Editorial

Reducing Recurrent Laryngeal Nerve Injury in Thyroidectomy

Galen of Pergamon (AD 129–216) was probably the first anatomist to describe the recurrent laryngeal nerve (RLN), arising from the brainstem going down into the chest and move up again in the neck, to lie posteriorly in the trachea-esophageal groove before entering the larynx by passing deep to the inferior border of the inferior constrictor muscle. Damage to this nerve, which is normally iatrogenic to neck surgery, is uncommon but will be devastating especially for professional voice user.

Thyroidectomy is the most common neck surgery with potential risk to recurrent laryngeal nerve injury. The injury can be due to an accidental transection, stretching injury, compression injury, accidental ligation, thermal injury or ischemia. In the early period of thyroidectomy (1877–1881), Wolfer in 1882 reported that the incidence of unilateral nerve injury was 25% and bilateral injury was 4.5%. Now, the incidence of nerve injury is very low but varies from center to center, ranging from 0.4 to 7.2% for temporary paresis and 0 to 5.2% for permanent injury. Why there is the difference in the incidence? Among the well-known factors that reduce the nerve injury is an adequate knowledge of the anatomy of the neck especially recurrent laryngeal nerve. There are unlimited number of variations that have been published every year which may be related to extra-laryngeal nerve branching, the intersection with inferior thyroid artery (ITA), interconnection with external laryngeal nerve (nerve of Galen) and non-recurrent laryngeal nerve, which is almost exclusively on the right side. A delicate dissection and exposure of the RLN as it emerges from the trachea-esophageal groove until it enters behind the cricothyroid point will delineate the complete anatomy of the nerve. Knowing the normal anatomy of the nerve alone is inadequate, especially for those doing a large number of thyroid surgeries. Besides those variations, the position of the nerves may become distorted because of the very large goiter stretching the nerve or scarring from previous surgery, making the nerve at higher risk of injury. Therefore, large, difficult thyroid and re-do surgery is probably best reserved to be done by an experienced thyroid surgeon.

Nothing is of paramount importance in surgery than good meticulous surgery. It has been a good practice that someone should not use more than one gauze during thyroidectomy. Good hemostasis will cause less bleeding which potentially can obscure the operating field. This is important as blind clamping and electric coagulation hemostasis in a wet bloody operating field may unintentionally cause damage to the nerve. Various hemostat appliances are now available including bipolar cautery, harmonic scalpel and radiofrequency cautery on top of the standard monopolar diathermy, suture ligation and surgical clips. All of these instruments have different collateral tissue damage and should be used appropriately. Choosing the correct instrument at the correct time, especially when dissection is performed in close proximity to the RLN, will reduce the incidence of injury. All-in-all, RLN should be identified and isolated before securing ITA, and mass ligation of the vessel should be abandoned. The nerve might also get caught in ligatures, damaged by high heat from harmonic scalpel or injured from the transmission of electrical current by monopolar diathermy.

Dissection of the thyroid should be performed as closed to the gland as possible. The technique of capsular dissection was introduced by Leigh Delbridge, taking the vessels at their tertiary branches, leaving the RLN with minimal exposure and blood supply undisturbed. However, there is always disagreement between routine exposures *vs* non-exposure of the nerve, as some scholars believe that routine complete exposure will lead to ischemia and increase the risk of injury. However, with the help of intraoperative nerve monitoring, this is proven not to be true. The electromyography signal of the RLN fails to show any significant differences between the two.

An intraoperating nerve monitoring has provided valuable information needed during thyroidectomy. It is not only to preserve the RLN structurally, but also functionally. Sweeping the nerve probe across the operating field will map the location of RLN long before the eyes visualize it. This accelerates the identification of the nerve which subsequently reduces operating time and at the same time prevents accidental injury of the nerve. In cases where there is extra laryngeal branching of the nerve, careful stimulation of the nerve will allow correct identification of the motor and sensory branches. Similarly, it will be useful in identifying anatomic variation in non-recurrent laryngeal nerve by stimulating vagus nerve at different levels.

In experienced or established endocrine centers, identifying the RLN is probably not a big issue as the surgeons are experienced. Unfortunately, the majority of thyroidectomies are not performed by the experienced surgeons. Thyroidectomies are common procedure but not performed by a general surgeon regularly. In this situation, the use of intraoperative nerve monitor probably will be helpful. Reoperative thyroidectomy is well known to have higher RLN injury rate. The scarring and fibrosis make identification of the tubular structure of the RLN difficult. The course of the nerve will be distorted, putting it at risk of injury. Therefore, the use of intraoperative nerve monitoring in this situation will be helpful even for experienced surgeons.

A forceful upper pole and medial retraction of the thyroid gland will cause compression of the RLN at the point where it enters the larynx behind the Berry's ligament, leading to temporary damage to the nerve fibers. Without nerve monitoring, traction or compression injury is not detected because the nerve remains intact. This is documented by loss of electromyography (EMG) signal upon stimulation of the vagus and RLN which not only shows neuropraxia, but also the site of the injury. The knowledge on the status of the nerve helps the surgeon to decide whether to proceed with the contralateral surgery or to do a staged procedure. A meta-analysis on the use of intraoperative nerve monitoring has shown that it has a significant impact in reducing transient nerve injury by traction but not in permanent injury.[1] Moreover, remedial measures such as primary tension-free nerve repair with thyroplasty may be performed immediately if complete transaction of the nerve is confirmed from the EMG monitoring.

In summary, injury to the RLN is a serious complication even if it is rare. New technologies make the surgery faster and less morbid, reducing incidence of nerve injury, but can never replace meticulous surgical technique, good anatomical knowledge and surgeon experience in identifying the RLN.

REFERENCE

1. Rulli F, Ambrogi V, Dionigi G, Amirhassankhani S, Mineo TC, Ottaviani F, Buemi A, DI Stefano P, Mourad M. Meta-analysis of recurrent laryngeal nerve injury in thyroid surgery with or without intraoperative nerve monitoring. Acta Otorhinolaryngol Ital 2014 Aug;34(4):223–229.

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