# OROPHARYNGEAL DYSPHAGIA: ANALYSES OF BRAZILIANS AND AMERICANS PROTOCOLS OF FLUOROSCOPY

## *Disfagia orofaríngea neurogênica: análise de protocolos de videofluoroscopia brasileiros e norte-americanos*

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**ABSTRACT**

The aim of this study is to analyze and compare the use of Brazilian and North American protocols for videofluoroscopy in patients with stroke. It was conducted a literature review in Brazilian and North American articles. It were selected articles with description of procedures for videofluoroscopy of swallowing in subjects who had stroke, published between 2003 and 2013. Qualitative and quantitative analysis of the procedures for videofluoroscopy was performed. It was considered the variables: positioning for the exam, consistency and quantities of the bolus, types of tools and use of protocols. Sixteen studies were included, nine (56.25%) North Americans and 7 (43.75%) Brazilians. It was observed that four of the national studies (57.14%) did not report the quantities offered, while all Americans detailed it between 2 and 15 mL; the types of food and their consistencies were detailed in all national and North American studies, but national studies did it generically, without identification of foods. Regarding the position of the patient during the examination, 57.14% of the national articles not reported it, while all American articles did. Utensils to supply the cake are cited in 55.55% of Americans articles and just 14.28% of the national described it aspect. As for use of protocols, only 33% of Americans do not cited, compared to 71.42% of the national. We noted that there is no standardization for procedures in videofluoroscopy, both in Brazilian as North American publications.

**KEYWORDS:** Deglutition; Fluoroscopy; Deglutition Disorders; Stroke

## INTRODUCTION

Swallowing is frequently seen as a simple act, once it is often involuntary and quotidian. Nevertheless, it is a complex process involving several structures that are correlated and connected to a neuronal mechanism. It uses a common space with breathing and aims at transporting material from the oral cavity to the stomach, without penetration in the airways, including several structures of mouth, pharynx, larynx and esophagus.

Any disorder interrupting the process of a safe and efficient swallowing is classified as dysphagia, and it may be of mechanic, neurogenic, senile or psychogenic origin[1].

There is a significant number of dysphagia in patients with a clinical history of stroke[2].

Dysphagia is considered one of the main risk factor for aspiration pneumonia, the most common complication in strokes, configuring the main cause of deaths in Brazil[3].

The assessment of swallowing is important in order to understand the way the food is being transported from the mouth until the stomach, and also to support the clinical and therapeutic planning. Such assessment may be divided in two stages: clinical and instrumental. The clinical assessment comprises the anamnesis, structural and functional

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Conflict of interest: non-existent

evaluation of speech and swallowing structures, and the observation of clinical signs during feeding[4].

The videofluoroscopy is the instrument that allows the assessment of all phases of swallowing. It may be characterized by the recording, in magnetic media, of biological and dynamic events generated by the exposure to X radiation. The recording is performed in real time (30 square per minute) and with an adequate quality for the morphofunctional study of the exposed region. One of the advantages of the exam is the possibility to register data and allow revisions without needing a new image capture and exposure to radiations[5]. It has as its main purpose to analyze whether the patient may have a safe and efficient oral feeding[6].

All the swallowing process, since the capture, preparation of the bolus and ejection, may by analyzed during the exam. The oral transit, the palatal competence, the protection of airways, and the competence of esophageal sphincter may be seen and re-seen[5]. Nowadays, the videofluoroscopy is considered the best instrumental exam to assess dysphagia[5,7].

This study aims to analyze and compare national and north-American researches using protocols for videofluoroscopic swallowing study, emphasizing the knowledge of procedures and specifications in the assessment of dysphagia after a cerebrovascular accident.

## METHODS

A systematic review of national and international literature was performed. During the first semester of 2013, articles published in indexed journals were selected from the following database: Medical Literature Analysis and Retrieval System (MEDLINE), Scientific Electronic Library Online (SciELO) and Caribbean and Latin-American Literature in Health Sciences (LILACS), once these database include most of national and international journals in health sciences.

The Health Sciences Descriptors was consulted in order to research the scientific articles. The following descriptors were selected in Portuguese and in English: deglutition disorders, radiography, physiopathology, rehabilitation, diagnosis, fluoroscopy, methods, standards, instrumentation, deglutition, physiology, barium, cerebrovascular accident. The terms “human” and “adults” were limiter.

