Risk Factors for Persistent Dysphagia After Anterior Cervical Spine Surgery

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abstract

Dysphagia is a relatively common complication of anterior cervical spine surgery. Smoking has not been definitively assessed as a risk factor for dysphagia. This study examined risk factors for dysphagia, including smoking and pain severity. The authors performed a cross-sectional cohort study of 100 patients who underwent anterior cervical diskectomy and fusion (ACDF). Dysphagia was assessed with the Yoo-Bazaz questionnaire. Clinical notes were reviewed for demographic information, diagnosis, preoperative pain severity, preoperative smoking status, and operative details. The dysphagia questionnaire was administered via telephone. The rate of dysphagia at an average of 2.75 years (33 months) was 26%. Rare and mild dysphagia were reported by 2% and 7% of patients, respectively. Moderate dysphagia was reported by 12% patients, and severe dysphagia was reported by 5% of patients. Smokers were more likely to report dysphagia symptoms, and their dysphagia scores were more severe than those in nonsmokers (1.17 vs 0.54; \( P = .02 \)). Patients undergoing revision surgery (n=7) had dysphagia at a rate of 71% compared with 23% of patients undergoing primary surgery (\( P < .004 \)). Age, sex, diagnosis, severity of preoperative pain, and number of levels treated did not reach statistical significance. The prevalence of persistent dysphagia at an average of 33 months after ACDF was 23% in primary cases. To the authors’ knowledge, the severity of dysphagia in smokers has not been reported previously. These data confirm previous reports that dysphagia symptoms persist in a significant proportion of patients more than 1 year after anterior cervical spine surgery. [Orthopedics. 2015; 38(4):e319-e323.]
The anterior Smith-Robinson approach is commonly used for surgical treatment of cervical spine pathology. This approach has a long track record with low complication rates. One of the most common complications after anterior cervical spine surgery is persistent dysphagia. Reported rates range from 2% to 60%, depending on the severity and time frame of assessment.

Data from several prospective studies and numerous retrospective studies have identified several risk factors for dysphagia after anterior cervical spine surgery. These risk factors include female sex, age older than 60 years, and multilevel surgery. The pathophysiology of dysphagia is likely multifactorial because of the complex anatomy and innervation of the oropharynx.

Bazaz et al prospectively evaluated 249 patients at 1, 2, 6, and 12 months after anterior cervical spine surgery using a novel dysphagia score. This score rated dysphagia as none, mild, moderate, or severe, depending on patient symptoms with solid and liquid foods. Prevalence at 1, 2, 6, and 12 months was 50.2%, 32.2%, 17.8%, and 12.5%, respectively. Female sex and multilevel surgery became significant at 6 months. Type of procedure, use of hardware, and number of levels fused did not significantly increase the prevalence of dysphagia in the study time frame. Smoking was not assessed.

Yue et al reported the long-term follow-up results of 74 patients who underwent anterior cervical discectomy and fusion (ACDF). Average follow-up was 7.2 years. Dysphagia was assessed with the Yoo-Bazaz scale. They found persistent dysphagia in 35.1% of patients at final follow-up. This contrasted with earlier studies with 1- to 2-year follow-up data that showed dysphagia rates of 10% to 15%.

Siska et al reported a small prospective study of 18 patients who underwent anterior cervical surgery and compared them with a control group of 11 patients undergoing posterior lumbar surgery. The authors used the Swallowing-Quality of Life Questionnaire (SWAL-QOL) to assess postoperative dysphagia and examined multiple patient factors, including smoking status. Smokers had a lower SWAL-QOL score compared with nonsmokers at 3 weeks postoperatively (64 vs 87). They did not report results for smokers at final follow-up.

To the authors’ knowledge, no previous study has assessed preoperative pain as a risk factor for dysphagia. Visual analog scale (VAS) scores are readily obtained preoperatively and at subsequent postoperative visits. The authors hypothesized that patients who report higher preoperative VAS scores, whether related to neck pain or radiculopathy, would also be more likely to report higher dysphagia scores. Knowledge of the relationship between preoperative VAS score and postoperative dysphagia would be helpful for counseling patients regarding their risks of this postoperative complication.

No prior study has conclusively identified smoking as a risk factor for dysphagia in long-term (more than 1 year) follow-up. Prior studies have lacked an adequate sample size to draw definite conclusions. The current authors hypothesized that smokers would have more dysphagia postoperatively due to underlying impaired mucociliary clearance and epithelial cell metaplasia, similar to effects seen in bronchial linings.

