Research Article

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Validity and reliability of the Turkish version of the Barnes-Jewish Hospital stroke dysphagia screen test in patients with acute stroke

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Abstract

Objective: To perform the validity and reliability of the Turkish version of the Barnes-Jewish Hospital Stroke Dysphagia Screen (BJH-SDS).

Methods: One hundred forty patients with acute stroke were screened using the BJH-SDS within the first 24 hours of stroke and scored by two blinded independent expert observers, followed by endoscopic evaluations within 24 hours of the screening tests. Cronbach's alpha and item-to-total correlations were used to assess internal consistency. Interrater reliability analyses were performed. Flexible fiber optic endoscopic evaluation of swallow (FEES) was used to describe the validity of the measures.

Results: The mean age of the patients was 67.20±12.82 years. The internal consistency of the test was good with Cronbach's α values between 0.831 and 0.894, and there was a very good interrater agreement based on an intra-class correlation coefficient between 0.850 and 1.000. The item-to-total correlation for test items was between 0.493 and 0.712, exceeding the commonly accepted level of >0.3. There was a significant positive association between the total test scores of the raters and FEES levels (r=0.733 p=0.001 and r=0.744, p=0.001).Based on the total scores, the sensitivity and specificity for detecting the presence of dysphagia were 78.6% and 80 to 82.8%, respectively.

Conclusion: Our results suggest that the Turkish version of the BJH-SDS is a valid and reliable instrument when determining dysphagia in patients with acute stroke.

Keywords: Acute, dysphagia, FEES, screening test, stroke

INTRODUCTION

Dysphagia is a serious condition commonly observed in patients with acute stroke. The prevalence rate for dysphagia varies between 37% and 78%, depending on the time and method of assessment (1-3). Generally, dysphagia resolves within the first two weeks in almost 90% of patients with stroke (4). Thus early period represents the most significant period of time for these patients. Dysphagia increases the risk of complications such as swallowing abnormality, dehydration, and malnutrition, and it is associated with increased short-term mortality (4-6). Aspiration-related pneumonia is the most important complication of dysphagia. Studies examining patients with dysphagia after acute stroke showed the presence of silent aspiration in 60% of patients, which may lead to a mortality rate of up to 50% (3).

Early recognition of dysphagia results in reduced complication rates, shortened hospital stay, and decreased healthcare costs (3, 7, 8). Various methods are available for the early detection and identification of dysphagia, such as videofluoroscopy (VF) and endoscopy, electrophysiologic tests measuring the dysphagia limit, and bed side screening tests (9-12). The American Stroke Association and the Joint Commission on Accreditation of Healthcare Organizations have described the importance of early diagnosis of dysphagia in acute stroke patients (13). These organizations recommended that this diagnosis should include a bedside screening test pro-

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tocol. Furthermore, the protocol should include a check list and the water swallow test to provide for the best patient outcomes (14, 15). The Barnes–Jewish Hospital-Stroke Dysphagia Screening (BJH-SDS) is recommended in accordance with these criteria (4).

Stroke represents an important heath problem both globally and nationally. Although nutritional management in patients admitted to hospitals with stroke is based on an assessment of swallowing function, no standardized dysphagia screening is used. Thus, we performed the reliability and validity testing of the Turkish version of BJH-SDS, which was originally developed in the stroke unit of BJH and was shown to be a reliable assessment tool in numerous previous studies (16).

METHODS

A total of 140 patients who were admitted to our neurology department with clinical and radiologic diagnoses of acute stroke between February 2016 and February 2017 were included in this study. The study was approved by the Local Ethics Committee Dışkapı Yıldırım Beyazıt Training and Research Hospital (date: 16.01.2017). All patients were informed regarding the study details and written informed consent was obtained. All investigators conformed to the ethical standards as described in the Declaration of Helsinki.

The inclusion criteria were as follows: diagnosis of acute stroke based on clinical and magnetic resonance imaging (MRI) results, aged> 18 years, and normal cognitive functions (Mini-Mental Test Score >24 points).

The exclusion criteria included the presence of previous stroke, neurodegenerative or muscular disease histories that were potentially associated with swallowing disorder, malignancy, history of surgery in the head and neck region, bilateral cranial infarction, and psychiatric disorders. Also, the presence of infectious diseases such as HIV, hepatitis B or C, decompensated heart failure, and nasal obstruction were exclusion criteria for fiber optic endoscopic evaluation of swallow (FEES).

