

Comparison of Three Techniques of Nasogastric Tube Insertion in Anaesthetised, Intubated Patients: A Study of 120 Patients

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Abstract

Background: Insertion of nasogastric tube in an anaesthetized intubated patients may be difficult as patient cannot follow the swallowing instructions and therefore have a high first attempt failure rate. We hypothesized that simple modifications in technique of NG tube insertion will improve the success rate.

Methods: A total 120 patients, aged 20 to 70 years, undergoing gastrointestinal surgeries, who required intraoperative NGT insertion were enrolled into our study. The patients were randomly allocated into 3 groups, group C: control group, group F: neck flexion with lateral neck pressure and group R: reverse Sellick's manoeuvre group. The number of attempts for successful NGT insertion, time taken for insertion and adverse events were noted.

Results: Both the two modified techniques were found more successful and comparable than the conventional method at first attempt. The least time taken for insertion was noted in the reverse Sellick's method. On intergroup analysis, neck flexion and reverse Sellick's methods were comparable but faster than the conventional method with respect to time taken for insertion and have lesser adverse effects.

Conclusion: Reverse Sellick's manoeuvre and neck flexion with lateral neck pressure are better alternatives to conventional method for successful, quick and reliable NGT insertion with minimal adverse events in anesthetized, intubated patients.

Keywords: Nasogastric tube (NGT), Reverse Sellick's manoeuvre, Neck flexion.

I. Introduction

In several abdominal surgeries, the insertion of NGT is an essential procedure and is often performed by an anaesthesiologist in operation room. Conventional insertion of a nasogastric tube in anaesthetized, paralysed, intubated patient is often a difficult and frustrating job and failure rate is higher at first attempt. So, an apparently innocuous simple procedure, it is an invasive procedure and repetitive attempts result in adverse events such as kinking, knotting and false passage as the distal portion of NGT has multiple apertures- it's weakest part. The most common sites for impaction are piriform sinus, arytenoid cartilage (1,2,4) and the oesophagus, which becomes compressed by inflated cuff of an endotracheal tube (9). Once there is a failed passage, NGT is warmed by body heat and becomes softer and more likely to coil during next attempt (8). Several modifications in the conventional technique include head flexion, reverse Sellick's manoeuvre (6), use of various forceps & endoscopes, stylets, split endotracheal tube etc. are tried with variable success rate. The present study was carried out with an aim to evaluate two modified minimally invasive methods of NGT insertion- head flexion with lateral neck pressure and reverse Sellick's manoeuvre to compare the conventional method with reference to success rate at first attempt, time taken for insertion and adverse events.

II. Methods

This prospective randomised study was conducted in patients aged 20-70 years, American Society of Anaesthesiologists physical status class I and II with normal airway (Mallampati grade 1 or 2), requiring NGT insertion. Exclusion criteria were coagulation disorders, oesophageal stenosis or varices, and the history of radiotherapy in the head and neck region. Written informed consent was obtained from all patients.

After admission of these patients, a pre-anesthetic visit was made. Before the induction of anaesthesia, the optimum nostril for NGT insertion was chosen based on the better fogging produced on a metal tongue depressor during exhalation. After premedication with glycopyrrolate (0.004 mg/kg), midazolam (0.02 mg/kg) and fentanyl (2 microgram/kg), the induction was done with thiopentone sodium (6 mg/kg) and succinylcholine (2 mg/kg) to facilitate tracheal intubation. Anaesthesia was maintained with sevoflurane and injatracurium.

Patients were randomly allocated into 3 groups: Group C (control group), Group F (neck flexion with lateral pressure), Group R (reverse Sellick's manoeuvre).

After tracheal intubation, sterile, lubricated, 14F, 105 cm ROMOLENE NGT was inserted. The NGT was featured with Luer connector at proximal end, radiopaque line throughout the length, lead markings at

the distal end and ball-weighted tip. NGT insertion was always performed by either of two experienced anesthesiologists. This was one with the aim to reduce skill bias.

