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Warming Endotracheal Tube in Blind Nasotracheal Intubation throughout Maxillofacial Surgeries

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ABSTRACT

Introduction: Blind nasotracheal intubation is an intubation method without observation of glottis that is used when the orotracheal intubation is difficult or impossible. One of the methods to minimize trauma to the nasal cavity is to soften the endotracheal tube through warming. Our aim in this study was to evaluate endotracheal intubation using endotracheal tubes softened by hot water at 50 °C and to compare the patients in terms of success rate and complications.
Methods: 60 patients with ASA Class I and II scheduled to undergo elective jaw and mouth surgeries under general anesthesia were recruited.
Results: success rate for Blind nasotracheal intubation in the control group was 70% vs. 83.3% in the study group. Although the success rate in the study group was higher than the control group, this difference was not statistically significant. The most frequent position of nasotracheal intubation tube was tracheal followed by esophageal and anterior positions, respectively.
Conclusion: In conclusion, our study showed that using an endotracheal tube softened by warm water could reduce the incidence and severity of epistaxis during blind nasotracheal intubation; however it could not facilitate blind nasotracheal intubation.

Introduction

Procedures performed on the head and neck have been practices by physicians of all eras.[1] These procedures could be associated with undesirable post-operative complications due to the surgical or anesthesia procedures.[2] Therefore, numerous techniques have been devised to overcome this problem.[3-8] Blind nasotracheal intubation clinically is a method of intubation without visualization of glottis that is used when orotracheal intubation seems difficult or impossible.[9,10] Naturally, the success rate of this method is low and while its complication rate is high.[11] This method is the most common intubating method used by Anesthesiologists in France.[12] Blind intubation or the use of fiber-optics may be easier to achieve from the nasal than the oral route; however, it can cause significant side effects particularly damage to the nasal mucosa, septum or turbinates.[13] Nasal hemorrhage is also common and retropharyngeal dissection has also been reported. Approaches have been considered to minimize nasotracheal complications Includes the use of lubricants, vasoconstrictor, lower size endotracheal tubes and telescoping tube into endotracheal catheters and warming nasotracheal tubes. Vasoconstrictors such as cocaine, lidocaine/phenylephrine, oxymetazoline, and lubricants like saline and water-soluble gel are used to reduce the complications of nasotracheal intubation; however, their efficacy is controversial. Furthermore, these drugs may be associated with threatening complications. Sympathomimetic drugs can cause severe increase in blood pressure, dysrhythmias, myocardial infarction and heart failure, especially in elderly patients with coronary artery disease. Using modified esophageal stethoscopes can help reducing traumas caused following nasotracheal intubation. However, this method requires prior preparation and sterility of endotracheal tube may be affected. A suction catheter can also be used to guide and insert nasotracheal tube. As the tube reaches the hitch, the catheter is passed through the tube to reach the throat. Later, the tube can be pushed towards the trachea through the catheter with lower traumatizing possibility. This method has been shown to increases the success rate of airway establishment yet reducing hemorrhage occurrence

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and degree. Method of warming and its benefits have been little studied. Endotracheal tube in order to BNTI Is placed in warm water at a temperature of approximately 50 °C for almost 20 minutes, and so it is used for intubation. According to previous studies, the warming endotracheal tube is a good practice because it increases the flexibility of the tube when passes through the high curvature of nasopharynx, and the result will be less trauma that is important in patients with pathologies that are prone to injury and epistaxis. Elsewhere mentioned that warming is an effective method and fuss-free that reduce nasal trauma during intubation and does not create additional problems for patient. Moreover, this method requires no additional equipment and also avoids unwanted systemic effects that are endemic for topical agents.[14]

Materials and Methods

In a double-blind prospective clinical trial and after approval of the regional ethics committee, 60 patients with ASA class I and II who were scheduled to undergo elective maxillofacial surgeries in Tabriz Imam Reza Hospital in 1391 were recruited. After obtaining informed written consents, all patients were randomly assigned to one of the two groups are as follows: Group C (control): Blind nasotracheal intubation without warming the tracheal tube and Group W (Warmed): Blind nasotracheal intubation performed using the warmed and softened tube by warm 50 °C water for 5 minutes. Patients in both groups were premedicated using 0.02 mg/kg, fentanyl 2 mg/kg, and vasoconstrictor phenylephrine drops (4 drops in each nostril). Induction of anesthesia was performed with propofol 2 mg/kg and cisatracurium 0.15 mg/kg. Later, anesthesia was maintained isoflurane and after adequate anesthesia depth was achieved (BIS less than 50) intubation was attempted. Exclusion criteria from the study were: limited mouth opening (less than 35 mm), Mallampati III and above, thyromental distance of less than 65 mm, limitation of neck movement, sternomental distance of less than 12.5 cm, patients with a history of recurrent epistaxis, and patients with coagulation disorders or skull base fracture. Inclusion criteria were: patient willingness, ASA physical class I or II, age range of 15 to 65 years and elective maxillofacial surgeries requiring nasal intubation. Time of intubation, number of attempts and complications including epistaxis, laryngospasm, hoarseness, sore throat and hemodynamic changes in heart rate (HR), mean blood pressure (MBP) and pulse oximetry (SaO_2) were recorded. All demographic information including age, sex, weight, ASA, history of surgery, type of surgery and the morbidity were noted. SPSS 16 (SPSS Inc., Chicago, IL, USA) was used for analysis of the data. Descriptive statistics (frequency, percentage, mean and standard deviation) were used to describe the data. T-test was used for comparison of the intubation time and success rate, HR, MBP and SaO_2. Chi-square test was used to compare the number of attempts and complications.

