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Short Communication

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It Sometimes Happens: Staging Surgery in Coexisting Graves' Disease and Thyroid Cancer

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Conflict of Interest
No potential conflict of interest relevant to this article was reported.

ABSTRACT

Thyroidectomy is a safe procedure often performed either for benign or malignant thyroid diseases. Complication rate is low and bilateral recurrent laryngeal nerve (RLN) injury associated with thyroidectomy is rarely described. The RLN may be injured bilaterally and damage is usually recognized postoperatively. With an increased use of intraoperative neural monitoring (IONM), an adaptation of the resection strategy appears to be necessary in case of an intraoperative loss of signal of the first operated side with total thyroidectomy planned. We review a case of a 21-year-old female with a history of Graves' disease who underwent a total thyroidectomy in a 2-stage procedure due to a loss of RLN function detected intraoperatively. The patient recovered uneventfully from the 2 surgeries.

Keywords: Thyroid gland; Graves' disease; Laryngeal recurrent nerve; Injury

INTRODUCTION

Thyroidectomy is a safe procedure often performed either for benign or malignant thyroid diseases. Complication rate is low and includes vocal fold paresis or paralysis, hypoparathyroidism, hypocalcaemia, hematoma and wound infection (1,2). The recurrent laryngeal nerve (RLN) may be injured bilaterally and damage is usually recognized postoperatively. Standards for RLN management include: i) extensive knowledge of nerve anatomy, ii) visual identification, iii) nerve exposure, iv) experience and training, and v) pre- and post-operative laryngoscopy. Visual identification of the RLN during thyroid surgery has been shown to be associated with lower rates of RLN palsy, but it does not guarantee success against the outcome of postoperative vocal cord (VC) paralysis. Intraoperative verification of anatomical and functional RLN integrity of the first resected thyroid lobe is a prerequisite for a safe thyroid operation (3).

CASE REPORT

A 21-year-old female patient presented with symptomatic, left-dominant, bilateral multinodular toxic goiter with no retrosternal extension, biochemically consistent with Graves' disease recurred after 18 mouths medical treatment. Patient presented with severe

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Author Contributions

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Graves' ophthalmopathy with eyesight threatening symptoms refractory to steroids. The patient was recommended for a first-time thyroidectomy. The patient had no previous surgical procedures in the neck area. Pre-operative video laryngoscopy showed optimal bilateral vocal cord mobility. During thyroid gland surgery, an enlarged thyroid lobe was observed on the left side. Persistent adherence resulting from thyroiditis was observed during dissection. The intermitted intraoperative neural monitoring (I-IONM) records show that, after completing surgery on the left dominant side, the left RLN had been injured (i.e. traction injury, type 1 segmental nerve lesion) (**Fig. 1**). V1 and V2 electromyography (EMG) signals were 780 μV and 61 μV respectively. R2 signal proximal to the injured point was 84 μV. R2 signal distal to injured point was 1.045 μV. IONM troubleshooting algorithm was applied systematically. Therefore, thyroidectomy was staged for the right side. Left parathyroid glands were identified and preserved with the standard technique, and branches of both inferior thyroid arteries were ligated and divided close to the capsule of the gland. Identification of the left external branch of the superior laryngeal nerve was not achieved. The patient was extubated uneventfully. From the first night after surgery, the patient complained of hoarseness and swallowing disorder. The laryngeal examination findings from postoperative day 1 showed VC palsy on left side. The final left lobe histological examination revealed micropapillary multifocal thyroid carcinoma, positive for *BRAF* V600E mutation (**Fig. 2A**). The patient was discharged from the ward on postoperative day 2. Speech therapy was started. At postoperative week 13, laryngeal examination revealed complete recovery of the left vocal fold function. The patient was scheduled for completion right thyroidectomy. During second surgery, adherence was also observed during dissection. I-IONM was offered. Continuous intraoperative neural monitoring (C-IONM) was unavailable in the hospital. After completing surgery, the right recurrent laryngeal nerve had been injured (traction injury, type 1). V1 and V2 EMG signals were 690 μV and 54 μV respectively. R2 signal proximal to the injured point was 84 μV. R2 signal distal to injured point was 845 μV. IONM troubleshooting algorithm was applied systematically. The definitive histological examination reported neoplastic nodule of a proliferative nature referable to a follicular variant of papillary microcarcinoma has been reported (**Fig. 2B**). The postoperative laryngeal

