Recurrent laryngeal nerve palsy

Vocal cord paresis, also known as recurrent laryngeal nerve paralysis or vocal fold paralysis, is an injury to one or both recurrent laryngeal nerves (RLNs), which control all muscles of the larynx except for the cricothyroid muscle. The RLN is important for speaking, breathing and swallowing.

Recurrent laryngeal nerve palsy (RLNP) is a potential complication of anterior cervical discectomy and fusion (ACDF).

Retractors should not be placed deeper than the platysma to avoid injury to recurrent laryngeal nerve, which runs between the esophagus and trachea. Blunt retractors are used to avoid internal jugular vein injury

Incidence

11% temporary (84% of temporary palsies resolve clinically by 6 months), 4% permanent paresis (Vocal cord paralysis).

Incidence may be higher in revision surgery.

Symptoms

Include: hoarseness, breathiness, cough, aspiration, mass sensation, dysphagia, and vocal cord fatigue [1].

Avoid sharp dissection in paratracheal muscles. Some cases may be due to prolonged retraction against trachea and not to nerve division; to reduce this risk, after the self-retaining retractor is placed, have the anesthesiologist deflate the cuff on the ET tube and then inflate it to minimal leak pressure. More common with right sided approaches, primarily in the lower cervical spine (C5–6 and below) where the RLN is more vulnerable [2].

While performing the anterior cervical approach, injury to important anatomic structures in the vicinity of the dissection represents a serious risk. The midportion of the recurrent laryngeal nerve and the external branch of the superior laryngeal nerve are encountered in the anterior approach to the lower cervical spine. The recurrent laryngeal nerve is vulnerable to injury on the right side, especially if ligation of inferior thyroid vessels is performed without paying sufficient attention to the course and position of the nerve, and the external branch of the superior laryngeal nerve is vulnerable to injury during ligature and division of the superior thyroid artery. Avoiding injury to the recurrent laryngeal nerve (especially on the right side) and superior laryngeal nerve is a major consideration in the anterior approach to the lower cervical spine. The sympathetic trunk is situated in close proximity to the medial border of the longus colli muscle at the C6 level (the longus colli diverge laterally, whereas the sympathetic trunk converges medially). The damage leads to the development of Horner's syndrome with its associated ptosis, meiosis, and anhydrosis. Awareness of the regional anatomy of the sympathetic trunk may help in identifying and preserving this important structure

while performing anterior cervical surgery or during exposure of the transverse foramen or uncovertebral joint at the lower cervical levels. Finally, the spinal accessory nerve (embedded in fibroadipose tissue in the posterior triangle of the neck) is prone to injury. Its damage will result in an obvious shoulder droop, loss of shoulder elevation, and pain. Prevention of inadvertant injury to the accessory nerve is critical in the neck dissection [3].

The rate of RLN palsy of 14.1% was greater than any published rate of RLN injury after primary ACDF operations, suggesting that there is a greater risk of hoarseness and dysphagia with reoperative ACDF surgeries than with primary procedures as reported in these studies [4].

The cervical spine is approached from the right side unless the patient has undergone a prior approach from the left side. If so, the original incision line is used. If a patient has subclinical vocal cord palsy on the side of the incision, proceeding with an incision on the opposite side is risky. The potential for recurrent laryngeal nerve palsy is highest on the right side, although the risk has not been documented in recent reports. The thoracic duct, however, can be injured when the approach is from the left side.

For C5–6, the skin incision is made at level of criccoid cartilage, for other levels, appropriate adjustments up or down may be made, sometimes with the assistance of fluoroscopy. The incision is approximately 4–5cm horizontally, centered on the SCM. Many right handed surgeons prefer operating from the right side of the neck, although the risk to the recurrent laryngeal nerve (RLN) is lower with a left sided approach (the RLN lies in a groove between the esophagus and trachea). The skin may be undermined off the platysma to permit a ver- tical incision in the platysma in the same orientation as its muscle fibers. Alternatively, some incise the platysma horizontally with scissors horizontally.

There still is substantial disagreement on the actual prevalence of RLNP after ACDF as well as on risk factors for postoperative RLNP [5].

Case series

The aim of a study of Huschbeck et al. was to describe the prevalence of postoperative RLNP in a cohort of consecutive cases of ACDF and to examine potential risk factors.

This retrospective study included patients who underwent ACDF between 2005 and 2019 at a single neurosurgical center. As part of clinical routine, RLNP was examined prior to and after surgery by independent otorhinolaryngologists using endoscopic laryngoscopy. As potential risk factors for postoperative RLNP, they examined patient's age, sex, body mass index, multilevel surgery, and the duration of surgery.

