

Novel intraoperative technique for predicting post operative recurrent laryngeal nerve function in thyroid surgery

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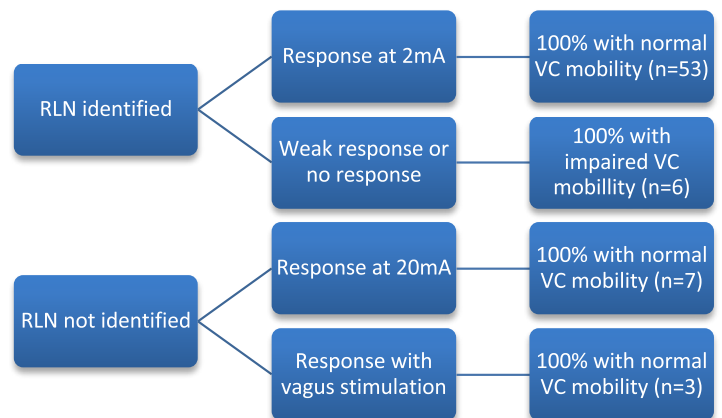
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Recurrent laryngeal nerve (RLN) injury is a rare complication of thyroid surgery with potentially devastating sequelae. In addition to direct visualization, intraoperative neural monitoring has gained widespread use among surgeons.^{1,2,3} Commonly used methods of IONM include NIM® IONM (Medtronic) that utilizes EMG recordings of laryngeal musculature with properly positioned contact endotracheal tube and nerve stimulation with either a monopolar or bipolar probe. In contrast to the NIM IONM, recent technologic advancements have produced a handheld monitor with a biphasic balanced stimulus that allows for continuous nerve activation with reduced potential nerve damage and fatigue (Checkpoint® Nerve Monitor, Checkpoint Surgical LLC) and bypasses the need for laryngeal EMG with an endotracheal tube. The surgeon is able to stimulate the RLN and directly palpate laryngeal musculature for muscle activation, providing real time evidence of nerve function without the purported increase risk of nerve fatigue.

To our knowledge, there are no studies involving the Checkpoint Nerve Monitor in monitoring the RLN in thyroid surgeries. This study assesses the clinical utility and accuracy of a novel method of RLN IONM intended to help protect the nerve and limiting nerve fatigue.

Methods and materials

A retrospective chart review study was conducted under IRB approval of patients undergoing thyroid surgery with Checkpoint nerve monitoring. Inclusion criteria: adult patients who underwent hemithyroidectomy, total thyroidectomy, completion thyroidectomy with Checkpoint RLN monitoring, with pre and post-operative laryngoscopy. All diagnoses were included. Exclusion criteria: postoperative complications, lack of laryngoscopy



Results

Total RLNs examined that met inclusion criteria were n=69. All RLNs that were identified and stimulated with Checkpoint® nerve monitor at 2 mA (n=53) at the conclusion of surgery were confirmed to be functional with mobile vocal cords on post-operative flexible laryngoscopy (53/53; 100%). Identified RLNs that had weak or no response on stimulation intraoperatively had corresponding hypomobility or paralysis on post-operative flexible laryngoscopy (6/6; 100%). RLNs not identified during the procedure (10/69; 14.5%) produced a response with vagus nerve stimulation (3/10) or at 20 mA stimulation (7/10), and proved to be intact with mobile vocal cords.

Discussion

Intraoperative nerve monitoring (IONM) in thyroid surgery affords a unique advantage over direct visualization in that the monitoring can predict postoperative function by directly monitoring neuropraxic nerve injury. However, evidence unequivocally demonstrating the benefit of nerve monitoring is lacking due to low power and wide variation in IONM use across various centers.⁴ IONM can

have variable positive predictive values ranging from 10-90% where loss of IONM signal does not always correspond to RLN palsy based on post-operative laryngeal examination.⁵ A presumed shortcoming of the NIM nerve monitor is nerve fatigability from repeated intraoperative stimulation and subsequent loss of signal that does not necessarily correlate to post-operative vocal cord mobility. Post-operative laryngoscopy may be necessary to assess nerve function, contributing to patient discomfort and resource utilization. Our findings suggest that the Checkpoint nerve monitor can serve as a positive prognostic indicator of vocal cord function if the nerve is identified and stimulated successfully at 2 mA. Conversely, trends show that inability to stimulate an identified nerve is suggestive of impaired vocal cord mobility.

Conclusion

The use of the Checkpoint nerve monitor is a novel technique for assessing the RLN viability during and at the conclusion of thyroid surgery and could serve as a prognostic indicator of vocal cord mobility. While continued accrual of data is in progress to further validate these findings, clinical implications of the Checkpoint nerve monitor could include possible cost reductions and improved patient comfort via lessening the need for postoperative laryngoscopy.

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The Checkpoint Stimulator is a single-use, sterile device intended to provide electrical stimulation of exposed motor nerves or muscle tissue to locate and identify nerves and to test nerve and muscle excitability. Do not use this Stimulator when paralyzing anesthetic agents are in effect, as an absent or inconsistent response to stimulation may result in inaccurate assessment of nerve and muscle function. For a complete list of warnings and precautions regarding the use of the Stimulator please see www.checkpointsurgical.com.

There are no financial relationships, funding, or conflicts of interest to disclose.

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