Use of GlideScope in Patients Undergoing NIM Thyroidectomy

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Abstract

Objectives: Thyroidectomy and parathyroidectomy using the nerve integrity monitor (NIM) require proper placement of the endotracheal tube with electrodes aligned correctly within the larynx. The purpose of this study is to determine the percentage of patients who require positional adjustments of the endotracheal tube prior to beginning surgery and to understand the value of using the GlideScope to assure proper NIM tube placement within the larynx. Methods: This prospective study examines operative data from 297 patients who underwent NIM thyroidectomy and parathyroidectomy. After routine orotracheal intubation by an anesthesiologist and positioning of the patient for surgery, a GlideScope was used to check the position of the tube in 2 planes: depth of tube placement and rotation of the tube within the larynx assuring proper placement of the electromyogram electrodes within the glottis. Results: Tube adjustment was required for 66.5% of patients. In 48.1% of cases, tube retraction or advancement to a proper depth was needed. Tube rotation was required for 30.1% of patients, and 11.8% of patients required both adjustment of tube depth and tube rotation to properly align electrodes. Conclusions: After the anesthesiologist places the NIM endotracheal tube, and the patient is positioned for surgery, additional tube adjustment is often needed prior to the start of surgery. The GlideScope is readily available in the operating suite, its use adds little time to the procedure, and assures proper NIM tube placement. The use of the GlideScope is recommended.

Keywords

nerve integrity monitor, thyroidectomy, parathyroidectomy, intraoperative nerve monitoring, GlideScope

Introduction

Recurrent laryngeal nerve (RLN) injury is one of the most devastating complications of thyroid surgery and can impact quality of life, social and occupational function, as well as swallowing and breathing. The incidence of permanent RLN injury is low and varies from 0.5% to 5% of the patients, whereas transient injuries have been documented in 1% to 30% of cases.1-3

In performing thyroidectomy, the gold standard is visualization of the RLN. The nerve integrity monitor (NIM) is thought to serve as a valuable adjunct.4 In a study of 29 998 nerves by Dralle et al, the dissections were divided into 3 groups: a first group, with no RLN identification, a second group with visual identification of the nerve, and a third group with visual identification plus NIM. They found that visualization of the RLN is the gold standard and that there is no statistical difference for nerve visualization with or without monitoring.5 A 2011 meta-analysis of 64 699 nerves also found no statistical difference in the rate of true vocal cord paralysis while using NIM versus RLN identification without monitoring.6 Studies conducted in more recent years have reached a similar conclusion and have found no statistically significant improvement in outcomes while using NIM.7-9 However the data and potential benefits remain controversial.

Despite a lack of evidence to support routine use of the NIM, RLN monitoring is valued by many surgeons for its potential benefits of faster and more reliable nerve identification, assistance in dissection, and verification of RLN function.

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postoperatively. Thus, its use is becoming more prevalent. A study conducted in 2019 showed a marked increase in intraoperative NIM use with 83% of participants reporting use in some or all cases, compared with a 2007 study that revealed only 44.9% use.10,11

Although NIM thyroidectomy is increasing in the United States and around the globe, protocol for equipment set up and use varies greatly between providers. A guideline statement was published in 2010 to improve quality of intraoperative neuromonitoring through encouraging uniformity in equipment set up, endotracheal tube placement, and intraoperative problem-solving. One of the biggest issues for NIM reliability and function is lack of a standardized approach for proper endotracheal tube placement. When positioned properly, the recording electrodes on the endotracheal tube make contact with the medial surface of the vocal cords to monitor RLN integrity. However, after intubation, tube dislocation occurs in up to 69% of patients while placing the patient in neck extension.12 During patient positioning, the endotracheal tube can be displaced up to 2.1 cm inward and 3.3 cm outward.13 Incorrectly positioned electrodes are the most common cause of equipment failure and can lead to dysfunction of the monitor, unreliable monitor feedback, and increase the risk for RLN injury.14 Because of this, many experts suggest a standard protocol for tube placement and readjustment after the patient is positioned for surgery.4 For verification, it has been suggested that video laryngoscopy be utilized to check the tube position as it provides a superior glottic view.12,15

The GlideScope is a video laryngoscope that allows video visualization of placement of the endotracheal tube. The GlideScope has proven to be effective in both primary intubation and in management of the difficult airway in both adults and children and has been shown to improve the glottic view when compared with traditional laryngoscopes.15-17 Thyroidectomy and parathyroidectomy using the NIM require proper placement of the endotracheal tube with the electrodes aligned correctly within the larynx. The purpose of this study is to determine the percentage of patients who require endotracheal tube readjustment prior to beginning surgery and to understand the value of using the GlideScope to assure proper NIM tube placement within the larynx.

Materials and Methods

This study was performed under a claim of exemption by the Investigational Review Board at the University of Mississippi Medical Center and conforms to recognized ethical standards for research (IRB #FWA00003630). Data were taken from 297 operative notes of patients who underwent NIM thyroidectomy or parathyroidectomy. At the start of each case, the anesthesiologist performed a direct laryngoscopy and intubation with the NIM endotracheal tube. The patient was positioned in neck extension for surgery, and the GlideScope was used to visualize the position of the endotracheal tube and recording electrodes within the larynx. If repositioning of the endotracheal tube was necessary, the surgeon recorded the adjustments in 2 planes: tube advancement/retraction and rotation of the tube. Once proper positioning of the endotracheal tube electrodes was confirmed with the GlideScope, the patient was prepped and the procedure commenced.