214 consecutive cases were included. The prevalence of preoperative RLNP was 1.4% (3/214) and the

prevalence of postoperative RLNP was 9% (19/211). The number of operated levels was 1 in 73.5% (155/211), 2 in 24.2% (51/211), and 3 or more in 2.4% (5/211) of cases. Of all cases, 4.7% (10/211) were repeat surgeries. There was no difference in the prevalence of RLNP between the primary surgery group (9.0%, 18/183) versus the repeat surgery group (10.0%, 1/10; p = 0.91). Also, there was no difference in any characteristics between subjects with postoperative RLNP compared with those without postoperative RLNP. We found no association between postoperative RLNP and patient's age, sex, body mass index, duration of surgery, or number of levels (odds ratios between 0.24 and 1.05; p values between 0.20 and 0.97).

In this cohort, the prevalence of postoperative RLNP after ACDF was 9.0%. The fact that none of the examined variables was associated with the occurrence of RLNP supports the view that postoperative RLNP may depend more on direct mechanical manipulation during surgery than on specific patient or surgical characteristics [6].

A prospective cohort study conducted on 90 patients scheduled for anterior cervical spine surgeries underwent consecutive pre and postoperative vocal cord examination for edema and paralysis by both anterior and lateral approaches laryngeal ultrasonography. Rigid laryngoscopy was the standard confirmatory tool. For postoperative vocal cord edema, the anterior ultrasonography approach diagnostic sensitivity = 88.2%, specificity = 78.9% with PPV = 78.9% and NPV = 88.2% and the novel lateral ultrasonography approach diagnostic sensitivity = 88.2%, specificity = 94.7% with PPV = 93.75% and NPP = 90%. While for paralysis, the anterior ultrasonography approach diagnostic sensitivity = 86.7%, specificity = 85.7% with PPV = 81.25% and NPV = 90% and the novel lateral ultrasonography approach diagnostic (sensitivity, specificity with PPV and NPP) = 100%. The diagnostic accuracy of the novel lateral approach was more correlated to rigid laryngoscopy (91.7% and 100%) compared to anterior approach for vocal cord edema and paralysis (83.3% and 80.6%). Overall incidence of vocal cord paralysis was 16.6%. Risk of vocal cord paralysis was statistically significant more in female, multiple disc herniation, lower and mixed disc levels, Langenbeck retractor, cage and plate and duration of surgery ≥ 1.5 h. Transcutaneous Laryngeal ultrasound is a valid comfortable tool for prediction of vocal cord edema and paralysis after anterior cervical spine surgeries with superiority of the novel lateral over anterior approach [7].

A total of 114 patients undergoing anterior cervical procedures over a 6-year period were included in a retrospective, case-control study. The diagnosis was cervical radiculopathy, and/or myelopathy due to degenerative disc disease, cervical spondylosis, or traumatic cervical spine injury. All our participants underwent surgical treatment, and complications were recorded. The most commonly performed procedure (79%) was anterior cervical discectomy and fusion (ACDF). Fourteen patients (12.3%) underwent anterior cervical corpectomy and interbody fusion, seven (6.1%) ACDF with plating, two (1.7%) odontoid screw fixation, and one anterior removal of osteophytes for severe Forestier's disease. Mean follow-up time was 42.5 months (range, 6-78 months). The overall complication rate was 13.2%. Specifically, we encountered adjacent intervertebral disc degeneration in 2.7% of our cases, dysphagia in 1.7%, postoperative soft tissue swelling and hematoma in 1.7%, and dural penetration in 1.7%. Additionally, esophageal perforation was observed in 0.9%, aggravation of preexisting myelopathy in 0.9%, symptomatic recurrent laryngeal nerve palsy in 0.9%, mechanical failure in 0.9%, and superficial wound infection in 0.9%. In the vast majority anterior cervical spine surgery-associated complications are minor, requiring no further intervention. Awareness, early recognition, and appropriate management, are of paramount importance for improving the patients' overall functional outcome [8].

Staartjes et al. analyzed a prospective registry of all consecutive patients undergoing zero-profile ACDF for disc herniation, myelopathy, or stenosis. RLN palsy was defined as persistent patient self-reported dysphagia, hoarseness, or respiratory problems without other identifiable causes. RLN palsy was assessed at scheduled 6-week telephone interviews.

Results: Among 525 included patients, 511 primary and 40 secondary ACDF procedures were performed. Hoarseness was present in 12 (2.2%) cases, whereas dysphagia and respiratory difficulties both occurred in 3 (0.5%) cases. Overall incidence of RLN palsy was 2% after primary procedures and 8% after secondary procedures (P = 0.017). These rates are in line with the peer-reviewed literature, and the difference remained significant after controlling for confounders in a multivariate model (P = 0.033). Other reported risk factors, such as age, sex, surgical time, and multilevel procedures, had no relevant effect (P > 0.05).

Based on our data and other published series in the literature, RLN palsy may occur more frequently after secondary ACDF procedures with a clinically relevant effect size. There is a striking lack of uniformity in methods and reporting in research on RLN injury. [9].

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