

Swallowing Disturbance Questionnaire for Detecting Dysphagia

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Objectives: To assess the accuracy of the swallowing disturbance questionnaire (SDQ) that had originally been designed and validated for detecting swallowing problems among patients with Parkinson's disease and was now applied for identifying patients with dysphagia associated with various other etiologies.

Study Design: Prospective.

Methods: One-hundred patients with the complaint of swallowing disturbances who underwent a full swallowing survey at the Tel-Aviv Voice and Swallowing Disorder Clinic participated. They all filled in the SDQ. The collected data included patient characteristics, medical history, and the results of an oromotor examination and a fiberoptic endoscopic evaluation of swallowing (FEES). The SDQ results were compared to the FEES and oromotor examination findings.

Results: The responses to the questions in the SDQ were highly correlated with the findings of the oral part of the oromotor examination (85.71% sensitivity, 87.6% specificity). Items on the laryngopharyngeal phase reliably assessed dysphagia symptoms in correlation to the FEES examination (67.3% sensitivity, 76.7% specificity). The total SDQ score correlated with the total oromotor and the FEES scores (79.7% sensitivity, 73% specificity).

Conclusions: The SDQ is a sensitive and accurate tool for identifying patients with true swallowing disturbances arising from different etiologies and for indicating the need for more in-depth instrumental swallowing evaluations.

Key Words: Swallowing disturbances, fiberoptic endoscopic evaluation of swallowing (FEES), dysphagia, questionnaire, swallowing disorder, cerebrovascular accident (CVA).

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Level of Evidence: 3a.

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INTRODUCTION

It is estimated that 45% of all patients hospitalized at a certain point in their lifetime suffer from some form of dysphagia, and that 6 to 10 million Americans (2%–3% of the population) have swallowing disturbances that affect their quality of life.¹ Aspiration is the most severe swallowing disturbance.^{1,2} It is defined as food content descending below the level of the true vocal cords into the trachea and has been linked to pneumonia, the most common cause of infectious death.³ The underrecognition and low levels of awareness to the presence of swallowing disturbances by patients, caregivers, and health professionals result in underreporting, low frequency of complaints and a delay in the diagnosis of these problems. Early detection and effective intervention can help prevent the serious consequences of dysphagia.^{4,5} In 2001, an evidence-based analysis of the literature showed that a fiberoptic endoscopic evaluation of swallowing (FEES) followed by swallowing therapy reduced

the incidence of aspiration pneumonia among patients with stroke.⁶

The literature describes two methods of screening for swallowing disturbances. The first method is comprised of a series of clinical subjective evaluations performed by a speech–language pathologist (SLP), and it includes tests such as cervical auscultation during swallowing, changes in oxygen blood saturation during water drinking, and a complete bedside evaluation that includes observation on the act of deglutition while swallowing different food consistencies. The results of these tests were compared with an objective clinical swallowing evaluation (fiberoptic examination or videofluoroscopy), and the sensitivity and specificity of the latter tests ranged between 50% and 80%.^{7,8} It should be noted that some of these tests cause patient discomfort and bear some risk of complication (e.g., aspiration). The second method involves the use of questionnaires. Several questionnaires have been developed to characterize an individual's oropharyngeal dysphagia. Most of them were aimed toward screening specific patient populations for swallowing problems, and some were epidemiologic studies that used a questionnaire as a screening tool for detecting swallowing problems in the general population. Very few questionnaires focused upon detecting swallowing disturbances in designated patient populations, and they generally relied on the findings of subjective reporting and objective swallowing tests.^{9–12} None of those questionnaires gained much popularity.

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Our group developed and validated a swallowing disturbances questionnaire (SDQ) for detecting dysphagia symptoms in patients with Parkinson's disease (PD) and compared its findings to an objective anatomical and functional swallowing assessment. The SDQ questionnaire substantially reduced Type I errors (specifically, missing an existing swallowing problem) in our study group. The SDQ has since been recognized as a validated tool to detect early dysphagia in patients with PD.¹³ Moreover, when The Movement Disorders Society commissioned a task force to assess available clinical rating scales and qualify them according to their clinical utility, two dysphagia scales were recommended and one of them was our SDQ.¹⁴

The purpose of the current study was to assess the accuracy of the SDQ in detecting patients with swallowing disturbances arising from various etiologies other than PD and to determine the optimal cutoff score for

determining patients who require further in-depth evaluations of a highly probable dysphagia.

