Dysphonia and Dysphagia Following the Anterior Approach to the Cervical Spine

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Background: Speech and swallowing dysfunctions are common following the anterior approach to the cervical spine. Despite functional morbidity and legal implications, the incidence and etiologic factors of these complications have not been adequately elucidated.

Objective: To better define speech and swallowing dysfunction both in the quantitative and qualitative sense.

Methods: A questionnaire was mailed to 497 patients who had undergone anterior cervical fusion or anterior cervical discectomy at a university hospital (study group). One hundred fifty questionnaires were sent to a control group.

Results: The study group response rate was 46%; the control group response was 51%. The incidence of hoarseness in the study group was 51%; the incidence in the control group was 19%. The difference was statistically significant (P<.01). Dysphagia was present in 60% of study group patients vs 23% of control group patients (P<.01). Qualitative questions revealed that constant hoarseness, pain with talking, difficulty eating solid foods, and odynophagia were significantly more common following the anterior approach to the cervical spine.

Conclusions: Our findings show a much higher incidence than previously reported of both voice and swallowing impairment following the anterior approach to the cervical spine. Hoarseness and dysphagia may adversely affect recovery and the patient’s sense of well-being. Preoperative counseling and postoperative evaluation are essential.


The anterior approach has become popularized among neurosurgeons and orthopedic surgeons for operative exposure of the cervical spine. However, abnormalities in voice and swallow are commonly noted following this technique. While these problems hold important functional and legal implications, little attention has been generated and minimal research has been conducted to solve these issues. The incidence is uncertain, and the etiology is speculation. This study was designed with the intent of better defining this complication, both in the quantitative and qualitative sense.

RESULTS

There were 497 patients entered into the study group. One hundred twelve questionnaires (22.5%) from the study group were eliminated on return because of an incorrect address in the hospital database. Of the remaining questionnaires, 176 were completed (46% response rate). There were 82 men and 94 women in the group. Average patient age was 53.2 years. A rightsided approach was used in 135 patients, left-sided in 14, and frontal in 12; 15 patients did not respond. A bone graft was used in 73 patients. The mean time since surgery was 3.3 years. Hoarseness was present in 89 patients (51%) following ACF or ACD. Dysphagia was present in 105 patients (60%) (Figure). Twenty-one patients had previous ACF or ACD. Reflux was noted in 27% of patients. Eighteen percent noted difficulties breathing postoperatively. Four patients (2%) had been evaluated by an otolaryngologist, and 2 had surgery related to airway problems.

One hundred fifty questionnaires were sent to patients who had lumbar laminectomy performed within the previous 5 years. Seventy-seven questionnaires from this control group were returned (51% response rate). Patients were asked whether they had previously undergone ACF or ACD; those who answered yes were excluded from analysis. A total of 62 questionnaires from the control group were evaluated. There were 28 men and 34 women in the group. Average patient age was 54.6 years. A rightsided approach was used in 129 patients, left-sided in 23, and frontal in 4; 15 patients did not respond. A bone graft was used in 37 patients. The mean time since surgery was 2.9 years. Hoarseness was present in 28 patients (21%); this difference was not statistically significant (P=.22). Dysphagia was present in 42 patients (31%); this difference was not statistically significant (P=.76). Qualitative questions revealed that constant hoarseness, pain with talking, difficulty eating solid foods, and odynophagia were significantly less common following the anterior approach to the lumbar spine.
PATIENTS AND METHODS

A questionnaire study was performed at a university hospital. All patients who had undergone anterior cervical fusion (ACF) or anterior cervical disectomy (ACD) within a 10-year period were identified by surgical coding. A control group of patients who had undergone general anesthesia for an unrelated orthopedic procedure (lumbar laminectomy) was identified. Questionnaires regarding speech and swallowing function were mailed to both populations. Questions also addressed additional complications and satisfaction with the procedure. For purposes of brevity, the questionnaire is not included in this article. A 3-page confidential questionnaire was mailed to patients, with patients having the option of citing their names. Demographic data were elicited. Patients were asked if they had any difficulties preoperatively with swallowing or hoarseness and whether there was any history of neck surgery. If patients answered yes to prior neck surgery, they were asked to describe it. They were asked whether they had previously been diagnosed as having acid reflux or stomach acid problems. If the answer was yes, they were asked if they took medication and whether it was prescription medication. Patients were asked which side of the neck their scar was on, whether a bone graft was used, and the levels of surgery in the cervical spine, if known. Rating scales (0-10) were provided for patients to evaluate the perceived impact of hoarseness and swallowing after surgery for those who were symptomatic, and all patients were asked to rate satisfaction with surgery. Queries regarding specific components of hoarseness and dysphagia in symptomatic patients were made in an attempt to further delineate the complaints (Table 1). Patients who were symptomatic were asked how quickly after surgery the problems began and how long they lasted. Details regarding surgical procedures were not obtained. A preliminary chart review revealed vastly different dictated details that were not consistent enough to analyze.