The descriptors were used isolated and combined aiming at obtaining the greatest number of possible associations.

### Selection criteria

The articles selection obeyed the following inclusion criteria: national and north-American articles; articles published between 2003 and 2013, including a review that revealed the actual state of scientific production on videofluoroscopy in patients with stroke; articles describing the application of videofluoroscopic exams in patients after a cerebrovascular accident, and recommending procedures for the conduction of such exams, with analysis of the advantages.

The inclusion of north-American articles was determined in order to establish a comparative analysis with the Brazilian production.

Articles involving other diseases; articles that did not match the period chosen for the research or that did not present the stages of videofluoroscopy detailed in the study were excluded.

### Data analysis

The procedures used for the videofluoroscopy were analyzed qualitative and quantitatively.

The qualitative analysis was based in Bardin[8] and aimed to describe objectively and systematically the existing content of the researched articles. At first, it was an exploratory analysis from an approximation with the main theme and the search of familiarity with the raised facts. Afterwards, the characteristics of facts and phenomena were described. Finally, the determinant factors for the occurrence of facts/phenomena were raised; this was characterized as the explicative phase of the research[9].

Results were distributed in the following analysis categories: Brazilian article, north-American article, position criteria for the exam, consistency used, amount offered in milliliters (mL), equipment used for offering the bolus, and use of protocols for the procedures and/or results analysis.

The quantitative analysis was based on the obtaining of the absolute and relative frequencies (percentage) of the results classified in the above categories.

## LITERATURE REVIEW

Of the 36 articles analyzed, 16 were pertinent to the theme, fulfilling all the inclusion criteria. Nine articles (56,25%) were north-American and seven (43,75%) were national (Figures 1 and 2).

| ORIGINAL TITLE | AUTHOR | YEAR | AIM | MAIN FINDINGS (RESULTS) |
|---|---|---|---|---|
| Incidência de disfagia orofaríngea após acidente vascular encefálico em hospital público de referência | Schelp *et al*.[13] | 2004 | To determine the incidence of dysphagia post stroke. | Among the 102 patients clinically assessed by the speech pathologist, 76,5% presented dysphagia at the moment of the assessment. Most of them presenting a mild dysphagia. |
| Software para análise quantitativa da deglutição | Spadottoi *et al*.[14] | 2008 | To present a software that allows a detailed analysis of swallowing dynamics. | The mean time of the pharyngeal transit of swallowing was different when comparing the methods used (chronometer and software). |
| Evolução de pacientes com disfagia orofaríngea em ambiente hospitalar | Abdulmassih *et al*.[15] | 2009 | To assess the evolution of patients with neurogenic oropharyngeal dysphagia after a stroke during the hospitalization period until the discharge. | There was a prevalence of moderate dysphagia followed by the mild and severe degrees. The instrumental diagnosis pointed prevalence of laryngeal aspiration, followed by alteration in the oropharyngeal phase, laryngeal penetration, and alteration in the oral phase of swallowing. The speech pathologists' conducts pointed manipulation of food as presenting excellent results, followed by postural and protective maneuvers. |
| Associação entre disfagia e o topodiagnóstico da lesão encefálica pós-acidente vascular encefálico | Bassi *et al*.[25] | 2004 | To analyze the association between the findings of swallowing assessment and the topodiagnosis of the encephalic lesion after a cerebrovascular accident. | All patients presented more than one swallowing disorder. The most frequent one was delay in the swallowing reflex, followed by residual in pharyngeal recess. |
| Estudo clínico e videofluoroscópico da disfagia na fase subaguda do acidente vascular encefálico | Xerez *et al*. [26] | 2004 | To correlate clinical disorders of swallowing with the ones observed during videofluoroscopy in patients with stroke in the sub-acute phase. | Dysphagia was identified in 19 (73%) of the 26 patients who underwent videofluoroscopy; 10 (38,46%) presented penetration/ aspiration of liquid. Results showed that there is no correlation between the presence of dysphagia and/or dysarthria and the presence of penetration/aspiration of liquid during videofluoroscopy. |
| Protocolo para controle de eficácia terapêutica em disfagia orofaríngea neurogênica (PROCEDON). | Silva *et al*.[27] | 2010 | To present a proposal for the control of therapeutic efficacy in neurogenic oropharyngeal dysphagia. | It was verified severe oropharyngeal dysphagia in the pre-speech therapy, Functional Oral Intake Scale (FOIS) level 1, presence of laryngotracheal aspiration for more than one consistency and Time of Pharyngeal Transit (TPT) of 13 seconds. After the speech therapy, it was verified moderate oropharyngeal dysphagia, FOIS level 5, absence of laryngotracheal aspiration and TPT of 4 seconds. |
| Estudo comparativo da deglutição com nasofibrolaringoscopia (NFL) e videodeglutograma (VD) em pacientes com acidente vascular cerebral. | Doria *et al*.[28] | 2003 | To compare data obtained with the NFL and the VD regarding parameters studies by both methods. | While VD allows the analysis of the oral preparatory phase, oral phase and beginning of the pharyngeal phase of swallowing, the NFL allows the study of pharyngeal-laryngeal sensibility and mobility, besides the direct visualization of the bolus. The statistical test of McNemar did not show statistically significant difference between the parameters analyzed when comparing NFL with VD. |

