

1.1 How to Avoid Injury of Inferior Laryngeal Nerve

Jacob Moalem, Orlo H. Clark

University of California, Division of Endocrine Surgery, San Francisco, Calif., USA

PEARLS

- Detailed knowledge of the inferior laryngeal nerve (ILN)'s anatomic relationships and variations is imperative to safely perform thyroidectomy or parathyroidectomy.
- Avoid mass ligation and stay as close as possible to the thyroid gland at all times.
- Definitively identify the ILN prior to sacrificing branches of the inferior thyroid artery (ITA).
- Maintain meticulous hemostasis and a clean dissecting field at all times for excellent visualization.
- Fully evaluate the thyroid gland and adjacent lymph nodes for suspicious nodules prior to performing thyroidectomy or parathyroidectomy to eliminate the potential for reoperation.
- Consider a 'you touch it – you buy it' policy: soften the indications for thyroid lobectomy any time a lobe is exposed for another reason.
- Perform preoperative direct laryngoscopy on all patients with dysphonia or risk factors for unilateral vocal cord dysfunction at baseline.

PITFALLS

- Injury to the ILN is up to 5-fold higher in reoperative surgery. This risk is even higher when operating for malignancy as opposed to benign conditions.
- The most common site where the ILN is injured is near the ligament of Berry. Injury may occur because of excessive traction, cautery, a branched ILN, or misplaced hemostatic sutures.

Introduction

The terms 'inferior' and 'recurrent' laryngeal nerve have been used interchangeably to describe a branch of the thoracic vagus that loops around the subclavian artery (on the right) or aortic arch (on the left), and then ascends to terminally arborize [1]. The ILN carries sensory, motor and parasympathetic fibers, and divides into an internal branch (sensory to the vocal cords and subglottis) and external branch (motor to the intrinsic muscles of the larynx except cricothyroid). In as many as 70% of cases, this branching is extralaryngeal, predisposing a branch of the nerve to injury. In the vast majority of these cases, this bifurcation occurs more than 1.0 cm from the cricoid cartilage [2, 3].

ILN dysfunction is among the most common, feared and litigious complications of cervical explorations, and is associated with temporary or permanent vocal cord dysfunction. When bilateral injury occurs, the morbidity is even more dramatic, often requiring tracheostomy.

Practical Tips

- 1 Most authors assert that routine identification of the ILN, as opposed to its avoidance, is the method of choice to reduce the chance of injury [4].
- 2 In the modern surgical literature, the ILN has never been reported to enter the fascia of the thyroid gland. However, the nerve can be surrounded or displaced by a thyroid nodule or by an invasive thyroid cancer.

③ Many surgeons use relationships with the ITA, tracheoesophageal groove, and ligament of Berry as anatomical landmarks to identify the nerve. However:

- While the majority of ILNs lie posterior to the ITA, approximately 1/3 have been identified either anterior to, or interdigitating with, its branches (12–32.5 and 6.5–27%, respectively) [3, 5].

- In approximately 2/3 of the cases the ILN lies within the tracheoesophageal groove. However, in approximately 1/3 of the cases the nerve is lateral to the trachea, and in approximately 1% the nerve is anterior to the trachea [3].

- Autopsy studies demonstrate that the ILN is usually located dorsolaterally to the ligament of Berry, at a mean distance of 3 mm [6]. There are reports, however, where the nerve passes posteromedially to, or through, the ligament of Berry [7].

④ A particularly feared variant is the nonrecurrent ILN (NRILN). Known to occur in 0.3–1.6% of cases, NRILN is virtually always encountered on the right side where it is associated with (and may be predicted by [8]) an anomalous origin of the brachiocephalic artery. Of note, an NRILN may be associated with the superior thyroid artery (type A) or with the ITA (type B) [8]. In either case, its course is much more oblique (or even transverse) than expected. There are two reports of left-sided NRILN, both in association with a right-sided aortic arch [9].

⑤ The use of loupes with 2.5–3.5× magnification helps to optimize visualization and minimize risk of injury to the ILN.

⑥ Although increasingly employed, there is no convincing evidence that routine use of intraoperative ILN monitoring or stimulation results in lower rates of nerve injury [10].

⑦ Recovery of function is possible in cases where postoperative palsy occurs despite intraoperative identification and preservation of the ILN. In this group, vocal cord recovery is described in as many as 94.6% of patients at a mean of 31 days [4].

Conclusion

As is widely reported, consistently safe thyroidectomy is feasible, but relies upon a meticulous surgical technique. Surgeon experience, intimate familiarity with the anatomy of the ILN, magnification, and constant vigilance all minimize the risk of highly morbid complications.

References

- 1 Mirilas P, Skandalakis JE: Benign anatomical mistakes: the correct anatomical term for the recurrent laryngeal nerve. *Am Surg* 2002;68:95–97.
- 2 Nemiroff PM, Katz AD: Extralaryngeal divisions of the recurrent laryngeal nerve. Surgical and clinical significance. *Am J Surg* 1982;144:466–469.
- 3 Ardito G, Revelli L, D'Alatri L, et al: Revisited anatomy of the recurrent laryngeal nerves. *Am J Surg* 2004;187:249–253.
- 4 Chiang FY, Wang LF, Huang YF, et al: Recurrent laryngeal nerve palsy after thyroidectomy with routine identification of the recurrent laryngeal nerve. *Surgery* 2005;137:342–347.
- 5 Steinberg JL, Khane GJ, Fernandes CM, et al: Anatomy of the recurrent laryngeal nerve: a redescription. *J Laryngol Otol* 1986;100:919–927.
- 6 Sasou S, Nakamura S, Kurihara H: Suspensory ligament of Berry: its relationship to recurrent laryngeal nerve and anatomic examination of 24 autopsies. *Head Neck* 1998;20:695–698.
- 7 Yalcin B, Ozan H: Detailed investigation of the relationship between the inferior laryngeal nerve including laryngeal branches and ligament of Berry. *J Am Coll Surg* 2006;202:291–296.
- 8 Toniato A, Mazzarotto R, Piotta A, et al: Identification of the nonrecurrent laryngeal nerve during thyroid surgery: 20-year experience. *World J Surg* 2004;28:659–661.
- 9 Henry JF, Audiffret J, Denizot A, et al: The nonrecurrent inferior laryngeal nerve: review of 33 cases, including two on the left side. *Surgery* 1988;104:977–984.
- 10 Dralle H, Sekulla C, Haerting J, et al: Risk factors of paralysis and functional outcome after recurrent laryngeal nerve monitoring in thyroid surgery. *Surgery* 2004;136:1310–1322.