Results of all questionnaires were recorded in a relational database and analyzed using a statistical program and spreadsheet. Statistical analysis was conducted using a 2-tailed, large-sample test for the population proportion and population mean. A standardized form test statistic, the z value, was calculated in determining P values. Confidence intervals were established at 93% or .05 σ for population proportions and 99% or .01 σ for population mean calculations.

Table 1. Specific Questions Asked of Patients Who Answered Affirmatively That They Had Difficulties With Speech or Swallowing Since Surgery

<table>
<thead>
<tr>
<th>Patients With Dysphonia</th>
<th>Patients With Dysphagia</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant hoarseness</td>
<td>Difficulty with solid foods</td>
</tr>
<tr>
<td>Breathiness</td>
<td>Difficulty with liquid foods</td>
</tr>
<tr>
<td>Voice cracking</td>
<td>Difficulty with saliva</td>
</tr>
<tr>
<td>Loss of vocal range</td>
<td>Difficulty with everything</td>
</tr>
<tr>
<td>Change in pitch</td>
<td>Pain with swallowing</td>
</tr>
<tr>
<td>Inability to reach high notes</td>
<td>Problems with food “sticking”</td>
</tr>
<tr>
<td>Pain with talking</td>
<td>Coughing with eating</td>
</tr>
<tr>
<td>Vocal tremor</td>
<td>Pneumonia since surgery</td>
</tr>
<tr>
<td>Muffled voice</td>
<td></td>
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<tr>
<td>Voice worse at night</td>
<td></td>
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<tr>
<td>Voice worse in morning</td>
<td></td>
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<tr>
<td>Vocal fatigue (low voice after talking too much)</td>
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</tbody>
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Incidence of hoarseness and dysphagia in all patients.

hoarseness were more likely to complain of constant hoarseness and pain with talking (P < 0.01). Control group patients were more likely to cite symptoms of voice breathiness and cracking, muffled voice, and worsening at night (P < 0.01). Patients with dysphagia in the study group were more likely to note difficulty with solid foods, odynophagia, and pneumonia since surgery (P < 0.01). Patients in the control group were more apt to note difficulty with liquids or saliva and coughing as present. There were more patients in the control group evaluated by a physician for their problems than in the study group (P < 0.03). Surprisingly, previous ACF or ACD in the study group did not correlate to an increase in postoperative complaints.

Patients who noted difficulty breathing following surgery were evaluated as a subset. Patients in the study group had a high incidence of hoarseness and dysphagia (72% and 78%, respectively). Reflux was present in 36% of these patients. In the control group, the incidence of hoarseness and dysphagia was also high (44% and 78%, respectively). Reflux was present in 67% of these control group patients.

Patients who noted symptoms of reflux were then evaluated as a separate group to determine if this complaint had an effect on symptom prevalence. Patients with reflux in both the study and control groups were more

women. Average patient age was 61.2 years. The mean time since surgery was 1.7 years. Hoarseness was present in 12 patients (19%). Dysphagia was noted in 14 patients (23%). Reflux was present in 35% of patients. Fourteen percent of patients noted postoperative difficulties with breathing. Two patients (3%) had been seen by an otolaryngologist, and none had surgery for their problems.

Patients were queried regarding specific symptoms (Table 2). Study group patients with postoperative

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likely to note difficulties breathing postoperatively (25% and 27% vs 18% and 6% in the general study and control group, respectively). Patients with gastroesophageal reflux disease (GERD) who had postoperative dysphagia or dysphonia were statistically more likely to be in the study group (<.01).

Patients in both the control and study groups who noted difficulties in voice and swallowing before surgery were assessed independently (Table 3). In the study group, 16 (94%) of 17 patients noted both hoarseness and dysphagia in the postoperative course.

Additional complications occurred in 45 patients following ACF or ADC. The most common complications were no improvement or pain following surgery (n=24) and need for further surgery (n=5). There was 1 each of the following: esophageal perforation, scar revision, tracheal stenosis, difficult intubation, and hip fracture from bone graft.

