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Original Research Article

A Novel Technique for Nasogastric Tube Insertion in Intubated Patients using Endotracheal Tube

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Conflict of interest: Nil

Abstract

Aim: The objective of the present study was to investigate novel technique for nasogastric tube insertion in intubated patients using endotracheal tube.

Methods: The study was conducted after obtaining a proper informed consent, in a total of 20 patients, who were studied in ICU and OT of Department of Anaesthesiology, Critical Care and Pain Management, SRMS-IMS from August 2022 – September 2022. Using laryngoscope with minimal positioning, appropriate size endotracheal tube was used as conduit after cutting it transversely throughout its length and was advanced till it reached oesophagus following which nasogastric tube was passed through more patent nostril and was directed into conduit endotracheal tube till full length and following conduit was removed.

Results: 20 patients were enrolled into this study. There were no statistically significant differences in the demographic data (age, gender, height, weight, and ASA physical status classification). The heart rate and mean arterial pressure before and after the procedure were found comparable. The overall success rate was 85%. Kinking of the NGT and nasal mucosal bleeding were the most common complications. Kinking of the NGT occurred in 2 patients.

Conclusion: The technique is easy and helpful for nasogastric insertion in unconscious intubated patients. Additionally, it neither alters vital responses nor increases intracranial pressure like with laryngoscopy. It is worth considering this approach as one of the maneuver in intubated patients (whether easy or anticipated difficult airway) for nasogastric tube insertion as first and last resort.

Keywords: nasogastric intubation, endotracheal tube, intubation.

Introduction

Insertion of nasogastric tube (NGT) is an essential procedure for several abdominal as well as thoracic surgeries and is often performed by anaesthesiologists in the operating room (OR). Conventional insertion of NGT in anaesthetised, paralysed, and intubated patient is often a

difficult and challenging job with a failure rate as high as 50% in the first attempt. [1]

According to the conventional method, NGT is inserted blindly through the nasal route with the head in a neutral position without instrumental assistance or any external laryngeal manipulation. The distal portion of the NGT has multiple apertures (the weakest part) making it susceptible to kink, coil, and knot. [2] The kinked or knotted NGT and the rugged wall due to apertures may invite mucosal tear leading to bleeding. Many modifications of conventional technique, such as head flexion, [1] lateral neck pressure, [3] neck flexion and lateral pressure [4,5] reverse Sellick's manoeuvre, [6] frozen NGT, [7] etc., – all have been tried to facilitate the NGT insertion and found better than conventional technique.

It has been acknowledged that most difficulties in NGT insertions are due to anatomic reasons. [8] The most common sites of impaction are the piriform sinus, the arytenoids cartilage [6,8] and the esophagus, which becomes compressed by the inflated cuff of an endotracheal tube. Another important issue concerns the material properties of the NGT. The NGT is usually made of polyurethane, which makes the NGT soft and less traumatic. It is not easy to guide the tube when using a small, soft, or long caliber instrument and the NGT tends to coil or kink when encountering an anatomic block. After a failed passage, the NGT is warmed by body heat and becomes softer and more likely to coil during the next attempt. A silicone stomach tube is more pliable and thus more difficult to insert. [9] Additionally, there are four non-opposing lateral eyes on the distal part of a common NGT. These eyes result in an incomplete caliber, as there are weak points on the distal end. The end of the NGT is easy to bend, and can kink when passing through an indirect or narrow passage or tunnel. Sometimes the NGT is already slightly folded by the package or is compressed by the outer caliber segments rolled up in a storage bag which also contributes to weak points during placement.