MATERIALS AND METHODS

All patients who were referred for swallowing evaluation to the Voice and Swallowing Unit in the Tel-Aviv Medical Center were invited to participate in this study. The patients had been referred by otolaryngologists, speech-language pathologists, neurologists, and other healthcare professionals. The study was approved by the ethics committee of Tel-Aviv Medical Center, and all patients signed an informed consent form before answering the questionnaire. The study participants were requested to complete the SDQ, a self-reporting 15-item questionnaire on swallowing disturbances (Table I).

The questions cover the common swallowing disturbances that appear in the oral and pharyngeal phases of swallowing. Five questions (questions 1–5) are related to the oral phase of swallowing and 10 questions (questions 6–15) are related to the pharyngeal phase. Fourteen questions are rated by a four-point

TABLE I.
Swallowing Disturbances Questionnaire (SDQ).

		0	1	2	3
	Question	Never	Seldom (once a month or less)	Frequently (1–7 times a week)	Very frequently (>7 times a week)
1.	Do you experience difficulty chewing solid food, like an apple, cookie or a cracker?				
2.	Are there any food residues in your mouth, cheeks, under your tongue or stuck to your palate after swallowing?				
3.	Does food or liquid come out of your nose when you eat or drink?				
4.	Does chewed-up food dribble from your mouth?				
5.	Do you feel you have too much saliva in your mouth; do you drool or have difficulty swallowing your saliva?				
6.	Do you need to swallow chewed-up food several times before it goes down your throat?				
7.	Do you experience difficulty in swallowing solid food (i.e., do apples or crackers get stuck in your throat)?				
8.	Do you experience difficulty in swallowing pureed food?				
9.	While eating, do you feel as if a lump of food is stuck in your throat?				
10.	Do you cough while swallowing liquids?				
11.	Do you cough while swallowing solid foods?				
12.	Do you experience a change in your voice, such as hoarseness or reduced intensity immediately after eating or drinking,?				
13.	Other than during meals, do you experience coughing or difficulty breathing as a result of saliva entering your windpipe?				
14.	Do you experience difficulty in breathing during meals?				
15.	Have you suffered from a respiratory infection (pneumonia, bronchitis) during the past year?		Yes		No

(0–3) scale (0 for no disturbance and 3 for severe disturbance), and one is a “yes/no” question (yes was scored 2.5 and no was scored 0.5).

After completing the questionnaire, all patients underwent a clinical oromotor examination for assessing the lips, mandible, tongue, and palatopharyngeal range of motion. The examination was performed by an SLP specialized in dysphagia, and it was graded as being normal (a score of 0) or impaired based on the presence of one or more function abnormalities of the lips, tongue, soft palate, or jaw structure (a score of 1).

All the patients in our study underwent a FEES by an otolaryngologist (J.T.C.) and an SLP swallowing specialist (Y.M.). The FEES test was performed with a 3.6-mm diameter Pentax/Vision-Sciences laryngoscope connected to a Storz camera and a Sony color monitor/Kay-Pentax system. After a topical vasoconstrictor was sprayed into the nasal cavity, the laryngoscope was inserted through the nose up to the oropharynx and hypopharynx to allow adequate visualization of the structures involved in swallowing. Patients were asked to swallow colored apple sauce (3 tablespoons of 5 cc), one cracker (three bites) and milk (5 cc from a tablespoon and then three consecutive swallows from a cup). The FEES examination was graded as normal (a score of zero) or pathological (a score of 1) based on the presence of:

1. Stasis of food in the vallecula, pyriform sinuses, pharyngeal walls, or postcricoid region.
2. Penetration—passage of material into the larynx that did not pass below the vocal folds.
3. Aspiration—passage of material below the level of the vocal folds.