A rating scale was provided to patients to assess the impact of voice and swallowing changes on recovery. A score of 0 represented no impact on recovery by hoarseness or swallowing changes, and 10 represented “extremely disruptive.” A score of 5 was considered “troublesome.” The mean for impact of hoarseness in the study group was 4.3; in the control group, it was 2.2. The mean for impact of dysphagia on recovery in the study group was 4.4; in the control group, it was 2.2. The mean for impact of voice and swallow changes on recovery. A score of 5 was considered “troublesome.” The mean was calculated. The mean of the entire study group was 7.5, and the control group mean was 7.3. The subgroup of hoarse patients listed a mean of 7.2 for the study group and 6.3 for the control group. Patients with dysphagia in the study group listed a mean of 7.2, and in the control group, a mean of 7.1. Finally, patients who cited “other complications” in the study group had a mean score of 5.9, and in the control group, this subset noted a mean of 6.3. There was no statistically significant difference in satisfaction with surgery between the study and control groups.

The duration of symptoms was evaluated (Table 4). Patients were instructed on the questionnaire to circle the most appropriate option, including persistent symptoms of less than 24 hours, 1 to 3 days, 3 to 7 days, 1 to 2 weeks, 2 to 4 weeks, less than 6 months, and less than 1 year. The study group was more likely to have symptoms of both hoarseness and dysphagia for more than 1 month. This difference was statistically significant (P=.002 and P=.048, respectively).

The side of approach to the cervical spine was ascertained in the study group, and the side of approach was evaluated with respect to symptoms. A right-sided approach was favored by surgeons and was used in 135 patients. Fifty percent of patients with this approach were hoarse, and 64% had dysphagia. The left-sided approach was less common, with only 14 patients noting this exposure. Seventy-one percent of these patients were hoarse, and 57 had postoperative swallowing problems. Twelve patients noted a scar in the front of the neck. With the frontal approach (scar in midline), 50% complained of both hoarseness and dysphagia. This category was evaluated separately, because it could not be determined which side was actually dissected. Fifteen patients did not provide an answer to this question.
The anterior approach to the cervical spine affords excellent exposure to the orthopedic and neurosurgeons who perform ACF and ACD. Controversy exists as to the frequency of complications and whether a right- or left-sided approach is anatomically more sound.

The incidence of hoarseness following this procedure is noted in the literature to occur in 0.06% to 21% of patients (mean, 3.6%).1,2 Injury to the recurrent laryngeal nerve, either from stretching or sectioning, is a well-known but rare source of hoarseness. Laryngeal injury from endotracheal intubation is also rare, with a 5% to 33% incidence.3,4 However, this may become more prevalent when significant retraction and consequent pressure occur during surgery. Infection is also rare but must remain in the differential diagnosis. Edema and fibrosis of the larynx is hypothesized to be a more common source of hoarseness and dysphonia following this procedure. This may occur as a result of retraction devices designed to provide adequate surgical exposure by displacing the larynx laterally. Our study showed a subjective incidence of 51%, much greater than that described in previous reports. Even more impressive is that the symptoms persisted for longer than 6 months in 38% of symptomatic patients. It appears that patients rarely are referred to otolaryngologists or speech pathologists for further evaluation.

It is questionable whether there is any difference in laryngeal injury with a right- or left-sided approach. One study5 has shown an increased strain placed on the right recurrent laryngeal nerve with retraction, as opposed to the left. The right-sided approach is favored by surgeons and avoids the thoracic duct. Our study shows an increased incidence of hoarseness with a left-sided surgical approach (71% via left-sided approach vs 50% with a right-sided approach). This question deserves further attention.

The incidence of dysphagia as a result of ACF or ACD is also widely disputed. Some authors cite some degree of dysphagia in all patients postoperatively,6 and other authors do not consider it a surgical complication. Some authors7,8 noted an incidence varying from 2% to 45%. The etiology, again, is uncertain. Hematoma, edema, infection, denervation, and bone graft dislodgement are all possible causative factors.7 A 1995 study8 attempted to elucidate the source of dysfunction. Questionnaires were mailed to 100 patients 12 to 22 months postoperatively; 73 responded. The postoperative incidence of dysphagia was 45%, with 12% of patients having persistent problems for more than 6 months. Five patients were evaluated with barium swallows and manometry. The barium esophagrams were all normal, and manometry revealed elevated pharyngeal pressures. Another study9,10 evaluated 13 patients with dysphagia following ACF or ACD. Prevertebral edema, diminished pharyngeal wall function, impaired opening of the upper esophageal sphincter, ineffective epiglottic deflection, and postswallow residue in the vallecula, pyriform sinuses, and posterior pharyngeal wall were seen. Neurogenic causes related to the pharyngeal plexus and superior laryngeal nerves and edema were thought to be responsible.

