

Airway management in a patient with a cleft palate after pharyngoplasty: a case report

[Une étude de cas d'assistance respiratoire dans un contexte de fissure palatine et de pharyngoplastie]

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Purpose: To describe a practical method of aiding nasotracheal intubation in a cleft palate patient with previous pharyngoplasty using a suction catheter under tactile guidance. Problems of airway management in these patients are also discussed.

Clinical features: A 26-yr-old woman presented for elective Le Fort maxillary osteotomy. She had a history of cleft lip and palate and subsequent palatoplasty and pharyngeal flap. She had no symptoms of upper airway obstruction or obstructive sleep apnea. Preoperative examination revealed a hypernasal voice and patent nasal passages. Anesthesia was induced and the patient paralyzed. An attempt to pass a 6.5-mm cuffed endotracheal tube through the right nostril met with resistance. A suction catheter was introduced into the nostril, while a finger was positioned over the flap and the velopharyngeal port, until its tip rested against the flap, the catheter coiled and a small loop could be palpated past the patent velopharyngeal port. The catheter was then hooked into the oropharynx. The endotracheal tube was "railroaded" over it and advanced into the glottis. There was minimal bleeding and no desaturation during the procedure.

Conclusion: Preoperative determination of the type of pharyngoplasty is essential to understand the anatomy of the patent velopharyngeal port. A history of pharyngeal flap infection, hyponasal voice or upper airway obstruction suggests possible port stenosis. We describe a tactile guided technique that is useful and practical. Use of a flexible suction catheter of small external diameter minimizes the potential for trauma, bleeding and creation of false passages.

Objectif : Décrire une méthode pratique pour faciliter l'intubation nasotrachéale chez une patiente, qui présente une fissure palatine traitée par pharyngoplastie, en utilisant un cathéter d'aspiration sous direction tactile. Les difficultés de l'assistance respiratoire survenues dans ce contexte sont aussi discutées.

Éléments cliniques : Une femme de 26 ans s'est présentée pour une ostéotomie maxillaire de Le Fort. Elle avait eu une fissure labiale et palatine traitée par une palatoplastie et un lambeau pharyngé. Elle ne présentait aucun symptôme d'obstruction des voies aériennes supérieures ou d'apnée du sommeil d'origine obstructive. L'examen préopératoire a révélé une voix hypernasale et des voies nasales perméables. L'anesthésie a été induite et la patiente paralysée. Au premier essai pour passer un tube endotrachéal à ballonnet de 6,5 mm dans la narine droite, nous avons rencontré une résistance. Un cathéter d'aspiration a été introduit dans la narine et un doigt a été placé sur le lambeau et l'ouverture vélopharyngée jusqu'à ce que le bout appuie sur le lambeau. Le cathéter s'est enroulé et une petite boucle était palpable au delà de l'ouverture vélopharyngée perméable. Le cathéter a été ensuite fixé dans l'oropharynx. Le tube endotrachéal a été glissé sur ce cathéter et avancé dans la glotte. Il n'y a eu qu'un saignement minime et aucune désaturation pendant la manœuvre.

Conclusion : La description préopératoire du type de pharyngoplastie est essentielle pour comprendre l'anatomie d'une ouverture vélopharyngée perméable. Des antécédents d'infection du lambeau pharyngé, de voix nasale ou d'obstruction des voies aériennes supérieures évoquent une sténose possible de l'ouverture. Nous décrivons une technique à direction tactile, efficace et pratique. L'usage d'un cathéter d'aspiration flexible et de petit diamètre externe réduit la possibilité de traumatisme, d'hémorragie et de création de faux passages.

UP to 20% of patients with cleft palate will develop velopharyngeal dysfunction after primary palatoplasty, requiring treatment with pharyngoplasty.¹ Many of them will undergo further procedures such as dental, orthognathic and maxillofacial surgeries that necessitate naso-

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tracheal intubation. Trauma to the vascular-muscular flap during nasotracheal intubation can lead to torrential hemorrhage. The history of prior pharyngoplasty poses a challenge to the anesthesiologist both in the management of the airway and nasotracheal intubation.

In this report, we describe a simple method of nasotracheal intubation in a patient with a cleft palate and history of pharyngoplasty and discuss problems of airway management in these patients.

Case report

A 26-yr-old woman presented for an elective Le Fort 1 maxillary osteotomy. She had a history of cleft lip and palate and had undergone a palatoplasty and a pharyngoplasty (pharyngeal flap type) for velopharyngeal incompetence. The surgeries were performed in another part of the country and her records were not available. Her past general anesthetics were uneventful and she was never informed about any difficulty with her airway. She had no other medical problems and no symptoms of upper airway obstruction or obstructive sleep apnea. The speech therapist noted a hypernasal voice. Preoperative nasopharyngoscopy was not performed.