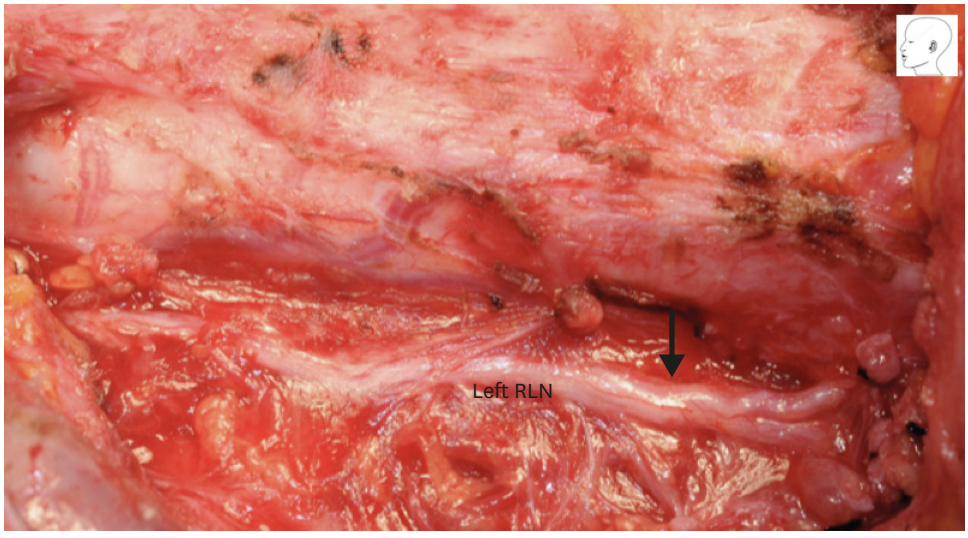

Fig. 1. The clinical case presentation. Intraoperative evidence of first left RLN injury. Nerve lesion is not visible to surgeon's eye. Only EMG evaluation can confirm injury. Type 1 lesion (black arrow) was caused by excessive traction on the thyroid gland at Berry's ligament.
RLN = recurrent laryngeal nerve.

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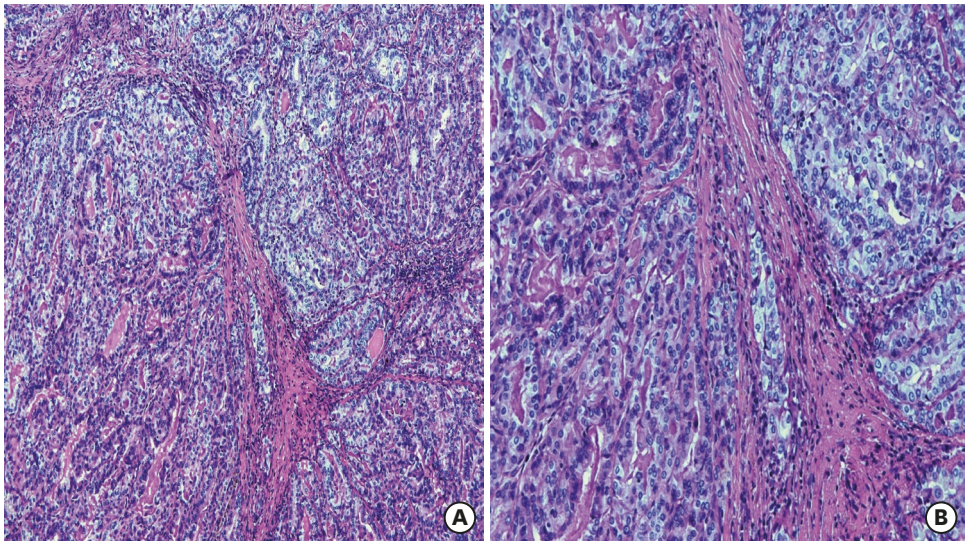

Fig. 2. (A) Histology showed a well-differentiated neoplastic invasive proliferation with a diffuse follicular growth pattern, mainly constituted by microfollicles containing a small amount of colloid, with dense fibrotic septa without a tumor capsule (hematoxylin and eosin, ×20). (B) At higher magnification the tumor was composed by neoplastic elements with enlarged nuclei with typical papillary thyroid carcinoma features consisting of grooves, overlapping and clearing (hematoxylin and eosin, ×20).

examination findings from postoperative day 1 showed VC palsy on right side. Speech therapy was offered again. At postoperative week 8, laryngeal examination revealed recovery of the right vocal fold function.

