

# Correlation of Dysfunction and Clinical Recovery in Ischemic Stroke

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## Research Article

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## Abstract

**Objective:** To correlate the neurological scales National Institutes of Health Stroke Scale (NIHSS) and the Modified Rankin Scale (MRS) with speech therapy scales Functional Oral Intake Scale (FOIS®) and the Severity Scale: Penetration and Aspiration (ROSENBK) in the acute phase, after 30 and 90 days of ischemic stroke.

**Methods:** A prospective cohort study in 60 patients, 24 (40.0%) females and 36 (60.0%) were male. All they performed in the first 24 hours of ischemic stroke neurological evaluation through the scales NIHSS and the MRS, functional clinical evaluation of swallowing with the application FOIS® and up to 72 hours of ischemic stroke nasolaringofibroscópica the evaluation of swallowing with ROSENBK. Spearman's correlation test was used and the non-parametric Wilcoxon test, Mann-Whitney.

**Results:** There was in 37.0% of patients in the acute phase, 30.0% after 30 days and 20.0% after 90 days of ischemic stroke. There was moderate correlation between neurological scales NIH and ERm, weak correlation between neurological scales with speech therapy scales and strong correlation between FOIS® and ROSENBK scales in the acute phase.

**Conclusions:** Moderate correlation between neurologic scales in the acute phase, after 30 and 90 days suggesting that can be used according to availability and experience of each service. Weak correlation of neurological scales with speech therapy scales is not possible isolated use of only one of the assessments. And a strong correlation between the scales speech therapy in the acute phase may facilitate the clinical assessment in services that do not have the instrumental

**Keywords:** Stroke; Deglutition; Neurologic Examination; Speech, Language and Hearing Sciences; Deglutition Disorders

**Abbreviations:** NIHSS: National Institutes of Health Stroke Scale; MRS: Modified Rankin Scale; FOIS: Functional Oral Intake Scale; OD: Oropharyngeal Dysphagia; ICT: Informed Consent Term

## Introduction

It is estimated that in 2016 the Stroke affected more than 17 million people in the world and 100 thousand deaths per year, being the main cause of morbidity and mortality in Brazil [1].

The post-stroke patient may have oropharyngeal dysphagia (OD), which is not considered a disease, but a symptom/sign of the underlying disease. OD is a disorder with specific signs and symptoms that interfere with the swallowing process and can affect any phase in the transportation of the bolus from the mouth to the stomach [2]. Such alterations are associated with increased morbidity and mortality, which can lead to clinical complications such as dehydration, malnutrition and aspiration pneumonia [3-8].

The incidence of OD in post-stroke patients ranges from 20% to 90% in the literature [9-31]. When submitted to speech and language assessment within 48 hours of hospitalization, the incidence varies from 43% to 50% [32,33].

It is absolutely necessary an accompaniment, interdisciplinary and speech therapy assistance to patients with OD through the clinical evaluation of swallowing combined with instrumental evaluation, known as videofluoroscopic and nasolaryngofibrosopic evaluation of swallowing. One of the forms of intervention is speech-language rehabilitation aimed at enabling and rehabilitating patients who are unable to feed themselves in order to improve the quality of life [34-36].

Patients with stroke also use neurological assessment scales that measure initial neurological deficits, aiding in the indication of acute treatment and in monitoring the patient's clinical and prognostic evolution [37]. For this purpose the International Stroke Scale of the National Institutes of Health Stroke Scale (NIHSS) [38] is used.

In the initial and sequential evaluation after stroke, a level of consciousness monitoring method can be used, in which the Glasgow Coma Scale (ECG) is recommended [39]. The modified Rankin Scale (ERm) [40] is used to measure the degree of incapacity and dependence in activities of daily living. Based on the hypothesis that the

post-stroke patient may present dysphagia evolution and follow-up with the main neurological monitoring scales, the present study aimed to correlate the NIH and ERm neurological scales with the Functional Oral Intake Scale (FOIS®) [41] and the Severity Scale: Penetration and Aspiration (ROSENBK) [42] in the acute phase, after 30 and 90 days of the stroke.

## Material and Method

A prospective longitudinal cohort study performed in patients admitted to the Stroke Unit of a University Hospital from July 2011 to July 2013.

This study was approved by the Research Ethics Committee under no. 2169.064/ 2010-03 of the Hospital de Clínicas of the Federal University of Paraná (HC-UFPR) and all individuals signed the Informed Consent Term (ICT).

The study sample consisted of 60 patients with stroke, confirmed by computed axial tomography, 24 (40.0%) of the female gender and 36 (60.0%) of the male. The patients' ages ranged from 30 to 88 years, mean of 61.6 years, standard deviation 13.6 years.