On clinical examination, she was 57 kg in weight and 161 cm tall. She had mid-facial hypoplasia with malocclusion, a large prominent protruding mandible, large tongue and scar evidence of chelioplasty and pharyngeal flap intraorally. Neck movement, thyromental distance and mouth opening were normal. Nostril patency was evaluated by ease of breathing and assessment of expiratory airflow when the contralateral nostril was occluded. The results were favourable. On phonation, her voice was not hyponasal.

In the operating room, standard monitoring was established. After three minutes of preoxygenation with 100% oxygen, anesthesia was induced with fentanyl 150 µg, thiopentone 250 mg and atracurium 25 mg. The airway was maintained with jaw thrust and chin lift using a two-hand technique while the patient was ventilated by an assistant with 3% sevoflurane in oxygen. Cotton tipped applicators coated with 2% lidocaine were inserted into the nostrils to anesthetize the nasal mucosa and to compare the relative patency of the nasal passages. The applicators were able to pass through both nostrils, although more easily through the right nostril. A single attempt to advance a 6.5-mm cuffed endotracheal tube through the right nostril into the oropharynx met with resistance. The endotracheal tube was withdrawn and mask ventilation resumed.

Next, a laryngoscope was inserted to allow direct vision of the oropharynx and held in position by an assistant. A 14-F soft tipped suction catheter was

advanced through the right nostril while the operator's index finger was positioned over the flap and the laterally located velopharyngeal port. The catheter was inserted gently until its tip rested against the pharyngeal flap. It was further advanced until the excess length coiled and a small loop could be palpated past the pharyngeal flap. The catheter was then hooked out into the oropharynx with the index finger. Suction of the oropharynx was carried out under direct vision and bleeding was noted to be minimal. The connector end of the suction tube was cut and the endotracheal tube "railroaded" over it. The endotracheal tube was advanced through the port of the pharyngeal flap into the oropharynx under direct vision with the laryngoscope and then advanced into the trachea.

Throughout the procedure, oxygen saturation remained above 97% and there were no significant hemodynamic changes.

Discussion

Pharyngoplasty is a surgical procedure of the pharynx designed to correct velopharyngeal incompetence by limiting the size of the pharyngeal port.² Essentially, there are two types of pharyngoplasty - the pharyngeal flap and the sphincter pharyngoplasty. The pharyngeal flap involves attaching a tissue flap from the posterior pharyngeal wall to the soft palate. This creates a mid-line obstruction in the velopharyngeal port between the naso and oropharynx²⁻⁴ with two lateral ports on either side of the flap for normal nasal breathing (Figure 1B). The pharyngeal flap may be skewed or displaced to one side such that the port size may differ on either side of the flap. The size of the ports also depends on flap width, pharyngeal size and postoperative wound contracture.

The sphincter pharyngoplasty was first described by Orticochea in 1968, and modified by Jackson in 1977.⁴⁻⁶ It consists of creating a dynamic sphincter from the posterior tonsillar pillars (including the palatopharyngeus muscle) sutured together with a small superiorly based flap from the posterior pharyngeal wall. The result is a sphincter encircling a central velopharyngeal port about 1 cm in diameter (Figure 1C).

It becomes apparent that nasotracheal intubation may be difficult postpharyngoplasty. Anesthesiologists should be aware of the type of pharyngoplasty performed and, therefore, of the anatomy of the velopharyngeal port through which the nasotracheal tube will pass into the oral cavity. Trauma to the vascular-muscular flap during nasotracheal intubation can lead to hemorrhage resulting in an airway crisis.

The lateral ports of the pharyngeal flap are more prone to contracture and stenosis from scarring.^{5,6}

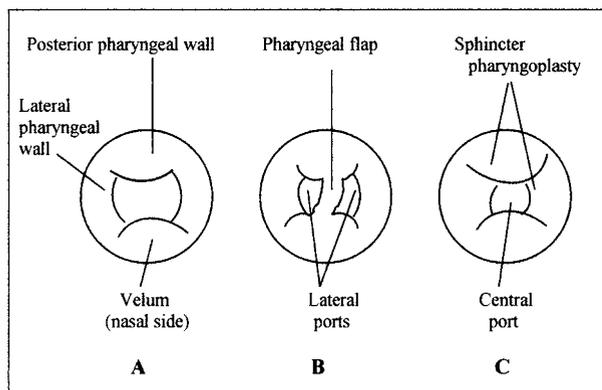


FIGURE The velopharyngeal port as seen on nasopharyngoscopy. A) normal; B) pharyngeal flap in the midline with lateral ports on either side; C) sphincter pharyngoplasty.

Scarring is minimal in sphincter pharyngoplasty and occurs in a vertical direction resulting in a slit-like opening.⁶ Stenosis of ports can present with hyponasality, upper airway obstruction and sleep apnea⁵ in severe cases. History of these symptoms should be sought actively during the preoperative assessment of patients. Patients with severe signs and symptoms of velopharyngeal ports stenosis may present for surgical correction and careful airway assessment is imperative.