In 2008, the "throat pack in situ" method was mentioned as a novel method by Walker [10] who first mentioned that NGT can be placed even with after the throat pack application following endotracheal intubation. The throat pack in situ is expected to obliterate or reduce the space in oropharynx, thereby can reduce the chance of deviation of NGT into oral cavity. Thus, the throat pack in situ can direct the NGT to its natural or intended path. According to Walker's observations, the NGT was found to enter straight into the stomach almost always. Unfortunately, Walker did not further evaluate this novel method through a clinical investigation to explore different data regarding NGT placement. Subsequently, only one clinical investigation [11] assessed this method in pediatric population and reported 88% success rate with the first attempt in comparison with "blind" technique. However, this technique needs further evaluation as it appears to challenge the common notion that NGT placement would not be feasible in the presence of throat pack. Besides, this novel technique has been evaluated only in pediatric population. These areas have been detected as lacunae in the existing literature. Combination of different methods has been utilized in the past in the hope that it would increase the success rate further for the proper placement of NGT. [12]

The objective of the present study was to investigate novel technique for nasogastric tube insertion in intubated patients using endotracheal tube.

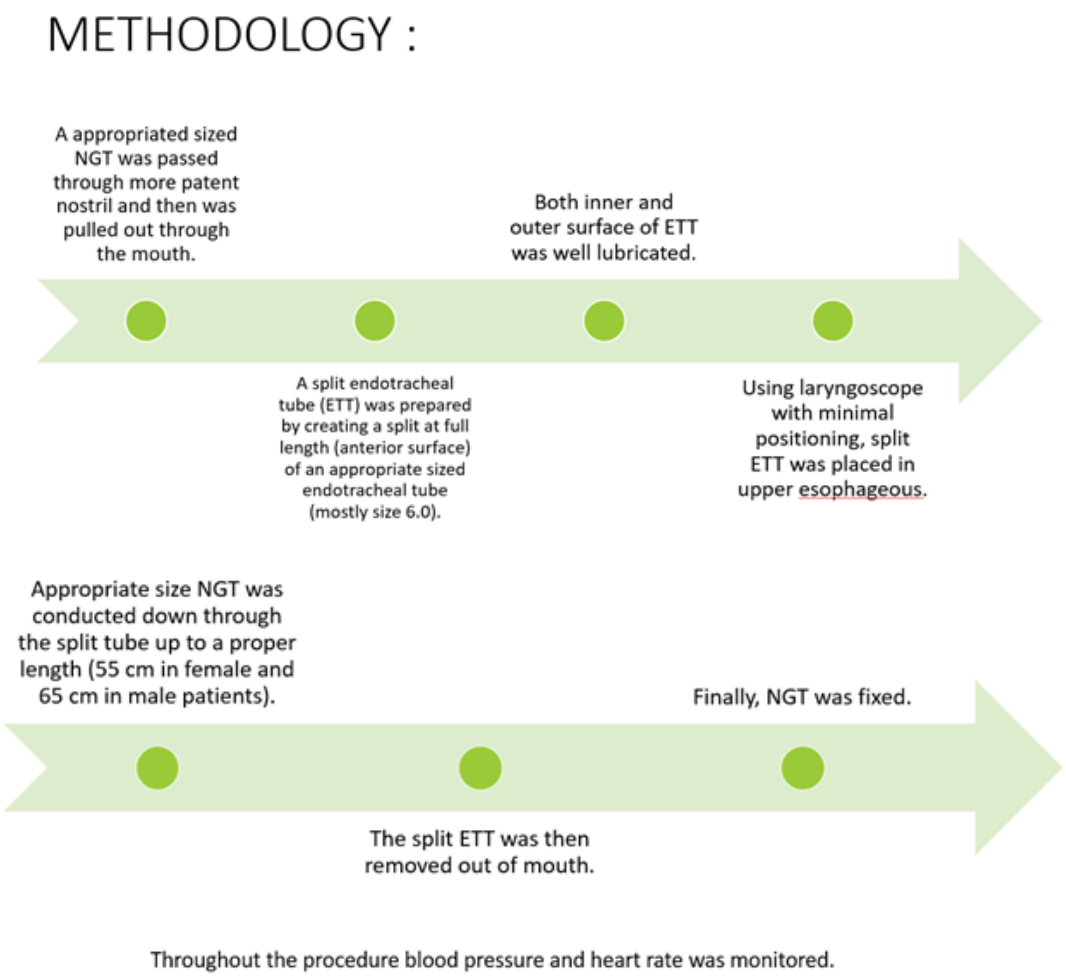
Materials and Methods

The study was conducted after obtaining a proper informed consent, in a total of 20 patients, who were studied in ICU and OT of Department of Anaesthesiology, Critical Care and Pain Management, SRMS-IMS from August 2022 – September 2022.

