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ORIGINAL RESEARCH

Efficiency of nasotracheal intubation with bougie and without bougie using Macintosh laryngoscope: A comparative study

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Abstract

Aim: To compare the efficiency of nasotracheal intubation using Macintosh laryngoscope with bougie and without bougie in incidence of bleeding, time lapse and haemodynamic stress response.

Methodology: The present randomised study was conducted in the department of Anaesthesiology among 120 adult patients scheduled for elective surgery and planned for general anaesthesia, after considering the inclusion and exclusion criteria. The study population was divided randomly by computer generated numbers into two groups with 60 patients in each group. Group 1(n=60): where nasotracheal intubation was done with bougie using Macintosh laryngoscope. Group 2(n=60): where nasotracheal intubation was done without bougie using Macintosh laryngoscope.

Results: In Group 1, 47 (78.33%) and 13 (21.67%) patients were successfully intubated in first and second attempt respectively while in Group 2, 38 (63.33%) patients were intubated in first attempt and 22 (36.67%) patient required second attempt with statistically significant difference. The mean time required for intubation in Group 1 was 31.10±2.36 and in Group 2 was 43.08±2.17, p value was significant. In Group 1, no. of patients with sore throat were 5 (8.33%), with dental injury were 4 (6.67%) and with nasal mucosal laceration were 3 (5%).In Group 2, no. of patients with sore throat as well as dental injury were 6 (10%), and with nasal mucosal laceration were 5 (8.33%). Hemodynamic variables were comparable among the groups.

Conclusion: Nasotracheal intubation done with bougie was easier and more successful in first attempt, required less time and had less post intubation bleeding when compared with intubation without bougie.

Keywords: Nasotra cheal Intubation, Bougie, Macintosh Laryngoscope

Introduction

Airway management plays an important role in the management of critically ill patients, trauma patients, and anes the sia for all surgeries and procedures performed inside andoutside of the operating room. From this point of view, anes thesiologists choose and apply various methods such as thebag and mask methods, airways simply inserted into the oralor nasal cavity, supraglottic airway devices, oral or naso tracheal intubation (NTI), percut ane ous dilated cricothyroi do to my and tracheostomy according to the patient's condition and the need for surgery [1].Nasotracheal intubation (NTI) involves passing an endotracheal tube through the naris into the nasopharynx and the trachea; most commonly after induction of general anesthesia in the operating room .Nas otracheal intubation (NTI) is used as a basic method for airway management under anesthesia and intensive care. It has become an effective alternative method to orotracheal intubation with increased benefits of offering better mobility andsurgical field in oral and maxillofacial surgery and possibly in trauma and critically ill patients. In theasotracheal intubation process and management,additional instruments, drugs, and skilled mane uvers are required, and with recent developments in techniques andmethods, potential problems or complications arising fromthe blind introduction of the endotracheal tube into the nasal cavity can be avoided [7,8,9,10]. Conventionally, routine naso tracheal intubation involves initial blind passage of an endotracheal tube via the nares inanaesthetised (i.e. post-induction) patients, after which laryngoscope is used for passage through the glottis along with or without Magill forceps (conventional technique). An epistaxis rate of approximately 54% [11] is noted with the use of conventional technique because of high vascularity of the nasal mucosa. Other complications like nasal structures avulsion, dissection of the mucosa of retropharynx [12] and bacteraemia secondary to nasal mucosa disruption are less common. Tube warming [13,14], pre-treatment of the nasopharynx with topical vasoconstrictor and tube to be guided into the pharynx using a catheter [15] decreases trauma. Even with use of nasal vasoconstrictors, tracheal tube warming and catheter guidance, nasal intubation is still associated with a high incidence of nasal trauma and tracheal tube cuff rupture [16].

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Bougie can also be used for guiding the ETT into the trachea. Bougie is a long, stiff plastic wand inserted into the trachea through the glottis during direct laryngoscopy (DL),it is a tracheal tube introducer, which is a simple, inexpensive device, first described by Macintosh in 1949 [17] to facilitate orotracheal intubation. Bougies have traditionally been used after one or more failed intubation attempts with direct laryngoscopy, at which point the airway is declared 'difficult'.In a randomized trial, the routine use of bougies on every DL intubation led to a higher rate of first-pass intubation success. And even allowing for the two-step technique (bougie insertion followed by ET tube insertion), the bougie technique required less total time to intubate the patient, on average, by reducing the time spent guiding the ET tube into the airway [18].Furthermore, there are reports of detachment of tip of the bougie during intubation due to parching and subsequent weakness of the material with repeated usage [19]. There are traumatic complications of bleeding in airway and esophageal laceration with usage of bougie [20].Thus, this study was carried out to compare the efficiency of nasot racheal intubation using Macintosh laryngoscope with bougie and without bougie in incidence of bleeding, time lapse and haemodynamic stress response.