DISCUSSION

With an increased use of IONM, an adaptation of the resection strategy appears to be necessary in case of an intraoperative loss of signal (LOS) of the first operated side with total thyroidectomy planned (**Table 1**) (1). When a true LOS is confirmed, the identification of the site of lesion that is, neural injury point mapping is recommended, and then consideration of optimal contralateral surgery timing is suggested (1). Option to stop the operation is mentioned but not strongly recommended in previous guidelines (1-3). The contralateral side resection with intact RLN function from the surgical point of view, basically has 3 options: i) no contralateral resection in bilateral goiter, Graves' disease, or low risk thyroid carcinoma (differentiated and medullary thyroid carcinomas) with the aim of 2-stage completion surgery after recovery of nerve function. ii) Contralateral subtotal resection ventrally of the RLN plane in benign goiter with a safety distance to the nerve with the aim

Table 1. Definition of LOS

Definitions
· Normal vocal cord movement at preoperative laryngeal examination
· Initial EMG satisfactory (V1 >500 μV)
· No EMG response with stimulation at 1–2 mA
· Low response <100 μV with stimulation at 1–2 mA
· Absent laryngeal twitch
· Troubleshooting algorithm applied systematically

With a LOS, there is an almost 80% risk of early postoperative vocal palsy. In this case, the further procedure has to be weighed depending on the underlying thyroid disease and the surgeon's expertise. LOS = loss of signal; EMG = electromyography.

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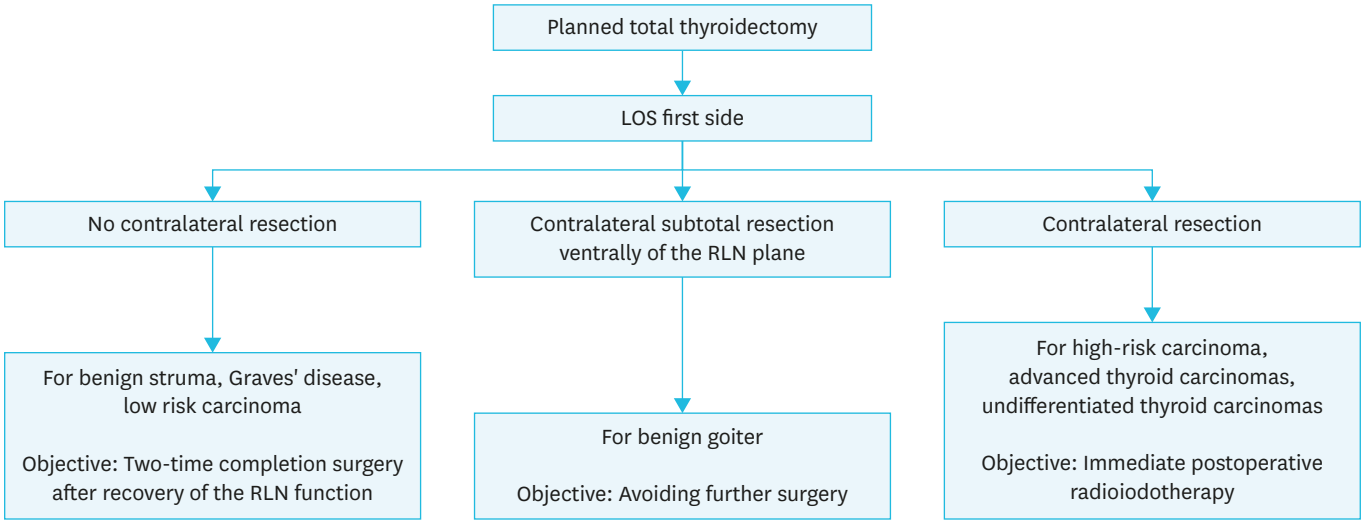

Fig. 3. Surgical options for planned total thyroidectomy and intraoperative signal loss on the first operated side.
LOS = loss of signal; RLN = recurrent laryngeal nerve.

of avoiding further-second surgery and anesthesia. iii) Total thyroidectomy as planned for advanced thyroid carcinomas (including undifferentiated thyroid carcinomas) with the aim of immediate postoperative radioiodine therapy (**Fig. 3**) (1-3).

