Reducing Nasopharyngeal Trauma: The Urethral Catheter-Assisted Nasotracheal Intubation Technique

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Nasal intubation is an advantageous approach for dental procedures performed in the hospital, ambulatory surgery center, or dental office, when possible. Although many who provide anesthesia services are familiar and comfortable with nasal intubation techniques, some are reluctant and uncomfortable because of lack of experience or fear of nasopharyngeal bleeding and trauma. It has been observed from experiences in various settings that many approaches may be adapted to the technique of achieving nasal intubation. The technique that is described in this paper suggests a minimally invasive approach that introduces the nasoendotracheal tube through the nasopharyngeal pathway to the oropharynx in an expedient manner while preserving the nasopharyngeal structures, thus lessening nasal bleeding and trauma to soft tissues. The technique uses a common urethral catheter and can be incorporated along with current intubation armamentaria. As with all techniques, some limitations to the approach have been identified and are described in this paper. Cases with limited mouth opening, neck injury, and difficult airways may necessitate alternative methods. However, the short learning curve along with the many benefits of this technique offers the anesthesia professional additional options for excellent patient care.

Key Words: Nasotracheal tube; Nasopharyngeal; Intubation; Special needs; Urethral catheter; Epistaxis.

General anesthesia via endotracheal intubation for dental treatment may be performed from an oral or a nasal approach.¹ The obvious benefits of nasal intubation include improved working space in the oral cavity and the ability of the dentist to evaluate jaw relationships. Although it is generally safe, nasotracheal intubation is not without complications. The incidence of minor bruising to the mucosa overlying the inferior turbinates has been reported as high as 54%.² A search of the literature reveals epistaxis rates ranging from 18 to 66%.³⁻⁸ Although epistaxis is the most frequently encountered com-

plication, other traumatic events such as middle turbinec-tomy have also been reported.^{6,7} These complications can make visualization of the trachea problematic and can force blood and debris into the lungs.

Physician anesthesiologists, dentist anesthesiologists, and nurse anesthetists are trained in various techniques for nasal and oral intubation, although the oral route is more common for most surgical procedures. For many anesthesia professionals who do not perform nasal intubations routinely, the technique can be more challenging than the oral approach. The number of cases requiring nasal intubation is growing in the population of patients with special needs. The approach described in this paper is intended to provide an alternative technique to assist in the nasal intubation process. It has been observed that this technique is associated with less nasopharyngeal trauma

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and bleeding in children.^{9,10} Avoidance of nasopharyngeal trauma in the airway is preferable from both the surgeons' and the anesthesiologists' perspectives, as perioperative laryngospasm and aspiration of fluids can have significant perioperative consequences. Although this technique is mentioned in the literature on pediatric anesthesia, it is not commonly used to provide adult anesthesia.^{9,10}

Patients with special needs present other challenges when intubation techniques are considered. Those with Apert's syndrome or Treacher-Collins syndrome often present with craniofacial anatomy that can make a traditional nasopharyngeal intubation approach with direct laryngoscopy problematic.^{11,12} Thus fiberoptic nasotracheal intubation is commonly used for these cases. Blockage of the patency of the nasotracheal tube could also occur in patients with enlarged lymphoid tissues, unusual turbinate dimensions, or nasal polyps and leads to undue trauma and bleeding.¹³

METHODS

The conventional approach to nasal intubation after induction of anesthesia is to prepare the nasal chamber with topical anesthetic and a vasoconstrictor (phenylephrine or rarely cocaine) to anesthetize and shrink the nasal mucosa. A series of sequentially sized soft, pliable nasopharyngeal tubes are lubricated and introduced into the naris to help dilate the nasal orifice and improve passage of the nasal endotracheal tube. When adequate dilation is reached, the patient is then hyperoxygenated by face mask for a short time.¹⁴ The deflated, lubricated nasotracheal tube is placed into the nasal orifice. Slowly and carefully, the tube is navigated through the nasal cavity toward the oropharynx to prevent damage to the delicate nasal mucosa and turbinates. Trauma can occur to the turbinates as a result of the sharp, rigid edge of the distal aspect of the nasotracheal tube. Some anesthesia providers warm the nasotracheal tube to soften it and lessen the trauma of the hard tube against the tissue. Ideally, secretions and blood in the posterior pharyngeal area should be minimal after the tube passes through the naris and nasopharynx. However, in cases with moderate to severe maxillary constriction or other pathology, this is not always the case.