Material And Method

The present randomised study was conducted in the department of Anaesthesiology over a period of two years after the approval from the Institutional Ethics Committee. This study was carried out in 120 adult patients scheduled for elective surgery and planned for general anaesthesia & was randomly allocated into two groups of 60 each.

Group 1(n=60): where nasotrac heal intubation was done with bougie using Macintosh laryngoscope.

Group 2(n=60): where nasotrac heal intubation was done without bougie using Macintosh laryngoscope.

Inclusion Criteria

1. ASA grade I & II
2. Age group of 18-65 years
3. Either gender.
4. Undergoing elective ENT and dental surgeries under general anaesthesia with controlled ventilation.
5. Normal INR<1.2.

Exclusion Criteria

1. Patient not giving consent for the study.
2. ASA Grade III, IV and V.
3. Body Mass Index $\geq$ 30 kg/m^2
4. Cervical spine disease.
5. Patients with co-morbidities such as hypertension or ischemic heart disease.
6. Patients with history of epistaxis, nasal polyp and DNS.
7. Patients with COPD.
8. Pregnant patients.
9. Emergency surgeries.

Methodology: A written informed consent was taken from all patients. A thorough pre anaesthetic evaluation was done a day prior to the surgery and all the necessary routine investigations carried out. All patients were kept fasting overnight. They were given Tab. Alprazolam 0.25 mg and Tab. Pantoprazole 40mg per orally on the night before surgery and again on the day of surgery at 6am with a sip of water.In the pre-operating room, baseline parameters- ECG, heart rate, systolic, diastolic, mean BP and peripheral oxygen saturation were noted. An intravenous line was secured with 18G cannula and ringer lactate (500 ml) was started.

Preme dications were given IV 30 minutes before the anaesthesia as follows:

- Inj. Midazolam 2mg
- Inj. Nalbu phine 0.1 mg/kg

In OT, after pre oxygenation with 100% O2 for 3minutes, patient was induced with Injection Propofol (2.5mg/kg IV) and Inj. Vecuronium (0.08 - 0.1 mg/kg IV).

Ventilation was done with a face mask for 3 minutes to allow the jaw to fully relax, the patient was intubated with endotracheal tube using Macintosh laryngoscope which was selected according to the sex of the patient.

In Group 1- Nasotracheal intubation done using bougie

A nasopharyngeal airway was placed via the more potent nostril after applying water soluble lubricating jelly. If both nostrils are equally patent, or if the comparative patency is not known, the right nostril was used. The laryngoscope blade was inserted and the best laryngeal view was noted. Bougie was placed through the nasopharyngeal airway with its tip facing anteriorly. While watching with the laryngoscope, the bougie was advanced to the glottic opening. If needed, rotation of the bougie, external laryngeal manipulation or Magill

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forceps was used to align the bougie with the vocal cords. The bougie was then advanced distally in the trachea until resistance was met. Nasopharyngeal airway was removed over the bougie. The tracheal tube was then removed from the warm saline, and water-soluble lubricant was placed on the tip. Using a Seldinger technique, the tracheal tube was threaded over the bougie and advanced, with the bougie as a guide, via the nare and through the glottis under Macintosh laryngoscope visualisation. The tube was secured at the level of nostril, the bougie and laryngoscope was removed and the nasotracheal tube placement was verified by bilateral chest auscultation and capnography. The balloon of the tube was inflated until the cuff pressure is adequate.If intubation was not successful even after two attempts with bougie then conventional technique was used.

In Group 2- Nasotracheal intubation done without bougie

After the best glottic view was obtained with the laryngoscope, the tracheal tube was removed from the warm saline, and water-soluble lubricant was placed on the tip. The tube was placed into the more patent nare. Using external manipulation,the tube was advanced through the pharynx and past the vocal cords under Macintosh laryngoscope visualisation. The tracheal tube was advanced until it was seen passing through the vocal cords with or without using Magill forceps. The blade was retrieved back slowly and NTT placement was verified by bilateral chest auscultation and capnography. The cuff was inflated until the cuff pressure was adequate.