The 140 patients included in the study were assessed within the first 24 hours of stroke. Demographic data, lesion side, and stroke subtype according to Bamford classification were recorded (17). The severity of the stroke was assessed using the National Institute Health Stroke Scale, while the functional disability was evaluated with the Modified Rankin scale (18, 19). Fiber optic endoscopic evaluation of swallow was administered within the first 72 hours.

Barnes–Jewish Hospital Stroke Dysphagia Screen (BJH-SDS) Test

The BJH-SDS is a bedside assessment tool that was developed in 2006 in order to identify the presence of dysphagia patients within acute stroke. The tool is administered by nurses (16).

The BJH-SDS consists of 5 items, each with two choices, i.e. present = yes, absent = no. The first four items assess consciousness, and asymmetry or weakness in facial, tongue, and palatal muscles. The level of consciousness is assessed by using the Glasgow Coma Scale, and the presence of dysarthria is identified together with the use of other items. The 5th item consists of the 3-oz water test, and the abnormality was defined as coughing, choking or breathlessness while swallowing, or wet/gurgled voice after swallowing.

Translation of BJH

As the initial step, permission was requested from the developers Edmiaston et al. to conduct the validity and reliability studies of the Turkish version of BJH-SDS (16).

The BJH-SDS was independently translated to Turkish by two bilingual physicians. Both translations were compared by five physicians (a neurologist, a specialist in physical medicine and rehabilitation, and three otolaryngologists) and a scale was formed. A pilot study for the initially prepared form was conducted in 15 patients, and using the feed-back obtained from these 15 patients, a re-assessment was performed to obtain the final document. It was translated into English by a native English-speaking, language expert. The final Turkish version's compliance with BJH-SDS was accepted following a comparison of the meaning and format of the original English form (Appendix).

Speech and language therapists (SPL) are available in only a very limited number of centers in Turkey. Swallowing disorders are generally assessed by the treating physician. Thus, the term "SPL" was replaced by the term "physician" in the first sentence of the tool.

Reliability

Cronbach's alpha coefficient and item-to-total correlations were used to assess internal consistency. Inter-rater reliability studies were also conducted. Agreement between two independent raters was analyzed using intraclass correlations (ICC). One hour between the examinations was considered to be sufficient to prevent bias because swallowing function may change over time.

Validity

The validity was assessed by the dysphagia level using FEES. Endoscopic evaluations were performed by an otolaryngologist who was blinded to the BJH-SDS test within the first 24 hours after performing the second BJH-SDS test.

Fiber optic endoscopic evaluation of swallow was performed by the same otolaryngologist using a non-ducted fiber optic nasopharyngoscope of 3.4 mm diameter, a light source, camera, monitor, and DVD recorder (Karl Storz GmbH & Co KG, Tuttlingen, Germany). The assessments were performed at the highest possible upright sitting position. Water was used for

the liquid, pudding for semisolid, and a bread for solid food evaluations. Findings were recorded as video images. At the end of the examination, the dysphagia level was scored from 1 to 6 according to the protocol of assessment of dysphagia developed by Dziewas et al. (20). One point was considered as "normal swallowing" and 2-6 points were defined as "dysphagia."

Statistical Analysis

All statistical analyses were performed using the Statistical Package for the Social Sciences 22.0 statistical package (SPSS IBM Corp.; Armonk, NY, USA). Descriptive statistics are presented as mean ± standard deviations for continuous variables and as percentage (%) for nominal variables. Internal consistency was measured using Cronbach's alpha, with >0.70 indicating an acceptable value. Item-to-total correlations were calculated using Spearman rho correlation coefficients. Correlation coefficients above 0.3 were considered as acceptable (21). Inter-rater reliability was estimated using ICCs. For ICC results, positive values ranging from 0 to 0.2 indicated poor agreement; 0.2 to 0.4, fair agreement; 0.4 to 0.6, moderate agreement; 0.6 to 0.8, good agreement; and 0.8 to 1, very good agreement (22). For validity, the Spearman rho correlation test and receiver operating curve (ROC) analysis were used to indicate the association between FEES and BJH. Correlation coefficient (r) was used to show the power of correlation. According to this; <0.30 indicated weak, 0.30 to 0.50 indicated moderate, 0.50 to 0.75 indicated good correlation, 0.75 to 1.0 indicated very good correlation between the variables. Best diagnosis indices in terms of sensitivity, specificity, positive and negative predictive value (PPV and NPV, respectively) for dysphagia were calculated using ROC analysis. P<0.05 was accepted as statistically significant.

