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Original Article

Effect of Bougie-Guided Nasal Intubations upon Bleeding: A Randomised Controlled Trial

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Abstract

Objective: Bleeding due to inadvertent trauma is a troublesome complication of nasal intubations. A lot of methods have been suggested to minimise this problem. A flexible bougie can be passed atraumatically via the nasal route to the trachea and an appropriate-sized endotracheal tube can be railroaded over it to avoid this problem. The primary objective of the study was to compare the severity of bleeding with bougie-guided and conventional nasotracheal intubations on a subjective scale. The time taken for successful intubations and the number of attempts required were also noted.

Methods: This randomised controlled study was performed in 40 adult patients requiring nasotracheal intubations for various elective surgeries over a 3-month period in a teaching hospital. The patients after satisfying the inclusion criteria were randomised into two groups of 20 each: Bougie-guided (Group B) and Not Bougie-guided (Group NB). Group B patients were intubated by railroading the endotracheal tube over a flexible bougie, and Group NB patients were intubated conventionally without the bougie. The degree of bleeding was noted on a subjective scale as nil, mild, moderate or severe. The time taken for intubation in seconds and the number of attempts taken were noted. The degree of bleeding was compared using Mann–Whitney U test, and the time taken for intubation was compared using the Student's t test after assessing normalcy. An alpha error of 5% was used, and p values less than 0.05% were considered significant.

Results: All patients randomised completed the study. The degree of bleeding was lesser in the Bougie-guided group than in the conventional group ($p=0.02$), and the time taken for intubation was longer in the bougie-guided group ($p<0.01$)

Conclusion: Using a bougie routinely for nasal intubations might minimise trauma during nasal intubations but increase the time taken for intubation marginally. The success rates for intubations may also be better.

Keywords: Bleeding, bougie, nasal intubations

Introduction

Familiarity with different airway management options is an essential skill for anaesthesiologists. Nasal intubation is routinely done for several head and neck surgeries to facilitate easy surgical access to the oral cavity. The tube is more secure and has lesser risk of kinking due to airway instrumentations. Postoperatively, the tube is also better tolerated by the patients and can decrease sedation requirements. One of the main problems in nasal intubation is bleeding, the incidence of which can range from 17% to 80% (1). Bleeding might hinder effective glottis visualisation and when severe poses the risk of aspiration. The tube can also get blocked by dislodged tissues and needs replacement or causes acute airway obstruction (2). Choosing an appropriate-sized endotracheal tube is also difficult, and sometimes there is a need to replace the tube with a smaller one. Removing the tube might cause more bleeding as the tamponade effect is lost, making subsequent visualisations difficult.

A lot of measures have been employed to minimise bleeding during nasotracheal intubations, which include topical vasoconstrictors, liberal lubrication, warming the endotracheal tube and passing a red rubber catheter (1) or a ureteric catheter attached to the proximal end of the endotracheal tube (3).

Passing a flexible bougie first is an atraumatic approach and makes subsequent tube changings easier. The technique was described in a case series of 16 patients who could not be intubated by conventional techniques (4). In difficult nasal intu-

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bations also, bougie-guided intubations have been used with success (5, 6).

Although bougie-guided nasal intubation has been described by several authors, only few randomised controlled trials have compared nasal intubation with and without bougie in terms of severity of bleeding. In this randomised controlled trial, 40 subsequent patients requiring nasal intubations were intubated with or without the bougie, and the incidence of bleeding was noted. The primary objective of the study was to compare the severity of bleeding in bougie-guided nasal intubations with conventional endotracheal intubations. The time taken for a successful intubation (from the time of removing the face mask till the appearance of an end tidal carbon dioxide ($EtCO_2$) tracing) and the number of attempts were also noted.