Once the nasotracheal tube reaches the posterior area of the mouth, the laryngoscope is used to elevate the base of the tongue to visualize the vocal cords and glottis. A Magill forceps is then used to help navigate the tip of the tube between the vocal cords, and the cuff is inflated. Placement of the tube is verified in the usual fashion.

In the technique described in the next section, use of the urethral catheter has many advantages that help

Figure 1. Rounded end of urethral catheter.

minimize trauma and expedite intubation. The urethral catheter can be used as a suction device in the oropharynx or esophagus (particularly in pediatric anesthesia), as a urinary straight catheter in the operating suite, or for retraction during tonsillectomy and adenoidectomy. Adaptation of the catheter to facilitate nasotracheal intubation is a unique application that is highly efficient. The urethral catheter is a smooth, soft, pliable tube with a funnel-like cup at one end and a rounded end on the narrow tip (Figure 1). The length of the urethral catheter is approximately 40 cm, and the diameter ranges from 8 to 20 French, corresponding to the size of the funnel-like proximal cup. Catheter size is selected according to the size of the nasotracheal tube selected, an approximation of the size of the naris to be intubated, and knowledge of whether any significant dilation of the naris will be necessary (Table). Selection of an inadequately small, highly flexible urethral catheter can result in a difficult introduction through the naris and can make the procedure troublesome, but too large a urethral catheter could increase the likelihood of bleeding and prevent completion of the intubation. The urethral catheter is always significantly smaller than the nasotracheal tube diameter, except at the proximal cup of the catheter, where the nasotracheal tube inserts into its lumen (Figure 2). The technique has not been attempted in small children (younger than 2 years of age), and guidelines for

Endotracheal Tube and Urethral Catheter Selection Guide

Nasal RAE Size	Suggested Urethral Catheter Size
5.0 uncuffed	14 French
5.5 uncuffed	14 French
6.0 cuffed	16 French
6.5 cuffed	16 French
7.0 cuffed	18 French
7.5 cuffed	18 French
8.0 cuffed	20 French

Figure 2. Nasotracheal tube lined up to funnel-like cup end of the urethral catheter.

the technique are suggested in this article for adults or for children who will accept a 5.0 nasotracheal tube or larger. Suggested sizes for selection of the urethral catheter according to nasotracheal tube size are provided in the Table.

As mentioned previously, placing the nasotracheal tube in a warm bottle of sterile water just prior to placement of the urethral catheter softens and assists in guiding the tube. The funnel-like proximal cup of the urethral catheter is placed over the distal end of the nasotracheal tube and is advanced up to the fully deflated cuff until it meets resistance. Lubricant is placed on the catheter tip and at the junction of the catheter/nasotracheal tube (Figure 3). Additionally, lubricant is placed on the cuff of the nasotracheal tube itself if a cuffed nasotracheal tube is used. The soft tissues are protected from the hard, angular end of the nasotracheal tube by covering it up with the urethral catheter in this way. Furthermore, the cuff is protected by the urethral catheter during the nasal passage phase, thereby reducing the incidence of cuff tear dur-

Figure 3. Catheter securely seated onto the nasotracheal tube.

Figure 4. Nasotracheal tube attached to urethral catheter.

ing tube insertion. (Figure 4 depicts attachment of the urethral catheter to the nasotracheal tube.)

Once the nasal passage has been treated with the appropriate topical vasoconstrictor, the lubricated smooth end of the urethral catheter is inserted into the nasal cavity

Figure 5. Introducing rounded end of urethral catheter into naris.

Figure 6. Catheter advanced to posterior oropharynx and visualized with laryngoscope.

and is pushed forward into the oropharynx atraumatically, bringing the distal end of the nasotracheal tube along. The urethral catheter can be safely guided through the nasal passage to the posterior oropharyngeal region until it is visualized in the mouth.

The urethral catheter is guided into the nasal chamber, producing a tactile sensation in the nasal passageway (Figure 5). The small, rounded tip of the urethral catheter encounters little resistance given a patent nasal passage; this may vary if nasal pathology is present. The soft conical shape of the proximal end of the urethral catheter acts as a gradual dilator for the nasotracheal tube. It is advanced until visualized in the posterior pharynx with a laryngoscope (Figure 6). Using a Magill forceps, the distal end of the urethral catheter is gently removed from the mouth (Figure 7), while the nasotracheal tube follows in a guided fashion through the same structures. This is done until the junction of the urethral catheter with the nasotracheal tube is externalized by the forceps (Figure 8), at which point an assistant can easily remove the funnel portion

Figure 7. Magill forceps used to withdraw rounded end of catheter from mouth.

