Case report: Nasotracheal intubation - look before leaping to assess the laryngeal view

[Présentation de cas : Intubation nasotrachéale : observer avant de se précipiter pour évaluer la vue laryngée]

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Purpose: To describe an airway management plan, including oral to nasal endotracheal tube exchange, when nasal intubation is required in the unanticipated difficult airway.

Clinical features: A nasal intubation was required for a patient undergoing oropharyngeal surgery. Following loss of consciousness and paralysis, a Cormack-Lehane class 3 view was obtained, and pressure over the thyroid cartilage failed to reveal the vocal cords. An Eschmann bougie was inserted into the oropharynx and blindly entered the trachea. An orotracheal tube was advanced into the trachea over the bougie, and the patient was ventilated with 100% O₂ following the bougie's removal. An endotracheal tube was then guided through the right nostril into the hypopharynx. An Eschmann bougie was inserted into the nasal tube, and advanced towards the glottic opening under laryngoscopic view. Digital pressure applied to the oral tube at the base of the tongue brought the vocal cords into view. The oral endotracheal cuff was deflated, and the bougie (inserted into the nasal tube) was advanced into the trachea alongside the orotracheal tube. The orotracheal tube was withdrawn, and the nasal tube was advanced into the trachea over the bougie. The patient's O₂ saturation and end-tidal CO₂ concentration remained at 99–100% and 30–33 mmHg, respectively, during these maneuvers, which required only a few minutes to perform.

Conclusion: When nasotracheal intubation is required, a plan of airway management is required to safely secure the airway. We emphasize the importance of direct laryngoscopy prior to insertion of an endotracheal tube through the nose, and describe a strategy for oral to nasal tracheal tube exchange.

Objectif : Décrire un plan de prise en charge des voies aériennes, y compris l'échange d'une sonde endotrachéale orale pour une sonde nasale, lorsqu'une intubation nasale est nécessaire pour des voies aériennes non anticipées comme difficiles.

Éléments cliniques : Une intubation nasale a été requise pour un patient subissant une chirurgie oropharyngée. Suite à la perte de conscience et la paralysie, une vue de grade 3 sur l'échelle de Cormack-Lehane a été obtenue, et une pression appliquée sur le cartilage thyroïdien n'a pas pu révéler les cordes vocales. Un mandrin d'Eschmann a été inséré dans l'oropharynx et introduit dans la trachée en aveugle. Une sonde orotrachéale a été glissée sur le mandrin, introduite dans la trachée, et le patient a été ventilé avec de l'O₂ 100 % après que le mandrin a été retiré. Une sonde endotrachéale a ensuite été guidée par la narine droite jusqu'à l'hypopharynx. Un mandrin d'Eschmann a été introduit dans la sonde nasale et ce jusqu'à l'ouverture glottique sous vision directe par laryngoscopie. Une pression digitale appliquée à la sonde orale à la base de la langue a permis de voir les cordes vocales. Le ballonnet orotrachéal a été dégonflé, et le mandrin (introduit dans la sonde nasale) a été avancé dans la trachée le long de la sonde orotrachéale. La sonde orotrachéale a alors été retirée, et la sonde nasale avancée dans la trachée grâce au mandrin. La saturation d'oxygène du patient et la concentration télé-expiratoire de CO₂ sont restées à 99 – 100 % et 30 – 33 mmHg, respectivement, durant ces procédures, qui n'ont nécessité que quelques minutes.

Conclusion : Si une intubation nasotrachéale est requise, un plan de prise en charge des voies aériennes est nécessaire. Nous soulignons l'importance d'une laryngoscopie directe avant l'insertion d'une sonde endotrachéale par voie nasale, et décrivons une stratégie pour l'échange d'une sonde trachéale orale à une sonde nasale.

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NASOTRACHEAL intubation poses an interesting problem, particularly when associated with a difficult airway.¹ The potential for airway misadventure may be compounded by epistaxis that interferes with visualization and securing the airway with conventional (non-surgical) techniques.² Piepho *et al.*² advocate to “look before you leap” prior to nasotracheal intubation: that is, to determine by direct laryngoscopy the potential for a difficult intubation (Cormack-Lehane classification), and to refrain from passing the endotracheal tube through the nose unless confronted by a class 1 or 2 view (see Figure). We recently encountered a patient with an unanticipated difficult airway who required a nasotracheal intubation. Using the algorithm suggested by Piepho *et al.*², in combination with a novel orotracheal to nasotracheal tube exchange, we achieved a simple airway management strategy that can be modified to suit a variety of challenging scenarios.

