The Dysphagia Short Questionnaire

An Instrument for Evaluation of Dysphagia: A Validation Study With 12 Months’ Follow-up After Anterior Cervical Spine Surgery

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Study Design. Prospective clinical validation study of questionnaire to assess dysphagia.

Objective. To test validity and reliability of Dysphagia Short Questionnaire (DSQ), and also to determine levels of dysphagia over time after anterior cervical spine surgery (ACSS).

Summary of Background Data. Dysphagia is common after ACSS but reports on the incidence vary widely between 1% and 79%, indicating an evaluation problem. Several tools for evaluation of dysphagia exist but common features are that they are cumbersome to use and usually are designed for patients with neurological or malignant diseases in the neck region. Others are not validated, for example, the Bazaz score. There is, thus, a need for a more adapted tool to evaluate dysphagia in patients undergoing ACSS.

Methods. The DSQ was constructed in collaboration with a group of ear-nose-and-throat specialists. In a first validation study, 45 patients with stationary dysphagia for various reasons completed the DSQ twice 2 weeks apart, the M.D. Anderson Dysphagia Inventory (MDADI), the Bazaz score, and a quality-of-life score, the EQ-5D. To evaluate the utility of the DSQ, a second validation study was performed, where 111 subjects undergoing ACSS for degenerative disk disease completed the form preoperatively and at 4 weeks, 3 months, and 1 year after surgery.

Results. In the first study, the DSQ correlated to MDADI (r = 0.59) and showed good reproducibility. The Bazaz score did not correlate to the DSQ, the MDADI, or the EQ-5D. In the second study, dysphagia was present in a few patients already preoperatively. At 4 weeks, 85% of the patients reported dysphagia. The level had dropped significantly at 3 months and had returned to baseline levels at 1 year.

Conclusion. We consider the DSQ to be a validated tool for the assessment of dysphagia in ACSS patients. Dysphagia after ACSS for cervical spondylosis is common but the symptoms on a group level are not very severe and are also temporary.

Key words: spine surgery, dysphagia, validation, questionnaire.

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A common complication to anterior cervical spine surgery (ACSS) is dysphagia. The mechanism is not fully understood, but reasonable explanations could be preoperative pressure on soft tissue structures, bulky implants, and damage to local innervation.3 Formation of scar tissue in the area of surgery postoperatively may also play a role.3 Reports on its incidence vary widely between 1% and 79%.1,4–12 One reason for the wide variation may be different definitions and measurements of dysphagia in the various publications. Another explanation is different time intervals of evaluation after surgery because the presence of dysphagia decreases with time in this population. However, some studies have shown persistent dysphagia several years after surgery.13,14 Furthermore, there is a tendency toward higher incidence of dysphagia when patient self-report and in prospective studies whereas objective methods of measurement, for example, video fluoroscopy or manometry, may underestimate the problem.3 To evaluate dysphagia from a patient-oriented perspective, there are some validated patient self-report questionnaires, for example, the M.D. Anderson Dysphagia Inventory (MDADI)15 and SWAL-QOL.16 These are relatively complex instruments and aim mostly at patients with neurological or malignant diseases in the neck region with significant swallowing problems. It can be assumed that ACSS patients experience less severe symptoms of dysphagia and therefore constitute a different subgroup. Bazaz et al10 presented an article on dysphagia after ACSS a much-simplified score, which later has been used in several other publications on similar patients. However, the Bazaz score has, to our knowledge, never been validated. The aim of this study was to design and validate an easy-to-use patient self-report dysphagia questionnaire and to apply it to a group of patients undergoing anterior cervical disc surgery.
Design of the Questionnaire
The Dysphagia Short Questionnaire (DSQ) was designed in collaboration with 4 ear-nose-and-throat specialists at the Department of Ear-Nose-and-Throat diseases, Uppsala University Hospital, with vast experience of treating patients with dysphagia. A number of common symptoms that could be expected in patients with oropharyngeal dysphagia were listed. After discussions within the group, the symptom list was reduced to finally contain five key questions, each covering different aspects of dysphagia, with various response categories representing different grades of clinical severity. Each response category was given a weight, that is, the number of points, in accordance with how serious and important this particular problem was considered to be for the patient. The questionnaire was again discussed with the group of ear-nose-and-throat physicians to get their opinion on relevance of the items, statements, and relative weights, and adjustments were made according to suggestions. A score was calculated by summing up the points given for each item to a maximum of 18 points, where lower scores represent milder symptoms and vice versa (see Appendix, Supplemental Digital Content 1, available at: http://links.lww.com/BRSA660). The questionnaire was tested on 10 patients who underwent ACSS to ensure that even patients with clinically mild symptoms of dysphagia were detected. We also wanted to know that no misunderstandings would appear among the tested patients, and also the approximate time for filling out the questionnaire, which typically took less than 1 minute.