Each FEES video was reviewed by the authors at the same time and decisions were made according to the presence of pathology. The otolaryngologist and the SLP were blinded to the patient’s SDQ scores when they evaluated his/her video.

Data Analysis

Cronbach’s α test was used to measure how well a set of 15 items in the SDQ measured a single unidimensional latent construct of the presence of swallowing problems. Values for Cronbach’s $\alpha > 0.7$ were regarded as an acceptable reliability coefficient.¹⁵ The total questionnaire score was compiled and compared with the combination of all objective clinical tests. The swallowing clinical assessment was considered pathologic if at least one of the examinations (i.e., FEES or oral part of the oromotor examination) demonstrated pathology. The receiver operating characteristic (ROC)¹⁶ analysis was used to find the cutoff point of the questionnaire’s total score (where the

sensitivity and specificity curves crossed) for detecting a swallowing problem.

RESULTS

The study group consisted of 100 consecutive patients (54 men, 46 women; mean age 61 ± 3.5 years) who reported having swallowing disturbances. A total of 100 swallowing evaluations were performed. The etiology of dysphagia and patients’ complaints were categorized and they are listed in Table II. The underlying diagnosis in these patients encompassed a wide variety of neurologic disorders, the most prevalent being stroke, followed by amyotrophic lateral sclerosis, muscular dystrophy, and Huntington’s disease.

Thirty patients suffered from head and neck tumors: 9 had prior head and neck surgery, 7 had received radiation therapy for cancer in the head and neck region, and 14 had both surgery and radiation. Eight patients were classified as having gastrointestinal disease: six had gastroesophageal and laryngopharyngeal reflux and two had an esophageal motility problem. No etiology was found to explain the complaints of dysphagia in 22 cases.

Sixteen of these 22 patients experienced globus sensation without any detected pathology. The remainder six patients had pathology in their pharyngeal phase (stasis of food in the hypopharynx), and exhibited reduced sensation in their hypopharynx due unknown etiology.

The reliability of the SDQ was confirmed by calculating the Cronbach’s α for the 15 questions as being 0.8. The mean SDQ score for the entire study cohort was 14.5 ± 9 (95% confidence interval, 13–16.6). The SDQ scores for the different swallowing disorder pathologies are detailed in Table III.

The “optimal” score, that is, where the sensitivity and specificity curves crossed, was equal to or more than 5 for the oral phase. Oral phase questions were found to be reliable for assessing dysphagia symptoms in correlation to the oral part of the oromotor examination (85.71% sensitivity, 87.6% specificity). The “optimal” score for the laryngopharyngeal phase was ≥ 11.5 . Laryngopharyngeal phase questions were found to be reliable for assessing dysphagia symptoms in correlation to the FEES examination (67.3% sensitivity, 76.7% specificity). The “optimal” score for both stages (oral and

TABLE II.
Pathology and Swallowing Evaluation Results.

Pathology	Normal	Oral*	Laryngopharyngeal†	Oral and Laryngopharyngeal	Total	
Neurologic disorder	9	5	12	14	40	(40%)
Head and neck tumor with/without radiation therapy	5	1	16	8	30	30%
Gastrointestinal disease	7	0	1	0	8	(8%)
None (no diagnosis)	16	0	6	0	22	(22%)
Total	37	6	35	22	100	(100%)

*Pathologic results in the oral phase in the oromotor examination.

†Pathologic results in the fiberoptic endoscopic evaluation of swallowing (FEES).

TABLE III.
Pathology and Swallowing Disturbance Questioner (SDQ) Score.

Pathology (Number of Patients)	Mean Oral SDQ Score (SD)	Mean Laryngopharyngeal SDQ Score (SD)	Total SDQ Score Min/Max	Total SDQ Score (SD)
Neurologic disorder (40)	5.08 (4.34)	12.81 (7.25)	3.5/38.5	17.89 (9.88)
Head and neck tumor with/without radiation therapy (30)	4.1 (3.9)	13.03 (5.23)	2/36.5	16.7 (8.21)
Gastrointestinal disease (8)	1.0 (1.73)	5.5 (3.27)	2.5/14.5	6.5 (4.83)
None (no diagnosis) (22)	1.71 (1.81)	7.25 (4.43)	0.5/20.5	8.96 (5.81)
Total (100)	3.66 (3.84)	10.97 (6.43)	0.5/38.5	14.53 (9.16)

laryngopharyngeal) of swallowing was ≥ 12.5 , with a sensitivity of 71.88% and a specificity of 78.38%; thus, the cutoff score for the SDQ was set at 12.5 (Fig. 1).