**Figure 1 – Brazilian articles published between 2003 and 2013 related to videofluoroscopic assessment of swallowing in oropharyngeal dysphagia in adults after a cerebrovascular accident.**

| ARTICLE | AUTHOR | YEAR | AIM | RESULTS |
|---|---|---|---|---|
| Stage transition duration in patients post stroke. | Kim *et al.*[16] | 2007 | To investigate the relation between the duration of oral transit and the presence of laryngotracheal aspiration. | Aspirators post stroke had the longest stage transition duration (STD). Furthermore, results indicated that STD correctly predicted the presence of aspiration 75% of the time and correctly predicted the absence of aspiration in stroke patients 93% of the time. |
| Neuromuscular electrical stimulation in stroke patients with oral and pharyngeal dysfunction. | Bülow *et al.*[17] | 2008 | To evaluate and compare the outcome of neuromuscular electrical stimulation versus traditional swallowing therapy in stroke patients. | Statistically significant positive therapy effects for both neuromuscular electrical stimulation and traditional therapy combined were found, but there was no statistically significant difference in isolated therapy effect between the groups. |
| The prediction of persistent dysphagia beyond six months after stroke. | Han *et al.*[18] | 2008 | To identify the videofluoroscopic prognostic factors that affect the recovery of swallowing function at an early stage after stroke and to make a tool for predicting the long-term prognosis | It was possible to objective and quantifiable predict long-term persistent dysphagia after stroke. The tool presented sensitivity of 91% and specificity of 92%. |
| Oropharyngeal dysphagia after stroke: incidence, diagnosis, and clinical predictors in patients admitted to a neurorehabilitation unit | Falsetti *et al.*[19] | 2009 | To define incidence of dysphagia, compare clinical bedside assessment and videofluoroscopy (VFS), and define any correlation between dysphagia and clinical characteristic of patients | Dysphagia was clinically diagnosed in 62 of 151 patients (41%). A total of 49 patients (79% of clinically dysphagic patients) underwent VFS. Penetrations and aspirations were observed, respectively, in 42.8% and 26.5% of patients with dysphagia, with 12.2% classified as silent. The dysphagia was not influenced by the type of stroke. |
| Predicting aspiration in patients with ischemic stroke: comparison of clinical signs and aerodynamic measures of voluntary cough. | Smith *et al.*[20] | 2009 | To identify stroke patients who are at increased risk of aspiration | Based on the findings of videofluoroscopy, 33 patients (34%) were at high risk of aspiration and (66%) were nonaspirators |
| Sensory transcutaneous electrical stimulation improves post-stroke dysphagic patients | Gallas *et al.*[21] | 2010 | To verify whether sensitive transcutaneous electrical stimulation applied submentally during swallowing could help rehabilitate post-stroke oropharyngeal dysphagia by improving cortical sensory motor circuits. | Results showed that oropharyngeal dysphagia symptoms had improved, while the videofluoroscopy measurements showed that laryngeal aspiration and pharyngeal residue had decreased and that swallowing reaction time had improved. |
| The influence of sour taste and cold temperature in pharyngeal transit duration in patients with stroke | Cola *et al.*[22] | 2010 | To determine the effect of sour and cold food in the pharyngeal transit times of patients with stroke. | The results showed that the pharyngeal transit time was significantly shorter during swallow of cold sour bolus when compared with other stimuli. |
| Longitudinal changes of the swallowing process in subacute stroke patients with aspiration | Seo *et al.*[23] | 2011 | To evaluate longitudinal changes of the swallowing process in stroke patients with aspiration using kinematic analysis. | Results suggest that delayed swallowing triggering at initial VFSS is a useful predictor of poor recovery from aspiration in stroke patients. |
| Targeting unlesioned pharyngeal motor cortex improves swallowing in healthy individuals and after dysphagic stroke | Michou *et al.*[24] | 2012 | To investigate the behavioral and neurophysiological effects of a new neurostimulation technique in healthy individuals and patients with dysphagia from stroke. | The beneficial neurophysiological and behavioral properties of neurostimulation, when applied to unlesioned brain, provide the foundation for further investigation into the use of neurostimulation as a rehabilitative approach for patients with dysphagia from stroke. |

