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Original Research Article

Nasotracheal vs. blind bougie insertion or bougie through nasal airway followed by tracheal intubation: A prospective randomised, controlled trial

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Abstract

Background: Nasotracheal intubation consists of blind nasal passage and external manipulation of the endotracheal tube through the glottis (‘conventional technique’), a technique associated with a high incidence of nasal trauma, bleeding and tube cuff damage.

Aims: Aim of our technique to compare old blind technique with new tech niques for ease of intubation using bougie and nasal airway with bougie techniques which facilitate ease of intubation and reduce nasopharyngeal trauma, pain and bleeding.

Settings and Design: These techniques including routine post-induction nasotracheal intubation by blindly passing a nasotracheal tube vs. passing a bougie blindly (‘bougie technique’) verses using a nasopharyngeal airway to guide bougie for nasotracheal for tracheal intubation.

Methods and Material: One hundred fifty adult patients were randomly assigned to three groups A, B and C50 each for the blind techquine, bougie technique and combined nasal airway bougie technique.

Statistical analysis used: social science statistical analysis.

Results: Significant intergroup difference was observed with intubation timings with groups A to B&C (p = 0.0027). The groups B and C showed no significant (p =0.1699) and bleeding during intubation. Differences were observed in bleeding 5 min after intubation or postoperative epistaxis in groups. No inter-group differences were observed in complications related to nasal intubation and nasal pain.

Conclusion: Nasal intubation over a bougie or passing bougie through nasal airwayis as successful as the conventional technique; it also significantly decreases both the incidence and severity of nasopharyngeal trauma and complications

Keywords: Bougie, nasopharyngeal airway, magill’s forceps, nasotracheal intubation, xylometazoline

Introduction

Nasotracheal intubation is commonly used when difficult orotracheal intubation is anticipated or when a nasal tube will improve surgical exposure. Conventionally, routine anaesthetised (i.e. post induction) nasotracheal intubation by initial blind passage of a tracheal tube via the nares up to oropharynx, followed by laryngoscopy-assisted passage through the glottis, with

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or without the aid of Magill forceps ('conventional technique'). Because the nasal mucosa is highly vascular, the conventional technique is reported to have an epitasis rate of approximately 54% [1, 2]. Less common are avulsion of structures within the nasal cavity and dissection of the retropharyngeal mucosa may also occur [3, 4], as well as bacteraemia secondary to the disruption of the nasal mucosa. Slight modifications to the conventional technique have been used to decrease the trauma associated with the passage of a tube through the nasal cavity and pre-treatment of the nasopharynx with a topical vasoconstrictor [5].

Nasotracheal intubation over a bougie is placed via a nasopharyngeal airway and to evaluate its effectiveness. This technique builds upon earlier work of bougie-guided nasal intubation with the addition of a well lubricated nasopharyngeal airway, which acts to protect the nasal cavity and direct the bougie towards the glottis. Nasotracheal intubation (NTI) is frequently performed for oral and maxillofacial surgeries. However, the nasal cavity is very narrow and has a large distribution of blood vessels; hence, the mucosa of the nasal cavity is very fragile. Severe complications can occur during NTI, including bleeding, laceration of the mucosa, and trauma to the nasopharyngeal airway. To decrease these complications, various methods have been developed, including lubrication with a water-soluble jelly, atraumatic tube design, use of topical vasoconstrictors, thermo-softening of the endotracheal tube (ETT), and obturation of the tube tip with a balloon or bougie [6]. Of these methods, topical vasoconstrictors (cocaine, epinephrine, phenylephrine, xylometazoline and oxymetazoline) have been used to decrease epistaxis and have shown similar reduction in the incidence of epistaxis. A conventional method using vasoconstrictors utilizes nasal packing with cotton swabs moistened with a vasoconstrictor and water-soluble jelly mixture. However, this method may induce discomfort or pain even with the use of topical anesthetics, to the point that some patients would refuse to cooperate. Thus, we usually initiate nasal packing after the induction of general anesthesia [7].

Patients and Methods

Source of data

Study was conducted in the department of Anesthesiology, at Kamineni Institute of Medical, Sciences Sreepuram Narketpally, Nalgonda Dist., for nasal intubation during period of October 2019 June to July 2022.

Methodology

Study design: Randomized controlled study after approval from Institutional ethical committee.