DISCUSSION

Performing instrumental swallowing evaluations, such as the FEES or videofluoroscopy, for each patient who complains of swallowing disturbances is impractical, time-consuming, and expensive. Therefore, there is a need for a validated clinical tool that is capable of determining when such further in-depth swallowing assessment is justified, and for guiding the selection of treatment strategies. Because of the lack of an altogether objective, reliable, and valid means of measuring

overall symptom dysphagia severity, the assessment of these patients has largely been qualitative.¹² The idea for the development of the Swallowing Disturbances Questionnaire (SDQ) emerged from our knowledge about the importance of early diagnosis and treatment of swallowing disturbances arising from different etiologies. Among these conditions are CVA, neurodegenerative disease, gastrointestinal disease, and anatomic changes due to head and neck surgery. Most of these patients visit outpatient clinics for periodic checkups, but issues related to swallowing difficulties are not always addressed for any number of reasons, such as the lack of awareness of swallowing disturbances by the patient or the healthcare professional, the use of compensatory swallowing techniques, and the giving a higher priority

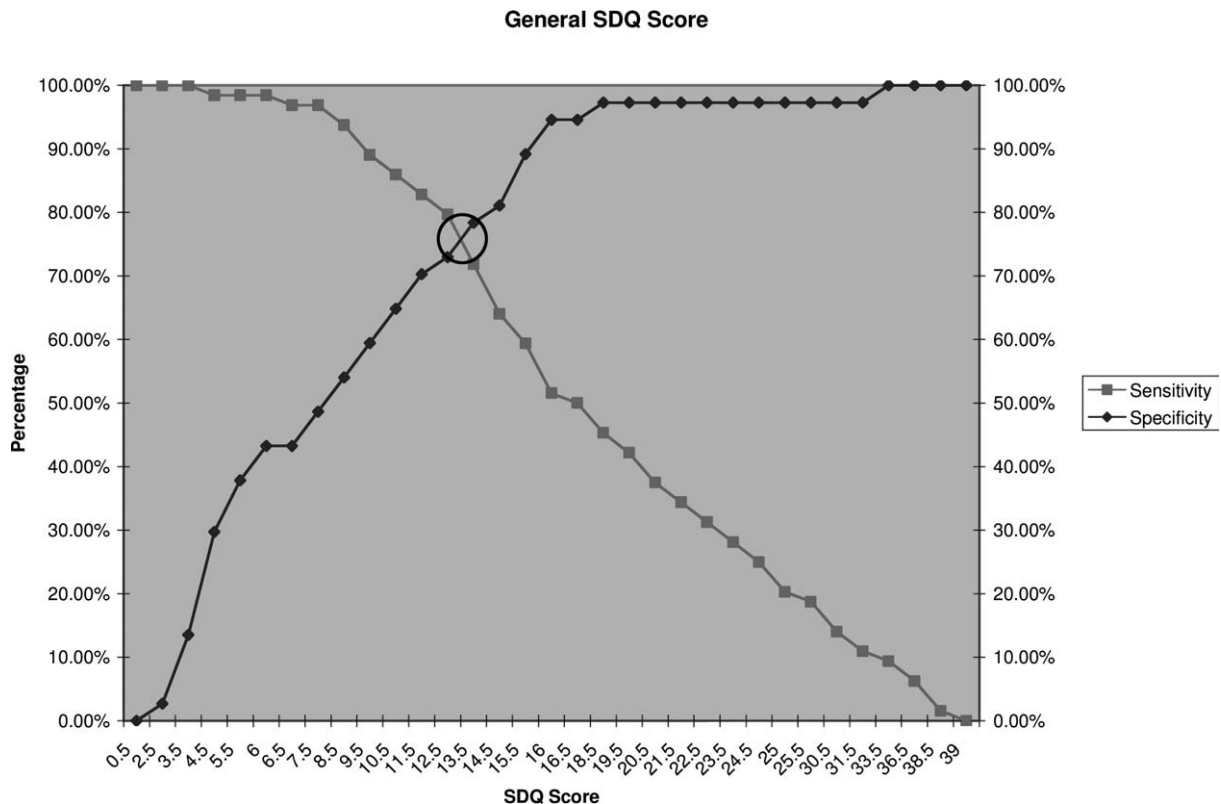


Fig. 1. The receiver operating characteristic (ROC) curve. This graph enables visualization of the sensitivity and specificity curves on a single axis. The “optimal” score where the sensitivity and specificity curves cross is shown. The specificity is 79.7% and the sensitivity is 73% when the SDQ score is ≥ 12.5 . X is the value assigned to the SDQ and Y is the percentage of sensitivity and specificity.

to other major health problems that need to be discussed with the physician. By distributing the SDQ to patients who are at relatively high risk of having difficulties in swallowing, it will be possible to obtain information on their swallowing status and identify more of those who need further evaluation.

Subjective measures of patients (e.g., pain, suffering, complains, anxiety, swallowing disorder symptoms, etc.) are impossible to measure explicitly; therefore, researchers usually construct a series of questions that patients' answer. These questions are eventually combined together into a single numeric value, which makes up the total score of a questionnaire. In order to make sure that the different questions measure the same general question internal consistency is measured. Cronbach's α is a common measure of the internal consistency of a test or a questionnaire that we used in our questionnaire. It evaluates how well a set of variables measure one-dimensional latent aspect of individuals. Its values range between 0 and 1, where 0.6 to 0.7 indicates acceptable reliability, and 0.8 or higher indicates good reliability.¹⁵ The reliability of the SDQ was confirmed by calculating the Cronbach's α for the 15 questions as being 0.8.