**Figure 2 – North-American articles published between 2003 and 2013 related to videofluoroscopic assessment of swallowing in oropharyngeal dysphagia in adults after a cerebrovascular accident.**

Of the national articles, four (57,14%) did not report the amount in milliliters of the food offered during the exam, while all north-American articles detailed the milliliters used, which varied from 2 to 15mL (Figure 3).

Silva[10] describes the volumes of 5 to 10mL, thick consistency as ideal for the identification of suggestive signals of penetration and aspiration, as well as to facilitate the interpretation and definition of conducts for patients after a cerebrovascular accident.

Regarding the type of consistency, all north-American articles brought detailed information about the consistency and the type of food offered. The national articles also mentioned the consistency used, although, generically without the identification of the food offered (Figure 4).

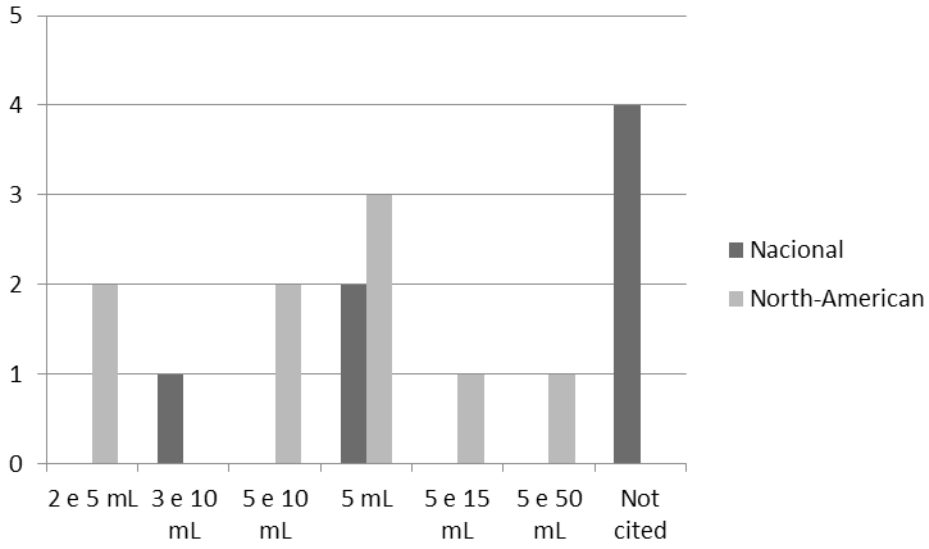



**Figure 3 – Quantity (in mL) of food offered for the videofluoroscopy of patients after stroke, according to national/Brazilian articles (N=8) and north-American articles (N=9), published between 2003 and 2013.**

