Relationship between Dysphagia, National Institutes of Health Stroke Scale Score, and Predictors of Pneumonia after Ischemic Stroke

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Background: The present study aimed to evaluate the relation between the National Institutes of Health Stroke Scale (NIHSS) score and the presence of laryngeal penetration and/or laryngotracheal aspiration in ischemic stroke patients and to verify what factors are predictors of the occurrence of pneumonia in the evaluated patients. *Methods:* This was an observational study of ischemic stroke in the acute or subacute phases. Neurologic examination included anamnesis, Bamford classification, and application of the NIHSS. Speech therapy evaluation was carried out after clinical stabilization of the patient, and all individuals who were considered dysphagic were sent for examination by means of videofluoroscopic recordings. The parameters observed in the objective examination were the presence of laryngeal penetration and/or laryngotracheal aspiration. The pneumonia data were obtained in accordance with local protocols, which were based on international guidelines. The relation of laryngeal penetration and laryngotracheal aspiration with the NIHSS score was assessed by the Mann–Whitney *U* test, and predictors for the occurrence of pneumonia were analyzed by multiple logistic regression using semiautomatic backward selection. Significance was set at P less than .05. *Results:* The relations between laryngeal penetration and the NIHSS score and between laryngotracheal aspiration and the NIHSS score were not statistically significant. The predictors for pneumonia occurrence in the ischemic stroke patients with a clinical diagnosis of dysphagia were age ($P = .002$; odds ratio [OR], 1.12) and NIHSS score ($P = .04$; OR, 1.17), whereas laryngeal penetration of liquid ($P = .065$; OR, 3.70) tended to correlate with pneumonia but not significantly. *Conclusions:* There was no relation between the NIHSS score and laryngeal penetration or laryngotracheal aspiration, and the principal predictors of pneumonia in dysphagic patients after ischemic stroke were advanced age and neurologic severity. **Key Words:** Stroke—deglutition—deglutition disorders—dysphagia—neurologic impairment—pneumonia predictors.

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Introduction

Stroke is one of the main causes of death and incapacity throughout the world. Epidemiologic studies have shown that strokes cause approximately 5.7 million deaths, with 85% occurring in underdeveloped or developing countries, where death rates are 3.5 times higher than in developed countries.[1,2] In Brazil, stroke is considered the main cause of death, with 10% of deaths occurring in the first 30 days and 40% in the first year.[3,4] As well as a high mortality index, an ischemic stroke can cause communication and swallowing disorders, with a significant impact on functional abilities.[5]

Oropharyngeal dysphagia is a common deficit after stroke, occurring in approximately 50%-91% of patient cases.[6-8] Of these cases, 65% present this symptom within the first 5 days of hospitalization, leading to a sixfold increase in risk for aspiration pneumonia and a threefold increase for mortality.[9-12] Pneumonia after stroke is frequently associated with the presence of laryngotracheal aspiration, 2%-25% of which are concomitant with silent aspirations.[13,14]

Diverse protocols have suggested that the National Institutes of Health Stroke Scale (NIHSS) can be a predictor in the identification of dysphagia risk in patients after stroke, despite not making reference to deglutition.[15-19] The majority of studies that describe the relationship between the NIHSS score and oropharyngeal dysphagia are based on clinical parameters observed in water and/or other consistency tests. Both screening protocols and clinical evaluations of swallowing recommend observation of specific clinical signs, such as saliva swallowing, the presence of cough, changes in vocal quality, and breathing discomfort. Even studies related to pneumonia indicators report difficulty in detecting silent aspirations using only clinical evaluation. Furthermore, dysphagia classification is often based on defining the presence or absence of a swallowing disorder, which makes it difficult to decide on a feeding route and the best food consistencies.[10,15,16]

Swallowing videofluoroscopy is considered the gold standard method for evaluating oropharyngeal dysphagia. Studies have highlighted the importance of an objective examination in identifying specific changes in swallowing dynamics, such as laryngeal penetration and laryngotracheal aspiration. In addition, an isolated clinical evaluation is not capable of predicting the occurrence of these signs in the poststroke patient.[20,21] One recent review of the screening of dysphagia found low sensitivity and specificity values for the identification of the presence of laryngeal penetration and silent aspiration using clinical characteristics.[11]

The present study aims to address 2 questions: (1) to evaluate the relation between the NIHSS score and the presence of laryngeal penetration and/or laryngotracheal aspiration in ischemic stroke patients and (2) to identify what factors are predictors of pneumonia occurrence in the evaluated patients.

Patients and Methods

Study Design, Setting, and Participants

This observational study used transversal methodology and a prospective study of a series of cases to achieve objectives 1 and 2, respectively. The individuals evaluated had been diagnosed with ischemic stroke in the acute or subacute phase, which was confirmed by neuroimaging (computed tomography or magnetic resonance). Patients were excluded if they presented hemorrhagic stroke, previous complaints of dysphagia, a previous modified Rankin Scale score greater than 1, pre-existing dementia, unstable clinical status, comatose state, another neurologic disease, or had undergone decompressive hemicraniectomy. All individuals were hospitalized at the Stroke Unit of Botucatu School of Medicin—Univ Estadual Paulista, Sao Paulo, Brazil, where they were evaluated in the period from April 2010 to May 2012.

The study protocol was approved by the Research Ethics Committee, Botucatu School of Medicine, Univ Estadual Paulista. All participants or their legal representatives were aware of the study objectives and gave written informed consent.

Measurements

Neurologic evaluation

Neurologic examination included anamnesis, Bamford classification,[22] and application of the NIHSS.[23] In this study, a certified vascular neurologist conducted the NIHSS simultaneously with the dysphagia evaluation. To avoid compromising result viability, videofluoroscopy did not constitute part of the test. All individuals were scored at admission and then daily until discharge. To fulfill the objective of this study, only scores from the day the swallowing videofluoroscopy was performed were selected.

Evaluation of dysphagia

The speech therapy evaluation[24] was carried out after clinical stabilization of the patient; all individuals considered dysphagic were sent for examination by means of videofluoroscopic recordings, using foods modified with barium sulfate. The examination was initiated by offering a pasty food, followed by a liquid. It is important to emphasize that the evolution of the quantity and consistency of the offerings was directly dependent on the performance of the patient in the previous deglutition, and the examination was interrupted when the presence of laryngotracheal aspiration was observed. For the examination, the patient was advised to remain in a lateral position, which allows visualization