We determined the necessary NGT length required to reach the stomach by measuring the distance from the patient's xiphoid process to the closer earlobe via the nose.

In group C, a lubricated NGT insertion was performed through the selected nostril, the head being maintained in a neutral position. In other two groups, a lubricated NGT was inserted through the selected nostril to a depth of 10cm. In group F, lateral neck pressure was applied at the same side as that of selected nostril with the neck flexed and the NGT was advanced in a similar manner to that described for Group C. In group R, anterior displacement (lifting) of the cricoid cartilage was done to facilitate the insertion of NGT.

The time taken for insertion (in seconds) was calculated from the initiation of NGT insertion through nostril up to successful placement of NGT within two attempts. This was measured with a stop watch. If both attempts were unsuccessful, then the technique was considered as a 'procedure failure'.

The correct placement was confirmed by observing the aspiration of gastric content from NGT or with a gurgling sound heard on auscultation over the epigastrium when injecting 10 cc of air through the NGT.

The following data were collected: number of attempts for successful NGT insertion, procedure time and adverse events during insertion like kinking, knotting, bleeding etc.

Observed data were entered into Microsoft Excel Workbook. Demographic data (age and procedure time) were given as mean ± standard deviation and were analysed with ANOVA test. Categorical data (ASA physical status classes, mallampati grades, gender distribution, insertion attempts and incidence of adverse events) were presented as number of patients (n) and were analysed by Pearson Chi-square test. Time necessary to insert the NGT and complications in each group were compared using ANOVA test. Results were considered as statistically significant when P<0.05.

III. Results

This study was conducted from April 2015 to September 2016. A total of 120 patients were enrolled for eligibility into the study. There were no statistically significant differences with regard to age, ASA grade and mallampatigrade among the three groups (table -1).

Parameters	Group C (n=40)	Group F (n=40)	Group R (n=40)	P
Age (years)	39.97±13.35	40.28±13.89	43.05±14.61	0.56
ASA I/II	26/14	22/18	27/13	0.474
MP I/II	25/15	31/9	23/17	0.145
Sex female/male	31/9	27/13	26/14	0.434

At first attempt, the highest success rate of NGT insertion was obtained in group R (82.5%,P=0.015)whereasat secondattempt, it was comparable ingroup F and group R(table-2).

Failure rate was highest in group C (42.5%). Both the modified techniques were found more successful than conventional method on first attempt (P=0.015). On intergroup analysis of the 1st attempt, reverse Sellick'smanoeuvre was found superior and significant over conventional method (P=0.004). Neck flexion technique was found comparable to reverse Sellick's method (P=0.188, non-significant) (table-2).

The least procedure time was noted in group R. Neck flexion and reverse Sellick'smethods were comparable but faster than the conventional method on intergroup comparison.

The incidence of coiling, kinking and bleeding were noted among the three groups. The highest rate of coiling and bleeding was seen in group C(42.5% & 32.5%). While the rate of kinking was comparable in all the three groups(table-3).

Parameters	Group C (n=40)	Group F (n=40)	Group R (n=40)	P
1 st attemptinsertion	21(52.5)	28(70)	33(82.5)	0.015
Intergroup analysis, P values are:0.108 C versus F; 0.004 C versus R; 0.188 F versus R				
2 nd attempt insertion	2(5)	8(20)	5(12.5)	0.001
Intergroup analysis, P values are: 0.001 C versus F; 0.001 C versus R; 0.830 F versus R				
Failure	17(42.5)	4(10)	2(5)	0.000
Intergroup analysis, P values are: 0.000 C versus F; 0.000 C versus R; 0.395F versus R				
Procedure time	48.33±6.89	38.85±6.15	36.82±6.40	0.000
Intergroup analysis, P values are:0.00 C versus F; 0.00 C versus R; 0.13 F versus R				

Table 3: Adverse events

Parameters	Group C (n=40) %	Group F (n=40) %	Group R (n=40) %	P
Coiling	17 (42.5)	6 (15)	4 (10)	0.0008
Kinking	5 (12.5)	3 (7.5)	4 (10)	0.757
Bleeding	13 (32.5)	2 (5)	1 (2.5)	0.000

IV. Discussion

Unconscious, intubated patients cannot follow the instructions to swallow like awake patients and cannot help in successful insertion of NGT. Threading the pliable NGT through anatomic obstacles without any manipulation is challenging. A common technique in the day-to-day practice involves blind nasal insertion while maintaining external laryngeal manipulation or under direct vision using a laryngoscope followed by instrumentation with Magill's forceps. Several methods have been described with varying degree of success.

