EVALUATING EFFECTIVENESS OF WARMING ENDOTRACHEAL TUBE IN BLIND NASOTRACHEAL INTUBATION IN MAXILLOFACIAL SURGERY

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Date Received:
March 21, 2015
Date Revised:
November 25, 2015
Date Accepted:
December 04, 2015

ABSTRACT

Objective: To compare the intubation time, number of attempts to intubation and complications of BNTIbyusing normal ETTs against those softened by warming them with water at 50°C.

Methodology: Eighty adult patients both male and female scheduled to undergo elective maxillofacial surgery under general anesthesia (GA) were randomly divided into two groups; Group A: BNTI carried out in patients using ETT without warming, Group B: BNTI using ETT warmed and softened with water at 50°C for 5 minutes. The intubation time, number of attempts to intubation and complications of BNTI in both the groups were recorded and compared.

Results: We found that BNTI in group B required lesser time and lesser number of attempts for intubation, with low incidences of complications as compared to group A. We found that the most frequent position of nasotracheal tube was tracheal followed by esophageal and anterior positions.

Conclusion: ETT softened by warm water facilitated BNTIwith reduced frequency and severity of observed complications like epistaxis, bronchospasm, laryngospasm, painful nose and post-operative sore throat.

Key Words: Blind nasotracheal Intubation, Warming, Endotracheal tube, Maxillofacial surgery

This article may be cited as: **Pasha AK, Farhat K, Iqbal A. Evaluating effectiveness of warming endotracheal tube in blind nasotracheal intubation in maxillofacial surgery. J Postgrad Med Inst 2015; 29(4): 279-83.**

INTRODUCTION

Blind naso-tracheal intubation (BNTI) is the passage of an endotracheal tube through nose into trachea without using a laryngoscope[1]. BNTI is a safe technique for difficult airway management when a fibreoptic bronchoscope (FOB) is not available[2]. Head and neck surgery could be associated with undesirable postoperative complications either due to the either surgical and / or anesthesia procedures[3]. Various techniques have therefore been devised to overcome such potential problems[4,5,6,7,8]. BNTI is defined as a method of intubation without visualization of glottis[9]. It might be used when orotracheal intubation appears difficult or impossible[10]. Nevertheless, the success rate of this technique is low while its complication rate is high. Since FOB is not available at various centers in Pakistan, BNTI is the most common intubating method used by many anesthesiologists. However, this techniquecan lead to significant untoward effects such as;damage to nasal mucosa, septum orturbinates, nasal hemorrhage (epistaxis) or even retropharyngeal dissection[8]. Methods devised toreduce nasotracheal complications include the use of lubricants (saline, water-soluble lignocaine gel), vasoconstrictor (oxymetazoline, cocaine, lignocaine-epinephrine/phenylephrine), lower size ETTs and warming nasotracheal tubes, although, some of these drugs may be associated with serious complications. For instance, sympathomimetic drugs can lead to rapid increase in blood pressure, arrhythmias, myocardial infarction and heart failure,particularly in elderly patients with coronary artery disease. One of the methods to insert nasotracheal tube is to pass a catheter through the ETT as it reaches the hitch. The catheter is then passed through the glottis into the trachea and the ETT is guided and gently passed over the catheter. This may helpin reducing the possibility of trauma to the delicate tissues. This method has been reported to increase the success rate of securing the airway and reduce hemorrhage. Very few investigators have studied the method of warming and its possible benefits. Before attempting BNTI, the ETT is placed in warm water at a temperature of 50 °C for almost 30 minutes. Priorstudies have shown that warming ETT increases its flexibility while it passes through the high curvature of nasopharynx resulting in lessertrauma. Furthermore, this technique does not

need additional equipment.This study was designed to compare the intubation time, number of attempts for intubation and complications of BNTI by using normal ETTs against those softened by warming them with water at 50°C.

METHODOLOGY

This was a prospective, randomized double-blind, clinicalstudy. After approval of the hospital's ethics committee, we included 80 adult patients of either gender (age between 18-65), having ASA class I or II physical status, scheduled to undergo elective maxillofacial surgeries requiring nasal intubation in Armed Forces Institute of Dentistry, Rawalpindi from November 2013 to April 2014. After obtaining written-informed consent,patients were randomly assigned to one of the two groups using computer-generated random table. Group A: BNTI carried out using ETT without warming, and Group B: BNTI carried out using ETT, warmed and softened with water at 50°C for 5 minutes. Patients with limited mouth opening (less than 3.5 cm), Mallampati> III, thyromental distance of less than 6.5 cm, limited neck movements, sterno-mental distance of less than 12.5 cm and patients with a history of recurrent epistaxis, coagulation disorders or basal skull-fracture were excluded from the study.