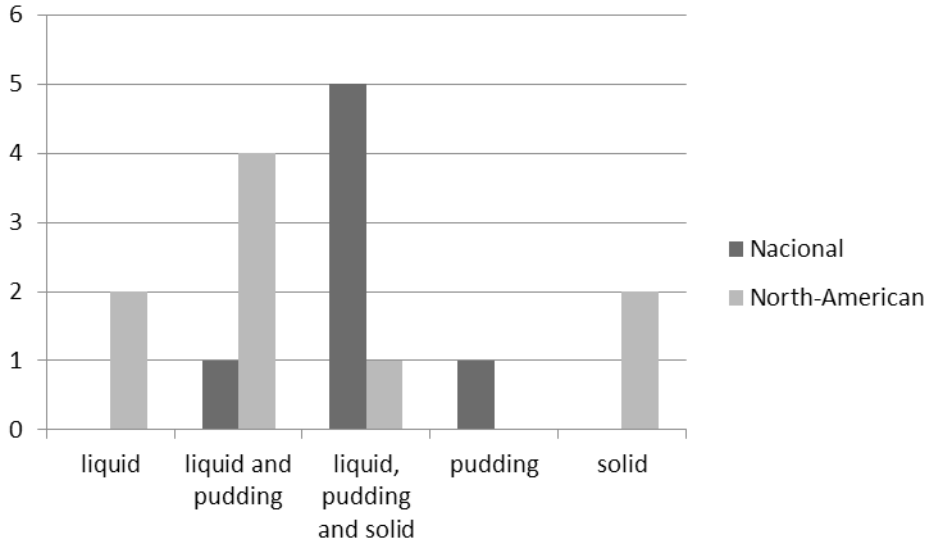


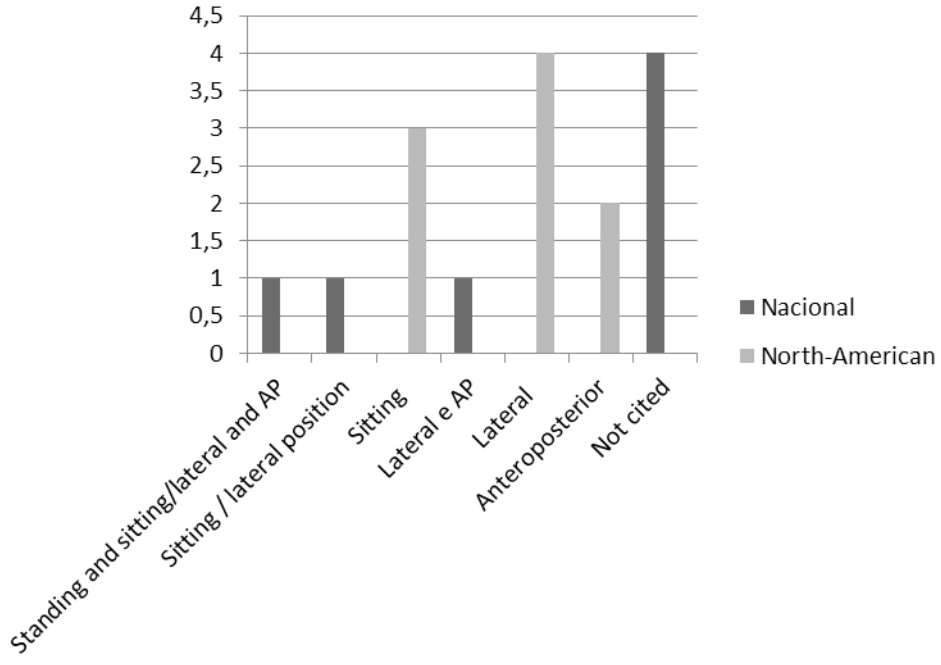

**Figure 4 – Consistencies offered during the videofluoroscopic exam in patients after stroke, according to national/Brazilian articles (N=8) and north-American articles (N=9), published between 2003 and 2013.**

Liquid and thick consistencies are processed and swallowed differently[11]. The propulsion of the bolus and its conduction vary according to the amount, the density and the viscosity of the material to be swallowed. The bolus characteristics determine the pressure to be generated in this cavity during the ejection, influencing the pharyngeal phase[12]. Most of the researches[13-24] described the consistencies and the amounts tested. Some studies[25-28] reported the consistency tested, however did not bring information regarding the amount offered.