Sample size: Three groups of 50 subjects each.
Duration of study: 37 months.
Sampling Method: Computer generated simple random number method.

Inclusion criteria

Patients of either gender who consented for oral surgeries between aged 20-60 years, belonging to ASA-I, II & III, weighing between 50-85 kgs and height 152-175 cm were included for the study.

Exclusion criteria

Patients with ASA grade IV and above, Bleeding disorders, Coagulopathy (clotting disorders),Apnea (a condition in which breathing stops due to obstruction in the upper respiratory system) Large nasal polyps (fleshy growths in the nose), Suspected nasal foreign bodies, recent nasal surgery, Infection in your upper neck, history of frequent episodes of epistaxis and contra indication to nasal intubation were excluded.

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Method of collection of data

150 patients aged between 20 years and 60 years of physical status ASA grade I, II and III undergoing oral, maxilla-facial surgeries were included in the study after ethical clearance from the college ethical committee. All patients were visited preoperatively and detailed preanaesthetic evaluation done and procedure was explained and written informed valid consent was obtained. All routine laboratory and radiological investigations were done. All patients were kept nil per mouth prior to day before surgery. Demographic data, initial vital collated before shifting the patient to operation room (OR). Other data collected in the OR.

Methods

Each patient was reassured, explained in detail about the procedure of the study during the preanaesthetic visit and informed consent was taken. All patients were confirmed to be physically fit, are advised overnight fasting, and were given tablet alprazolam 0.5mg and tablet Pantaprazole 40mg. patients were monitored by electrocardiogram, non-invasive blood pressure, pulse oximeter and Etco2. IV line was secured and fluids started.

Group A: Conventional Nasal Technique.
Group B: Bougie+ NTT Technique.
Group C: Bougie through Nasopharyngeal airway + NTT Technique.

IN the nasotracheal intubation NTT passed through nasopharynx up to oropharynx manipulated by using Magill's forceps in to the trachea. In the bougie technique, bougie passed blindly, or using a nasal airway to guide for bougie naso-tracheally for tracheal intubation with little manipulation if required. One hundred fifty adult patients were randomly assigned to three groups, the blind technique, bougie technique and combined nasal airway bougie technique 50 each.

Nasotracheal intubation is used in various conditions such as:

- **Oral surgeries:** Surgeries involving the teeth, gums, and jaw.
- **Maxillofacial surgery:** Reconstructive surgery of the face.
- Urethral reconstruction after taking oral mucosa.

All patients received pre-operative bilateral nasaloxymetazoline (0.05%), administered until the patientcomplained of a foul taste, suggesting pharyngeal spread. After the patient entered the operating room, the surgical resident caring for the patient and who was to rate nasal trauma, bleeding-was asked to wait outside so that they would be blinded to the intubation technique.

American Society of Anesthesiologists (ASA) standard monitors were applied and the patient was asked to breathe through each nostril individually and asked to state which felt more patent. Following verification of appropriate equipment and pre-anaesthetic time-out, general anaesthesia was induced. For patients who had a pre-operative intravenous (i.v.) line, pre-oxygenation was achieved with 100% O2through a face mask for 3 min or until O2 concentration was 100%. An i.v. induction was performed with midazolam 1-2 mg, fentanyl 50-100 µg, lidocaine 1 mg/kg (up to 75 mg) and propofol 1.5-2 mg/kg. If bag-mask ventilation was adequate, succinylcholine 1.5 mg/kg (up to 100 mg) or vecuronium 0.1 mg/kg (up to6-8 mg) was administered intravenously. After the ability to mask ventilate was confirmed, the randomisation envelope was opened by their search assistant and the randomized intubation technique revealed. Bag-mask ventilation was continued until fasciculation's were noted or full relaxation achived. The randomized technique was initiated following gone of three ways: For nasotracheal intubation, the lidocaine jelly (as local anesthetic and lubricant) was applied to the nasal cavity and ETT prior to intubation. The ETT was then passed through nares into nasopharynx under direct laryngoscopy. Once it reached nasopharynx, it was guided into the glottic opening by using Magill's forceps. During

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the procedure, oxygen saturation and heart rate was monitored continuously and time taken for intubation (in seconds) was recorded. The bougie tech or nasal airway technique was also applied in similar fashion. The bougie is manipulated in to the trachea the tracheal tube was passed over the bougie then advanced with code tip facing. The appropriate position of ETT was confirmed by clinical examination (auscultation over stomach and bilateral axilla) and $Etco_2$ monitoring. The ETT was secured by the using dynaplast.

