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INCIDENCE AND PREDICTORS OF NASOPHARYNGEAL AIRWAY TO FACILITATE NASOTRACHEAL INTUBATION

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Key Words:
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Background: Nasotracheal intubation is the most frequent approach of airway management in oral and maxillofacial surgical procedure. However, many times, it is related to ensuing bleeding from trauma to nasopharyngeal mucosa. This study was done to determine how effectively nasopharyngeal airways (NPAs) performed at making nasopharyngeal insertion simple and minimize trauma during nasotracheal intubation. **Objectives:** The aim of this study is to determine the incidence and predictors of nasopharyngeal airway to facilitate nasotracheal intubation. **Methods:** This study was carried out in the Anaesthesiology Department of Dhaka Dental College and Hospital. The subjects of the study were the patients who underwent maxillofacial surgery and required nasotracheal intubation. Nasotracheal intubation was done on 900 patients during the study period from January 2022 to December 2022. **Results:** The majority of patients 891(99.0%) had successful nasotracheal intubation. The patients in this study ranged in age from 10 to 60 years old and the majority were male 685(76.1%). A small percentage of patients reported postoperative complications such as runny nose 12 (1.3%), epistaxis or nasal bleeding 10(1.2%), nasal trauma or pain 12(1.3%), inflammation or ulceration of the nose with full recovery 6(0.6%), and sinusitis 10(1.2%) among individuals. For atraumatic nasotracheal intubation, nasal cavity dilatation with nasopharyngeal airways was useful. **Conclusions:** Dilatation of nasal cavity with nasopharyngeal airways (NPAs) extensively eases the insertion of endotracheal tube (ETT) into the

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nasopharynx and significantly decreases the incidence and severity of trauma and bleeding during nasotracheal intubation.

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INTRODUCTION

Nasotracheal intubation is the most frequent method of airway management in patients who need oral and maxillofacial surgery as it offers top accessibility for intraoral and facial surgical procedures. However, the most frequent complication of nasotracheal intubation is epistaxis, ensuing bleeding from trauma to nasal and nasopharyngeal mucosa, nasal septum and turbinates. [1] The possibility of trauma is inherently higher with nasotracheal intubation than with orotracheal intubation due to the fact that the tube passes through the narrow nasal passage. The incidence of bleeding is variable, ranging from 18% to 77% even in skilled hands. [2] Blood in the airway can make easy intubation difficult, obscuring the view of the larynx and increasing the risk of aspiration of blood. Several elements are essential for atraumatic nasotracheal intubation, along with choice of more patent nasal cavity, preparation of nasopharynx with vasoconstrictors (oxymetazoline and cocaine),[3] progressive dilatation of nasopharyngeal passage with nasopharyngeal airways (NPAs),[4] use of an appropriate sized endotracheal tube (ETT), lubrication of nasopharynx, lubrication of ETT, warming and softening the tip of ETT before insertion,[5] structure of the tracheal tube tip,[6] and the use of appropriate method without excessive pressure or attempts when resistance is encountered during insertion of ETT. A rigid tip or a sharp-edged Murphy's eye of conventional ETTs appears to be the source of nasal and nasopharyngeal mucosal injury during nasotracheal intubation. [7]

In particular, nasotracheal intubation provides the surgeons unrestricted access to the oral cavity and maxillofacial complex, allows for free movement of the facial bones during surgery, repair facial bone fractures, and enables proper mandibular and maxillary articulation during surgical procedures. [8] Nasotracheal intubation should be completed if bleeding starts during insertion of ETT to preserve the airway and to tamponade the bleeding point. [9] Understanding the anatomy of nasopharynx is important because it provides knowledge about the nasotracheal tube's course and potential difficulties. [10] Even though nasotracheal intubation is still a common approach for microlaryngeal surgery [11, 12] and oral & maxillofacial surgery, we believe that it improves intraoral access. It should be given more consideration for routine practice in majority of minor intraoral procedures. Prior to nasotracheal intubation, mechanical dilatation utilizing consecutively enlarged nasopharyngeal airways (NPAs) has been promoted as a strategy to minimize trauma and bleeding to the nasal mucosa.

METHODS

This cross-sectional study was conducted in the Department of Anaesthesiology of Dhaka Dental College and Hospital in the period of January 2022 to December 2022. The study subjects were the patients undergoing Oral and Maxillofacial Surgery required nasotracheal intubation. The study was conducted to understand the incidence & predictors of the nasopharyngeal airway to facilitate nasotracheal intubation. For this study, 900 patients of either sex in the age group of 10–60 years old having the criteria of American Society of Anesthesiologists (ASA) physical status I & II with Mallampati score I, II & III undergoing elective Oral and Maxillofacial Surgery were included. Age under 10 years & above 60 years old, ASA physical status III, IV, V & VI, limited mouth opening (<3 cm), Mallampati

score IV, redo cases, having history of bleeding diathesis and recurrent epistaxis, fracture of the base of skull & nasal bone, nasal deformity were excluded from the study.