It is generally considered important that the assessment includes more than one consistency[29]. It can be observed in Figure 2 that the studies expressively differ regarding the consistency used during the exam. However, the great majority offered two or more consistencies.

Despite the variation, north-American studies usually bring the liquid as the main tested consistency; among the national studies, five of the nine analyzed ones, tested three consistencies.

Concerning the patient's position during the exam, four (57,14%) of the national articles did not report the patient's position. All north-American articles detailed the subject's position (Figure 5).




Legend: AP=anteroposterior.

**Figure 5 – Subjects' position for the performance of the videofluoroscopic exam in patients after stroke, according to national/Brazilian articles (N=8) and north-American articles (N=9), published between 2003 and 2013.**

Subjects' position during the exam is proposed by Logemann[29] in the lateral and anteroposterior view. It is preconized that the position should be as close as possible to the natural positioning of the individual[1]. Both, the national and the north-American studies revealed gaps by not informing the view of the exam. Most of national studies do not bring any information regarding the subjects' position. Some north-American studies bring information only regarding the body position, but not regarding the cervical view.

The equipment used for the offering of the bolus is quoted by five (55,55%) north-American articles and only by one (14,28%) national article (Figure 6).

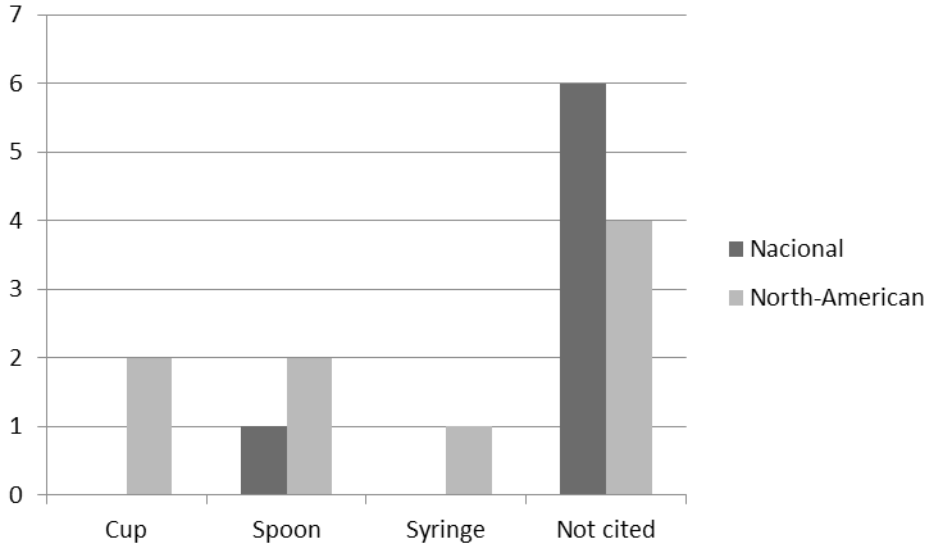
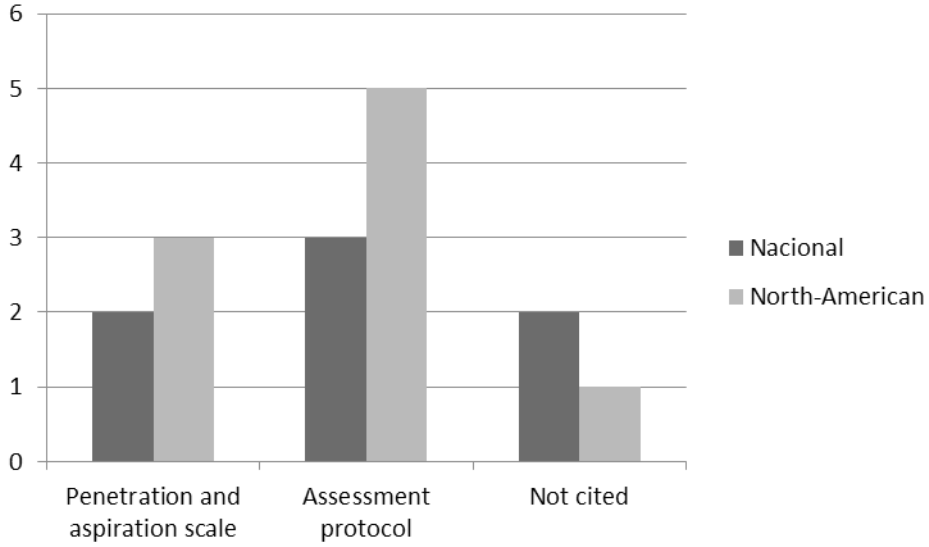