A total of 162 patients consented, of whom 150 were randomly assigned (conventional technique n = 50; bougie technique n = 50 bougie over nasopharyngeal airway + bougie 50.12 were excluded due to various reasons. Cormack and Lehane grading was used due to provider familiarity. 1(bleeding); 2 (signs of bleeding, but no immediate re-accumulation of blood after swabbing with gauze); or 3 (signs of bleeding with immediate re-accumulation of blood after swabbing with gauze) were noted. First pass success, defined as the frequency of successful nasotracheal intubation on the first attempt; and need for Magill forceps bougie passed directly.

Statistical analysis

The primary outcome bleeding and other categorical outcome variables were compared using Pearson's chi-square test and the total intubation time and other parameters withhttps://www.socscistatistics.com/tests/anova/default2.aspx.

Results

Table 1: Each group (n=50)

Parameter	Group-A	Group-B	Group-C	p-value
Age (years)	37.4±10.09	41.2±11.59	39.3±8.33	0.854 NS
Sex (male/female)	45/5	47/3	46/4	
Height (rmc)I	160.6±3.78	160.8±4.55	162.4±4.93	0.786 NS
Weight (kg)	59.3±7.68	60.2±4.81	59.8±4.08	0.945 NS
ASA grade I/II/111	28/19/3	26/22/2	25/22/3	
Malainpatt grade I/II/III	32/14/3	29/16/5	28/18/4	
Buck teeth (Yes/No)	3/47	2/48	4/46	
Illyzaciaental, distance (<5 or >5)	9/41	7/43	10/40	
Neck length (adequate/short)	43/7	45/5	44/6	--
Neck thickness (Normal/Thick)	42/8	44/6	43/7	--
Head and neck movement	2/48	3/47	5/45	--
(Restricted/Normal)				

NS = not significant.

Table 2: Pulse (n=50 for each group)

Parameter	Group-A	Group-B	Group-C	p-value
Pulse				
Base line	83.6±3.85	82.6±3.07	82.4±2.82	0.7629 NS
2 minutes after intubation	90.6±4.22	88.2±4.18	87.3±4.74	0.2023 NS
5 minutes after intubation	97.3±6.43	92.2±9.17	93.5±7.41	0.591 NS
10 minutes after intubation	91.2±7.65	86.8±4.08	89.4±6.28	0.689 NS

NS= Not significant.

Table 3: Each group (n=50 each)

Blood pressures	Group-A	Group-B	Group-C	p-value
Systolic				
Baseline	122.2±6.16	124.33±4.84	123.17±	0.895 NS
After 2 mits of intubation	144.2±3.08	136.5±2.98	135.8±4.21	0.0038 *S

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After 5mits	148.2±5.07	138.4±5.41	138.2±4.22	0.0047 *S
After10mits	135.17±5.29	133.33±4.84	132.16±4.91	0.601 NS
Diastolic				
Baseline	80.51±3.88	79.61±2.81	81.87±4.58	0.771 NS
After 2 mits of intubation	92.6±4.36	85.8±2.17	86.4±2.32	0.0086 *S
After 5mits	95.8±2.93	89.8±4.09	88.4±3.98	0.0128 *S
After10mits	87.85±2.56	86.33±2.31	86.33±2.96	0.198 NS
Mean				
Baseline	90.66±3.16	88.17±4.07	89.51±2.17	0.365 NS
After 2 mits of intubation	103.4±3.12	96.6±2.31	97.4±3.36	0.0105 *S
After 5mits	107.2.96	99.8±4.22	99.2±3.49	0.0049 *S
After10mits	94.83±3.19	93.66±2.16	94.89±2.07	0.463 NS

NS= Not significant, *s=significant.

Table 4: Time taken for Intubation. (Each group consists (n=50 each)

Parameter	Group-A	Group-B	Group-C	p-value
1st attempt Number	37 (74%)	42 (84%)	45 (90%)	--
Time taken	53.2±3.16	35.4±3.16	36.8±2.79	0.0001 *S
2nd attempt Number	8 (16%)	5 (10%)	3 (6%)	--
Time taken	64.2±3.19	43.6±3.36	55.4±2.71	0.0001 *S
3rd attempt Number	5 (10%)	3 (6%)	2 (4%)	--
Time taken	74.8±5.45	60.2±5.93	63.6±4.82	0.0028 *S

*S= Significant as p-values are <0.05.

