

# Pearls and Pitfalls in Head and Neck Surgery

Practical Tips to Minimize Complications

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### ▶ 1.2 How to Avoid Injury of the External Branch of Superior Laryngeal Nerve

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#### PEARLS

- Keep in mind that the external branch of the superior laryngeal nerve (EBSLN) may be found in the operative field of a thyroidectomy in 15–20% of the cases.
- Avoid mass ligatures of the superior thyroid pole vessels.
- Use nerve monitoring or, at least, a nerve stimulator, especially when performing a thyroidectomy in a voice professional.

#### PITFALLS

- Risk of EBSLN injury is much higher in large goiters.
- Excessive burning with the Bovie near the cricothyroid muscle (CTM) can cause the same functional impact on voice performance.

#### Introduction

The EBSLN is the main motor supply to the CTM. The contraction of this muscle stretches the vocal fold, especially during the production of high frequency sounds [1]. Therefore, EBSLN paralysis leads to an important impairment of voice performance, mainly among women and voice professionals.

This nerve crosses the superior thyroid vessels, usually more than 1 cm above the upper border of the superior thyroid pole, before reaching

the CTM, in a region defined as the sternothyroid triangle [2]. However, in 15–20% of the instances, it may cross the vessels closer or even inferiorly to the border. This is the type 2b nerve [3], and in this instance the nerve is more vulnerable to inadvertent injury during a thyroidectomy [4]. Moreover, if the thyroid gland is markedly enlarged, the superior thyroid pole is elevated, increasing the likelihood of a type 2b nerve and, consequently, the risk of its injury [5]. In half of the cases who presented this complication after thyroidectomy, it was permanent [4], and no effective treatment has been reported so far. Therefore, prevention of damage to the EBSLN during thyroidectomy is strongly advised.

#### Practical Tips

Although it is probably not necessary to actively search for the EBSLN during a routine thyroidectomy in the majority of the cases, it is important to keep in mind some situations that could increase the risk of its injury and to be prepared to prevent it:

- 1 According to some authors, type 2b EBSLN is more prevalent among patients with short stature [6] and large thyroid growth [5, 6].
- 2 So as to be able to obtain a positive contraction of the CTM when stimulating the EBSLN, ask your anesthesiologist not to paralyze your patient.

3 Consider using some kind of nerve monitoring or, at least, a simple disposable nerve stimulator, especially when operating on a voice professional or within a reoperative field. Some authors have demonstrated that nerve monitoring systems help to identify the EBSLN [7]. If a nerve monitoring system is employed, the potential noted after EBSLN stimulation is very typical, with a median amplitude of 269.9  $\mu$ V [Potenza et al., unpubl. data]. In addition, the contraction of the CTM, in response to a simple 0.5-mA stimulus on the EBSLN is very easily demonstrated in the surgical field.

4 Always keep in mind that there is a 15–20% chance of finding a type 2b nerve. Therefore, any anatomical structure resembling a small nerve going towards the CTM should be carefully preserved.

5 Magnification is advisable. Wide-angled surgical loupes, with  $\times 2.5$  to  $\times 3.5$  magnifying lenses, help to identify the EBSLN.

6 Sectioning the sternothyroid muscle markedly improves the visualization of the superior thyroid pole with no negative impact on voice performance [8].

7 Try to avoid mass ligatures of the superior thyroid pedicle. Instead, identify and ligate separately the branches of the superior thyroid vessels. If a harmonic scalpel or a sealing device is used, be sure not to include the EBSLN in the instrument.

8 The anatomical classification of the EBSLN was created based on a conventional thyroidectomy field. However, when performing a video-assisted thyroidectomy, remember that the EBSLN is greatly approximated to the superior thyroid pole, as no hyperextension of the neck is exerted. On the other hand, the great magnification offered by the endoscope helps to identify and preserve the nerve in virtually all patients. Some authors reported a higher rate of EBSLN identification when using nerve monitoring (83.6%  $\times$  42%;  $p < 0.05$ ) [9].

## Conclusion

In this chapter, the reader is introduced to a frequently overlooked complication of thyroidectomy, the injury of the EBSLN. The resulting paralysis of CTM is often permanent. It is important to realize that 15–20% of the nerves may be found during a thyroidectomy, and the surgeon must be able to identify them, preferably with nerve monitoring or with a nerve stimulator, in order to keep their integrity when dissecting the superior thyroid pole.

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