**Figure 6 – Specifications regarding the equipment for offering the bolus during the videofluoroscopic exam in patients after stroke, according to national/Brazilian articles (N=8) and north-American articles (N=9), published between 2003 and 2013.**

The instruments used for offering the bolus is another important aspect of methodology, once tools may change the dynamics of capture of the bolus. The syringe, despite uncommon for feeding, becomes interesting for standardization and for greater control over the bolus offered[14,16,20,21,26,30].

Concerning the use of standardized procedures for the performance of the exam and analysis of results, six north-American articles (66,66%) and five (71,42%) national ones did not mention the use of an scale for laryngotracheal penetration and aspiration. Three (42,85%) national articles and five (55,55%) north-American ones reported models of protocols (Figure 7). The videofluoroscopic exam, as originally described by Logemann[29], is still being followed by most of clinical practices. However, there is not a protocol or standard procedure[10,29,30].




Legend: P/A=Laryngeal Penetration/Aspiration.

**Figure 7 – Use of protocols for the analysis of the videofluoroscopy results in patients after stroke, according to national/Brazilian articles (N=8) and north-American articles (N=9), published between 2003 and 2013.**

## CONCLUSION

Most of the national articles do not describe methodology. This was not observed in the north-American articles. However, it is observed that there is not a standardization for procedures in videofluoroscopic assessment.

The terminologies used, mainly regarding the consistency and the dosage in milliliters are distinct. Studies that detailed the recipe and the type of food offered diverge regarding the classification of food consistency. The dosage in milliliters varies expressively in most of the analyzed studies.

Therefore, there is a need for standardization of procedures and terminologies used in videofluoroscopic swallowing study, in order to facilitate the inter-comprehension and reproducibility of studies.

**RESUMO**

Este artigo tem por objetivo analisar e comparar o uso de protocolos brasileiros e norte-americanos para videofluoroscopia da deglutição em pacientes com histórico de acidente vascular encefálico. Trata-se de uma revisão bibliográfica de artigos brasileiros e norte-americanos. Foram selecionados artigos com descrição de procedimentos para videofluoroscopia da deglutição em sujeitos que sofreram acidente vascular encefálico, publicados entre 2003 e 2013. Os procedimentos descritos para realização de videofluoroscopias foram analisados de forma quantitativa e qualitativa. Consideraram-se as variáveis: posicionamento para o exame, consistências e quantidades de oferta de bolo, tipos de utensílios e utilização de protocolos Foram encontrados 16 artigos que atenderam aos critérios supracitados, sendo nove (56,25%) norte-americanos e sete (43,75%) brasileiros. Observou-se que quatro dos estudos nacionais (57,14%) não relatam as quantidades oferecidas, enquanto todos os artigos norte-americanos detalharam as quantidades, que variaram entre 2 e 15 mL; os tipos de alimento e suas consistências foram detalhadas em todos os estudos nacionais e norte-americanos, porém os nacionais o fizeram de forma genérica, sem identificação dos alimentos. Quanto à posição do paciente durante o exame, 57,14% dos artigos nacionais não relataram e todos os artigos norte-americanos o fizeram. Os utensílios para oferta do bolo são citados em 55,55% dos artigos norte-americanos e em apenas 14,28 % dos nacionais. Quanto à utilização de protocolos para avaliação 33% dos estudos norte-americanos não os citam, comparados aos 71,42% dos nacionais. Observou-se a necessidade de padronização dos procedimentos e terminologias utilizadas na videofluoroscopia da deglutição, de modo a facilitar a intercompreensão e reprodutibilidade dos estudos.

**DESCRITORES:** Deglutição; Fluoroscopia; Transtornos da Deglutição; Acidente Vascular Cerebral

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