Using laryngoscope with minimal positioning, appropriate sized endotracheal tube was used as conduit after cutting it transversely throughout its length and was advanced till it reached oesophagus following which nasogastric tube was passed through more patent nostril and was directed into conduit endotracheal tube till full length and following it conduit was removed.

Patients with a history of coagulopathy, nasal stenosis, upper respiratory tract anomalies, esophageal varix, esophageal hiatus hernia and loose teeth were excluded. On patient's arrival to the operating room, a peripheral venous catheter was established. Standard monitoring was included non-invasive blood pressure, five-lead electrocardiography and pulse oximetry. In all patients, general anesthesia was induced with intravenous propofol 2 mg.kg−1, fentanyl 2 g.kg−1, vecuronium 0.12 mg.kg−1. All patients were tracheally intubated, with a 7.5 mm internal diameter endotracheal tube in females and an 8.0 mm internal diameter endotracheal tube in males. Anesthesia was maintained with 2-3% isoflurane, 50% nitrous oxide and 50% oxygen, with positive pressure ventilation.

Methodology



An appropriated sized NGT was passed through more patent nostril and then was pulled out through the mouth. A split endotracheal tube (ETT) was prepared by creating a split at full length (anterior surface) of an appropriate sized endotracheal tube (mostly size 6.0). Both inner and outer surface of ETT was well

lubricated using water soluble jelly. Using laryngoscope with minimal positioning, split ETT was placed in upper esophageous. Appropriate size NGT was conducted through the split tube up to a proper length (55 cm in female and 65 cm in male patients). The split ETT was then removed out of mouth. Finally, NGT was fixed.

In all procedures, successful insertion was confirmed by hearing the gurgling sounds of auscultation over the epigastrium when injecting 10 mL of air via the NG tube. All patients were examined by direct laryngoscopy in terms of oral mucosal bleeding after nasotracheal tube placement. The duration of insertion time was measured with a stopwatch by an assistant. Duration of insertion time was defined as the start when the NG tube was inserted through the nostril and as the end when the successful insertion was confirmed in first attempt. If the first attempt failed; the NG tube was fully withdrawn, cleaned, lubricated. Endotracheal tube assisted technique were repeated using the same technique. If two attempts for insertion were unsuccessful; the selected technique was considered as a failure. NG tube was inserted with the assistance of a laryngoscope and Magill forceps under direct vision in all failed procedures. When more than one attempt was required, NG tube insertion times for each attempt were summed, but times between attempts which included cleaning and relubricating of NG tube were neglected. Success rate of the selected technique (first attempt, second attempt and overall), duration of insertion for selected technique, complications such as kinking and mucosal bleeding were noted.

The data were analysed using Statistical Package for Social Sciences version 22.0 for Windows (IBM Corp. Released 2013. IBM SPSS Statistics for Windows, Version 22.0. Armonk, NY: IBM Corp.). The continuous variables such as age, height, weight, BMI, and procedure time for insertion of NGT in seconds were calculated using one‑way analysis of variance (ANOVA). Intergroup analysis of heart rates and MAP at any point of time was performed using one‑way ANOVA. Intragroup comparisons of mean HR and MAP before and after insertion of NGT were performed using paired t‑test. The remaining categorical variables analysed using the Pearson Chi‑square test. A P value < 0.05 was taken to be statistically significant.

Results

Table 1: Patient characteristics

Age (yr)	54.3 ± 10.076
Height (cm)	162.224 ± 8.428
Weight (kg)	63.318 ± 11.605
Gender (male/female)	8/12
ASA class, n (%)	2.22 ± 0.507
I	1 (5)
II	14 (70)
III	5 (20)

20 patients were enrolled into this study. There were no statistically significant differences in the demographic data (age, gender, height, weight, and ASA physical status classification).