In the validation process, we wanted to address the following questions: Does the DSQ measure dysphagia? Does higher score represent more severe dysphagia and lower score milder? Will repeated applications result in similar scores? Is there a correlation between the DSQ and general health expressed as quality of life (QOL)? Is the DSQ usable in a cohort of patients undergoing ACSS? The MDADI was chosen for comparison as this is an already-validated scoring system, whereas the Bazaz score was included as this has not been used in several studies on cervical spine diseases. A number of common symptoms that could be expected in patients with oropharyngeal dysphagia were listed. After discussions within the group, the symptom list was reduced to finally contain five key questions, each covering different aspects of dysphagia, with various response categories representing different grades of clinical severity. Each response category was given a weight, that is, the number of points, in accordance with how serious and important this particular problem was considered to be for the patient. The questionnaire was again discussed with the group of ear-nose-and-throat physicians to get their opinion on relevance of the items, statements, and relative weights, and adjustments were made according to suggestions. A score was calculated by summing up the points given for each item to a maximum of 18 points, where lower scores represent milder symptoms and vice versa (see Appendix, Supplemental Digital Content 1, available at: http://links.lww.com/BRSA660). The questionnaire was tested on 10 patients who underwent ACSS to ensure that even patients with clinically mild symptoms of dysphagia were detected. We also wanted to know that no misunderstandings would appear among the tested patients, and also the approximate time for filling out the questionnaire, which typically took less than 1 minute.

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was more symmetrical with 17 of the patients classified as "mild," 14 as "moderate," and 14 as "severe." There was a significant correlation ($r = 0.59$, $P < 0.01$) between the DSQ and the MDADI as seen in Figure 3. There was no correlation between DSQ and the Bazaz scores, and nor between the MDADI and the Bazaz scores. Time between T1 and T2 ranged from 8 to 37 days. Three patients conducted T2 in less time than the median time, which was 14 days. There was a significant correlation between the DSQ at T1 and T2 with a correlation coefficient of $r = 0.61$, $P < 0.01$. The Cronbach alpha coefficient was calculated to 0.82, indicating a very good intraclass correlation and reliability. The Bland-Altman diagram shows that a good agreement between DSQ at T1 and T2 with no systematic trend of lower values differs more than higher values or vice versa (Figure 4). The average EQ-5D was 0.61 (SD = 0.36). The distribution of EQ-5D showed a biphasic appearance (Figure 5). For this reason, nonparametric Gamma Correlation Test was chosen for these analyses. There was a weak, but significant, correlation between the DSQ and the EQ-5D ($r = -0.27$, $P < 0.05$), whereas no correlation could be detected with the MDADI ($r = 0.18$). The Bazaz score showed a paradoxical inverse correlation with the EQ-5D with higher QOL values associated with more dysphagia ($r = 0.31$, $P < 0.05$).

**The Second Validation Study**

Preoperatively the DSQ scores were low with a mean value of 1.4 (SD = 1.9), but 17 patients (15%) had a score of 4 or higher. At 4 weeks postoperatively, the mean value was 3.2 (SD = 2.5). Only 16 patients (14%) reported a DSQ value of 0, whereas 46 patients (41%) reported a DSQ value of 4 or higher. At 3 months, the average DSQ value had decreased to 1.7 (SD = 2.0). Both the values at 4 weeks and at 3 months were significantly higher than the preoperative value ($P < 0.05$). At 1 year after surgery, the DSQ levels were back to baseline values with a mean score of 1.2 (SD = 1.7); however, 13 patients (12%) scored 4 or more, which indicates a persistent swallowing problem (Figure 6). Of the 17 patients who scored 4 or more (mean = 5.5) preoperatively, 14 had improved at 1 year and scored less than 4 points (mean = 1.6), one remained the same at 4 points and 2 had deteriorated, one from 6 to 7 points and one from 4 to 5 points. There was no correlation seen between DSQ level and smoking habits at any time of observation.

**DISCUSSION**

The anterior approach is common in surgery aimed at treating degenerative disease of the cervical spine. The procedure is considered to be safe and effective, but there are a number of known complications, of which dysphagia is very frequent. The incidence of dysphagia after ACSS varies with different techniques and extent of surgery, and to the bulk of the implant used. Objective measurements of the ability to swallow are often not enough to identify these patients because dysphagia often is a subjective sensation of disturbance or discomfort when swallowing. Bazaz et al found an incidence of 50.3% at 1 month after surgery and 12.5% at 1 year after surgery. For this study, they used a grading system in which patients were evaluated via a telephone interview and classified on a 4-grade scale. However, the Bazaz score can be criticized from several different aspects. First, it is not self-administered; that is, it represents an interpretation of the patient’s dysphagia symptoms by the therapist, which may introduce a bias. Second, as we realized after having used the score clinically, it may have too few categories and, thus, does not result in enough discrepancy between patients. Yet another problem is that difficulties swallowing solids always score worse than liquids, while patients often actually experience quite the opposite. Also, as far as we know, the Bazaz scoring scale has never been formally validated despite its wide use. The MDADI is validated but may have some drawbacks in this group of patients. It is a rather
assigning these relevant weights, that is, “expert opinion” validation. The instrument also resulted in a fairly normal distribution in a group of patients with established dysphagia of different magnitude. The good correlation with the “gold standard” MDADI can be seen as a support for progressivity: low values are generated in patients with mild forms of dysphagia and higher values in patients with more severe symptoms. In the test-retest analysis, we had a significant, but not perfect, correlation. There may be several explanations to this. There may, of course, be a problem with the precision of our instrument: the repeatability is poor. However, other plausible explanations may also be considered. The first test was performed together with the SLPs at the clinic where the patient went through the investigation and tests for swallowing. After this first session, the patients may have become