Table 1. The disease characteristics of patients

	n=140 Median (min-max), n (%)
NIHSS score	3.00 (1.00-24.00)
Modified Rankin Score	3.00 (0.0-6.0)
Lesion Side	
Right	56 (40)
Left	84 (60)
Bamford classification (infarct area)	
Total anterior	21 (15.0)
Partial anterior	62 (44.3)
Posterior	45 (32.1)
Lacunar	12 (8.6)

NIHSS: National Institute Health Stroke Scale

Table 2. Corrected Item-total correlation results according to the two raters

Subtests	1st rater	2nd rater
	r	r
Item# 1	0.661	0.692
Item# 2	0.493	0.543
Item# 3	0.667	0.700
Item# 4	0.600	0.612
Item# 5	0.674	0.712

r: correlation

RESULTS

Patient Characteristics

The mean age of the 140 patients [58 (41.4%) females, 82 (58.6%) males] included in the study was 67.20 (SD 12.82) years. The disease characteristics of patients are presented in Table 1.

An assessment of the swallowing function showed the presence of oral phase disorder in 69 patients (49.3%). The mean Penetration-Aspiration Scale (PAS) based on FEES assessment was 1.50 (1.0-6.0).

Reliability

The first tests performed by the neurologist and the second by the physical therapy and rehabilitation specialist indicated that the internal consistency was "good" with a Cronbach's α values of 0.894 and 0.831, respectively.

Item-to-total correlation results according to both raters are shown in Table 2. According to the corrected item-total correlation, Spearman's rho correlation coefficients ranged between 0.493 for "item 2 " to 0.712 for "item 5" for both raters, and all of the subtests were above the acceptable standards.

Inter-rater reliability is presented in Table 3. In the measurements performed with ICC, the values ranged from 0.850 to 1.000, suggesting satisfactory stability and very good reliability of the subtests. None of the items showed good, poor or fair agreement.

Validity

A strong positive significant correlation was found between FEES stage and the total scores of the raters (r=0.733 p=0.001; r=0.744, p=0.001, respectively).

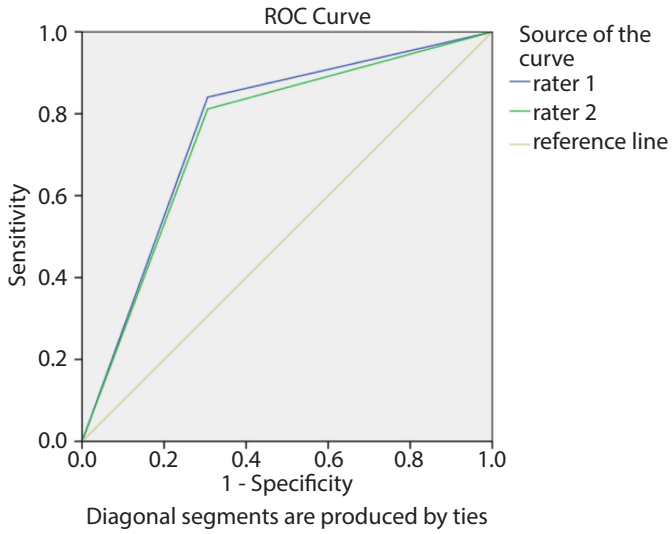
According to the total score; sensitivity, specificity, PPV and NPV were established as follows 78.6%, 80-82.8%, 75.6-72.3%

Table 3. Inter-rater reliability between inter-raters

Items1-5	ICC (95%CI)	p
Item# 1	1.000 (1.00-1.00)	0.001
Item# 2	0.850 (0.940-1.159)	0.001
Item# 3	1.000 (1.00-1.00)	0.001
Item# 4	1.000 (1.00-1.00)	0.001
Item# 5	1.000 (1.00-1.00)	0.001

ICC: intra-class correlation coefficient; CI: confidence interval

Figure 1. ROC curve analysis results for dysphagia
ROC: receiver operating curve



and 79.4-78.8%, respectively (Figure 1). These results indicate that Turkish version of BJH (T-BJH) is a very useful and accurate diagnostic tool in the prediction of the risk of dysphagia.