The authors prospectively collected smoking status and VAS scores for neck pain and radiculopathy for all spine patients at their institution. Using a surgical database from a single surgeon, they contacted patients who were more than 1 year postoperative to administer the Yoo-Bazaz questionnaire. The authors’ goal was to assess the relationship between preoperative smoking status and VAS score on the prevalence and severity of long-term postoperative dysphagia in patients undergoing anterior cervical spine surgery.

**Materials and Methods**

Institutional review board approval was obtained before the start of data collection for this cross-sectional cohort study. All patients who underwent primary and revision anterior cervical spine surgery by the senior author (M.R.L.) between October 2, 2008, and June 28, 2012, were identified through the authors’ institution’s electronic medical record and database. No patients who underwent corpectomy were included. The authors’ goal was to obtain data on 100 patients, which they achieved after contacting 166 consecutive patients who were at least 1 year from index surgery. All medical records, including clinic notes and operative reports, were reviewed, and data collected included basic demographics, pre- and postoperative VAS scores, preoperative smoking status, and preoperative diagnosis. Patients with any documented preoperative dysphagia were excluded. Diagnoses were arrived at based on predominantly radicular symptoms, predominantly myelopathic symptoms, or a mixed picture. Details of the surgical procedure, including the number of levels decompressed and whether the surgery was revision or primary, were also collected.

Surgical technique was similar in all patients. Patients were transferred onto the operating table in the supine position, and general anesthesia was induced. After intubation, an inflatable shoulder roll was placed to provide cervical extension. A standard left-sided approach through a transverse incision was used for all cases. After careful undermining of the longus colli muscles, a Shadow-Line retractor (CareFusion Corp, San Diego, California) was placed, followed by Caspar pins (Aesculap Implant Systems, LLC, Center Valley, Pennsylvania) for vertical distraction. The endotracheal tube was deflated and reinflated after retractor placement or repositioning. Instrumentation was used in all cases. Steroids (10 mg dexamethasone) were administered routinely to all patients intraoperatively.
Patients’ phone numbers as listed in their electronic medical records were used to contact them. Consecutive patients were called beginning with those 1 year from surgery and extending back to those 5 years from surgery. After attempting to reach 166 patients, the authors were able to complete the questionnaires on their goal of 100 (60.2%) patients. Verbal informed consent was obtained prior to conducting the survey. After obtaining informed consent, the Yoo-Bazaz dysphagia questionnaire was administered by the primary author (E.C.O.). Each patient was rated according to the scale as having no dysphagia or mild, moderate, or severe dysphagia. Current pain level was also assessed by a verbally administered numeric rating score.

Statistical analysis was completed using Prism 5.0 statistical software (GraphPad Software, Inc, La Jolla, California). Descriptive statistics were used to analyze groups, including means, 95% confidence intervals, and frequencies. Pearson correlation coefficients were used to determine correlation. Differences between groups were determined using Student’s t test and chi-square test, depending on the type of variable (continuous or categorical). Significance was defined as a P value less than .05.

**RESULTS**

Patient demographic information, along with preoperative diagnosis, smoking status, and number of levels instrumented, is listed in Table 1. The study group comprised 49 men and 51 women with an average age of 50.9 (range, 30-73) years. Average time from surgery was 33 months (range, 12-55 months). Thirty-nine percent of patients had never smoked, and 32% were former smokers (total, 71% nonsmokers), whereas 29% of patients were active smokers. Preoperative diagnosis was cervical spondylotic radiculopathy in 36% of patients, cervical myelopathy in 36%, and cervical myeloradiculopathy in 32% (Table 1). Seven cases were either revisions or reoperations.

Mean preoperative VAS score was 5.4 for all patients. The score was similar between the various diagnoses and the number of levels fused. Female patients had higher but nonsignificant preoperative VAS scores compared with males (6.0 vs 4.8; P=.3). Smokers also had significantly higher preoperative VAS scores compared with nonsmokers (6.4 vs 5.0; P=.02).

The overall rate of dysphagia for the study group at an average of 2.75 years (33 months) postoperatively was 26%. Primary cases of ACDF experienced dysphagia at a rate of 23%, compared with 71% of revision cases (Table 2; P<.004). Rare and mild dysphagia were reported by 2% and 7% of patients, respectively. Moderate dysphagia was reported by 12% of patients, and severe dysphagia was reported by 5% (Table 3).