Figure 8. Removing funnel-like cup end from the nasotracheal tube.

of the catheter from the nasotracheal tube. Next, the nasotracheal tube is withdrawn slightly and is reintroduced into the posterior nasopharynx. The nasotracheal tube is then guided into the trachea past the vocal cords with the aid of the Magill forceps via direct visual laryngoscopy in the usual fashion, or with the aid of an indirect visual laryngoscope camera such as the GlideScope (Verathon Inc, Bothell, Wash).

Although the fiberoptic technique is a viable option in nasotracheal intubation, it requires additional specialized equipment. Furthermore, it needs a higher level of training and leaves the distal end of the nasotracheal tube exposed; this can damage the walls of the nasal mucosa and turbinates. As in the traditional nasotracheal approach, the catheter technique is contraindicated in patients with open skull fractures, displaced Le Fort II and III fractures, and fractures of the cribriform plate.

DISCUSSION

The urethral catheter-assisted nasotracheal intubation technique described can be used to atraumatically guide a nasotracheal tube through the nasopharynx. This technique can reduce perioperative morbidity and can decrease the time it takes to prepare the nasal passage for intubation. For patients with Apert's syndrome, Treacher-Collins syndrome, or other anatomic abnormalities, a combined approach using the urethral catheter/nasotracheal tube in conjunction with the fiberoptic scope is possible. The urethral catheter is commonly stocked in hospitals and ambulatory surgical centers and can be a straightforward addition to any anesthesiologist's armamentarium. It is a cost-efficient way to improve care to patients and lessen apprehension and nasal intubation concerns of the anesthesia professional. Although the technique may be contrain-

licated in some situations, it is a generally safe and efficient procedure with minimal adverse effects.

REFERENCES

1. Tong JL, Smith JE. Cardiovascular changes following insertion of oropharyngeal and nasopharyngeal airways. *Br J Anaesth*. 2004;93:339–342.
2. O'Connell JE, Stevenson DS, Stokes MA. Pathological changes associated with short-term nasal intubation. *Anaesthesia*. 1996;51:347–350.
3. Morimoto Y, Sugimura M, Hirose Y, Taki K, Niwa H. Nasotracheal intubation under curve-tipped suction catheter guidance reduces epistaxis. *Can J Anaesth*. 2006;53:295–298.
4. Kim YC, Lee SH, Noh GJ, et al. Thermosoftening treatment of the nasotracheal tube before intubation can reduce epistaxis and nasal damage. *Anesth Analg*. 2000;91:698–701.
5. Watanabe S, Jaguchi Y, Suga A, Asakura N. A bubble-tip tracheal tube system. *Anesth Analg*. 1994;78:1140–1143.
6. Williams AR, Burt N, Warren T. Accidental middle turbinectomy: a complication of nasal intubation. *Anesthesiology*. 1999;90:1782–1784.
7. Moore DC. Middle turbinectomy: a complication of improper nasal intubation. *Anesthesiology*. 2000;92:1504–1505.
8. Piepho T, Thierback A, Werner C. Nasotracheal intubation: look before you leap. *Br J Anaesth*. 2005;94:859–860.
9. Elwood T, Stillions DM, Woo DW, Bradford HM, Ramamoorthy C. Nasotracheal intubation. *Anesthesiology*. 2002;96:51–53.
10. Delgado AV, Sanders JC. A simple technique to reduce epistaxis and nasopharyngeal trauma during nasotracheal intubation in a child with factor IX deficiency having dental restoration. *Anesth Analg*. 2004;99:1056–1057.
11. Basar H, Buyukkocak U, Kayamak C, Akpınar S, Sert O. An intraoperative unexpected respiratory problem in a patient with Apert syndrome. *Minerva Anestesiol*. 2007;73:603–606.
12. Sculerati N, Gottlieb MD, Zimble MS, Chibbaro PD, McCarthy JG. Airway management in children with major craniofacial anomalies. *Laryngoscope*. 1998;108:1806–1812.
13. Goranovic T, Milic M. Nasoendotracheal tube obstruction by a nasal polyp in emergency oral surgery: a case report. *World J Emerg Surg*. 2007;2:31.
14. Ray TL, Tobias JD. An alternative technique for nasotracheal intubation. *Southern Med J*. 2003;96:1039–1041.