Results

Patient age ranges from 13 to 90 years with a mean of 55.6 years old. Men comprise 21.5% of the patient sample and women make up 78.5%. A total of 297 surgeries by an otolaryngologist–head and neck surgeon make up our surgical sample with 38 parathyroidectomies and 259 partial and total thyroidectomies.

Most of the patients in this study were intubated with a traditional laryngoscope; however, a small subset of patients were intubated with a GlideScope, and their data are listed separately. For both groups, the GlideScope was used to confirm tube position after initial intubation and patient positioning.

Among the 272 patients intubated with a traditional laryngoscope, NIM tube adjustment was required for 66.5% of these patients. 45.6% of patients required tube retraction, which ranged from 0.5 to 4 CM with an average displacement of 1.34 CM needed to achieve the appropriate depth. 2.5% of patients required tube advancement, which ranged from 0.5 to 2 CM with an average displacement of 1.18 CM. Rotational adjustment was needed in 30.1% of patients to achieve optimal orientation. Among these patients, counterclockwise rotation was needed in 40.2% of patients and clockwise adjustment was required for 59.8% of patients. A total of 11.8% of patients required both tube advancement/retraction and rotational adjustments prior to surgery.

Among the 25 patients initially intubated with a GlideScope, 56% of these patients required NIM tube adjustment after the patient was positioned in neck extension; 44% of these patients required tube retraction and none required tube advancement to achieve and appropriate depth. On average, these patients required 0.93 CM of retraction (ranging from 0.75 to 1.25 CM). Rotational adjustment was required for 20% of patients. Among these patients, counterclockwise rotation was needed in 40% of patients and clockwise adjustment was required for 60% of patients. 8% of patients required both tube retraction and rotational adjustments prior to surgery.

Of the 297 patients in this series, 3 patients were lost to follow-up or moved out of state. One patient underwent a right thyroid lobectomy and suffered a left vocal fold paresis secondary to endotracheal cuff injury, which later resolved. Another patient with a 19 × 18 CM thyroid mass had inadvertent severance of the left RLN, which was recognized and repaired intraoperatively. There were 5 instances of transient vocal fold paresis, which all resolved spontaneously. The remaining patients had normal vocal fold function at their first postoperative follow-up examination.
Discussion

The use of the NIM system is fraught with several potential issues regarding the position of the endotracheal tube electrodes. This type of issue has been reported in 3.8% to 23% of patients undergoing NIM thyroidectomy. It is believed that a right-handed anesthesiologist tends to rotate the tube clockwise to approximately 30° when intubating the patient. This rotational error would require a counterclockwise rotation to properly align the NIM tube electrodes within the larynx. However, only 40.2% of our patients required counterclockwise tube correction. Additionally, in a study by Lu et al, among patients requiring tube adjustment after intubation, about 50% required tube advancement and 50% required retraction. However, in the current series, instances of tube retraction were far more common than tube advancement.

The difference between adequate NIM tube placement and optimal NIM tube placement in terms of reliability of the NIM system is not known. However, 2 separate studies revealed significantly decreased EMG amplitudes when the endotracheal tube was displaced by depth and rotation, which raises concern for a lack of reliability when the tube is malpositioned.

In the senior author’s experience, the use of the GlideScope has only been utilized for the past decade. However, in several previous series of thyroidectomies where tube position was not verified, there were few instances of NIM system failure related to tube placement. The NIM endotracheal tube has a long area wired for laryngeal contact, and it may be that this “sweet spot” allows the NIM system to function with tube placement that is not always optimal.

Even within the small subset of patients initially intubated with the GlideScope, repositioning of the endotracheal tube was frequent. Thus, it seems that following initial intubation with a traditional laryngoscope or the GlideScope, the position of the endotracheal tube needs to be rechecked once patient positioning for surgery is completed.

The true advantage of GlideScope verification and optimization of NIM tube placement is that it eliminates tube placement from the list of potential causes of a nonfunctioning nerve monitor, which may be encountered during thyroidectomy.

Conclusions

After initial intubation and patient positioning, NIM tube displacement occurs frequently. The use of the GlideScope permits optimal placement of the NIM tube prior to initiation of thyroidectomy. It promotes communication to assure optimal tube placement by both anesthesiologists and the otolaryngologist—head and neck surgeon. Confirming NIM tube position with the GlideScope also eliminates tube dislocation as a possible reason for a nonfunctioning NIM system. It is noninvasive, inexpensive, and usually requires less than 1 to 2 minutes to verify tube placement and adjust the tube as needed. The use of the GlideScope in this situation is recommended.

Authors’ Note

Preliminary data were presented as a poster at: the Triological Society’s Annual Meeting; April 10-13, 2013; Orlando, FL. Level of Evidence: 4

Declaration of Conflicting Interests

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