On the day of preanaesthetic checkup, history was taken properly by the anaesthesiologist with special attention to the history of bleeding disorder, nasal bleeding, trauma to head, neck & face and history of nasal obstruction. Thorough clinical examination was done emphasizing on airway assessment and nasal patency test. To assess the airway, the anaesthesiologist performed Mallampati scoring with the patient in sitting position, head in neutral position, instructed to open mouth as wide as possible and stick tongue right out. Measurement of mouth opening & cervical spine movement was observed by the anaesthesiologist. To identify more patent nasal cavity, all patients were instructed to compare their nasal airflow while breathing alternatively through right and left nostril. After proper preanaesthetic evaluation, standard anaesthetic technique was planned for all included patients.

On the scheduled operative day after confirming nothing per oral status, intravenous cannulation was done by 18G/20G IV cannula. Premedication was given with injection glycopyrrolate 4µgm/kg body weight, injection midazolam 50µgm/kg body weight and injection fentanyl 2µgm/kg body weight. In the preselected nasal cavity 1% Xylometazoline nasal drop was given for vasoconstriction of nasal mucosa. 2% lignocaine jelly was given in the same nasal cavity for lubrication of nasal passage prior to gradual insertion of nasopharyngeal airways (NPAs) for dilatation of the nasal cavity to perform uninterrupted nasotracheal intubation. Different size of nasopharyngeal airways (NPAs) (22FR to 34 FR) were used gradually according to the age for optimum dilatation of the nasal cavity. The maximum sized nasopharyngeal airway was kept in the nasal cavity for 5 minutes.

Preoxygenation was given with 100% oxygen for 3-5 minutes keeping nasopharyngeal airway in situ. Induction was done with injection propofol 2mg/kg body weight and suxamethonium 1-2mg/kg body weight was used as muscle relaxant for intubation. The nasopharyngeal airway was removed just before nasotracheal intubation. Before insertion of the appropriate sized endotracheal tube through nasopharynx the tip of the tube was kept in hot water (50°c) for 3-4 minutes and proximal part was lubricated with 2% lignocaine jelly. The ETT was inserted cautiously through the preselected nasal cavity with the bevel part facing towards the nasal septum. During insertion, if any resistance felt the tube was removed & reinserted with counter clock movement. According to resistance encountered during insertion of ETT through nasopharynx the difficulty level was graded as follows: (i) No resistance, (ii) Mild resistance, (iii) Moderate resistance, (iv) Failed to insert.

During laryngoscopy, bleeding status in the nasopharynx due to insertion of ETT through nasal cavity was assessed as follows: (i) No bleeding, (ii) Mild bleeding (Trace amount of blood), (iii) Moderate bleeding (pharynx occupied with blood), (iv) Severe bleeding (interruption of intubation).

The data for this study had been accumulated from patients' medical information. Statistical evaluation of the results used to be got via the use of a window-based computer software program devised with Statistical Packages for Social Sciences (SPSS-24).

RESULTS

Nasotracheal intubation was successful in most of the patients 891(99.0%). The intubation procedure was uneventful or easy in 567(63.0%) patients, mildly difficult in 195(21.67 %) patients, moderately difficult in 97(10.78 %) patients, very difficult in 32(3.55%) patients and 9(1.0%) cases were failed to intubate. In this study, there were

more male 685(76.1%) than female 215(23.9%). More patients with difficult intubation were male and had large tongues and a higher Modified Cormack Lehane grade. There were no incidences of hypoxia during intubation period.

Table 1: Demographics of the patients

Characteristics	No of cases	Percentage
Gender		
Male	685	76.1%
Female	215	23.9%
Age groups (in years)		
10-20	46	5.1%
20-30	189	21%
30-40	330	36.7%
40-50	225	25%
50-60	110	12.2%
***Weight (kg)**	55 (32-87)	
***Height (cm)**	165.1 (142.2-180.3)	

*Data are expressed as median (range)

The patients were between the ages of 10 to 60 years. Majority of them fall into age group 30-40 years and only 46(5.1%) fall into 10-20 years' age group. According to gender distribution, 685 (76.1%) of these patients were male, whereas 215 (23.9%) were female. The median weight and height of the patients were 55 (32-87) kg and 165.1 (142.2-180.3) cm respectively (Table-1).