DISCUSSION

The pathophysiology of swallowing disorder involves peripheral and central mechanisms, which play a major part. It is a synchronous and persistent process with a certain pattern that is initiated by the brainstem (23, 24). Cortical and subcortical pathways playa role in pharyngeal swallowing (25). Although swallowing consists of a series of successive actions, the duration of laryngeal elevation, opening of the upper esophageal sphincter, and breath-holding phases vary depending on the bolus volume and viscosity. Stroke impacts on swallowing at multiple levels based on the interruption in the feedback loop. Recovery is dependent on the cortical healing (23, 24).

Although dysphagia may rapidly improve following stroke, the swallowing function may exhibit variability in some patients (24). Neurogenic oropharyngeal dysphagia is considered to represent a prognostic marker in patients with stroke. In a study by Ickenstein et al., the presence of aspiration within the first 72-hour period was found to predict severe swallowing disorder in the first 90 days following stroke identification and management of dysphagia should be promptly undertaken after stroke (3).

In recent years, numerous bedside swallowing screening tests have been developed in order to assess dysphagia in patients with stroke, each with varying degrees of validity and reliability (16, 26-29). Currently, no consensus exists on a standard screening test (30). However, use of the BJH-SDS is commonly endorsed based on its ability to meet a number of criteria such as high sensitivity and reliability, and quick and easy administration (4).

In the first study by Edmiaston et al., the BJH-SDS was administered by nurses to a total of 300 patients with acute stroke within the first 8 to 32-hour period after the initial incident (16). The tool was validated against the Mann Assessment of Swallowing Ability Scale; the inter-test reliability was 94%, and the inter-rater reliability was 92.5% (20, 31).

In another study by Edmiaston et al., the BJH-SDS was administered to 225 patients with acute stroke, and the test results were compared with videofluoroscopy findings (32). The sensitivity and specificity for dysphagia were 94% and 66%, respectively, and the corresponding figures for aspiration were 95% and 50%.

In the present study, the tool was administered by a neurologist and a physical therapy and rehabilitation specialist. Routine assessment of the first 4 items within the context of the neurologic examination provided convenience, and the water swallowing test allowed a rapid assessment of the presence of dysphagia. The administration time of the BJH took < 2 minutes. This is similar to the time required to complete the English version of the instrument.

In our study, a high inter-rater reliability was observed, although the correlation was only moderate for the 4th item. This may be due to irritation experienced by the patients during the examination because the assessment of the palatal arch may pose certain challenges in patients with a very strong gag reflex. In other items of the test, the inter-rater correlation was high. This is consistent with the report of the Edmiaston et al. when they evaluated the BJH in the original language (16). Thus, it may be concluded that the BJH also possesses reliability in repeated assessments, implying high reproducibility.

The test was validated by using FEES. The severity of dysphagia was assessed using the PAS scale developed by Dziewias et al., and a high correlation was identified based on the total score, the sensitivity was 78.6%, and the specificity was 80 to 82.8% (20). These results indicate that the T-BJH is a very useful and accurate diagnostic tool in the prediction of the risk of dysphagia.

Edmiaston et al. validated the BJH-SDS by using VF (32). Our study confirmed the reliability of the test using FEES. Videofluoroscopy is considered as the gold standard for the detection of dysphagia. However, in the German Neurology and Stroke Association's report, FEES was reported as the most commonly used method in the objective evaluation of neurogenic dysphagia (33). Fiber optic endoscopic evaluation Sallows effective and reliable assessment of swallowing, determination of appropriate nutrition strategies, and the efficacy of different swallowing maneuvers. Furthermore, bedside use and good tolerability provide additional advantages (34). We also consider such benefits of FEES, which can be associated with

time-savings, with respect to nutrition management in vital stabilization and treatment planning stages during the acute period in the stroke unit.

In conclusion, a reliability and validity study of the BJH-SDS in a language other than English was performed for the first time. The study confirmed the reliability and validity of the Turkish version in patients with stroke. Moreover, the effectiveness of this test has been shown by using FEES, which has easy application, is radiation free, and has increased in popularity in recent years more than VF. The test's reliability and validity have been updated. We believe that more extensive use of different language versions of this practical and rapid tool, which is easy to administer by healthcare professionals, may assist in reaching a consensus for the management of dysphagia during the acute phase of stroke.

Ethics Committee Approval: Ethics committee approval was received for this study from the ethics committee of Dışkapı Yıldırım Beyazıt Training and Research Hospital (date: 16.01.2017).

Informed Consent: Written informed consent was obtained from subject who participated in this study.

Peer-review: Externally peer-reviewed.

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