Our group originally developed and validated a the SDQ for the detection of swallowing problems among PD.¹³ We demonstrated that patients' perceptions of their swallowing function are not always reliable, and that existing problems may be undetected if diagnosis relied solely on self-reporting, probably due to the decreased awareness and knowledge about what are the specific symptoms associated with swallowing problems.^{17,18} Based on the SDQ assessment alone, 50% of the noncomplaining but affected PD patients were referred to further evaluations that they otherwise would not have undergone.

In the current work, our aim was to examine the efficacy of the SDQ in detecting patients with swallowing disturbances that arose from a variety of etiologies other than PD. Based on the results of this study, we propose that patients with a total SDQ score of equal to or more than 12.5 are the ones who should be referred to a comprehensive swallowing assessment that includes an objective swallowing evaluation, such as the FEES or videofluoroscopy.

It was found that the oral phase questions were highly correlated with the oromotor examination, where the laryngopharyngeal phase questions were correlated with the FEES examination with decreased sensitivity and specificity. Thus, patients' reports on the SDQ regarding their oral phase problems more accurately than the laryngopharyngeal phase swallowing problems. The oral phase of swallowing is mostly under voluntary control, whereas the pharyngeal phase is a reflexive stage depended on the swallowing central pattern generator (CPG) at the brainstem, which receives sensory feedback from the oropharynx.¹⁹

Therefore, it can be assumed that because the oral phase is voluntary, patients are more in control and aware of the food manipulation than in the reflexive pharyngeal phase.

The questionnaire is suitable for patients who are able to read and understand its contents. It can be also read to the patient by a caregiver, nurse, or physician. We propose that the SDQ should be routinely administered to high-risk patients for swallowing problems during their visits to neurologic, gastroenterologic, and otolaryngologic clinics so that swallowing disturbances will be detected, evaluated, and treated without delay.

CONCLUSION

The score of a newly constructed questionnaire correlated significantly with FEES and oromotor examination (oral and laryngopharyngeal stages of swallowing) results. The SDQ is a useful tool for detecting symptoms of dysphagia and for providing important information on clinical abnormalities of swallowing. An SDQ score of more than 12.5 is a good predictor of the presence of both known and undiagnosed swallowing disturbances.

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