Dysphagia after ACSS has been reported by several authors but with a big variation in incidence. In a previous article from Riley et al.³ with an attempt to make a meta-analysis of the literature, they concluded that better outcome tools were needed. The DSQ is a self-administered instrument, which is easy to use and interpret. The design process of our evaluation instrument ensured the extraction of relevant items and extensive tool with many questions that make it cumbersome to use, and it is designed and validated for patients with dysphagia caused by a malignancy. These patients presumably have more severe dysphagia than patients after ACSS. They also represent a subgroup in which psychological factors may have an influence on their health-related QOL, whereas in ACSS patients the treatment aims at full cure and the prognosis for the dysphagia is good.

Figure 2. The first validation study: The distribution of the M.D. Anderson Dysphagia Inventory (MDADI) at T1.

Figure 3. The first validation study: There was a significant correlation between the Dysphagia Short Questionnaire (DSQ) and the M.D. Anderson Dysphagia Inventory (MDADI); $r = -0.59, P < 0.01$. 

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more aware of their problem and therefore more focused on it at the time of retest. This hypothesis is supported by the fact that the retest values are higher than the test values. Another plausible explanation is a temporal fluctuation of the dysphagia symptoms. Even though the patients were supposed to have chronic stationary problems, the severity may not be exactly the same 2 weeks later. However, we only included patients with dysphagia in the first validation study. If we had performed it instead on a group of patients after ACSS, we would have encountered several problems. First of all, the dysphagia would not have been stationary, which would have influenced the test-retest investigation as the patients could be expected to improve their symptoms during the 2-week test period, and depending on time after surgery, a varying group of patients would be entirely without dysphagia symptoms, scoring 0 on both tests, and thus improving the correlation coefficient considerably. Too many patients with zero scores would also have contributed to considerable floor effects. The fact that we saw a correlation within a group of individuals with various degree of dysphagia supports the validity and strength of the score.

We could see a weak correlation to the QOL outcome instrument EQ-5D in the first validation study. However, the study population has chronic problems, many of which are caused by malignant diseases, and they may have many factors apart from the dysphagia that may negatively affect the QOL. This was also evident with the MDADI, which, despite being constructed with the aim to measure the impact of dysphagia on QOL and emotional status, failed to correlate with EQ-5D. On the contrary, the Bazaz score is probably more aware of their problem and therefore more focused on it at the time of retest. This hypothesis is supported by the fact that the retest values are higher than the test values. Another plausible explanation is a temporal fluctuation of the dysphagia symptoms. Even though the patients were supposed to have chronic stationary problems, the severity may not be exactly the same 2 weeks later. However, we only included patients with dysphagia in the first validation study. If we had performed it instead on a group of patients after ACSS, we would have encountered several problems. First of all, the dysphagia would not have been stationary, which would have influenced the test-retest investigation as the patients could be expected to improve their symptoms during the 2-week test period, and depending on time after surgery, a varying group of patients would be entirely without dysphagia symptoms, scoring 0 on both tests, and thus improving the correlation coefficient considerably. Too many patients with zero scores would also have contributed to considerable floor effects. The fact that we saw a correlation within a group of individuals with various degree of dysphagia supports the validity and strength of the score.

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Postoperative dysphagia is very common after ACSS, particularly during the first weeks after surgery. The level of postoperative dysphagia is generally mild, and it resolves over time. At 1 year only a small fraction of patients remain with chronic problem. Whether additional improvement occurs with more time cannot be answered in the present study.

In the second part of the study, we found that at least 15% of the patients experienced a not negligible dysphagia before surgery, but it is unclear whether this is the expected prevalence of dysphagia in a normal population or whether it is a consequence of the degenerative disc disease. However, the fact that the majority of these patients improved after surgery would support the latter interpretation. Also, other authors have reported the possible coupling of dysphagia and cervical spondylosis; for example, sometimes patients with cervical spondylosis may develop large ventral osteophytes, which may cause dysphagia, which was not the case in our study population as this would have rendered exclusion.

On average, the DSQ values did not significantly differ between preoperative levels and at 1 year after surgery, which erroneously could be interpreted that surgery does not cause chronic dysphagia. Some individuals with preoperative dysphagia improve, while others deteriorate and remained with symptoms at 1 year. In the short term, it seems clear that ACSS causes dysphagia in almost all patients, but the symptoms gradually resolve during the first few months, and at 1 year only a small fraction remains. The symptoms, on a group level, were considerably milder after ACSS compared to the patients in the first validation group who also had more stationary problems.

CONCLUSION
As the DSQ correlates with the MD Anderson Dysphagia Inventory, a “gold standard” for dysphagia measurement, we can conclude that it measures dysphagia quantitatively. Its reproducibility is also satisfactory. We can, thus, consider the DSQ a validated tool for measuring dysphagia.

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