Case report

A slight 73-yr-old female patient was scheduled for right hemi-glossectomy, resection of the floor of the mouth and bilateral neck dissection with possible tracheostomy, and free rectus abdominus muscle flap for treatment of oral-pharyngeal cancer. The patient's medical history was significant for smoking, lupus erythematosus, and hypothyroidism. Her laboratory work-up including blood chemistry, complete blood count, electrocardiogram and coagulation profile was unremarkable. Her medications included sodium levothyroxine 0.75 mg *po* qd, ASA 325 mg qd, hydroxychloroquine sulphate 60 mg qd, raloxifene hydrochloride 60 mg *po* qd. Her airway examination was unremarkable (three finger-width mouth opening, Mallampati score 2, three finger-width hyoid-mental distance, normal head and neck extension, and flexion) but for a small ulcerated lesion on the right lateral aspect of the tongue. A computed tomography scan of the neck indicated a 3.1 × 1.4 cm lesion at the right lateral aspect of the tongue invading the floor of the mouth, that did not cross the midline. Preoperative consultation with the oral surgeon confirmed the requirement for a nasotracheal intubation to facilitate surgical access to the oropharynx. Standard intraoperative monitors were applied, in addition to a 20G catheter inserted into a radial artery. Intravenous fluids and drugs were administered via a 16G catheter inserted into an upper extremity vein. Pre-induction medications included glycopyrrolate 0.3 mg *iv*, midazolam 2.0 mg *iv*, and rocuronium 2.5 mg *iv*. Neosynephrine/lidocaine 2% spray was applied

FIGURE Algorithm for nasotracheal intubation strategy adapted with permission from Piepho T, Thierbach A, Werner C. Nasotracheal intubation: look before you leap. *Br J Anaesth* 2005; 94: 859–60 (reference 2).

to the most patent (right) nostril. Following careful head positioning, loss of consciousness occurred after injection of sufentanil 25 µg and propofol 50 mg *iv*. Muscle paralysis was produced by succinylcholine 100 mg *iv*. The patient's lungs were easy to ventilate by bag and mask.

Laryngoscopy with a #4 Macintosh blade revealed a Cormack-Lehane class 3 view of the oropharynx, and pressure over the thyroid cartilage [BURP (backwards/upwards/rightward/posterior) maneuver] failed to reveal the vocal cords. An Eschmann bougie was inserted into the oropharynx, and blindly entered the trachea on the first attempt. A #7.5 Sheridan orotracheal tube was easily advanced into the trachea over the bougie, and the patient's lungs were mechanically ventilated with 100% oxygen following the bougie's removal. Bilateral breath sounds, ribcage excursion, and palpation of the endotracheal cuff in the sternal notch precluded endobronchial tube placement.

The patency of the right nasal passage was facilitated by easy insertion of a lubricated soft #6.5, followed by #7.5 Argyle nasal pharyngeal airway. A pre-warmed #7.5 nasal RAE® Mallinckrodt tube (Juarez, Mexico) was then gently guided without incident through the right nostril into the hypopharynx. An Eschmann

bougie was inserted into the nasal RAE tube, and advanced towards the glottic opening under laryngoscopic view. An assistant applied digital pressure on the oral endotracheal tube at the base of the tongue in a posterior and slightly rostral direction, which brought the posterior vocal cords into plain view. The endotracheal cuff was deflated, and the Eschmann bougie (inserted into the nasal RAE tube) was advanced into the trachea alongside the orotracheal tube. The orotracheal tube was withdrawn, and the nasal RAE tube was advanced into the trachea over the Eschmann bougie. Following removal of the bougie, the patient's lungs were mechanically ventilated via the nasal RAE tube, with appropriate confirmation of correct tube placement. The patient's O_2 saturation and end-tidal CO_2 concentration remained at 99–100% and 30–33 mmHg, respectively, throughout these maneuvers which required only a few minutes to perform. The operation proceeded uneventfully (maintenance anesthesia: sufentanil $10 \mu\text{g}\cdot\text{hr}^{-1}$, desflurane 3–5% end-tidal concentration in 50% oxygen: 50% air) and consent to publish this report was obtained from the patient during the postoperative period.