Thereafter, anaesthesia was maintained by O_2, N_2O, Is oflurane& Inj. Vecuronium 1mg SOS. At the end of surgery, all patients were reversed with Inj. My opyrolate 5ml and extubated.

Following points were noted intraoperatively:

1. Number of intubation attempts
2. Time to intubation (T0= Baseline/Before induction, T1= Immediately after induction, T2= At the time of intubation, T3= 1 minute after intubation and T4= 5 minutes after intubation).

It is the time from the first entrance of a tracheal tube into the nasal opening to the presence of end-tidal CO_2 through the NTT.

3. Magill forceps used or not used.
4. Post-intubation bleeding was assessed by subjective bleeding scale as-

0- No bleeding,

1- Minimal bleeding not requiring suctioning,

2- Moderate bleeding which will require suctioning without hampering visualisation,

3- Severe bleeding which will require suctioning and hampers visualisation.

5. Haemodynamic parameters were also noted.

Then they were shifted to postoperative ward and postoperative complications like sore throat, dental injury and nasal mucosa laceration were noted.

Statistical Analysis: The data was collected on the prescribed Performa, compiled and was entered in Microsoft excel sheet. The data was analysed using the Statistical package for social sciences "SPSS version 20" (IBM, Chicago, USA).P value<0.05 was considered significant at 95% confidence interval.

Results: In Group 1 (n=60);naso tracheal intubation was done with bougie using Macintosh laryngoscope while in Group 2 (n=60); where naso tracheal intubation was done without bougie using Macintosh laryngoscope. Patients with age range 18-65 years were included in the study. The mean age in Group 1 was 39.38±11.17 and in Group 2 was 39.75±11.04. Among Group 1 females were 25 (41.7%) and rest were males (58.3%). In Group 2 females were 31.7% (n=19) and males were 67.4% (n=41). In Group 1; 47 (78.33%) patients were successfully intubated in first attempt, whereas 13 (21.67%) patients required second attempt. In Group 2, 38 (63.33%) patients were intubated in first attempt and 22 (36.67%) patient required second attempt. The mean time required for intubation in Group 1 was 31.10±2.36 and in Group 2 was 43.08±2.17 with statistically significant difference (Table 1).

Table: 1 Baseline characteristics among the groups

Group	Female		Male		Chi Square	p value
	N	%	N	%		
Group 1	25	41.7	35	58.3	1.82	0.42
Group 2	19	31.7	41	67.4		
	ASA					
	Grade I		Grade II			
	N	%	N	%		
Group 1	38	63.3	22	36.7	1.23	0.59
Group 2	32	53.3	28	46.7		

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	No. of Attempts					
	1		2			
	N	%	N	%		
Group 1	47	78.33	13	21.67	7.13	0.041*
Group 2	38	63.33	22	36.67		
	Mean		SD		t test	p value
Group 1	31.10		2.36		51.31	<0.01*
Group 2	43.08		2.17			

*: statistically significant

In Group 1, no post intubation bleeding was recorded in 32 (53.33%) patients, mild bleeding was recorded in 21 (35%) patients, moderate bleeding was recorded in 7 (11.67%) patients, whereas no patient had severe post intubation bleeding. In Group 2, no post intubation bleeding was recorded in 11 (18.33%) patients, mild bleeding was recorded in 36 (60%) patients, moderate bleeding was recorded in 11 (18.33%) patients, whereas severe post intubation bleeding was recorded in 2 (3.33%) patients. Complications which might occur due to intubations were also recorded, they include sore throat, dental injury and nasal mucosal laceration. In Group 1, no. of patients with sore throat were 5 (8.33%), with dental injury were 4 (6.67%) and with nasal mucosal laceration were 3 (5%).In Group 2, no. of patients with sore throat as well as dental injury were 6 (10%), and with nasal mucosal laceration were 5 (8.33%) as shown in Table 2.

