The Role of Nerve Monitoring to Predict Post-Operative Recurrent Laryngeal Nerve Function in Thyroid and Parathyroid Surgery

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INTRODUCTION

Over the last 10 years the role of monitoring the RLN during endocrine surgery has been utilized in an attempt to reduce iatrogenic nerve injury. Despite extensive utilization of various nerve monitoring techniques there is no clear-cut evidence that routine nerve monitoring will reduce the incidence of nerve injury. (1)

Several authors have suggested the benefit of intra-operative nerve monitoring in the prediction of postoperative nerve function. This becomes particularly useful in cases where intra-operative traction may have caused a paresis of the nerve. In situations where the surgeon is going to dissect the contra-lateral nerve it is valuable to be able to reliably predict if the ipsilateral RLN is both anatomically and physiologically intact. This would provide the surgeon real time information to integrate into the intra-operative decision making and in select cases consider staging the contralateral dissection.

METHODS AND MATERIALS

Data was collected retrospectively for all patients who underwent thyroidectomy and parathyroidectomy with continuous RLN monitoring from 2004 to 2009. All surgeries where performed under the care of one senior surgeon (FRM). The Medtronic-Xomed nerve integrity monitoring (version 2.0) was utilized. The event threshold on the NIM was set to 100µV and impedance differences were recorded to be less than < 0.5 mOhms on each channel (left and right RLN).

After identification of the RLN, the disposable nerve stimulator (Medtronic-Xomed) was then applied at a setting of 0.5 mAmp to assess physiologic nerve integrity. The evoked EMG was monitored and assessed for an audible signal and a compound action potential tracing on the monitor screen. The response of the nerve was dictated into the operative report as positive/brisk response on 0.5 mAmp or negative. If the response was negative at 0.5 mAmp the nerve was then stimulated at 1 and 2 mAmps. No response at 2 mAmps was considered to be a paretic nerve and a negative stimulation test.

RESULTS

A positive EMG response to stimulation at 0.5 mAmp with normal vocal cord mobility was considered a true positive and no stimulation response with immobile vocal cord on postoperative laryngoscopy was considered a true negative. The sensitivity, specificity, positive predictive value (PPV), and negative predictive value (NPV) of the nerve stimulator to predict postoperative nerve function were calculated. To further analyze the data it was broken down into pathologic categories of thyroid malignancy, goiter, benign thyroid follicular lesions, Grave’s disease, and parathyroid pathology. The results for the rates of early (within 12 weeks) and permanent (> 6 months) post-operative paralysis are shown in Table 1. The sensitivity, specificity, positive and negative predictive values for different pathologies and cumulative cases are shown in Table 2.

DISCUSSION

Stimulation of the RLN during thyroid and parathyroid surgery is a useful tool in predicting postoperative RLN function. The role of intra-operative monitoring of the recurrent laryngeal nerve has been debated in the literature. Several studies point to the role of intra-operative monitoring in predicting postoperative function. In a previous series evaluating 81 RLNs at risk Otto and Cochrane demonstrated that digital palpation of the posterior cricoarytenoid muscle was found to be a good predictor of postoperative nerve function with an overall sensitivity and specificity of 92.2% and 75% respectively (2).

In our study we present a larger series with 909 nerves at risk with breakdown of the analysis by pathologic subsets. Our sensitivity and specificity data confirms prior data from the literature that suggests that stimulation of the RLN is better at predicting that an anatomically intact nerve is functional when there is an appropriate EMG response as opposed to predicting that an anatomically intact nerve is not functioning when there is no EMG response. The overall sensitivity was excellent at 98.4%, however specificity was only at 62.5% for all groups.

An interesting subgroup included the patients who had a false positive stimulation test (positive stimulation on EMG monitor but immobile vocal cord post-operatively). We had 12 of the 909 nerves demonstrate this false positive testing (1.3%). These patients had an overall good prognosis for recovery of normal vocal fold mobility with 11 of the 12 recovering normal vocal fold mobility anywhere from 3 to 12 weeks post-operative. On the other hand the subgroup with negative stimulation (no response on intra-operative stimulation) had a less optimistic pattern with only 14 of the 34 demonstrating normal vocal cord mobility in the post-operative period.

CONCLUSIONS

Stimulation of the RLN during thyroid and parathyroid surgery is a useful tool in predicting postoperative RLN function. The sensitivity of stimulation is high showing positive stimulation to be an excellent predictor of normal nerve function. Negative stimulation is more predictive of paralysis in cases of thyroid carcinoma and Grave’s disease.

REFERENCES