Intubation procedure

A pad was placed under patient head and neuter head position was maintained. A conventional nasal tube was selected for all patients while it was warmed at 50 °C water for patients in Group W. Endotracheal tube size was selected based on the type and specific circumstances of each patient (the size which was suitable for oral intubation). The tube was Inserted until one of the following situations occurred:

I= tracheal position: the target position: Endotracheal tube enters the trachea which is confirmed with breath sounds auscultation and capnography and after approval, the cuff is filled and tube is secured in place.

II= anterior position: the endotracheal tube cannot move forward and is stopped. When applying pressure to the tracheal tube, tube compression effect to the larynx can be seen from the outside. Looking at the neck, anterior movement of the larynx can be seen. In this mode the tube is pulled back and reinsert until it moves into the trachea while head and neck are in mild flexion position.

III and IV = left or right positions: while inserting the trachea tube, it enters the pyriform sinus and stops. Later, the tube is pulled back and tube direction is changed towards the midline and reinserted.

V= esophagus position which is approved with the absence of breath sounds and capnography.

Results

No significant difference could be observed between both groups regarding demographic characteristics. Table 1 summarizes the comparison of pre-anesthetic evaluations in both groups. Table 2 summarizes the comparison of intubation parameters in both groups. Table 3 summarizes the complication between both groups. As can be seen, no significant difference existed between both groups in this regards. Table 4 summarizes the comparison of hemodynamic changes between both groups. As can be seen, no significant difference existed between both groups in this regards.

Discussion

Blind nasotracheal intubation technique is particularly valuable in and used in emergency scenarios as well as elective conditions. It clinically is a method of intubation without observation of glottis[9] that is used when the orotracheal intubation is difficult or impossible.[10] Blind nasotracheal intubation is recommended in difficult airway algorithm.[11] The success rate of this method is less and its complications increased.[12] This method is the most common intubating method in difficult intubation conditions that anesthesiologists use.[13] Approaches that have been adapted to minimize nasotracheal complications include the use of fiber-optics, lubricant gels, vasoconstrictors, muscle relaxants, rotational movement of the tube[14], filling tube cuff in pharyngeal bed[15] and

Table 1. Comparison of pre-anesthetic evaluations in both groups

		Mean	Std. deviation	*P*
Sternomental Distance (Cm)	Control group	17.26	± 1.9134	0.051
	Warming Group	18.97	± 1.2524	
Thyromental Distance (Cm)	Control group	8.13	± 1.026	0.903
	Warming Group	8.1	± 0.875	
Mouth opening rate (Mm)	Control Group	44.33	± 6.418	0.067
	Warming Group	39.93	± 11.117	
ASA	Control Group	_	_	1.000
	Warming Group	_	_	
Weight	Control Group	71.7	±13.44	0.153
	Warming Group	69.33	± 15.14	
Age	Control Group	31.1	±10.77	0.684
	Warming Group	29.93	±11.28	
Gender	Control Group	_	_	0.145
	Warming Group	_	_	

Table 2. Comparison of intubation parameters in both groups

		Mean	Std. deviation	*P*
Duration of intubation (Sec)	Control Group	72.9	± 53.38	0.099
	Warming Group	48.53	± 59.02	
Attempts intubation (Number)	Control Group	2.63	± 1.159	0.153
	Warming Group	2.20	± 1.157	
Success rate	Control Group	70%	_	_
	Warming Group	83.3%	_	

Table 3. Comparison of intubation complications

		YES	NO	*P*
Hoarseness (Number)	Control group	1 (3.3%)	29 (96.6%)	1.00
	Warming Group	1 (3.3%)	29 (96.6%)	
Sore throat (Number)	Control Group	14 (46.6%)	16 (53.3%)	0.43
	Warming Group	10 (33.3%)	20 (66.6%)	
Laryngospasm (Number)	Control Group	0 (0%)	30 (100%)	1.00
	Warming Group	1 (3.3%)	29 (96.6%)	