Methods

The study was conducted in a teaching hospital in India over a 3-month period. After obtaining ethics committee approval, 40 subsequent adult patients (older than 18 years) undergoing elective surgical procedures requiring nasal intubations were recruited for the study. Inclusion criteria were adult patients of the American society of Anaesthesiologists (ASA) physical status 1, 2 and 3, undergoing elective surgeries requiring nasotracheal intubations. Exclusion criteria were patients with bleeding diathesis, maxillary trauma, anatomical deformities predicting difficult intubation, compromised nasal patency, uncontrolled hypertension and ASA physical status 4. Informed written consent was obtained from all patients. The study was designed in accordance with the ethical standards guidelines provided by the Helsinki declaration. All patients were premedicated with oral diazepam the night before, and nasal decongestants (oxymetazoline 0.05%) were administered 15 minutes before the procedure. The patients were randomised into two groups: Group B and Group NB by computer-generated randomisation tables. After pre-oxygenation, all patients were induced with fentanyl, propofol and vecuronium intravenously in doses deemed appropriate by the anaesthesiologist. Routine monitoring by pulse oximetry, non-invasive blood pressure, electrocardiogram and $EtCO_2$ monitoring were used in all patients.

In Group B, a Talwalkar's bougie (flexible bougie of 4 mm diameter and 700 mm length, Figure 1) was gently introduced through the selected nostril till it reached the oropharynx. A Macintosh blade was introduced, and a pair of Magill's forceps was used to guide the bougie through the glottis. The endotracheal tube of appropriate size was threaded over the bougie into the glottis under direct vision. The following measures were done if difficulty in passing the tube beyond the glottis was encountered-removing the laryngoscope and flexing the neck, rotating the tube so the bevel faces laterally, tube removed and smaller size introduced. Group NB was intubated conventionally. Bleeding was assessed using a subjective scale as 0 - No bleeding, 1 - Minimal bleeding not requiring suctioning, 2 - Moderate requiring suctioning but not hampering visualisation and 3 - Severe requiring suctioning and hampering visualisation.

All patients were intubated by the same operator who was an experienced anaesthesiologist with over 10 years of practice. The time taken for the intubation (time of face mask removal till appearance of $EtCO_2$ tracing), number of attempts and hemodynamic changes before and after intubation and any complications were also noted.

Statistical analysis

Statistical analysis was performed using Microsoft Excel 2016 with Realstatistics add on package. Shapiro-Wilk test was used to test normal distribution of interval data. Mann-Whitney U test was used to compare ordinal data (Degree of bleeding), and the Student's t test was used to analyse parametric data (time taken for intubation, number of attempts). Categorical data was compared using Chi -Squared test and Fishers Exact test for smaller values (less than 5) in contingency tables. An alpha error of 5% was used, and p values less than 0.05 were considered significant.

Results

Baseline characteristics such as age, sex ratio, body mass index, neck circumference and Mallampatti grading were similar in both groups (Table 1). The number of patients with nil, mild, moderate and severe bleeding degrees, respectively, were 11, 7 and 2 and 0 in Group B and 3, 12, 4 and 1 in Group NB. The first pass success rates were 98% in Group B and 90% in Group NB. The time taken for successful intubation was 30.45 ± 2.8 and 18.25 ± 2.4 s in groups B and NB, respectively (Table 2). The inability to negotiate the tube beyond the glottis was noted in three patients in NB group and none in B group.

Discussion

Various measures have been advocated to manage bleeding during nasotracheal intubations. Most of the time the bleeding is due to mucosal injury and is self-limiting. Keeping a suction catheter inside the tube has also been suggested to prevent occlusion of tube due to tissues and clear the secretions as the tube is advanced. Such telescoping has shown to decrease bleeding (7). However, this method can create a

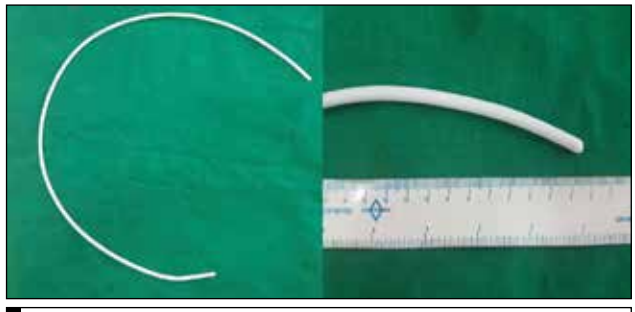

Figure 1. Talwalkar's bougie

rough edge at the juncture of the catheter and tip of the tube. Serial dilatation of nasal passages is advocated by some practitioners, but it consumes time and still can cause trauma. Warming and softening of the tube can reduce trauma but can distort the tube also (8).

