Nerveäna Power Index – A new tool for Recurrent Laryngeal Nerve Monitoring during thyroidectomy

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Introduction

Nerve injury is a major concern during thyroid and other head and surgeries. Surgeons and anesthesiologists have utilize various technologies and techniques to monitor nerve integrity during these procedures. Recently, the Nerveäna™ System introduced a new tool for real time nerve monitoring. We describe the use of this novel tool in a child undergoing thyroidectomy.

Case Report

A 10 year old, 36 Kg, female with a locally metastatic papillary thyroid carcinoma presented for total thyroidectomy and central neck dissection. Neck ultrasound showed a nodule measuring 1.9 x 1.5 x 1.2 cm in the left thyroid lobe. Following premedication, anesthesia was induced with sevoflurane and an IV catheter was placed. The trachea was intubated with a 6.0 mm cuffed endotracheal tube with a LSE 500 ms Dragonfly single channel electrode (Neurovision Medical Products, Ventura, CA, USA). Correct electrode position was confirmed using videolaryngoscopy. The electrode was connected to the Nerveäna monitoring unit. The output from the monitoring unit was visualized on a laptop with an EMG Viewer™ software program. In addition to the standard monitoring for nerve detection, the Nerveana Power Index (NPI) was utilized to trend recurrent laryngeal nerve function. The NPI values at baseline and at thirty minutes after baseline are shown in Table 1. Upon surgery completion, both RLNs were stimulated proximally and distally relative to the glottis and final NPI values are shown in Table 1. Extubation was uneventful and vocal cords movement was normal.

Initial NPI Values	R VC	L VC
Baseline	366	458
Baseline + 30 mins	327	421
Final NPI values	Right RLN	Left RLN
Proximal	389	431
Distal	378	333

Table 1. NPI Values

Figure 1. Nerveäna EMG View display showing NPI Values

Discussion

The Nerveäna™ System has a new tool for prevention of nerve injury during surgery called the "Nerveäna Power Index." If all other factors are the same, the repeated stimulation of the RLN, especially at the same anatomic spot, can indicate by loss of power of the muscle response that Neuropraxia is occurring. The Nerveäna System integrates the evoked response, determining the presence of a Compound Motor Action Potential response by an empirically derived CAP Threshold. The "power" of a nerve/muscle response is best determined by integration of the displayed evoked EMG (the area under the waveform). By displaying the CAP integral as a percentage of the CAP threshold, the Nerveäna system creates an Index (Nerveäna Power Index, NPI™) of the power of nerve/muscle response as a percentage of the threshold level of response. The equation for the NPI is: Neuropraxia Power Index (%) = 100 x Event CAP Integration Value / Integration Threshold Value. Repeated stimulation of the nerve under the same conditions provides the surgeon with a real-time index of Neuropraxia (Table 1 and Figure 1). The NPI, being quantitative, is much more valuable than simple loss of stimulated responses. In practice, the healthy RLN when first stimulated delivers approximately 450%. In the presence of nerve fatigue the number drops throughout the case. A response approaching 100% should be investigated for possible impending nerve injury.