Table 2: Heart rates and mean arterial pressure before and after the procedure

Parameters	Hemodynamics	
	HR (bpm)	MAP (mm Hg)
Before	74.78±8.86	77.97±9.08
After	74.86±8.87	77.98±9.10

The heart rate and mean arterial pressure before and after the procedure were found comparable.

Table 3: Success rate and procedure times

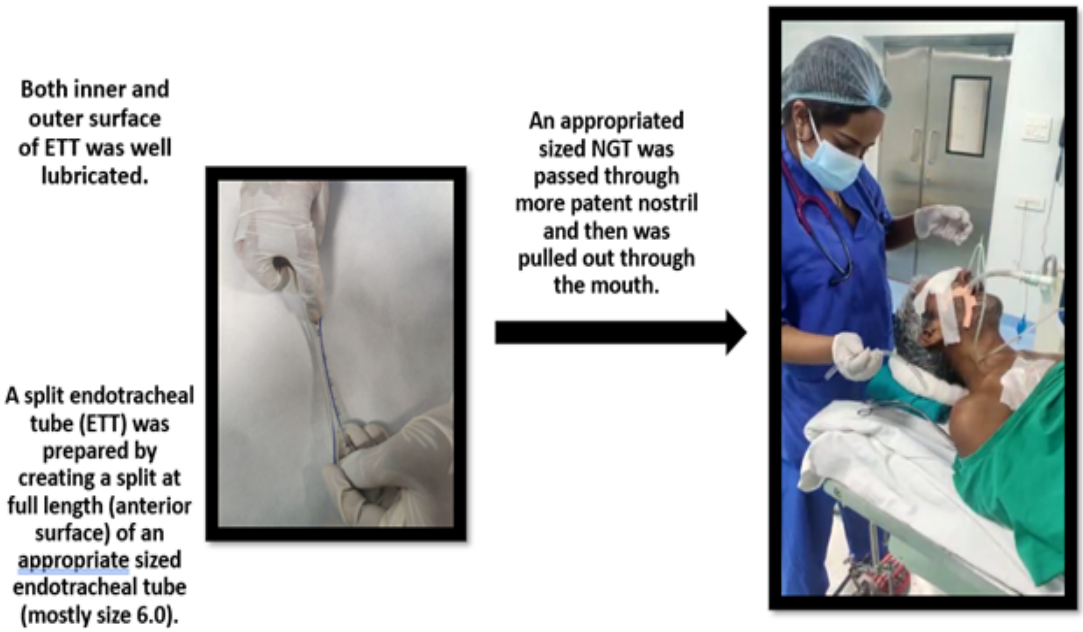
Success rate	
Overall success, n (%)	17
Unsuccessful	3
Procedure times (s)	42.2±21.4

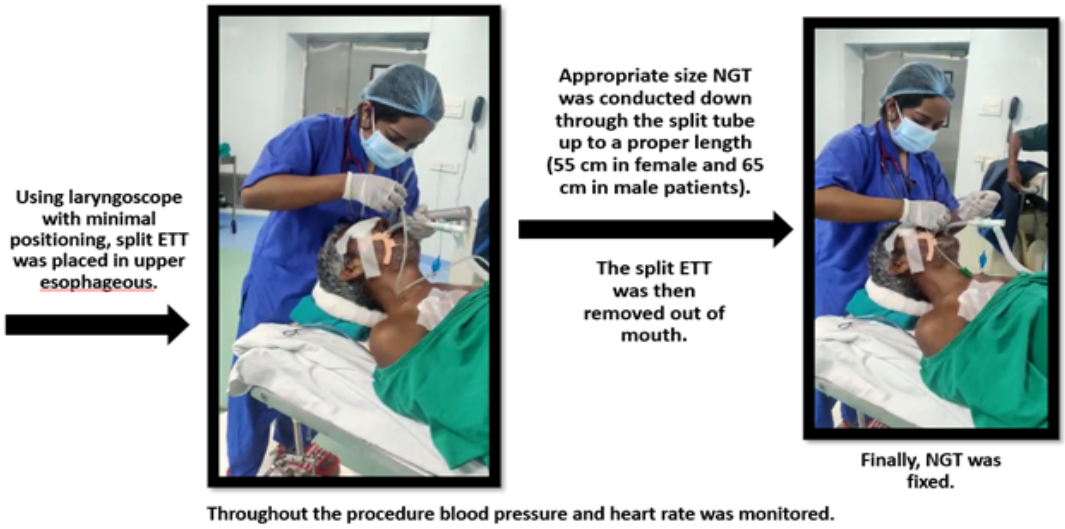
The overall success rate was 85%.