Table: 2 Comparison of Post-intubation bleeding among the groups

Bleeding	Group 1		Group 2		Chi Square	p value
	N	%	N	%		
0=Nil	32	53.33	11	18.33	13.18	<0.01*
1=Mild	21	35	36	60		
2= Moderate	7	11.67	11	18.33		
3=Severe	0	0	2	3.33		
Complications						
Sore Throat	5	8.33	6	10	0.10	0.75
Dental injury	4	6.67	6	10	0.44	0.51
Nasal mucosal laceration	3	5	5	8.33	0.54	0.46

*: statistically significant

Hemodynamic parameters were found to be comparable among the study groups as shown in table 3. In Group 1, mean SPO2 level at T0 was 97.70±1.34, at T1 was 97.63±0.99, at T2 was 97.50±1.14, at T3 was 97.43±1.29 and at T4 it was 97.47±1.08 (Table 13). In Group 2, mean SPO2 level at T0 was 98.05±1.03, at T1 was 97.88±1.35, at T2 was 97.68±1.63, at T3 was 97.97±1.25 and at T4 it was 97.93±1.10 (graph 1).

Table : 3 Comparison of SBP (mmHg) among the groups

Group		SBP(mmHg)				
		T0	T1	T2	T3	T4
Group 1	Mean	126.93	141.00	130.92	125.73	119.50
	SD	6.04	6.01	5.39	8.83	6.41
Group 2	Mean	128.57	144.10	130.68	125.04	120.48
	SD	8.01	8.12	11.01	9.69	9.31
t test		1.55	2.68	0.59	0.91	0.96
p value		0.22	0.13	0.68	0.47	0.42
		DBP(mmHg)				
Group 1	Mean	80.82	91.77	89.00	86.43	84.19
	SD	4.52	5.06	6.64	6.80	7.84
Group 2	Mean	81.13	92.22	87.33	84.05	82.56
	SD	4.88	6.11	6.52	5.79	5.92
t test		2.35	0.12	1.87	2.19	0.86
p value		0.37	0.71	0.18	0.49	0.52
		HR				
Group 1	Mean	78.65	89.6	86.83	84.26	82.02
	SD	2.35	2.89	4.47	4.63	5.67
Group 2	Mean	78.96	90.05	85.16	81.88	80.39

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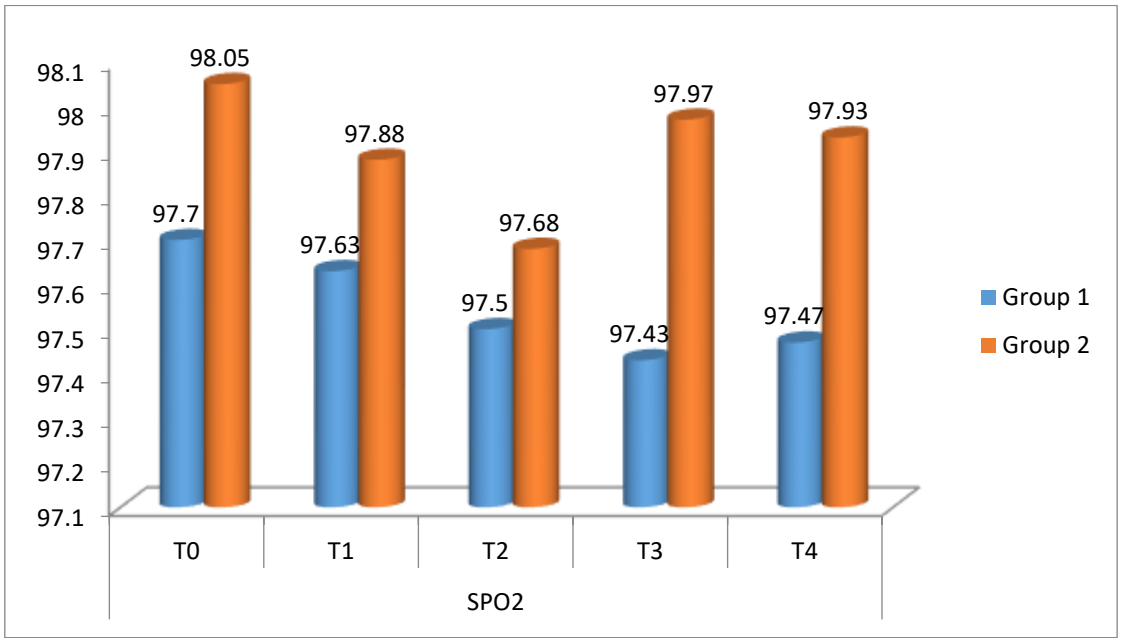
	SD	2.71	3.94	4.35	3.62	3.75
t test		2.28	0.05	1.8	2.12	0.79
p value		0.41	0.75	0.22	0.53	0.56



