Original Article

Does Prewarming of Tracheal Tubes Prevent Epistaxis Following Nasotracheal Intubation? A Prospective, Randomised, Single-Blind Study

Anuja Agrawal, Bhavika Sangada, Dinesh Chauhan, Tejash Sharma

Department of Anaesthesia, Dhiraj Hospital, SBKS MIRC, Sumandeep Vidyapeeth, Waghodia, Vadodara, Gujarat, India

Abstract

Introduction: Nasotracheal intubation has always been considered more traumatic than orotracheal intubation. According to previous studies, warming of endotracheal tubes is a good practice because it softens the tube and increases its flexibility, thereby resulting in less trauma. We aimed to study whether prewarming of nasotracheal tube resulted in less nasal trauma and epistaxis as compared with a tracheal tube at the room temperature. Our primary aim was to evaluate trauma and epistaxis due to nasotracheal intubation. The secondary aim was to observe the grade of epistaxis, ease of nasotracheal intubation, time taken to intubate, number of attempts to intubate and need for Magill's forceps for intubation. **Patients and Methods:** This prospective, randomised, single-blind study was conducted on 30 participants. Randomisation was done by a concealed envelope method. All participants belonged to the American Society of Anesthesiologists Physical Status I and II. They were allocated to one of two groups ($n = 15$ in each group). Patients in Group A were intubated with normal nasotracheal tubes at room temperature, while those in Group B were intubated with prewarmed nasotracheal tubes. The tracheal tubes were warmed at 45°C for 60 min. Institutional protocol for general anaesthesia was followed in both groups. Statistical analysis was performed using Medcalc software for Windows version 12.7.5.0. (Belgium). **Results:** Intubation was significantly easier in Group B (15) compared to Group A (5) ($P < 0.0005$). Time taken for intubation was significantly shorter in Group B (44.73 ± 11.02 s) as compared to Group A (74.46 ± 21.27 s) ($P < 0.0001$). The incidence of epistaxis was significantly higher in Group A (9) as compared to Group B (1) ($P < 0.005$). **Conclusion:** Incidence of epistaxis following nasotracheal intubation was significantly less with prewarmed tracheal tubes as compared to normal tracheal tubes.

Keywords: Epistaxis, nasotracheal intubation, prewarming tracheal tube

Introduction

Nasotracheal intubation is a commonly performed procedure in patients undergoing oral and maxillofacial surgery, and it has always been considered more traumatic than orotracheal intubation. Advancement of the nasotracheal tube can traumatise nasal passages, causing bleeding and avulsion of a turbinate or even retropharyngeal dissection. In a prospective series, the incidence of bleeding due to nasotracheal intubation was documented to be as high as 18%–77% even in experienced hands.[1]

Access this article online

Quick Response Code:

Website: www.arwy.org

DOI: 10.4103/ARWY.ARWY_14_19

Address for correspondence: Dr. Bhavika Sangada, Department of Anaesthesia, Dhiraj Hospital, SBKS MIRC, Sumandeep Vidyapeeth, Waghodia, Vadodara, Gujarat, India.
E-mail: bhavikasangada28@gmail.com

How to cite this article: Agrawal A, Sangada B, Chauhan D, Sharma T. Does prewarming of tracheal tubes prevent epistaxis following nasotracheal intubation? A prospective, randomised, single-blind study. Airway 2019;2:77-80.

Approaches to minimise complications due to nasotracheal intubation include the use of lubricants, vasoconstrictor, lower size endotracheal tubes (ETTs), telescoping tube into endotracheal catheters and warming of nasotracheal tubes. The objective of our study was to compare the incidence of epistaxis, grade of epistaxis, ease of nasotracheal intubation, time taken to intubate, number of attempts to intubate and the need for Magill's forceps for intubation while performing nasotracheal intubation with tracheal tube at room temperature versus one that has been prewarmed to 45°C for 60 min.

Patients and Methods

After obtaining permission from the Institutional Ethical Committee, the study was conducted over 4 months. The registration number for this trial is CTRI/2017/02/007840. After obtaining written informed consent, 30 patients aged 18–60 years belonging to the American Society of Anesthesiologists Physical Status I and II and Mallampati Class I and II posted for surgeries requiring nasotracheal intubation were included in the study. Exclusion criteria for the study included patients with a history of nasal bleed, repeated nasal trauma, coagulation disorder, anticipated difficult intubation, and body mass index >25 kg/m^2.

Patients were prospectively randomised into two groups (Group A or Group B) by concealed envelope method with each group comprising 15 patients. Patients in Group A were intubated with nasotracheal tubes kept at room temperature (control group), while patients in Group B were intubated with prewarmed nasotracheal tubes kept for warming in normal saline at 45°C for 60 min. All the patients who were recruited for the study went through both arms of treatment. None of them were lost to follow-up.