Table 4. Comparison of hemodynamic changes

		Preanesthetic Mean± Std. deviation	Postanesthetic Mean± Std. deviation	Post intubation Mean± Std. deviation
HR (Beat/min)	Control group	14.016 ± 88.13	13.24 ± 83.26	14.94 ± 87.93
	warming Group	18.56 ±83.1	17.12 ± 82.13	17.07 ± 90.13
	P-VALUE	0.135	0.775	0.597
SBP (mmHg)	Control group	18.41 ± 128.73	25.17 ± 111.1	19.55 ± 121.8
	warming Group	12.86 ± 123.83	18.45 ± 100.8	17.19 ± 120.16
	P-VALUE	0.23	0.073	0.73
MBP (mmHg)	Control group	14.27 ± 92.03	18.55 ± 81.30	19.14 ± 93.16
	warming Group	12.44 ± 93.96	14.44 ± 72.53	16.69 ± 92.73
	P-VALUE	0.57	0.04	0. 926
SaO_2	Control group	1.60 ± 98.33 %	1.28 ± 99.13 %	1.82 ± 99.06 %
	warming Group	1.67 ± 98.57 %	1.25 ± 99.4 %	1.07 ± 99.53 %
	P-VALUE	0.58	0.23	0.41

the optimal position of the head and neck.[14] Depoix and colleagues showed that in 13.2% of their cases the tube did not pass nostril via nasal intubation and in 2.3% of cases nasal intubation was not possible and patients were intubated orally.[8] In our study, we did not observe any cases in which tube did not pass through the nostril and oral intubation was not required in any case. One of the reasons was warming endotracheal tube that increases the flexibility of the tube when passing through the high curvature of nasopharynx, and then the result will be fewer traumas and less resistance to entry of endotracheal tube. Using enough lubricant with phenylephrine as a vasoconstrictor more facilitates passage of the tube from nose curvature. Blind nasotracheal intubation success rate in the control group was 70% and in the study group was 83.3%. Although the success rate in the study group was higher than the control group, this difference was not statistically significant. This success rate was measured in three and less than three attempts and intubation failure was considered for more than three times. Because our patients were under general anesthesia and received muscle relaxants, after three attempts, the patient was intubated with laryngoscopy under direct visualization. In a study, blind nasal intubation success rate of 100% with using relaxants and 70% without the use of muscle relaxants was reported[15]; the results of this study are inconsistent with previous studies showing 13.2% rate of failure.[16] Failure in nasal intubation in our study despite using relaxants might have been due to the following facts: Firstly, we only did three attempts the previous studies had performed it up to 5 times. Secondly, all patients in our study were patients undergoing oral and maxillofacial surgery in a high percentage of difficult intubation and in 30% of cases that nasal intubation had failed, intubation under direct vision was difficult as well. Cheema *et al*. tried up to 5 attempts in their study and used succinylcholine; yet, they reported no cases of hypoxia that is consistent with our study.[15] Most frequent tube position was esophageal followed by tracheal and anterior positions respectively. Filling tube cuff in pharynx bed has been reported to change esophageal position to the tracheal situation[17] which was confirmed in our study as well. According to Thong *et al*. and Ayla *et al*., warming endotracheal tube increases kinking risk for endotracheal PVC tubes.[14,18,19] However, due to its advantages such as non-traumatized nose and increased ease of nasal passage, warming the tube should not be overlooked. Lu and colleagues showed that warming the tracheal tube with warm water reduced the rate and severity of epistaxis during nasotracheal intubation.[20] He reported that epistaxis rate was 76.7% in the group without softening endotracheal tube and 43.6% in the group with softened endotracheal tube by warm water. In our study, the epistaxis in the control and study groups were 66.3% and 33.3% respectively. However, the severity of epistaxis in the study group was significantly lower than control group. Our study confirms the results of Lu and colleagues. Lixy *et al*. compared the hemodynamic changes following nasotracheal intubation using various methods such as: glidescop, fiberoptic and Macintosh blade. In all three cases after anesthesia induction, a significant decrease in BP and RPP (Rate Product Pressure) were observed in all groups. But there was no significant change in HR. On the other hand a significant increase in MBP, RPP and DBP were observed in all groups during intubation, the increase was greater from others in fiber optics.[21] In our study, the hemodynamic changes after induction of anesthesia, and after intubation, were statistically significant. Despite the lack of laryngoscopey and considering that the rate of changes was less than 20% of baseline in our study, these changes were insignificant.

Conclusion

In conclusion, our study showed that using an endotracheal tube softened by warm water could reduce the incidence and severity of epistaxis during the act of blind nasotracheal intubation. However, it fails to facilitate blind nasotracheal intubation.

Ethical issues: This study was reviewed and confirmed by the ethics committee of Tabriz University of Medical Sciences.

Conflict of interests: The authors declare no conflicts of interest.

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