Dysphagia after anterior cervical discectomy

- Effects of Neuromuscular Electrical Stimulation on Chronic Dysphagia in a Single Subject after Anterior Cervical Discectomy and Fusion Surgery: A Case Report
- Beyond Fusion: Assessing the Horizon of 3-level Cervical Disk Arthroplasty Outcomes
- A Randomized Controlled Trial Evaluating Efficacy and Complications of Low-Dose rhBMP-2 for Anterior Cervical Diskectomy and Fusion
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- Deep Surgical Site Infection with Epidural Abscess Following Anterior Cervical Discectomy and Fusion: A Case Report and Incidence Analysis in Sweden
- Conservative management of a cervical hematoma after anterior cervical discectomy and fusion: A case report
- Comparison of effectiveness between zero-profile anchored cage and plate-cage construct in treatment of consecutive three-level cervical spondylosis

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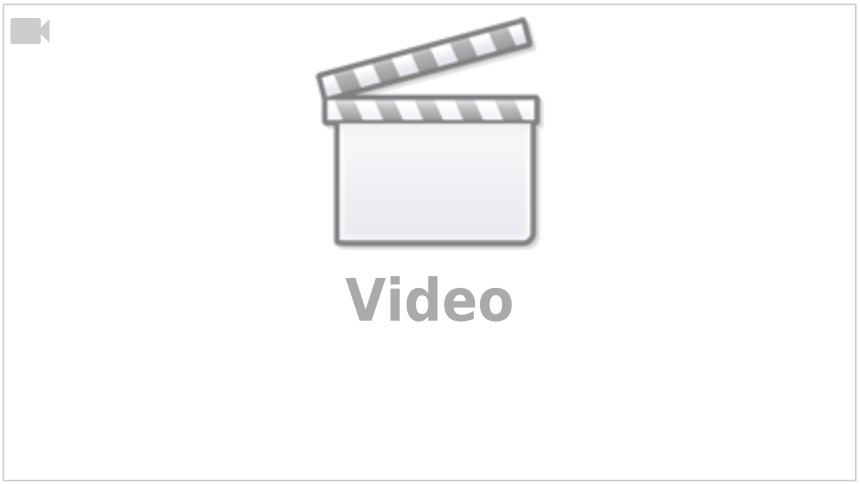

see MD Anderson Dysphagia Inventory.

Most Anterior cervical discectomy and fusion patients fully recover their ability to swallow within a few days after surgery. Sometimes, however, dysphagia lingers for weeks, months, or even longer. Studies that have followed ACDF patients post-surgery for at least 2 years have found differing results regarding dysphagia.

No significant relationship was demonstrated between sex, age, number of operated segments, pre-existing dysphagia, gastroesophageal reflux disease, hypertension and the incidence of dysphagia after surgery [1)]

The etiology is poorly understood but has been reported to be associated with vocal cord paralysis, dislodgement of instrumentation and unidentified causes, such as hematoma, adhesion formation and denervation of the pharyngeal plexus. A surgical treatment of dysphagia after ACIF has not been reported. Removal of the cervical instrumentation in patients will improve the dysphagia. This improvement with surgical management, as compared with the dissatisfaction before surgical treatment, documents that this surgical treatment is a reasonable option [2)]

Soft tissue damage due to the use of automatic retractors in MACDF is not minor and leads to general discomfort in the patient in spite of good neurological results. These problems most often occur when automatic retractors are used continuously for more than 1 hour, as well as when they are used in multiple levels. Dysphagia, dysphonia and local pain decreased with the use of transient manual blades for retraction, and with intermittent release following minimally invasive principles [3)].

Postoperative dysphagia is a significant concern.

Dexamethasone, although potentially protective against perioperative dysphagia and airway compromise, could inhibit fusion, a generally proinflammatory process.

While ACDF is the most commonly performed procedure for cervical spondylotic myelopathy in patients with Parkinson's disease, it is associated with longer length of stay, higher incidence of postoperative dysphagia, and postprocedural pneumonia, as well as higher inpatient mortality compared with posterior cervical procedures [4)]

Level of evidence: Level III.

Epidemiology

Reported incidence of dysphagia after ACDFs has been as high as 79%. There, however, have been no studies that have specifically looked at developing a criteria for reducing the incidence of dysphagia for outpatient ACDFs.

