting with deeply pooled bilateral secretions and ending the observation segment with no visible secretions.
Level 2	Any secretions that changed from a "1" rating to a "3" rating, respectively, from a "3" rating to a "1" rating during the observation period.
Level 3	Most severe rating. Any secretions seen in the area defined as the laryngeal vestibule. Pulmonary secretions were included if they were not cleared by swallowing or coughing at the close of the segment

Table 2
Translation into Portuguese of the Murray *et al*. scale of secretion classification

Nível 0	**Classificação normal. Sem secreções visíveis na hipofaringe ou apenas algumas bolhas transitórias visíveis nas valéculas e seios piriformes. Estas secreções não são bilaterais nem organizadas.**
Nível 1	Algumas secreções visíveis antes ou após deglutição seca, bilateralmente ou organizadas. Neste nível, pode haver alteração na quantidade de secreções acumuladas ao longo da avaliação. Significa que o examinado pode apresentar secreções bilaterais no início do exame e terminar sem secreções visíveis.
Nível 2	Quaisquer secreções que mudaram de uma classificação ''1'' para uma classificação ''3 ou vice-versa.
Nível 3	Classificação mais severa. Secreções visíveis no vestíbulo laríngeo, incluindo as secreções pulmonares que não sejam eliminadas por deglutição ou tosse.

least 10 years of experience in endoscopic evaluation of swallowing). Further, 40 videos were randomly selected (recorded between 2018 and 2019) by total agreement between the two evaluators—10 videos for each level of severity—to establish the rating standard reference. The videos showed a complete image of the hypopharynx and had a mean duration of 45 seconds. These 40 videos were subsequently redistributed at random in a power point presentation and submitted for blinded evaluation and reevaluation, with a four-week interval, by six otolaryngologists and two members of the swallowing evaluation team. The distribution of years of experience in nasolaryngoscopy among the six evaluating otolaryngologists was as follows: six years - one; five years - one, four years – two; three years - one. The videos were presented in a standard computer, and all evaluators had the opportunity to watch the videos in presentation mode individually and could watch it up to three times before recording the results in a spreadsheet . Inter- and intra-evaluator agreement was analyzed. Intra- and inter-evaluator reliability and validity were analyzed according to the defined reference standard. Non-parametric tests were used because of the absence of normal distribution (Kolmogorov-Smirnov: $p>0.05$). Friedman's ANOVA was used to test intra-evaluator reliability in the group of six evaluators and the swallowing evaluation team. Additionally, Cohen's kappa and Fleiss' kappa were used to test inter-evaluator reliability in the swallowing evaluation team

and the group of six evaluators, respectively. All analyses were performed using the SPSS 21 (International Business Machines Corporation, Armonk, USA) software.

Results

The analysis of intra-evaluator reliability showed consistency between the two evaluation moments, both in the trained team (Q=2.556; gl [3], p=0.465) and the group of six evaluators without previous training (Q=13.362 gl [11], p=0.270). As there were no significant differences between the two moments in both groups, paired analysis for each evaluator was not performed. The analysis of inter-evaluator reliability showed a considerably good correlation for the experienced team in the first evaluation moment (k=0.832; p<0.00) and a good correlation in the second moment (k=0.796; p<0.01). The analysis of the various levels of the scale showed that the highest agreement occurred for the extreme levels and that it was more marked and homogeneous in the first and second moments, respectively (Table 1). Agreement among the team of six evaluators was moderate in the first moment (k=0.432; p<0.00) and second moment (k=0.553; p<0.00). Agreement in this group was higher for the extreme levels of the scale in both the evaluation moments (Table 3).

As shown in Table 1, agreement in the team with previous experience in the use of the scale varied between 77% and 95% in the first evaluation moment and between 80% and 92% in the second moment. It was higher than that in the group without previous training in using the scale in which the agreement intervals were 30–55% and 60–74% in the first and second moments, respectively.

Discussion

In this study, the Secretion Severity Rating Scale was translated from English into European Portuguese and culturally adapted using the method of translation and backtranslation. The validation of the instrument showed good results regarding the overall construct validity and inter- and intra-evaluator reliability.