Bleeding can also cause impairment of glottis visualisation and aspiration, which can be prevented by passing a bougie first atraumatically and threading the endotracheal tube over it. Any trauma caused by the leading edge of the tube may not affect intubation, as the bleeding might be sealed by the tamponade effect of the tube. Gum elastic bougie (GEB) has been used successfully for nasal intubation in patients where conventional intubation failed (4), and it has also been recommended that GEB guidance be used in first attempt in all cases.

The Seldinger technique of passing the bougie and railroading the endotracheal tube was also reported by Abrons et al. (9) in 2016 as a case series of three patients. However, randomised controlled trials analysing the effect of bougie guidance on bleeding is lacking. We have analysed the severity of bleeding with the Seldinger technique on a subjective scale in this randomised trial.

Several authors have used a suction cannula inside the lumen of the endotracheal tube, covering the tip and bevel of the tube with red rubber tube etc., each method poses its own problem. Any foreign body used to cover the bevel of the tube poses a risk of dislodgement and aspiration. Using a suction cannula may not reduce trauma but only helps in visualisation of the glottis, excessive suctioning can also cause atelectasis.

As expected, the incidence of bleeding was significantly lower in the Bougie-guided group than in the without Bougie group. The ease of insertion was also better in the bougie group. The operator felt the white colour of the Talwalkar's bougie made the visualisation of the bougie better as compared to the transparent endotracheal tube. A snug fit between the introducer bougie and the endotracheal tube has been deemed essential in preventing tissues getting in between the bougie and the bevel of the endotracheal tube (10). This was not achievable with our technique, but we did not encounter this problem in any of our subjects.

Some of the limitations of this study are the small sample size, using a subjective scale as a primary objective and lack of blinding. A post hoc power analysis using a Type I error of 0.05% and the incidence of bleeding as 45% and 85% showed a power of 77.7%. For a power of 80 and alpha error of 5%, to detect a 30% difference in the severity of bleeding, a sample size of 98 is needed on the basis of standard deviations from previous studies which have used incidence of bleeding after intubations as the primary objective. In a similar study (11) assessing the effectiveness of a red rubber catheter to cover the endotracheal tube, a blinded observer, the surgeon, was asked to assess the bleeding before the surgery. We felt that an immediate assessment of bleeding might be more accurate (as trivial bleeding might stop after the bleeding time) and more practical. Further large-scale trials would establish the usefulness of this technique when routinely used for nasal intubations.

Table 1. Baseline characteristics

Parameter	Group B	Group NB	Significance
Age (in Years, Mean±SD)	42.25±2.9	47.5±1.3	No (p=0.26)
Sex (Male:Female)	2.3:1	1.6:1	No (p=0.32)
BMI (kg m^{-2}, Mean±SD)	28.7±1.89	29.1±2.6	No (p=0.57)
Neck circumference (cms)	35±3.46	36.85±3.28	No (p=0.1)
Mallampatti (1 or 2 /3 or 4)	18/2	16/4	No (p=0.37)

Group B- Bougie-guided; Group NB: No bougie; SD: standard deviation

Conclusion

Using a bougie to aid nasal intubations will help in minimising the severity of bleeding which might help in increasing

Table 2. Grading of bleeding, success rates and time taken for intubations

Parameter		Group B	Group NB	Significance
Bleeding	Nil	11	3	Mann-Whitney
	Mild	7	12	U = 113.5
	Moderate	2	4	p=0.0198
	Severe	0	1	Significant
First pass success		19/20	18/20	
Time taken for intubation in successful attempt (Seconds, Mean±SD)		30.45±2.83	18.25±2.42	p<0.01, Significant

Group B: Bougie-guided; Group NB: No bougie; SD: standard deviation

the success rate of intubations. Further large-scale trials are warranted for applying this simple but effective method routinely during nasal intubations.

Ethics Committee Approval: Ethics committee approval was received for this study from the ethics committee of Vinayaka Missions Medical College.

Informed Consent: Written informed consent was obtained from patients who participated in this study.

Peer-review: Externally peer-reviewed.

Author Contributions: Concept – P.V., D.K.T.; Design – P.V., D.K.T.; Supervision – D.K.T.; Resources – P.V., D.K.T.; Materials – P.V.; Data Collection and/or Processing – D.K.T.; Analysis and/or Interpretation – P.V.; Literature Search – D.K.T.; Writing Manuscript – P.V.; Critical Review – D.K.T.

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