Table 5: Complications: Group-A (n=50) Group-B (n=50) Group-C (n=50)

	Group-A (n=50)	Group-B (n=50)	Group-C (n=50)
Bleeding			
After passing the nasal instrument	10/50 (20%)	4/50 (8%)	2/50 (4%)
After 5minutes	3/50(6%)	0/50 (0%)	0/50 (0%)
Trauma	3/50 (6%)	0/50 (0%)	0/50 (0%)
Pain	5/50 (10%)	1/50 (2%)	0/50 (0%)
Tube cuff damage	2/50 (4%)	--	--

*Trauma, pain and cuff damage in Group-A is very significant.
*****Bleeding parameters are also very significant between Group-A when compare to Group-Band Group-C.

Demographic figures like age, sex, height & weight in group A, B & C are not significant. Other intubation parameters like ASA grade & other parameters are similar as shown in Table. 1.
Pulse changes in base line after 2 mins, 5 mins & 10 mins, there is no significant change in group A, B & C as shown in Table. 2.
In blood pressure significant changes are seen after intubation in group A,B & C with significant p values of 0.0038 & 0.0047 in systolic blood pressure, 0.0086 & 0.00128 in diastolic blood pressure & 0.0105 & 0.0049 in Mean blood pressure respectively. No significant differences observed at base line & at 10 mins pressures respectively as shown in Table. 3.
In intubation attempts significant changes seen at 1st,2nd& 3rd attempts, when group A compared to group B & group C, with p values of 0.001,0.0001,& 0.0028 respectively as shown in Table. 4.
Complications are more in group A, when compared to other groups as shown in Table. 5.

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Discussion

Nasal bleeding is the most frequent complication of nasotracheal intubation [11]. Several recommendations have been made to reduce its incidence. These include local application of vasoconstrictive drugs, softening of the tube, and use of a nasopharyngeal airway as a pathfinder [12] but this problem cannot be avoided entirely [13].

Nasotracheal intubation is a great alternative to the oral route. Just be sure your patient meets the criteria, have your equipment ready, and keep the portable suction unit nearby, just in case of bleeding.

Nasotracheal intubation is indicated for surgery where the ETT may interfere with the operative site (mouth, jaw, teeth). Patients who have poor mouth opening pose a challenge to oral intubation. The nasal tube is less likely to become dislodged by patient movement.

Typically, smaller ETT tubes were used (7.0 or 7.5 mm) in male, 6-6.5 used in females. Laryngoscopy proceeded in standard fashion to expose the vocal cords, assuming there is adequate mouth opening. The ETT tube is placed in the prepared nostril and advanced into the trachea. Magill forceps may be used to grasp the tip of the ETT and guide placement, if required ETT placement is then confirmed.

Nasotracheal intubation involves a three-stage process. Firstly, nasopharyngeal intubation, secondly, directs laryngoscopy to visualise the vocal cords and thirdly, passage of the tracheal tube into the trachea. Attempting the initial nasopharyngeal intubation in these groups of patients may cause profuse bleeding. This may make visualisation of the larynx difficult during direct laryngoscopy. Pass the tube 24 to 28 cm in an adult, depending on the size of the patient. Check and secure the tube in the standard fashion. Direct visualization can also be used for nasotracheal intubation. With the patient supine, use the laryngoscope in the same manner as for standard intubation. While visualizing the cords, use the Magill forceps to grasp the tube which is already inserted through the nasopharynx and pass it through the cords only tube techquine. With bougie technique, it passes directly or little manipulation is required.

Our data show that nasal intubation over a bougie placed via a nasopharyngeal airway (bougie technique) has the same success rates as the conventional technique with a significant decrease in the incidence and severity of nasal bleeding and reduction in the use of Magill forceps. The bougie technique decreases both the incidence and severity of nasal trauma. Not having to orally manipulate the tube is advantageous in two ways: there is no risk of trauma to the tube or airway from oropharyngeal manipulation of forceps; and in cases where the oropharynx lacks the room for manipulation of forceps; the tracheal tube can still be safely guided via external manipulation of the bougie.