Dysphagia is a common occurrence after anterior cervical approach but was also found after posterior cervical procedures. Intubation alone was not a risk factor for postoperative dysphagia in a cohort [5)].

Etiology

The etiology is so far unknown.

Using the Kaiser Permanente Spine registry database, between January 2009 and September 2013, we identified all inpatients (there were no outpatients) who underwent primary elective one-level

ACDFs. A cohort of patients were identified with in-hospital length of stay (LOS) > 48 h in which the reason for continued admission was primarily significant dysphagia (DG). Patient's demographics and intraoperative data (ACDF levels (upper [C2-3, C3-4], middle [C4-5, C5-6], lower [C6-7, C7-T1]), and operative times (<100, 100-199, ≥ 200, minutes)) was used to determine risk factors for dysphagia.

We found 747 single-level ACDF cases with a cohort of 239 (32.0%) who met the criteria for dysphagia (DG) with > 48 h admission. The DG group and non-dysphagia group (NDG) had similar demographics. Diabetes was excluded from regression analysis due to the low frequency. Compared to the lower spine level (C5-6, C7-T1), the upper spine level (C2-3, C3-4) ACDF had a higher likelihood for dysphagia (OR = 2.23, 95% CI = 1.35-3.68, p = 0.0016); no difference was found for middle spine level (C4-5, C5-6) ACDF.

Single-level ACDF at the upper cervical spine (C2-3, C3-4) was found to be the only risk factor for dysphagia with LOS > 48 h based on inpatient data from a spine registry. Age, BMI category, gender, ASA classification, smoking, and operative time were not predictive factors. These findings should be used for excluding patients who undergo outpatient single-level ACDF surgery to reduce significant postoperative dysphagia [6].

Patient age was found to be a significant predictor of postoperative dysphagia ($p < .006$), with an odds ratio of 1.113 (95% confidence limits, 1.04, 1.21) per year of age. Other factors studied were not found to be significant predictors. The overall incidence of these Anterior cervical discectomy and fusion complications from the world literature was also calculated. The overall incidences of dysphagia, hoarseness, and unilateral true vocal fold motion impairment in the literature were calculated as 12.3%, 4.9%, and 1.4%, respectively. We conclude that dysphagia, hoarseness, and unilateral vocal fold motion impairment continue to remain significant complications of anterior cervical diskectomy with fusion. Older patients may be at higher risk for dysphagia [7].

There is a high incidence of subjective voice and swallowing complaints following transcervical anterior approaches to the spine, and such complaints can persist beyond 1 year in many patients. Exposure of more than 3 spinal levels or above level C4 are 2 factors significantly associated with outcome [8].

Results indicate that lordotic change in spinal alignment and longer operative times are associated with increased postoperative dysphagia. Surgeons should counsel patients in whom a large angular correction is expected about the possibility for postoperative dysphagia. Furthermore, future studies on dysphagia incidence should include radiographic alignment as an independent predictor of dysphagia [9].

The dC2-C7 angle may play an important role in the development of dysphagia in both anterior and PC spine surgery. Overenlargement of cervical lordosis should be avoided to reduce the development of postoperative dysphagia [10].

Heese et al. hypothesised that direct pressure induced by the medial retractor blade on pharynx/esophagus mucosal wall leads to local ischemia. Subsequently postoperative hyperemia and swelling of the pharynx/esophagus may result in swallowing disturbance. To prove the hypothesis local blood flow inside the pharynx/esophagus wall during anterior cervical surgery was measured using a laser Doppler (LD) perfusion monitor unit.

Fifteen patients underwent standard anterior cervical discectomy and fusion (ACDF). The LD probe was placed underneath the medial retractor blade in order to gain information at the maximum point

of pressure applied onto the pharynx/esophagus wall. Local perfusion was measured prior to retractor opening (5 min), during spreading of the retractor and after its closure (5 min). Perfusion was measured semiquantitatively in perfusion units (PU). Local perfusion ranged from 30 to 210 PU (mean 107) prior to retractor opening, from 7 to 60 PU (mean 30) with open retractor and from 15 to 280 PU (mean 117) after retractor closure. In all 15 patients the open retractor led to hypoperfusion ranging from 21 to 93% compared to the baseline level. In seven patients a reactive hyperemia at the end of the procedure was detected (32-89% compared to baseline level). In four patients after hypoperfusion during spreading of the retractor the baseline levels were reached again and in four patients perfusion remained diminished even after retractor closure. To best of our knowledge, this is the first report on intraoperative measurement of local perfusion of the pharynx/esophagus wall during anterior cervical surgery. Diminished local perfusion was observed in all patients during spreading of the retractor and post-procedure hyperemia was recorded in 46% of the patients. The local ischemia of the pharynx/esophagus wall may be a crucial step in the development of postoperative dysphagia [11)].