Graph 1: Comparison of SPO2 among the groups

Discussion

This randomised study was carried out in 120 adult patients scheduled for elective surgery and planned for general anaesthesia. The study population was divided randomly by computer generated numbers into two groups with 60 patients in each group.Group 1 (study group) (n=60): where naso tracheal intubation was done with bougie using Macintosh laryngoscope. Group 2 (control group) (n=60): where nasot racheal intubation was done without bougie using Macintosh laryngoscope. The mean age in study group was 39.38±11.17 and in control group was 39.75±11.04. The p value was not significant. This was in accordance to the study of Abrons RO et al. [66] and Pour fakhr P et al. [70], where there was no difference in base line variables and demographic characteristics in intervention group and control group. This study showed that there was male predominance in both study and control group. The p value was not significant, showing no difference in study and control group, same as found by Abrons RO et al. [66] and Pourfakhr P et al. [70].The mean age in study group was 65.90±11.237 and in control group was 65.75±11.039, showing no significant result, which was in accordance to result of Mont G et al [65], Abrons RO et al [66] and Pour fakhr P et al [70].An attempt was defined as the beginning of the advancement of a tracheal tube or bougie inside the nasal opening and ends with either the presence of end-tidal CO_2 (successful attempt) or withdrawal of tube (failed attempt). So, in study group, 47 (78.33%) patients were successfully intubated in first attempt, whereas 13 (21.67%) patients required second attempt, whereas in control group 2, 38 (63.33%) patients were intubated in first attempt and 22 (36.67%) patient required second attempt. The p value was significant, showing that nasotracheal intubation done with bougie was easier and successful in first attempt in comparison with intubation without bougie. But Abrons RO et al. [66] failed to find such result and Pourfakhr P et al. [70] also did not find such result, which they presumed because of the participation of learners in theirstudy, which made it likely that the results were generalizable. The mean time required for intubation in study group was 31.10±2.36 and in control group was 43.08±2.17. The p value was significant, showing that nasotracheal intubation done with bougie required less time when compared with intubation without bougie. This result was in accordance with result of Pour fakhr P et al. [70]. But Abrons RO et al. [66] failed to find such results and found that intubation with bougie required more time than conventional technique.In study group, no post intubation bleeding was recorded in 32 (53.33%) patients, i.e. in more than half of the patients,whereas in control group, only 11(18.33%) patients had no post intubation bleeding, mild bleeding was recorded in 36 (60%) patients, and also severe post intubation bleeding was recorded in 2 (3,33%) patients. The p value was significant, showing that nasotracheal intubation done with bougie had less post intubation bleeding when compared with intubation without bougie. The result was in accordance with result of Abrons RO et al. [66] and Pourfakhr P et al. [70], who showed less bleeding in study

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group when compared to control group. Complications which might occur due to intubations were also recorded, they include sore throat, dental injury and nasal mucosal laceration. In study group, no. of patients with sore throat were 5 (8.33%), with dental injury were 4 (6.67%) and with nasal mucosal laceration were 3 (5%).In control group, no. of patients with sore throat as well as dental injury were 6 (10%), and with nasal mucosal laceration were 5 (8.33%). The p value was not significant for all complications. These results were in accordance with result of Driver BE et al. [82].Systolic Blood pressure (mmHg) (SBP), diastolic blood pressure (mmHg) (DBP), heart rate (HR) and SPO2 were monitored 5 times at different time intervals. There was no significant difference found in study as well as control group. The p value was not significant. This result was in accordance with results found by Pour fakhr P et al. [70].A major limitation of this study is that the anaesthetist is not blinded to the intervention. Weinformed the intubating anaesthetist of group allocation after anaesthesia had been induced to limit performance bias. Another limitation was that, nasal bleeding islikely multifactorial, and variables such as volume of water-soluble lubricant andnasal cavity anatomy were not (or could not be) controlled for.

Conclusion

From this study it could be concluded that naso tracheal intubation done with bougie was easier and more successful in first attempt, required less time and had less post intubation bleedingwhen compared with intubation without bougie. However, these findings should be considered provisional until the generalizability is assessed in other institutions and settings.