Patients older than 18 years; with clinical criteria of stroke, with recent cerebral image compatible with stroke and confirmed by neurologist; with application of the NIH scale within the first 24 hours after the onset of symptoms; with study of deglutition up to 72 hours after the onset of symptoms of stroke; ECG level of consciousness greater than or equal to 11; without conducting speech therapy and patient and/or legal guardian signed the ICT.

Patients with a previous history of head and neck surgery were excluded; with previous structural anomalies of oropharyngolarynx; with damage to the brainstem; with hemodynamic instability and death.

The study was divided into four stages after confirmation of stroke. The first step was the neurological evaluation where the data were collected in the patient's medical record. The neurological evaluation was performed by the trained neurologist who performed the NIHSS that occurred within the first 24 hours after stroke.

In the second stage, the functional clinical evaluation of swallowing was always performed by the same speech therapist (author) soon after the patient's eligibility criteria. The Deglutition Safety Assessment Protocol was used [43].

The clinical signs of aspiration [44], described in the form of feeding were evaluated and the food consistencies prepared at the time of evaluation were evaluated: liquid, nectar, honey and pudding, following the American Dietetic Association [45] standard.

Solid food consistency was excluded from the clinical evaluation, since patients presented complaints of coughing and coughing with other food consistencies.

In the evaluation, three swallowing sequences of 5ml, 10ml and free gullet of each food consistency were offered, without interval. After the functional clinical evaluation of swallowing, FOIS® [41] was applied.

In the third stage, nasolaryngofibrosopic evaluation of swallowing was performed by otorhinolaryngologists accompanied by the same audiologist (author) with experience in the examination, up to 72 hours after the stroke in the outpatient clinic of the Peroral Endoscopy Sector and/or in the HC-UFPR bed. The data from the Nasolaryngofibrosopic Deglutition Evaluation Protocol [46] were followed. The consistencies offered in the examination were similar to those used in the second step, and the inorganic dye of blue aniline was added to contrast with the pink coloration of the mucosa. After the examination was applied the Severity Scale for Dysphagia: Penetration and Aspiration [42].

In the fourth stage, the re-evaluation was performed

after 30 and 90 days of the stroke with the return of the patient to the Sector of Peroral Endoscopy of the HC-UFPR for reevaluation of the three previous stages.

The patient who did not return after 90 days was applied the questionnaire "Telephone Contact After 90 Days". Of the 60 patients, 14 (23.0%) did not return and the telephone contact was made by the same speech therapist (author) with the patient and/or the person using a verbal terminology and was given the opportunity to ask questions.

In the statistical analysis, the non-parametric Spearman test was used to verify the correlation between the scales in the acute phase, after 30 and 90 of the stroke. Fisher's test was used at a significance level of 0.05.

## Results

There was an OR in 37.0% of the patients in the acute phase, 30.0% after 30 days and 20.0% after 90 days of the stroke. The values of rho ( $\rho$ ) according to the DANCEY & REIDY (2006) [47] classification were used for the correlations, being rho weak (0.10 to 0.39), moderate (0.40 to 0,69) and strong (0.70 to 1.00), (Table 1). There was a moderate correlation between the NIH and ERm neurological scales, poor correlation between the neurological scales with the speech-language scales and a strong correlation between the FOIS® and ROSENBEK scales in the acute phase.

Crossings Between the Scales	Correlation*
NIH acute phase X ERm acute phase	Moderate
NIH acute phase X ERM after 30 days	Moderate
NIH acute phase X ERM after 90 days	Moderate
NIH acute phase X FOIS®acute phase	Weak
NIH acute phase X FOIS® after 30 days	No correlation
NIH acute phase X FOIS® after 90 days	No correlation
NIH acute phase X ROSENBEK acute phase	Weak
NIH acute phase X ROSENBEK after 30 days	No correlation
NIH acute phase X ROSENBEK after 90 days	No correlation
ERm acute phase X NIH after 30 days	Moderate
ERm acute phase X NIH after 90 days	Moderate
ERm acute phase X FOIS®acute phase	Weak
ERm acute phase X FOIS®after 30 days	Weak
ERm acute phase X FOIS®after 90 days	No correlation

ERm acute phase X ROSENBEK acute phase	Weak
ERm acute phase X ROSENBEK after 30 days	Weak
ERm acute phase X ROSENBEK after 90 days	No correlation
<i>FOIS@</i> acute phase X NIH after 30 days	Weak
<i>FOIS@</i> acute phase X NIH after 90 days	Weak
<i>FOIS@</i> acute phase X ERm after 30 days	Weak
<i>FOIS@</i> acute phase X ERm after 90 days	No correlation
<i>FOIS@</i> acute phase X ROSENBEK acute phase	Strong
<i>FOIS@</i> acute phase X ROSENBEK after 30 days	Moderate
<i>FOIS@</i> acute phase X ROSENBEK after 90 days	No correlation
ROSENBEK acute phase X NIH after 30 days	Weak
ROSENBEK acute phase X NIH after 90 days	Weak
ROSENBEK acute phase X ERm after 30 days	No correlation
ROSENBEK acute phase X ERm after 90 days	No correlation
ROSENBEK acute phase X <i>FOIS@</i> after 30 days	Moderate
ROSENBEK acute phase X <i>FOIS@</i> after 90 days	Weak