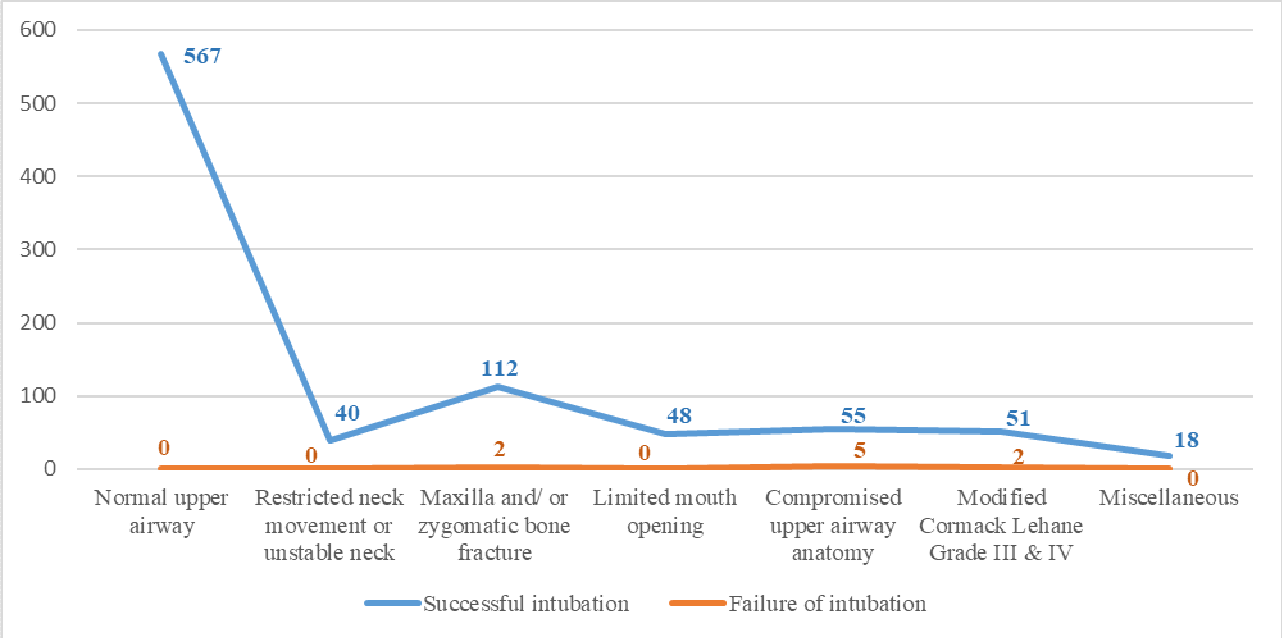

Figure 1: Number of successful and failed nasotracheal intubation with causes of failure

According to number of success or failure of intubation technique, total of 891 cases were successfully intubated. Among them 324 cases were difficult to intubate inspite of facing difficulties in which 112 cases with maxilla and/or Zygomatic bone fracture, 55 cases with compromised upper airway anatomy, 51 cases with Modified Cormack Lehane Grade III & IV, 48 cases with limited mouth opening, 40 cases with restricted neck movement or unstable nack, and 18 cases with miscellaneous causes were successfully intubated. Only 9 cases were failed to intubate, 5 cases of them were failed due to compromised upper airway anatomy, 2 of them were failed in patients who had maxilla and/or zygomatic bone fracture and other 2 of them were failed due to limited visualization of vocal cord also known as Modified Cormack Lehane Grade II & IV. (Figure I).

Table 2: Postoperative complications of nasotracheal intubation

Postoperative complications	n=50	%
Runny nose postoperatively	12	1.3%
Epistaxis or bleeding	10	1.2%
Painful nose/ trauma to nasal mucosa and turbinates	12	1.3%
Inflammation or ulceration of nose with complete recovery	6	0.6%
Sinusitis	10	1.2%

Most of the cases recovered without any complications. A few number reported some postoperative complication such as runny nose 12 (1.3%), epistaxis or nasal bleeding 10(1.2%), trauma to nasal mucosa or painful nose 12(1.3%), Inflammation or ulceration of nose with complete recovery 6(0.6%) and sinusitis developed among 10(1.2%) patients (Table 2)

DISCUSSION

The majority of patients (99.0%) had successful nasotracheal intubation. The patients ranged in age from 10-60 years and males were predominated (76.1%). No patient experienced any instances of hypoxia while being intubated. In this study, 891 cases were successfully intubated. Among them 324 cases were difficult to intubate inspite of facing difficulties in which 112 cases with maxilla and/or Zygomatic bone fracture, 55 cases with compromised upper airway anatomy, 51 cases with Modified Cormack Lehane Grade III & IV, 48 cases with limited mouth opening, 40 cases with restricted neck movement or unstable nack, and 18 cases with miscellaneous causes were successfully intubated. Only 9 cases were failed to intubate; 5 cases were due to compromised upper airway anatomy, 2 cases were due to maxilla and/or Zygomatic bone fracture and 2 cases were due to Modified Cormack Lehane Grade III & IV.