Discussion

This case of nasotracheal intubation in an unanticipated difficult airway highlights important aspects of safe airway management. A common complication of nasotracheal intubation is epistaxis, with a reported incidence of 15–80%, depending on a variety of factors including vasoconstrictor drug application to nasal passage, type and size of nasotracheal tube, use of heat-softened tube, and patient characteristics.^{3–9} Because epistaxis can interfere with visualization of the oropharynx and thus impede intubation, a recommendation² has been made to assess the airway by direct laryngoscopy prior to passing an endotracheal tube through the nares. If confronted by a potentially difficult airway (Cormack Lehane grade > 2), the airway may be initially secured orally without being impeded by blood in the hypopharynx secondary to epistaxis. Afterwards, the potential for nasal intubation can be explored in a controlled manner, as illustrated in the present case report.

Modern airway management protocols emphasize ventilation of the lungs to permit adequate oxygen exchange, and this can be achieved with a variety of techniques (e.g., supraglottic airway devices) in addition to endotracheal intubation. Oral intubation can also be achieved using a variety of techniques (e.g., fiberoptic bronchoscope or laryngoscope, videolaryngoscope) when this is not possible using conventional laryngoscopy. The clinical situation, practitioner

expertise and availability of equipment will influence airway management strategy when confronted with a challenging situation. In the present case, the patient's lungs were easy to ventilate by bag and mask, and establishing a secure airway could be achieved in a comparatively leisurely manner. The use of a rapidly reversible hypnotic (propofol) and muscle relaxant (succinylcholine), and a modest dose of opioid (sufentanil) provided the option of waking up the patient as per standard airway management protocols.

In this case, the patient's trachea was intubated orally, using a blindly inserted Eschmann bougie as a guide. Conversion of an orotracheal to nasotracheal intubation may be challenging, particularly with a suspected or known difficult airway, and a variety of strategies have been suggested. Reports describe the use of a bronchoscope passed through the nasal passage. In some cases, the bronchoscope was "pre-loaded" with an endotracheal tube that was inserted into the trachea just prior to, or following removal of the orotracheal tube.¹⁰ In other cases, the distal end of the bronchoscope was advanced through the mouth, guided into the proximal orotracheal tube opening (connector removed), and both bronchoscope and orotracheal tube passed retrogradely back through the nasal passage.¹¹ Reports also describe the use of a flexible endotracheal tube exchanger that is inserted into the nostril, fished out through the mouth, and then threaded into the distal trachea through the orotracheal tube. The orotracheal tube may then be either fed retrogradely back through the nasal passage (connector removed)¹² or carefully sliced longitudinally, and peeled away from the tube exchanger in the pharynx, so that a nasotracheal tube can be then guided through the nose into the trachea over the tube exchanger.¹³ A two-part endotracheal tube exchanger (Patil Two Part Intubation Catheter, Cook, Bloomington, IN, USA) has been described, with one section inserted into the trachea through the orotracheal tube, and a second section threaded through the nose into the nasopharynx and out of the mouth. The orotracheal tube is then removed over the first section, the two sections are then connected through a special connector, and a nasal endotracheal tube is then threaded over the tube exchanger through the nose.¹⁴

We used a nasally inserted Eschmann bougie that was threaded into the trachea (alongside the orotracheal tube) as a guide for the nasotracheal tube. This technique has merit because it uses equipment that is readily available, is effective in the presence of secretions or blood in the oropharynx, avoids potentially traumatic retrograde passage of equipment through the nasopharynx, and is arguably less prone

to mechanical dislodgement of the guide (bougie). Additional security can be provided by simple modifications such as the insertion of a second Eschmann bougie (or, preferably, a tube exchanger with ventilating capabilities) into the orotracheal tube prior to its removal. Because of the thin size of the bougie and tube exchangers, the adult trachea can easily accommodate a combination of these, inserted through the nose and mouth.

Digital displacement of the orotracheal tube posteriorly and rostrally brought the vocal cords into view. Presumably, this maneuver is the equivalent of BURP applied externally to the larynx, whereby the orotracheal tube acts as an anchor that drags the cords into view with appropriate displacement. Posterior displacement of the orotracheal tube using the laryngoscope blade to improve the view of the larynx has been previously described.¹⁵

In summary, when nasal intubation is required, a plan of airway management must be formulated to keep as many options open as possible, so that the airway can be safely secured. We emphasize the importance of direct laryngoscopy prior to insertion of an endotracheal tube through the nose, and describe an effective and simple conversion strategy for oral to nasal tracheal tube exchange that can be modified to accommodate a variety of airway scenarios.

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