Table 4: Total time for insertion and complications

Total time for insertion (s)	39.5 ± 19.5
Complication, n (%)	
Kinking	2
Bleeding	1

Kinking of the NGT and nasal mucosal bleeding were the most common complications. Kinking of the NGT occurred in 2 patients.





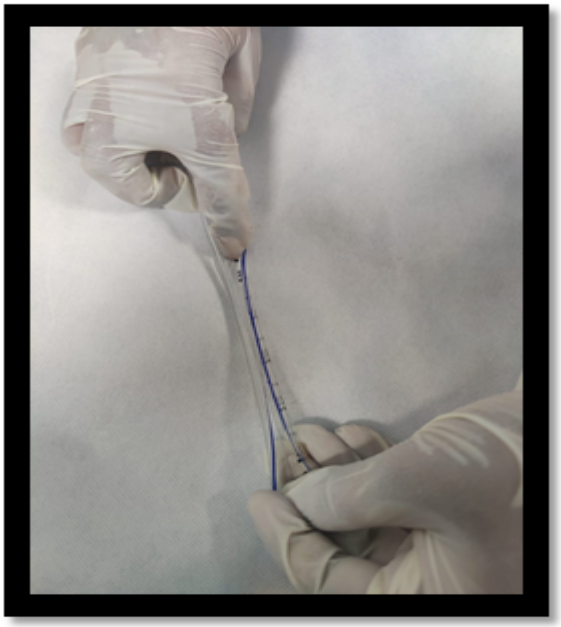


Figure 1: A split endotracheal tube (ETT) was prepared by creating a split at full length (anterior surface) of an appropriate sized endotracheal tube (mostly size 6.0). Both inner and outer surface of ETT was well lubricated.

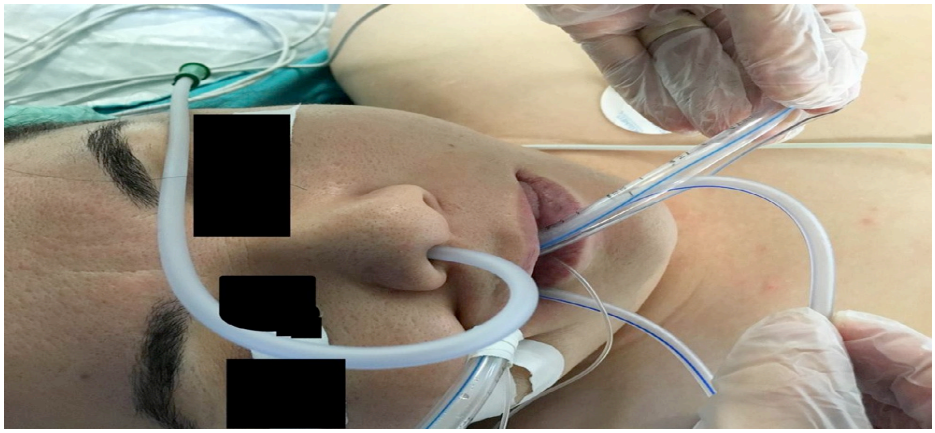


Figure 2: Endotracheal tube assisted technique

Discussion

With the proven supremacy of enteral nutrition, nasogastric (NG) tube insertion is now a must to deliver nutrition or medication in hospital wards and intensive care. [15] Patient cooperation by swallowing on instruction while inserting an NG tube is important. As unconscious patients cannot follow the swallowing instructions, NG tube insertion in an unconscious intubated patient may be difficult, often having high first attempt failure rates (nearly 50%). [16] After each unsuccessful insertion, incidences of mucosal bleeding and hemodynamic complication increase. [7]

