Cost and training are diffusion patterns limits for neural monitoring in thyroid surgery

Hui Sun[1], Hoon Yub Kim[2], Paolo Carcoforo[3], Gianlorenzo Dionigi[4]

[1]Division of Thyroid Surgery, China-Japan Union Hospital of Jilin University, Jilin Provincial Key Laboratory of Surgical Translational Medicine, Jilin Provincial Precision Medicine Laboratory of Molecular Biology and Translational Medicine on Differentiated Thyroid Carcinoma, Changchun 130033, China; [2]Department of Surgery, KUMC Thyroid Center, Korea University Hospital, Korea University College of Medicine, Seoul, Korea; [3]Department of Surgery and Department of Morphology, Surgery and Experimental Medicine, S. Anna University Hospital and University of Ferrara, Ferrara, Italy; [4]Division for Endocrine and Minimally Invasive Surgery, Department of Human Pathology in Adulthood and Childhood "Gaetano Barresi", University Hospital G. Martino, University of Messina, Messina, Italy

Correspondence to: Gianlorenzo Dionigi. Division for Endocrine and Minimally Invasive Surgery, Department of Human Pathology in Adulthood and Childhood "Gaetano Barresi", University Hospital G. Martino, University of Messina, Via C. Valeria 1, 98125, Messina, Italy.
Email: gdionigi@unime.it.

The use of intermitted (I-IONM) and continuous intraoperative neural monitoring (C-IONM) in thyroid surgery is increasing, but true characterisation of the diffusion of I-IONM and especially C-IONM is not available (1-5).

According to preliminary reports, the translation of C-IONM devices from intermittent neural monitoring (I-IONM) is constitutive to the advancement of thyroid surgical practice and technology (2-4). Although there is little comparative effectiveness and cost-effectiveness research to support the use of C-IONM over I-IONM, it has been suggested that C-IONM has better outcomes in terms of reduction of permanent recurrent laryngeal nerve (RLN) palsy (4). C-IONM has been successful used first in human study and achieved regulatory approval (5). The subsequent adoption of C-IONM by clinicians, however, remains complex and defectively analyzed.

There are several factors that influence the diffusion of C-IONM.

Among the greatest barriers to the adoption of C-IONM accessories are the costs associated with the purchase by healthcare institutions, particularly in publically funded systems. Although cost might explain the earliest delays in diffusion, this barrier does not fully account for the different rates of diffusion.

Surgeon-specific factors may instead have played an important role. Surgeons may be reluctant to use C-IONM that has no simple application, setup time, electromyography (EMG) baseline achievement, risk malfunction or failure, displacement, particularly if such C-IONM are not perceived to offer technical advantages over I-IONM. Surgeons may find it difficult to justify use of C-IONM when procedures are technically less complex, particularly if they are performing benign thyroid procedures: in a total thyroidectomy for goiter, use of C-IONM does appear to alter the surgical procedure because of opening the carotid sheat, dissecting the vagal nerve and positioning the C-IONM probe.

Furthermore, C-IONM requires both technical and interpretative component mentoring. Technical component means using and setting up the monitoring equipment correctly and understanding the inherent properties of the system to avoid an erroneous setup. Interpretive component: i.e., is the endocrine surgeon performing C-IONM able to distinguish between a true response versus

an artifactual one? Is the surgeon performing C-IONM able to distinguish between an RLN risk EMG profile versus an artifactual one? When problems occur, can thyroid surgeon perform appropriate troubleshooting to identify and correct the issue at hand?

I-IONM and (more) C-IONM will not only require special training and acquisition of skills. These technologies will also change the existing surgical training pattern and reshape the learning curve of residents by offering new solutions, new intraoperative strategies, decision making, new techniques for thyroidectomy (both open, endoscopic, and robotic).

Next generation more customised (and less expensive) C-IONM accessories, may therefore better penetrate the clinical arena (1-6).

Acknowledgments

Footnote

Conflicts of Interest: The authors have no conflicts of interest to declare.

References

1. Vasileiadis I, Karatzas T. Cost-effectiveness of recurrent laryngeal nerve monitoring in thyroid surgery. Gland Surg 2019;8:307-11.
2. Singer MC. Safety and feasibility of a novel recurrent laryngeal nerve monitoring technique. Laryngoscope 2018;128 Suppl 4:S1-8.
3. Schneider R, Randolph GW, et al. Continuous intraoperative neural monitoring of the recurrent nerves in thyroid surgery: a quantum leap in technology. Gland Surg 2016;5:607-16.
4. Schneider R, Sekulla C, et al. Dynamics of loss and recovery of the nerve monitoring signal during thyroidectomy predict early postoperative vocal fold function. Head Neck 2016;38 Suppl 1:E1144-51.
5. Schneider R, Sekulla C, et al. Postoperative vocal fold palsy in patients undergoing thyroid surgery with continuous or intermittent nerve monitoring. Br J Surg 2015;102:1380-7.
6. Lamade W, Fogel W, et al. Intraoperative monitoring of the recurrent laryngeal nerve. A new method. Chirurg 1996;67:451-4.