When bougie was passed they tend to be in alignment with the glottis. For this last reason, when a bougie is placed via a nasopharyngeal airway, tracheal advancement of the bougie most often requires slight manipulation. The performance of various airway boogies has been reported [14] and the benefits of the bougie for this use are related to their relative firmness and coudetip. We found that while the bougie technique had similar success rates as the conventional technique, the procedure took approximately less than 80 seconds. These beneficial effects of the bougie technique could be extended to both adult and paediatric groups.

The most frequent sizes of properly fitted NT tubes were 6.5 in male and 6 female patients, respectively. Positioning of the cuff and distal tip was only appropriate when using a properly sized tube in 6.5 to7 of male and 6-6.5female patients, respectively. These results suggest that using an NT tube that is properly sized for a particular patient will not ensure appropriate placement, as defined by cuff and distal tip positions.

Our results suggest that not much difference of demographic data, the demographic data and other parameters are seen in Table-1. Only small variation seen regarding age, sex, height and weight. In other parameters like ASA grade, Buck teeth, Mallampati grade, neck length, neck thickness and head and neck movement which are almost similar not much variation seen depicted in (Table no 1).

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When it comes to pulse, baseline at 2 min, 5 min and 10 min after intubation there is not much variation seen in groups which are not significant (Table no 2).
In blood pressure readings even though baseline parameters they are not significant but after 2 min, 5min after intubation lot of variation seen in systolic diastolic and mean pressures with significant p value (0.0038) at 2 min and (0.0047) at 5 min in systolic pressure. Same results also observed in diastolic pressure with p value of (0.0086) at 2 min and (0.0128) at 5 min which are very significant. For mean blood pressure also at 2 min p value is (0.0105) and at 5 min (0.0049) which are also very significant, at 10 min no significant changes in as blood pressures settled to near normal, at 2 min and 5 min after intubation these changes more seen in group A due to ETtube and magils forceps manipulation these values are shown in (Table no 3).
Regarding intubation timings it is (53.2± 3.16) when compared to group B (35.4± 3.16) and in group C (36.8±2.79) with p value of 0.001 which is clinically very significant which are shown in (Table no -4).
Upto second attempt 8 in group A, 5 group B and 3 in group C unable to intubate them and their timings prolongs to (64.2±3.19), (43.6±3.36) and (55.4±4.71) respectively with p value of 0.001 which is also clinically highly significant. At 3rd attempt only 5 remained in group A, 3 In group B, 2 in group C and timings extended to (74.8±5.45), (60.2±5.93) and (63.6±4.82) with p value 0.0028 which is also significant which is shown in (Table 4).
Regarding complications more bleeding is seen in group A cases 10/50(20%) when compared to 4/50(8%) and 2/50(4%)in group B and C after the tube or bougie or nasal airway passed, but bleeding observed after 5 min also in group A only 4/50(8%).this is probably due to tube manipulation from external nares to oropharynx via nasopharynx which probably caused trauma and postop pain ETtube cuff damage also observes in 2 cases(4%) which was replaced immediately.

Table 6

Research authors	Intubation time 1st attempt	Bleeding	Trauma	Pain
Jithendra Singh *et al*.	52.02±6.89	Minimum	less	few
Prashant *et al*.	44.84±18.26	Minimum	less	few
Jones *et al*.	33.08±13.43	Minimum	less	few
Present study	53.2±3.16	3/50	5/50	4/50

Our results are of intubation timings comparable with that of Jithendra Singh [15] 52.02±6.89, Prashant *et al*. [16] 44.84±8.26 and that of Jones *et al*. [17] 33.08±13.43. Our results show timings are nearly nearer 53.2±3.16 to the above researchers.
The limitation of this study is that nasal bleeding is likely multifactorial, and variables such as mean arterial pressure, volume of water-soluble lubricant and nasal cavity anatomy were not (or could not be) controlled.

Conclusion

In conclusion, nasal trauma is common with nasotracheal intubation with conventional technique. The technique of nasal intubation over a bougie placed via a nasopharyngeal airway uses familiar skillsets and results in significantly less nasal trauma and less need for Magill forceps, with no difference in success rate, when compared with a conventional technique, even in the hands of individuals inexperienced with the technique.

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Conflicts of interests: Nil.

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