Our dysphagia incidence of 60% is higher than most reports. Thirty-two percent of patients had symptoms for more than 6 months. It was somewhat surprising that some specific complaints of speech and swallow dysfunction were actually more prevalent in the control group than the study group. The fact that pain with both talking and swallowing was significantly more common in the study group is notable. Also, the constant hoarseness that is noted by study patients may represent true laryngeal injury, as opposed to the more intermittent problems noted by the control group. Although rare, only study group patients noted postoperative pneumonia. It is not known if this was related to aspiration. Patients who experienced difficulties breathing in the postoperative period were more likely to have hoarseness and dysphagia in both the study and control groups. It is possible that, again, this group represents true laryngeal injuries.

Several subgroups were evaluated separately to determine if there were any common themes in the symptomatic patients. It was thought that a diagnosis of reflux would predispose patients to postoperative problems. Although there was a significant difference in dysphonia and dysphagia between patients with GERD in the study and control groups, this was reflective of the study findings in general. The incidence of GERD among all study group patients vs those with postoperative hoarseness and dysphagia remained constant, although high. It is not known if reflux in edematous tissue would delay the healing process. Further evaluation is warranted.

Patients who had preoperative difficulties with swallow and voice were also evaluated as a subgroup. This subset of patients was small for both the study and control groups. However, there was a remarkably high incidence of postoperative problems with both voice and swallowing in the study group, which was not reflected in the control group. At 94% incidence of postoperative problems, this subset showed the most promise in identifying patients who may be predisposed to postoperative problems. At the very least, this is a viable screening question in the preoperative evaluation, and patients who answer yes may benefit from referral to a speech pathologist and otolaryngologist for further workup and counseling.

It is notable that, despite the impairment in the recovery process symptomatic patients perceived, these patients were apparently not dissatisfied with the procedure. Although the voice and swallow dysfunctions are noticed by the patients and considered to be detrimental, those affected are apparently able to separate these complications from surgical improvement from the ACF or ACD.

This study has several limitations. First, it is a questionnaire study and is both retrospective and subjective. Second, it was conducted with patients who received their procedures at only one institution. It may be reflective solely of an academic institution. Finally, no objective data were obtained to verify the subjective findings or attempt to determine an etiology. This is the topic of ongoing research. It is, however, the largest study on this topic. Some debate exists in the literature regarding the functional impact, as well as existence, of these prob-
lems. Determining the presence and impact of dysphonia and dysphagia following the anterior approach to the cervical spine before instituting a more extensive, invasive study was imperative. Since no recent studies could be found that accurately describe the incidence of postoperative dysphagia and dysphonia following endotracheal intubation, a control group was believed to be vital to interpreting data. The control group consisted of patients undergoing a nonrelated procedure, also performed by the same orthopedists and neurosurgeons. Patients with previous ACF were excluded from the control group in an attempt to avoid crossover. Positioning in a lumbar laminectomy does involve turning the patient over into a prone position, and this, if anything, may overestimate the amount of laryngeal complaints in patients undergoing endotracheal intubation.

CONCLUSIONS

The study is limited in being a retrospective questionnaire study, dependent on accurate patient recall. It is representative of a university hospital and may not reflect private institutions. A large cohort and control group were used to improve data analysis; however, a prospective study is still optimal and needed. Unfortunately, the etiology of these problems cannot be determined on the basis of this study.

Our study shows a much higher incidence of dysphagia and dysphonia following the anterior approach to the cervical spine than previously reported. Postoperative hoarseness was noted in 51% of patients following ACF or ACD. A postoperative incidence of dysphagia of 60% was present. Patients with preoperative hoarseness and dysphagia had a very high incidence (94%) of both voice and swallow difficulties in the postoperative course. Patients with difficulty breathing postoperatively noted a much higher incidence of hoarseness and dysphagia than the control group. Patients with GERD in our study were more likely to note difficulties breathing in the postoperative period, and those in the study group were significantly more likely to have postoperative voice and swallow problems. Symptoms persisted for more than 6 months in 38% of those patients with hoarseness and 32% of patients with dysphagia. Hoarseness and dysphagia may adversely affect recovery and the patient’s sense of well-being. A history of dysphonia or dysphagia should be elicited preoperatively. These patients may be at a much higher risk of postoperative problems and should be counseled accordingly.

Accepted for publication July 13, 2000.


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