Blinding was done to prevent bias in the results of the study. Group allocation was done by Investigator 1 who also prepared the tubes. Tubes were placed in a warm cabinet set to a specific temperature. Before removal of the tube from the chamber, the cabinet temperature was measured using a thermometer. An experienced anaesthesiologist (Investigator 2) intubated all the patients and collected data. Tabulation of data and statistical analysis was done by the statistician (Investigator 3).

Patients were kept nil by mouth for 8 h before surgery. On arrival to the operating room, multiparameter monitors were attached and baseline vital parameters were noted. An intravenous line was secured with 20 SWG cannula and Ringer lactate solution was started. All patients were premedicated with ondansetron 0.08 mg/kg, glycopyrrolate 0.004 mg/kg and midazolam 0.05 mg/kg intravenously. Following preoxygenation for 5 min, patients were induced with propofol 2–2.5 mg/kg intravenously till the loss of verbal response followed by succinylcholine 2 mg/kg intravenously. Patients were intubated with a nasotracheal tube as per the group allocation. Magill's forceps were used to direct the tube into the laryngeal opening as and when required. After confirming bilateral equal air entry, the tube was fixed. Anaesthesia was maintained with oxygen and nitrous oxide (50:50), isoflurane and atracurium 0.5 mg/kg intravenously as a loading dose and 0.1 mg/kg intravenously as and when required.

Our primary aim was to observe for epistaxis. The secondary aim was to observe for the ease of intubation, time taken for tracheal intubation, number of attempts to intubate and use of Magill's forceps to facilitate intubate. The severity of epistaxis was graded as Grade 0, 1, 2 and 3. (Grade 0 - no bleeding, Grade 1 - soakage was of half a gauze, Grade 2 - when soakage was of half to one gauze and Grade 3 - when soakage was more than one gauze. Ease of tracheal intubation was graded subjectively as easy or difficult as per the assessment of the anaesthesiologist intubating the patient. Time taken for intubation was considered from the point the tracheal tube was inserted into the nostril until equal air entry was confirmed. Other parameters recorded included heart rate, systolic blood pressure, diastolic blood pressure, mean arterial pressure and SpO_2 using an automated multiparameter monitor. After the surgical procedure, residual neuromuscular blockade was antagonised and patients extubated according to the standard protocol. Patients were monitored in the postoperative recovery room for 24 h.

The sample size was calculated using data about the incidence of epistaxis from an earlier study.[2] Using a comparison of two proportions, two-sample, two-sided equality with a power of the study of 80% and confidence interval of 95%, the calculated sample size

was 14. We, therefore, proposed to study 15 patients in each group.

After completion of the study, data were collected and entered into Microsoft Excel 2010. Statistical analysis was performed using Medcalc software for Windows version 12.7.5.0. (Acacialaan, Ostend, Belgium). Qualitative data were analysed using the Chi-square test and quantitative data were analysed using the Student's *t*-test. $P \leq 0.05$ was considered as statistically significant.

Results

Both groups were comparable demographically. They were also comparable with respect to ASA status and Mallampati grade. Incidence of Grade 1 epistaxis was significantly higher in Group A compared to Group B ($P < 0.005$) [Table 1]. In Group A, 10 cases of 15 were found to be difficult, whereas in Group B, all 15 cases were easy. This difference was statistically highly significant ($P < 0.0005$). Only one case of epistaxis was noted in Group B. Overall incidence of epistaxis was higher in Group A as compared to Group B which was statistically significant. Mean time for intubation was significantly less in Group B as compared to Group A ($P < 0.0001$) [Table 1]. All the patients in the study were intubated in the first attempt except for the one patient in Group B.

Discussion

Nasotracheal intubation is commonly done in cases of head and neck surgeries either to provide access to a surgeon or due to non-availability of oral route. Nasotracheal intubation is associated with higher incidence of nasal trauma resulting in epistaxis. Epistaxis can occur due to direct trauma, inexperience of the anaesthesiologist, material of tube or fragility of tissue. Epistaxis may result in difficult intubation by obscuring the view of larynx or aspiration of blood into the lungs.[2]

Various methods have been recommended to reduce the incidence of nasal trauma and epistaxis such as cocaine, lidocaine-phenylephrine, oxymetazoline,[3-6] saline or water-soluble lubricating jelly. These methods have been used to anaesthetise, lubricate and shrink the nasal mucosa to ease the passage of the nasotracheal tube. Other methods such as incrementally dilating the nasal passage with nasopharyngeal airways[1] or using insertion aids[7,8] to increase the curvature of the endotracheal have also been suggested.

We used the warming method to decrease the incidence of epistaxis during nasal intubation. In our study, we found that warming of the nasotracheal tube results in significantly reduced incidence of epistaxis due to nasal intubation. We also found that warming of the nasotracheal tube not only made the intubation easier but it also lead to significantly shorter intubation time.