The most frequent complication of nasotracheal intubation is trauma to nasal mucosa and turbinates (1.3%) following painful nose. However, trauma to the nasal mucosa is inevitable when a giant-diameter ETT is inserted through the nasal cavity. [13] Epistaxis (1.2%) or bleeding is most probable to occur if the insertion of the endotracheal tube (ETT) through the nasal passage is difficult. Variable rates of bleeding are described in the study after nasotracheal intubation. [14] Therefore, techniques to ensure easy and smooth insertion of the tube through the nasal passage are vital to reduce the incidence of epistaxis. [15] Postoperative runny nose (1.3%) and sinusitis (1.2%) also occurred as complications in this study.

To reduce the risk of epistaxis, it is essential to employ strategies that make inserting the tube through the nasal passage

simple and painless Prior to this study, we made an effort to reduce nasopharyngeal damage in accordance with published recommendations [16], and as a result, we were able to determine which nasal cavity was more patent by comparing airflow. The predictors of difficult airway used in this study are reliable. From an anatomical perspective, The Kiesselbach's plexus damage is the typical cause of epistaxis following nasotracheal intubation. It helps to prevent epistaxis during intubation if the arteries of Little's area (The Kiesselbach's plexus) in the anterior inferior quadrant of the nasal septum are effectively constricted. Therefore, choosing the nasal cavity that is broader than the other during a physical or radiological assessment and pretreating the nasal cavity with a vasoconstrictor could help to lessen the amount of epistaxis during nasotracheal intubation. [17-19]

Mechanical dilatation of nasal cavity by using incrementally sized nasopharyngeal airways (NPAs) prior to nasotracheal intubation has been recommended. [20] However, the tube in the pharynx would be easier to identify if a nasopharyngeal airway was used. Since this instrument is constructed of a latex-free substance, patients who are allergic to latex can still use the "pathfinder" technique. Enk et al. said the "pathfinder" method is the use of the Wendl tube to facilitate nasopharyngeal passage of the ETT and decrease nasopharyngeal bleeding and postoperative nasal pain. [21]

In consideration of these facts, we preferred to widen the nasal cavity using 22Fr to 34Fr NPAs gradually according to age, which was then kept in place for five minutes while the anaesthesia was being induced. Using the NPA improved the mask ventilation and oxygenation during the induction of anaesthesia. A failed mask ventilation increases the patient's risk of deoxygenation during induction of general anaesthesia, particularly in settings where mask ventilation is difficult.

Another research found that the silicone-based wire-reinforced tracheal tube with a hemispherical bevel tip was superior to the polyvinyl chloride-based tracheal tube in terms of both frequency and severity of epistaxis. [22] In contrast to preformed tubes, the two types of tubes have different thicknesses. Although reinforced tubes have a little larger external diameter than preformed tubes, which are more rigid and inflexible, this difference in flexibility may be the reason why reinforced tubes perform better overall. [23] Simple thermosetting of the tip of the nasotracheal tube before intubation helps to limit the nasal damage and severity of epistaxis. Since previous studies have indicated that it is recommended that the tip of the ETT should be inserted into warm water at 50°C for softening before intubation. [24]

Limitations of the study

The present study was conducted in a very short period due to time constraints and funding limitations. The small sample size was also a limitation of the present study.

CONCLUSION

Using the findings from the current study as groundwork, an easy method of dilatation of the nasal cavity with the nasopharyngeal airways throughout induction of anaesthesia appears to facilitate the nasopharyngeal passage of the endotracheal tube and decreases the incidence and severity of trauma and bleeding throughout nasotracheal intubation.

RECOMMENDATION

This study can serve as a pilot to much larger research involving multiple centers that can provide a nationwide picture, validate regression models proposed in this study for future use and emphasize points to ensure better management and adherence.

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Airway to Facilitate Nasotracheal Intubation research means that editors need much assistance from referees in the evaluation of papers submitted for publication. I would also like to be grateful to my colleagues and family who supported me and offered deep insight into the study.

DECLARATION

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