The adaptation to the Portuguese language of an instrument for the measurement of secretion accumulation in the laryngeal vestibule is of major importance because it allows prediction of the risk of aspiration and inherent pneumonia. This fact has been widely reported by the scientific community and was the motive for this study[3,7,13,14,15].

Dysphagia is a common problem, especially in older patients, and occurs in over 80% of individuals in nursing homes aged 70 years and above[3]. However, the ability of subjective symptoms of dysphagia to predict swallowing dysfunction objectively is not ideal[3]. Therefore, a fast, valid, and reproducible method of stratifying patients in terms of the risk of aspiration is useful and enables adequate clinical and nutritional planning and counseling[3].

The scale of rating of secretions developed by Murray *et al.* is a useful tool for the evaluation of patients with dysphagia by aiding in the early assessment of the risk of aspiration in these patients[3]. The pertinence of the scale is so consensual that, in 2021, the German Neurological Society included in its dysphagia guidelines the recommendation for its use in all nasal endoscopic procedures[10]. This recommendation was achieved through a systematic review performed by a multidisciplinary group experienced in the evaluation of individuals with dysphagia.

Table 3
Levels of inter-evaluator agreement in the group with previous experience in the use of the scale and among the six evaluators for both evaluation moments

	First moment				Second moment			
	Level 0	Level 1	Level 2	Level 3	Level 0	Level 1	Level 2	Level 3
Team AED	0,941	0,778	0,883	0,952	0,814	0,827	0,800	0,917
6 evaluators	0,540	0,368	0,301	0,554	0,710	0,600	0,638	0,744

The values of intra-evaluator agreement (evaluators with and without experience) obtained in this study did not differ significantly between the two evaluation moments, which reflects the correspondence between the observed and evaluated facts. Intra-evaluator agreement has been confirmed by other studies with experienced evaluators, even if other statistical tests were used[4,9,13]. There was only one study in the literature[5] with data on intra-evaluator agreement (evaluators without experience). It showed moderate agreement among less experienced evaluators, which is in line with the results of this study.

The values and characteristics of inter-evaluator agreement assessed in this study have been confirmed by previous research[4,9], although some studies have shown lower values[9,12].

The differences in the robustness of agreement between experienced and non-experienced evaluators found in this study have also been reported by other authors[2,9,12]. The results show that although the scale is easy to use, it requires a learning curve, and this has also been reported in studies that evaluated the use of similar scales[11]. This learning curve may explain why the values obtained for the various levels of the scale were more homogeneous in the second evaluation moment than in the first moment and why there was a higher agreement for the more extreme levels of the scale, similar to the findings reported by other authors[4,16]

Conclusion

In this study, the Secretion Severity Rating Scale was translated from English into European Portuguese. Its validation showed good results for overall construct validity and inter- and intra-evaluator reliability. The Portuguese version of the Secretion Severity Rating Scale is a reliable and valid instrument for rating the severity of one of the main symptoms of oropharyngeal dysphagia. It is recommended as an instrument to be used in any nasal laryngoscopic evaluation and the endoscopic evaluation of swallowing. Nevertheless, its use requires a learning curve, as is common with instruments that depend on the evaluator's experience.

Conflicts of Interest

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

Data Confidentiality

The authors declare having followed the protocols in use at their working center regarding patients' data publication.

Protection of humans and animals

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

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Availability of scientific data

There are no datasets available, publicly related to this work.

Bibliographic references

1- Murray J, Langmore SE, Ginsberg S, Dostie A. The significance of accumulated oropharyngeal secretions and swallowing frequency in predicting aspiration. Dysphagia. Spring 1996;11(2):99-103. doi: 10.1007/BF00417898.

2- Pluschinski P, Zaretsky E, Stöver T, Murray J, Sader R, Hey C. Validation of the secretion severity rating scale. Eur Arch Otorhinolaryngol. 2016 Oct;273(10):3215-8. doi: 10.1007/s00405-016-4073-7.

3- Kuo CW, Allen CT, Huang CC, Lee CJ. Murray secretion scale and fiberoptic endoscopic evaluation of swallowing in predicting aspiration in dysphagic patients. Eur Arch Otorhinolaryngol. 2017 Jun;274(6):2513-2519. doi: 10.1007/s00405-017-4522-y.