Patients were pre-medicated with metoclopramide 10 mg and dexamethasone 4 mg IV for nausea/vomiting prophylaxis and tramadol 100 mg IV for analgesia. Xylometazolinenasal drops (4 drops in each nostril) were used as vasoconstrictor to reduce nasal bleeding due to instrumentation.Induction of anesthesia was performed with propofol 2 mg/kg and atracurium 0.5mg/kg was used to facilitate tracheal intubation.Anesthesia was maintained with 3-4% sevoflurane and 50% N_2O in O_2. Incremental doses of atracurium 10 mg IV was used for subsequent relaxation on required basis. Intubation was attempted after confirming the achievement of an adequate depth of anesthesia with Bispectral Index. The demographic data, time of intubation, number of intubation attempts and complications:including epistaxis, laryngospasm, hoarseness, sore throatand desaturation during procedure were recorded in two groups.

Intubation procedure

A pad was placed under the head of the patient while the neutral head position was maintained. A conventional preformed north-nasal tube made up of polyvinylchloride was selected for all patients while it was warmed at 50°C water for 5 minutes for patients in group B. Endotracheal tube size was selected according to the suitability for each patient using standard formulas and guidelines. The tube was introduced until one of the resulting situations occurred:

I= Tracheal Position (the target position): Endotracheal tube entered the trachea, confirmed by auscultation of the breath sounds and capnography. The cuff wasthen filled with air and tube was secured in place using paper sticking.

II= anterior position: The ETTwas not able to advance forward. While applying pressure to the tracheal tube, tube compression effect to the larynx could be observed from the outside. Anterior movement of the larynx could also be seen when looking at the neck. In this mode the tube was pulled back and reinserted until it moved into the trachea while head and neck were kept in mild flexion position.

III and IV (left or right positions): While inserting the trachea tube, it entered the pyriform sinus and stopped. The tube washence pulled back and tube direction was changed towards the midline and reinserted.

V= esophagus position:This was confirmed withabsence of breath sounds and capnography.

Statistical Analysis

Data was analyzed using SPSS 16. Descriptive statistics (frequency, percentage, mean and standard deviation) were used to describe the data. Value of $p< 0.05$ was considered as statistically significant. T-test was used for comparison of the intubation time and success rate, while chi-square test was used to compare the number of attempts and complications.

RESULTS

As far as demographic characteristics and pre-anesthetic evaluations were concerned, no significant differences were observed between the two groups (Table 1). Table 2 compares thetime required for successful intubationin both the groups. Table 3 compares the number of attempts for intubation in both the groups.Table 4 summarizes the complications recorded between both the groups.

Time for successful intubation was more in group A (157.32+ 1.87) as compared to group B (134.45+ 2.22) which was statistically significant ($p<0.05$).

Majority of patients were intubated in first attempt in both the groups. There was a significant difference between group A and group B while comparing the 1st ($p=0.05$) and 2nd ($p=0.02$) attempt. However there was insignificant difference between the groups while comparing the 3rd ($p=0.39$) and 4th ($p=0.15$) attempts.

There were significantly higher complaints of traumatic nose bleed in group A as compared to group B ($p=0.001$).

DISCUSSION

BNTI is auseful technique used for intubation in elec-

Table 1: Demographic data and pre-anesthetic evaluation of the two groups

	Group A (n=40)	Group B (n=40)	p-value
Mean age+ SD	41+ 2.89	40+ 1.67	0.06 NS
Gender M/F	25/15	21/19	0.365 NS
Mean weight+ SD	59.5+ 3.21	60.4+ 2.43	0.16 NS
ASA Grading I/II	24/16	26/14	0.644 NS
Sternomental distance (cm)	16.54 + 2.54	17.12 + 3.76	0.42NS
Thyromentaldfistance (cm)	8.13 + 3.33	8.2 +4.67	0.93NS

*p<0.05; ^{NS}p>0.05

Table 2: Comparison of time required for successful intubation in both the groups

Time (seconds) mean + SD	Group A(n=40)	Group B(n=40)	p-value
	157.32+ 1.87	134.45+ 2.22	0.0001*

*p<0.05; ^{NS}p>0.05

Table 3: Comparison of number of attempts of intubation in both the groups

Number of Attempts	Group A(n=40)	Group B(n=40)	p-value	Significance
1	24 (60%)	32 (80%)	0.05*	Significant
2	12 (30%)	04 (10%)	0.02*	Significant
3	04 (10%)	02 (05%)	0.39 NS	Non-Significant
4	0	02 (05%)	0.15 NS	Non-Significant
Total	40 (100%)	40 (100%)		