In neck flexion with lateral neck pressure method, the compression of the ipsilateral lateral neck at the level and lateral border of the thyrohyoid membrane to transiently collapse the ipsilateral piriform sinus, slightly move the arytenoids cartilage so that the NGT can more easily pass through via the lateral or posterior hypopharynx(9).

Reverse Sellick's manoeuvre lifts the cricoid cartilage anteriorly(6). The anterior displacement helps to open the oesophagus more widely thus easing the passage of NGT.

In the present study, a higher success rate for NGT insertion was found in the reverse Sellick's manoeuvre group(82.5%), followed by neck flexion with lateral neck pressure group(70%) compare to the conventional group (52.5%). The neck flexion with lateral pressure group appeared to be an attractive alternative to the conventional method considering the intergroup analysis. The overall success rate of two modified techniques for NGT insertion in the present study was comparable with the observations of Appukutty and Shroff(1). Considering to attempts we found 95% success rate with reverse Sellick's manoeuvre.

Ratzlaff et al.(7) found that the degree of NGT flexibility significantly affected the ease with which the NGT was inserted and also reported that the rigid tubes required fewer insertion attempts. The different methods for increasing the rigidity of tube include immersion of the NGT in ice-cold water, keeping the NGT in a refrigerator, using a water-fill method, freezing the NGT with distilled water or choosing a large calibre NGT etc significantly reduce NGT kinking but takes longer time for insertion. In our study, the time required for insertion of the NGT in group C was 48.33±6.89 seconds. In group F & group R, insertion time was only 38.85±6.15 and 36.82±6.40 seconds respectively which was shorter than group C.

Incidence of coiling and kinking also complicate the situation. Coiling around the epiglottis in non-intubated patients may present with choking, respiratory distress, tachypnea and cyanosis leading to morbidity. Accidental insertion of NGT into the tracheobronchial tree may cause morbidities like pneumothorax, haemothorax or even death. In guidewire assisted technique, there are less chances of coiling and no kinking according to Mohan Chandra Mandal et al(4) but more chances of bleeding. In neck flexion and reverse Sellick's methods, there are very less chances of kinking and bleeding with shorter time for insertion. Our study supports this theory.

Forward displacement of the larynx occasionally causes bradycardia via vasovagal reflex due to compression of the bilateral carotid arteries. Forward neck flexion sometimes causes increased peak pressure of airway, when the endotracheal tube bends but we didn't encounter such events in any of the patient(4).

pH testing and X-rays are the two first-line tests for confirmation of correct placement of NGT. Calorimetric carbon dioxide indicator device, endoscopy, ultrasonography, fluoroscopy and magnet tracking are the other reported methods available for confirmation of the right placement. The 'bubble technique' is also a safe, simple and economical technique for NGT placement confirmation. Auscultation method is largely discredited if used on its own. We used this simple test in spite of above limitations owing to feasibility ground according to Mohan Chandra et al (4). This remains as a major limitation of the present study. We could not incorporate the obese, obstetric, paediatric and emergency patients with a full stomach in the present study. In future, larger studies involving those populations may consolidate the suitability of these modified techniques and may establish the superiority of any one technique in those difficult or special situations.

V. Conclusion

The present study indicates that reverse Sellick's manoeuvre and neck flexion with lateral neck pressure, both are better alternatives to conventional method for successful, quick and reliable NGT insertion with acceptable adverse events in anaesthetised, intubated adult patients. An extended study after elimination of the major limitations of the present study is warranted to establish the superiority of anyone of these modified techniques.

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