Lu *et al.* studied the effect of softened nasotracheal tube on the incidence of epistaxis following nasotracheal intubation. The study suggested that in nasotracheal intubation, the use of a softened ETT made possible by warming would be an effective way to prevent epistaxis. They also mentioned that besides reducing epistaxis associated with nasotracheal intubation, a softened ETT may enable an easier passage of ETT of larger sizes, which may reduce airway resistance and offer better pulmonary hygiene and easier tracheal toilet.[9]

Table 1: Demographic data and study parameters of patients in both groups

Parameter	Group A (normal)	Group B (warmed to 45°C for 60 min)	*P*
Age (years) (Mean±SD)	39.67±17.61	37.33±17.5	NS
Gender (Male/Female)	8/7	8/7	-
BMI (kg/m2) (Mean±SD)	27.31±3.19	28.12±3.90	NS
Mallampati Class (I/II)	11/4	10/5	-
ASA physical status (I/II)	11/4	10/5	-
Attempt to intubate (1/2)	15/0	14/1	> 0.05
Time for intubation (s) (Mean±SD)	74.46±21.27	44.73±11.02	<0.0001
Use of Magill forceps (yes/no)	15/0	15/0	1
Ease of intubation (easy/difficult)	5/10	15/0	<0.0005
Epistaxis incidence	9	1	<0.005

SD: Standard deviation, BMI: Body mass index, NS: Not significant, ASA: American Society of Anesthesiologists

Kim *et al*.[8] found that simple thermosoftening treatment of the nasotracheal tube with warm saline helps to reduce epistaxis and nasal damage, which is in concordance with our study.

Our technique has several advantages and better or equivalent results compared to other techniques. It can be easily performed and it is cost-effective as it does not require additional equipment. Our technique also avoids the systemic side effects of vasoconstrictor drugs. This technique can be used even outside the ideal setting by keeping the tube in warmed fluid heated up to a particular temperature, which can be checked by using a thermometer.

The limitation of our study was that the anaesthesiologist intubating the patient could be easily biased as the temperature of the tracheal tube was evident. However, this limitation does not alter our results. To prevent the introduction of any bias due to the skill of the anaesthesiologist, all patients were intubated by the expert anaesthesiologists.

Some of the drawbacks of our technique are that it requires special preparation that is time consuming. Furthermore, the time interval between receiving the nasotracheal tube from the heating chamber and nasotracheal intubation is not possible to define. This may affect the flexibility of the tube and efficacy of the technique.

We suggest that as this technique has not been studied extensively, further studies are required to address this issue. We warmed nasotracheal tubes at 45°C for 60 min. Further research is indicated wherein tracheal tubes are warmed to temperatures <45°C or for lesser time and their efficacy under such modified conditions in reducing nasal trauma can help in the future development of this particular technique.

Conclusion

Prewarming the nasotracheal tube helps in reducing the incidence of epistaxis and reduces the time for intubation. It also increases the ease of insertion through the nostril with almost no complications though Magill's forceps were required in all cases to direct the softened tube into the glottis.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

References

1. Elwood T, Stillions DM, Woo DW, Bradford HM, Ramamoorthy C. Nasotracheal intubation: A randomized trial of two methods. Anesthesiology 2002;96:51-3.
2. Hussain S, Afzal F, Bangash L, Butt T, Ali K, Qayyum A. Frequency of epistaxis during nasotracheal intubation with or without vasoconstrictor drops in patients undergoing maxillofacial surgery. PJMHS 2014;8:841-4.
3. Gross JB, Hartigan ML, Schaffer DW. A suitable substitute for 4% cocaine before blind nasotracheal intubation: 3% lidocaine-0.25% phenylephrine nasal spray. Anesth Analg 1984;63:915-8.
4. Katz RI, Hovagim AR, Finkelstein HS, Grinberg Y, Boccio RV, Poppers PJ. A comparison of cocaine, lidocaine with epinephrine, and oxymetazoline for prevention of epistaxis on nasotracheal intubation. J Clin Anesth 1990;2:16-20.
5. O'Hanlon J, Harper KW. Epistaxis and nasotracheal intubation – Prevention with vasoconstrictor spray. Ir J Med Sci 1994;163:58-60.
6. Kay J, Bryan R, Hart HB, Minkel DT, Munshi C. Sequential dilatation: A useful adjunct in reducing blood loss from nasotracheal intubation. Anesthesiology 1985;63:A259
7. Watanabe S, Yaguchi Y, Suga A, Asakura N. A "bubble-tip" (Airguide) tracheal tube system: Its effects on incidence of epistaxis and ease of tube advancement in the subglottic region during nasotracheal intubation. Anesth Analg 1994;78:1140-3.
8. Kim YC, Lee SH, Noh GJ, Cho SY, Yeom JH, Shin WJ, *et al.* Thermosoftening treatment of the nasotracheal tube before intubation can reduce epistaxis and nasal damage. Anesth Analg 2000;91:698-701.
9. Lu PP, Liu HP, Shyr MH, Ho AC, Wang YL, Tan PP, *et al.* Softened endothracheal tube reduces the incidence and severity of epistaxis following nasotracheal intubation. Acta Anaesthesiol Sin 1998;36:193-7.