Pressure induced by retractor blades onto pharynx/esophagus were measured intraoperatively in order to gain more information regarding traumatization of the pharynx/esophagus wall. Thirty-one patients underwent anterior cervical discectomy and fusion (ACDF) for degenerative disc disease. An online pressure transducer was applied to the rear side of the medial retractor blade (epi-esophageal-pressure, epi-P) and a cylindric, inflatable transducer was preoperatively inserted into the pharynx/esophagus under fluoroscopic guidance at the level to be operated on (endo-esophageal-pressure, endo-P). Pressure values were recorded continuously during the operation. Mean arterial pressure (MAP) and endotracheal cuff pressure (ETCP) were recorded additionally. An in vitro model was developed in order to analyze the impact of the retractor blade design onto the epi-esophageal-pressure. Mean epi-P before and following adequate retractor opening for exposure of the disc space was 58.3 and 92.7 mmHg. Thirty, 60 and 90 min later the epi-P decreased to 79, 70 and 66%, respectively. Mean basal endo-P was 9.8 mmHg and increased to 20.6 mmHg after retractor placement. Thirty, 60 and 90 min later the endo-P decreased to 80, 71 and 62%, respectively. The mean MAP was 76 mmHg and the ECTP was adjusted to 25 mmHg during the procedures. In the in vitro model retraction pressure correlated inversely with the contact area between visceral wall and retractor blade. During ACDF the retraction pressure onto the pharyngeal/esophageal wall exceeds MAP and even more the mucosal perfusion pressure of 25 mmHg. Over time the pharynx/esophageal wall adapts to the applied pressure induced by the retractor blade. The contact area between them influences the retraction pressure [12)].

Prospective multi-center cohort study

explore the association between operative level and postoperative dysphagia after anterior cervical discectomy and fusion (ACDF).

Summary of background data: Dysphagia is common following ACDF and has several risk factors including soft tissue edema. The degree of prevertebral soft tissue edema varies based upon the operative cervical level. However, the operative level has not been evaluated as a source of postoperative dysphagia.

Methods: Adult patients undergoing elective ACDF were prospectively enrolled at three academic

centers. Dysphagia was assessed using the Bazaz questionnaire, Dysphagia Short Questionnaire (DSQ), and Eating Assessment Tool-10 (EAT-10) preoperatively and at 2, 6, 12, and 24-weeks postoperatively. Patients were grouped based on inclusion of specific surgical levels in the fusion construct. Multivariable regression analyses were performed evaluating the independent effects of number of surgical levels and inclusion of each particular level on dysphagia symptoms.

Results: A total of 130 patients were included. Overall, 24 (18.5%) patients had persistent postoperative dysphagia at 24 weeks and were older, female, and less likely to be drink alcohol. There was no difference in operative duration or dexamethasone administration. Patients with persistent dysphagia were significantly more likely to have C4-C5 included in the fusion construct (62.5% vs. 34.9%, P=0.024) but there were no differences based on inclusion of other levels. On multivariable regression, inclusion of C3-C4 or C6-C7 were associated with more severe EAT-10 (β:9.56, P=0.016 and β:8.15, P=0.040) and DSQ (β:4.44, P=0.023 and (β:4.27, P=0.030) at 6 weeks. At 12-weeks, C3-C4 fusion was also independently associated with more severe dysphagia (EAT-10 β:4.74, P=0.024).

Conclusion: The location of prevertebral soft tissue swelling may impact the duration and severity of patient-reported dysphagia outcomes at up to 24 weeks postoperatively. In particular, inclusion of C3-C4 and C4-C5 into the fusion may be associated with dysphagia severity [13].

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