Inserting a nasogastric tube into anesthetized and intubated patients is sometimes very difficult and traumatic. After several failed attempts, complication rates usually increase. Threading the pliable NGT through probable anatomic obstacles without any manipulations or facilities is challenging. Therefore, some authors suggest the compression of the ipsilateral lateral neck at the level and lateral border of the thyrohyoid membrane to transiently collapse the ipsilateral piriform sinus and slightly move the arytenoids cartilage so that the NGT can more easily pass through via the lateral or posterior hypopharynx. [8] Deflation of the cuff of the endotracheal tube can release the compression over the esophagus and improve NGT passage. The methods adopted, which have high success rates, include the use of a slit endotracheal tube placed via the nasoesophageal route [16], a laryngoscope with a Magil forcep [17] a GlideScope for placement, [18] or gloved finger steering to navigate the NGT. [2] However, these methods may be difficult in patients with limited mouth opening and cervical spine injuries, and some of these methods may be time-consuming in preparation or performance.

Gupta et al. [19] observed higher rate of successful NGT insertion following inflation with air in anaesthetized and intubated patients with the head in neutral position. The opening up of the collapsed upper oesophageal sphincter by this method is transient but is sufficient for the successful advancement of the NGT to reach the stomach. Reverse Sellick's manoeuvre is the technique of widening [6] the oesophageal opening mechanically while the air inflation technique of Gupta et al. [19] achieves the same with pneumatic splinting effect. Appukutty and Shroff16 reported that, when the NGT was made more rigid using oesophageal guidewire, the procedure required less number of attempts at the cost of higher incidence of adverse events such as trauma and bleeding. In the current study, the incidence of adverse events was the least in the reverse Sellick's group.

Following induction of anaesthesia and tracheal intubation, the sphincter is closed and the act of deglutition is also not possible. This might be responsible for the failure of nasogastric intubation and deflection of the NGT to the pyriform fossa. [19] Moreover, the inflated tracheal cuff may create some posterior bulge towards oesophageal wall and transmits pressure; thereby, put some hindrance for smooth passage of NGT. Freezing the NGT and thereby hardening it, may circumvent to some extent the above hindrance, and thus, facilitates the introduction of NGT in anaesthetised, intubated adult patients. There are quite a few methods for the confirmation of the position of NGT insertion, such as auscultation at the epigastrium of a whooshing sound by deflating a feeding syringe, aspiration of the tube content and testing of the pH of the aspirate with pH paper, capnography, and using portable X-ray. [20]

Walker, [10] the pioneer of throat pack in situ technique for NGT insertion, opined that the application of throat pack can obliterate the oropharyngeal space and thereby can facilitate the passage of NGT toward its normal path. The present

researchers have the notion that the throat pack application before the NGT placement fills up the spacious oropharynx thereby eliminating one less resistant path, that is, the oropharynx where the NGT often deviates. Thus, the propensity of the NGT to coil back in the oropharynx decreases and it is steered to its intended normal pathway, that is, the esophagus. Whenever a NGT is inserted, if it encounters any resistance during its passage it tries to move into the least resistant area, that is, the oropharynx and thus there can be kinking, coiling, or bleeding due to local trauma. After a failure, subsequent attempts of NGT placement using the same tube and utilizing the same technique can lead to the same adverse outcome owing to the "memory effect".5 The NGT loses its rigidity due to the property of thermoplasticity, also contributes to this failure.7 A throat pack obliterates or reduces the space in oropharynx there by prevents deviation of NGT into oral cavity. [10] This explains the lesser incidence of adverse events such as coiling or kinking in the combined group. [21]

Conclusion

The technique is easy and helpful for nasogastric insertion in unconscious intubated patients. Additionally, it neither alters vital responses nor increases intracranial pressure like with laryngoscopy. It is worth considering this approach as one of the maneuver in intubated patients (whether easy or anticipated difficult airway) for nasogastric tube insertion as first and last resort.

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