*p<0.05; ^{NS}p>0.05

Table 4: Comparison of Complications in both the groups

Complications	Group A (n=40)	Group B (n=40)	p value
Traumatic nose bleed	15	3	0.001*
Bronchospasm	3	Nil	0.07NS
Laryngospasm	1	Nil	0.314 NS
Painful nose	2	Nil	0.15 NS
Postoperative sore-throat	2	Nil	0.15 NS
Desaturation during procedure	Nil	Nil	0

*p<0.05; ^{NS}p>0.05

tive procedures as well as emergency situations. This technique is used when oro-tracheal intubation is either difficult, impossible or there is surgical requirement like in maxillofacial procedures. BNTI is recommended in the management of a difficult airway[11]. This method has low success rate and more complications[12].

BNTI is the most commonly used technique employed by anesthesiologists during difficult intubation[13]. Methodologies adapted to minimize nasotracheal complications consist ofusinglubricant gels, muscle relaxants, rotating the tube during advancement, local vasoconstrictor sprays[10], fiberoptic aids[14], filling tube cuff in pharynx[1] and most importantly, the optimal position of the head and neck[14,15]. Depoix and colleagues demonstrated that in 13.2% of their cases the tube did not pass through the nostril during nasal intubation and in 2.3% of cases resulted in failed nasal intubation and consequently patients had to be intubated orally[1,6]. In our study, we did not witness anycases in which tube could not pass through the nostril and thus oral intubation was not required in any case. We find that warming the ETT increases its flexibility resulting in lesser resistance to its passage and decreasing trauma to the tissueswhile passing through the high curvature of nasopharynx. Applying adequate lubricant gel to ETT and nostrils as well as spraying the nasal cavity with vasoconstrictor, such as xylometazoline or phenylephrine further facili-

tate passage of the tube through nose curvature. In our study, the success rate for BNTI in the group "B" was significantly more than in group "A" for the first two attempts. BNTI with two or lesser attempts were defined as successful while more than two attempts were considered as failed intubation. After two failed attempts, laryngoscopy under direct visualization was used for intubation as the patients were under the effects of general anesthesia. In one of the studies, BNTI success rate was reported to be 100% with using relaxants and 70% without the use of muscle relaxants. The results of this study are inconsistent with earlier studies showing 10% rate of failure in each study group. Failure in BNTI in our study, despite using muscle relaxants,could possibly be owing to the subsequent facts: Firstly, we tried intubating the trachea with two or lesser attempts while the previous investigators had attempted BNTI up to five times. Secondly, we selected patients undergoing oral or maxillofacial surgery in which the percentage of difficult or failed intubation is otherwise higher than the other surgical groups. We also observed that in 10% of cases in which BNTI failed, intubation under direct vision was challenging as well. In another such study, Cheema et al. tried BNTI with up to 5 attempts, using succinylcholine as the muscle relaxant[15]. They did not report any case of hypoxia, which was consistent with our study. In our study, we observed that the most frequent tube position was esophageal followed by tracheal and anterior position, respectively. Filling the cuff once the ETT reaches the pharyngeal bed has been reported to change esophageal to the tracheal position[1,16]. Again, this was also confirmed in our study. Ayla et al[17], as well as Ying et al, confirmed that warming the ETT makes it more prone to kinking[18]. Nevertheless, we believe that the advantages (such as non-traumatized airway tissue and increased ease of nasal passage) outweighs the potential risk of kinking and therefore warming the ETT for BNTI must be considered. Lu and coworkers revealed that warming the tracheal tube with warm water reduced the rate and severity of epistaxis during nasotracheal intubation[19]. They reported that the frequency of epistaxisin the group without softening endotracheal tubewas 76.7%, while in the group in which they were softened using warm water, the frequency was 43.6%. In our study, the epistaxis in the pre-warmed group was 7.5% while in group without pre-warming it was 37.5% having a significant difference between the two groups. Our study results were therefore in consistence with those of Lu and colleagues. Moreover there were no reports of bronchospasm, laryngospasm, painful nose and post-operative sore throat in patients where pre warming of ETT was carried out, further emphasizing its significance.

CONCLUSION

Softening ETT by warming before attempting BNTI significantly facilitates intubation and reduces the risk of potential complications, such as epistaxis.

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CONTRIBUTORS

AKP conceived the idea, planned the study, and drafted the manuscript. KF helped acquisition of data and did statistical analysis. AI drafted and critically revised the manuscript. All authors contributed significantly to the submitted manuscript.