Mean dysphagia scores by group are summarized in Table 4. Scaled scores are listed in the first column and represent a possible score from 0 (no dysphagia) to 4 (severe dysphagia) based on the Yoo-Bazaz scale. Binary scores are listed in the second column. The presence of any dysphagia was assigned a value of 1. The absence of dysphagia was assigned a value of 0. No significant differences in prevalence of dysphagia or severity were noted between men and women. Age (older or younger than 50 years) did not correlate...
with prevalence or severity of dysphagia. Diagnosis of cervical spondylotic radiculopathy, cervical spondylotic myelopathy, or cervical myeloradiculopathy did not correlate with an increased prevalence or severity of dysphagia. Similarly, number of levels fused did not correlate with prevalence of dysphagia, although there was a trend for patients with 3 levels fused (n=9) to report higher dysphagia scores (1.33 vs 0.66). This trend was not statistically significant ($P=0.14$). The authors found no correlation between preoperative VAS score and dysphagia for any group.

The prevalence of postoperative dysphagia in active smokers at the time of surgery was 38%, compared with 21% in nonsmokers. This difference trended toward ($P=0.08$) but did not reach statistical significance. Overall, active smokers reported significantly higher dysphagia scores compared with nonsmokers (1.17 vs 0.54; $P=0.02$). There was no difference between patients who had never smoked at the time of surgery vs patients who were former smokers at the time of surgery. To the authors’ knowledge, this study is the first to show an increased severity of dysphagia in smokers in long-term follow-up after ACDF.

Several studies have analyzed smoking and its relationship to postoperative dysphagia after ACDF. Siska et al conducted a prospective study of 29 patients, 18 of whom underwent anterior cervical surgery. They used the SWAL-QOL dysphagia-specific tool to assess postoperative dysphagia. Their analysis showed that smokers had significantly lower scores at 3 weeks postoperatively (64 vs 87; $P=0.02$). They did not comment on differences seen at final follow-up at 1.5 years. Based on their sample size, their study was likely underpowered to detect a difference in smokers at long-term follow-up.

In another prospective study of patients undergoing anterior cervical surgery, Smith-Hammond et al evaluated 38 patients undergoing anterior cervical surgery...
procedures and compared them with 19 patients undergoing posterior cervical and 26 patients undergoing posterior lumbar procedures. At a median of 1 day postoperatively, dysphagia was assessed objectively using videofluoroscopic swallow evaluations and subjectively by completing the Dysphagia Disability Index questionnaire. The prevalence of dysphagia on the first postoperative day was approximately 50% in the anterior cervical group. The authors concluded that tobacco use was not a significant risk factor for dysphagia. Unfortunately, dysphagia was not assessed at longer time intervals from surgery, and a larger sample size may have been needed to detect differences between smokers and nonsmokers.

To the current authors’ knowledge, this is the first published study in which preoperative VAS score was used in an attempt to correlate higher preoperative pain with an increased risk of postoperative dysphagia. Their findings failed to demonstrate a clear relationship between preoperative VAS score and the prevalence of postoperative dysphagia. This implies that patients who express severe pain from their pathology are likely at the same risk of postoperative dysphagia as those with less pain.

The only study the authors identified in the literature that assessed pain as a risk factor for dysphagia was a retrospective analysis. That study assessed dysphagia in 454 patients using a telephone-administered Cervical Spine Outcomes Questionnaire. This questionnaire has a section on severity and duration of pain. The authors found that for each year after the first episode of the patient’s pain, there was a 4% increase in the likelihood of developing dysphagia (odds ratio, 1.04). Patients whose least severe episodes had the highest pain scores were more likely to have dysphagia (odds ratio, 1.27). The varied and subjective nature of pain may make it difficult to assess objectively as a risk factor for dysphagia in anterior cervical spine surgery.

The current study cohort included 7 revision cases. The prevalence of dysphagia in these cases was 71% (5 of 7), and this was significantly different from that in primary cases (Table 2). Previous studies showed mixed results regarding dysphagia after multiple anterior neck approaches. Yue et al. found no relationship between the number of anterior neck surgeries or the presence of a possible nonunion and the prevalence of dysphagia at final follow-up. Lee et al. reported a higher prevalence of dysphagia in revision cases at 2-year follow-up (27.7% vs 11.3%). Their study included 38 revision cases compared with 261 primary cases. In the current study’s sample of 7 revision cases, dysphagia was present in the majority of patients.

**Conclusion**

Long-term dysphagia (more than 1 year) was found in 26% of patients at an average of 33 months after anterior cervical spine surgery. This study confirms previous findings that dysphagia persists for more than 2 years in a subset of patients after ACDF. The authors also found that smokers had more dysphagia after anterior cervical spine surgery compared with nonsmokers. They identified smokers as an at-risk population that may warrant follow-up research on possible interventions to mitigate their risk of dysphagia. Revision cases had dysphagia at a rate significantly higher than did primary cases, confirming previous studies that have identified this risk factor. There was no correlation between age older than 50 years, female sex, number of levels fused, diagnosis, or preoperative VAS score on long-term prevalence or severity of dysphagia.

**References**