Already in the early 1900s, several surgeons focused on the possibility of performing thyroidectomy in two stages. In 1929 Pemberton and later Blizzard, Billroth, Wolfler (4), Kocher, and Mayo emphasized the importance of this procedure in reducing RLN injuries by specifying that by practicing a lobectomy, the risk of an anatomical or functional nerve injury is lower than that of total thyroidectomy (4).

The IONM is essential for the reduction of the risk of bilateral injury of the RLN (5-10). In fact, 94% of surgeons from 1,119 clinics interviewed in Germany say they would change their non-dominant lobe strategy following a LOS on the first operated side: 85% would terminate the procedure with a lobectomy; 9% would reduce the extent of contralateral resection while only 6% would continue total thyroidectomy as planned (10).

It is clear that the surgeon who uses IONM must be perfectly expert in the LOS problem-solving algorithms. The international IONM study group recommends the application of a detailed problem resolution algorithm (11,12). Equally important is the choice to start the dominant surgical procedure (13). The dominant lobe is defined as the largest lobe, the one affected by a suspected or overt tumor, the one with the highest number of nodules or the major nodule, which causes compression symptoms, or which has a hyperfunctioning hot nodule. Using this approach, we have a time control of the disease and the reason that led to the choice of surgery (14).

In the case of a 2-stage thyroidectomy for a patient with a diagnosis of carcinoma on the dominant lobe, the correct timing for completion must be considered. In this regard, it should be remembered that differentiated thyroid carcinomas have a good prognosis despite the local extension or the presence of lymph node and distant metastases (12,15).

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An anesthetic reassessment is important when planning a thyroidectomy in 2 stages, considering that the patient will have to undergo second anesthesia although in recent years anesthetic skills have considerably reduced the risk associated with second anesthesia (16).

In literature, no significant increases in morbidity have been reported in patients undergoing completion of thyroidectomy (17). The collaboration of the whole multidisciplinary team is fundamental in this type of surgery. Completion thyroidectomy must be scheduled after the resolution of neuropraxia (which usually occurs during 8 weeks) or in the case of permanent paralysis, only after evaluating the respiratory space at laryngoscopy. In this regard, specific speech therapy can improve or facilitate the recovery of laryngeal function (2,18,19).

Communication with the patient is essential. The patient must be informed about the use of the IONM and the possible implications of a LOS. In informed consent, it is necessary to specify the possibility of having a thyroidectomy in 2 phases and the patient must share this indication to avoid a bilateral lesion of the recurrent nerve.