Source: the author (2015)

Caption: \* = rating of DANCEY & REIDY (2006)

Table 1: Distribution of Crossings between the Nih, Erm, Fois@ and Rosenbek Scales in the Acute Phase after 30 nd 90 Days of Stroke.

## Discussion

It is important to note that in Brazil stroke is considered the main cause of mortality [1], with 10% occurring in the first 30 days and 40% in the first year [48]. Perhaps the greatest number of studies in the acute phase is due to the ease of early hospital intervention, and after discharge there is a greater difficulty for the patient to return to the speech-language pathology, which occurred in the present study, in which we had difficulties adhering to follow-up after the 90 days of the stroke.

It was observed the predominance of OD in the acute phase presenting evolution after 30 and 90 days of stroke, agreeing with the literature, where many patients recover and dysphagia improves or disappears after days or weeks of neurological stroke [16,27,28].

In the literature, the correlation between dysphagia and NIHSS in the acute phase [21,30,48-55] and follow-up after 30 days [56,57] are studied as parameters. Our 90-day follow-up data cannot be compared - because there are no studies - in the present study patients presented mild neurological impairment on the NIH scale with a prevalence of OD in the scores between six and 13 in the acute phase, scores ranging from zero to thirteen after 30 days and a score of zero to five after 90 days, in agreement with the literature [30,48,52,54,58].

Regarding ERm and the presence of dysphagia, acute phase studies [21,59-61] and after 90 days of stroke were found in the literature [29,62]. The data of the present study corroborate with studies [21,29,59,60,62], which report that patients with scores greater than three

(moderate disability) in ERm present difficulties in swallowing, they conclude that the higher the score, the higher the risk of dysphagia.

In the acute phase, 30 and 90 days after the stroke, level 7 prevailed on the FOIS® scale (total oral route without restrictions). Studies have been found correlating FOIS® with dysphagia in the acute phase [27,41,63-66] and after 90 days [67].

In relation to the ROSENBEK scale, the score 1 (contrast does not enter the airway) prevailed at all times of the study, in the acute phase, 30 and 90 days after the stroke, corroborating our previous studies [27,66].

No correlation was found in the literature between the NIH and ERm scales with the FOIS® and ROSENBEK scales at any time of the acute phase at 90 days. Therefore, the data collected in this study may be considered preliminary for knowledge about the main neurological scales and dysphagia in the acute phase up to 90 days after stroke.

Our study excluded patients with brainstem involvement. The idea was to avoid selection bias of patients with high probability of worsening of the level of consciousness and with possible initial dysphagia.

It is observed in the present study that the crossing between the NIH and ERm scales in the acute phase, after 30 and 90 days of the stroke, showed a moderate correlation between them suggesting that they can be used according to the availability and experience of each service. Considering that the NIH scale needs to be applied by a trained neurologist, ERm is an alternative for other health professionals, such as speech therapists, physiotherapists, nurses, among others, to monitor the evolution after stroke.

All crosses of the NIH neurological evaluation scales and the ERm with the FOIS® and ROSENBEK assessment scales in the acute phase, after 30 and 90 days of the stroke, had a poor correlation, and therefore it was not possible to use only one of the evaluations, necessitating the hiring of the professional speech therapist in the interdisciplinary team to evaluate swallowing.

Of the five crosses between the FOIS® and ROSENBEK scales, the moderate correlation prevailed at two crosses between the acute phase and after 30 days and a strong one in the acute phase. In the 90 days correlations, there was only one weak and one without correlation, which could only be the result of alteration of the sample in the

later period. Therefore, it can be suggested that the use of these scales in the acute phase are equivalent and may facilitate the speech-language evaluation.

## Conclusion

The objective of the study was to correlate the NIH and ERm neurological scales with the FOIS® and ROSENBEK speech scales in the acute phase, after 30 and 90 days of the stroke, a weak correlation of the FOIS® and ROSENBEK scales was observed with the NIH scales and the ER, and moderate correlation between the NIH and ERm scales, both in the acute phase, after 30 and 90 days of the stroke. There was a strong correlation between the FOIS® and ROSENBEK scales in the acute phase after stroke.

It is necessary to carry out more studies related to the neurological scales with the OD.

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