4- Pluschinski P, Zaretsky Y, Almahameed A, Koseki JC, Leinung M, Girth L. et al. Secretion scale by Murray et al. for FEES®: comparison of reliability and validity of the German long and short version. Nervenarzt. 2014 Dec;85(12):1582-7. doi: 10.1007/s00115-014-4192-6.

5- Hey C, Pluschinski P, Stöver T, Zaretsky Y. Validation of the German short version of the Murray Secretion Rating Scale. Laryngorhinootologie. 2015 Mar;94(3):169-72. doi: 10.1055/s-0034-1385848.

6- Osbeck Sandblom H, Dotevall H, Svennerholm K,

Tuomi L, Finizia C. Characterization of dysphagia and laryngeal findings in COVID-19 patients treated in the ICU - an observational clinical study. PLoS One. 2021 Jun 4;16(6):e0252347. doi: 10.1371/journal.pone.0252347.
7- Ota K, Saitoh E, Baba M, Sonoda S. The secretation severity scale: a potentially useful tool for management of acute-fhase fasting stroke patients. J Stroke Cerebrovasc Dis. May-Jun 2011;20(3):183-7. doi: 10.1016/j.jstrokecerebrovasdis.2009.11.015.
8- Brady SL, Wesling MW, Donzelli JJ, Kaszuba S. Swallowing Frequency: Impact of Accumulated Oropharyngeal Secretion Levels and Gustatory Stimulation. Ear Nose Throat J. 2016 Feb;95(2):E7-10. doi: 10.1177/014556131609500203.
9- Yamaguchi T, Mikushi S, Ayuse T. Evaluation of swallowing function in patients with oropharyngeal secretions. Clin Exp Dent Res. 2019 Jul 23;5(5):557-565. doi: 10.1002/cre2.223.
10- Dziewas R, Allescher HD, Aroyo I, Bartolome G, Beilenhoff U, Bohlender J. et al. Diagnosis and treatment of neurogenic dysphagia – S1 guideline of the German Society of Neurology. Neurol Res Pract. 2021 May 4;3(1):23. doi: 10.1186/s42466-021-00122-3.
11- Kaneoka AS, Langmore SE, Krisciunas GP, Field K, Scheel R, McNally E. et al. The Boston Residue and Clearance Scale: preliminary reliability and validity testing. Folia Phoniatr Logop. 2013;65(6):312-7. doi: 10.1159/000365006.
12- Gerschke M, Schöttker-Königer T, Förster A, Netzebandt JF, Beushausen UM. Validation of the German Version of the Yale Pharyngeal Residue Severity Rating Scale. Dysphagia. 2019 Jun;34(3):308-314. doi: 10.1007/s00455-018-9935-2.
13- Shapira-Galitz Y, Shoffel-Havakuk H, Halperin D, Lahav Y. Association between laryngeal sensation, pre-swallow secretions and pharyngeal residue on fiberoptic endoscopic examination of swallowing. Dysphagia. 2019 Aug;34(4):548-555. doi: 10.1007/s00455-019-10001-4. Dysphagia, 34 (4), 548-555. doi:10.1007/s00455-019-10001-4.
14 - Link DT, Willging JP, Miller CK, Cotton RT, Rudolph CD. Pediatric laryngopharyngeal sensory testing during flexible endoscopic evaluation of swallowing: feasible and correlative. Ann Otol Rhinol Laryngol. 2000 Oct;109(10 Pt 1):899-905. doi: 10.1177/000348940010901002.
15 - Takahashi N, Kikutani T, Tamura F, Groher M, Kuboki T. Videoendoscopic assessment of swallowing function to predict the future incidence of pneumonia of the elderly. J Oral Rehabil. 2012 Jun;39(6):429-37. doi: 10.1111/j.1365-2842.2011.02286.x.
16 - Rosenbek JC, Robbins JA, Roecker EB, Coyle JL, Wood JL. A penetration-aspiration scale. Dysphagia. Spring 1996;11(2):93-8. doi: 10.1007/BF00417897.