REFERENCES

1. Schneider R, Randolph GW, Dionigi G, Wu CW, Barczynski M, Chiang FY, et al. International neural monitoring study group guideline 2018 part I: Staging bilateral thyroid surgery with monitoring loss of signal. Laryngoscope 2018;128 Suppl 3:S1-17.
PUBMED | CROSSREF
2. Schneider R, Lorenz K, Sekulla C, Machens A, Nguyen-Thanh P, Dralle H. Surgical strategy during intended total thyroidectomy after loss of EMG signal on the first side of resection. Chirurg 2015;86:154-63.
PUBMED | CROSSREF
3. Dralle H, Schneider R, Lorenz K, Phuong NT, Sekulla C, Machens A. Vocal cord paralysis after thyroid surgery: current medicolegal aspects of intraoperative neuromonitoring. Chirurg 2015;86:698-706.
PUBMED | CROSSREF
4. Pemberton JD. Exophthalmic goiter: indications for the stage-operation. Arch Surg 1929;18:735-44.
CROSSREF
5. Randolph GW, Dralle H; International Intraoperative Monitoring Study Group, Abdullah H, Barczynski M, Bellantone R, et al. Electrophysiologic recurrent laryngeal nerve monitoring during thyroid and parathyroid surgery: international standards guideline statement. Laryngoscope 2011;121 Suppl 1:S1-16.
PUBMED | CROSSREF
6. Dralle H, Sekulla C, Lorenz K, Nguyen Thanh P, Schneider R, Machens A. Loss of the nerve monitoring signal during bilateral thyroid surgery. Br J Surg 2012;99:1089-95.
PUBMED | CROSSREF
7. Sadowski SM, Soardo P, Leuchter I, Robert JH, Triponez F. Systematic use of recurrent laryngeal nerve neuromonitoring changes the operative strategy in planned bilateral thyroidectomy. Thyroid 2013;23:329-33.
PUBMED | CROSSREF
8. Sun H, Wu CW, Zhang D, Makay Ö, Zhao Y, Carcofaro P, et al. New paradigms for neural monitoring in thyroid surgery. Surg Technol Int 2019;34:79-86.
PUBMED
9. Dionigi G, Frattini F. Staged thyroidectomy: time to consider intraoperative neuromonitoring as standard of care. Thyroid 2013;23:906-8.
PUBMED | CROSSREF
10. Dralle H, Sekulla C, Lorenz K, Nguyen Thanh P, Schneider R, Machens A. Loss of the nerve monitoring signal during bilateral thyroid surgery. Br J Surg 2012;99:1089-95.
PUBMED | CROSSREF
11. Zhou L, Dionigi G, Pontin A, Pino A, Caruso E, Wu CW, et al. How does neural monitoring help during thyroid surgery for Graves' disease? J Clin Transl Endocrinol 2018;15:6-11.
PUBMED | CROSSREF

https://doi.org/10.16956/jes.2019.19.3.88

12. Schneider R, Lorenz K, Sekulla C, Machens A, Nguyen-Thanh P, Dralle H. Surgical strategy during intended total thyroidectomy after loss of EMG signal on the first side of resection. Chirurg 2015;86:154-63.
PUBMED | CROSSREF
13. Melin M, Schwarz K, Lammers BJ, Goretzki PE. IONM-guided goiter surgery leading to two-stage thyroidectomy--indication and results. Langenbecks Arch Surg 2013;398:411-8.
PUBMED | CROSSREF
14. Kim HY, Sun H, Chai YJ, Tufano R, Dralle H, Navarra G, et al. Loss of the neuromonitoring signal on the first side in planned total thyroidectomy. J Endocr Surg 2017;17:89-95.
CROSSREF
15. American Thyroid Association (ATA) Guidelines Taskforce on Thyroid Nodules and Differentiated Thyroid Cancer, Cooper DS, Doherty GM, Haugen BR, Kloos RT, Lee SL, et al. Revised American Thyroid Association management guidelines for patients with thyroid nodules and differentiated thyroid cancer. Thyroid 2009;19:1167-214.
PUBMED | CROSSREF
16. Tufano RP, Noureldine SI, Angelos P. Incidental thyroid nodules and thyroid cancer: considerations before determining management. JAMA Otolaryngol Head Neck Surg 2015;141:566-72.
PUBMED | CROSSREF
17. Bainbridge D, Martin J, Arango M, Cheng D; Evidence-based Peri-operative Clinical Outcomes Research (EPiCOR) Group. Perioperative and anaesthetic-related mortality in developed and developing countries: a systematic review and meta-analysis. Lancet 2012;380:1075-81.
PUBMED | CROSSREF
18. Erdem E, Gülçelik MA, Kuru B, Alagöl H. Comparison of completion thyroidectomy and primary surgery for differentiated thyroid carcinoma. Eur J Surg Oncol 2003;29:747-9.
PUBMED | CROSSREF
19. Dionigi G, Boni L, Rovera F, Rausei S, Castelnuovo P, Dionigi R. Postoperative laryngoscopy in thyroid surgery: proper timing to detect recurrent laryngeal nerve injury. Langenbecks Arch Surg 2010;395:327-31.
PUBMED | CROSSREF

https://doi.org/10.16956/jes.2019.19.3.88