Upper airway sequelae following pharyngoplasty are a recognized complication as surgery further narrows the already impaired nasal airway in patients with cleft palate. There is also a posterior and downward change in the position of the tongue postpharyngoplasty and this may further impede the pharyngeal airway.⁷ Some authors had reported chronic snoring in 80% of pharyngoplasties especially after a pharyngeal flap⁵ while sleep apnea can occur in as many as 10% of patients, the risk being much smaller after sphincter pharyngoplasty.^{5,6} Thurston *et al.*⁸ reported a 10% incidence of upper airway obstruction postpharyngeal flap; the majority was associated with early postoperative infection.

Care should be given to the younger patients. Warren *et al.*⁹ reported higher airway resistance in younger patients with pharyngeal flaps compared to a control cleft population. In his study, the airway resistance in older children (age 15 and over) did not demonstrate the same degree of elevation. This is perhaps due to improvement of airway patency due to maxillofacial growth.

Bell *et al.*¹⁰ suggested routine use of nasopharyngoscopy preoperatively for patients with a history of pharyngoplasty when nasal intubation is planned. This is useful in the assessment of the location, shape and size of the velopharyngeal port.⁶ However this requires cooperation from the patient and may not be suitable for children less than six years.

The patient described had a history of pharyngeal flap for velopharyngeal dysfunction; her past anesthetic records were not available. Preoperative nasopharyngoscopy was also not available. Here, patency of the nasopharynx was evaluated from history and simple bedside examination. Absence of sleep apnea, hyponasal voice and upper airway obstruction and a simple test of nostril occlusion indicated that stenosis of the ports was unlikely.

Various methods have been described previously to assist with nasotracheal intubation in patients with a pharyngeal flap.¹¹⁻¹³ The aim is to minimize trauma to the vascular muscular pharyngeal flap. Our approach is different from other introducer-guided nasotracheal intubation techniques.^{11,12} In practice, we find it difficult to pass the introducer directly through the velopharyngeal ports as described by Becker *et al.*¹¹ and Kopp *et al.*¹² This is because the velopharyngeal ports do not lie in the same plane as the advancing introducer. Furthermore, in the case of a pharyngeal flap, the flap may be displaced or skewed to one side, making direct passage of an introducer even more difficult. To overcome these problems, we advanced the suction catheter until it coiled and protruded from the patent velopharyngeal port.

The technique we described is a tactile guided, simple and minimally traumatic method. Use of a malleable and flexible suction catheter with a small external diameter minimizes the potential for trauma, bleeding and creation of false passages. It also has the added advantage of allowing suctioning of blood in the oropharynx. Prior application of a vasoconstrictor such as phenylephrine to the nostril before instrumentation would have been useful in shrinking the nasal mucosa but was not available in our anesthetic setting. Prior oral intubation with an endotracheal tube to secure the airway, as advocated by Becker *et al.*¹¹ and Kopp *et al.*,¹² was not necessary in our case. However, despite its advantages, this tactile guided approach remained a blind method and should be performed with care by skilled personnel.

In conclusion, we describe a simple, practical and atraumatic method using a soft tipped suction catheter as an introducer under tactile guidance to aid nasotracheal intubation in a patient with a history of pharyngoplasty. Preoperative determination of the type of

pharyngoplasty is important to understand the anatomy of the velopharyngeal port so as to minimize trauma to the flap and potentially serious hemorrhage. A history of postpharyngeal flap infection, signs and symptoms of hyponasal voice or upper airway obstruction should alert anesthesiologists to the possibility of port stenosis, in which case preoperative nasopharyngoscopy is recommended.

References

- 1 *Davies D.* Cleft lip and palate. *Br Med J* 1985; 290: 625–8.
- 2 *De La Pedraja J, Erbella J, McDonald WS, Thaller S.* Approaches to cleft lip and palate repair. *J Craniofac Surg* 2000; 11: 562–71.
- 3 *Trier WC.* Pharyngoplasty. *In:* Bardach J, Morris H (Eds.). *Multidisciplinary Management of Cleft Lip and Palate.* Philadelphia: WB Saunders Company; 1990: 400–7.
- 4 *Bardach J, Salyer KE, Jackson IT.* Pharyngoplasty. *In:* Bardach J, Salyer KE (Eds.). *Surgical Techniques in Cleft Lip and Palate,* 2nd ed. St. Louis: Mosby Year Book; 1991: 274–96.
- 5 *Billmire DA.* Surgical management of clefts and velopharyngeal dysfunction. *In:* Kummer AW (Ed.). *Cleft Palate and Craniofacial Anomalies—Effects on Speech and Resonance.* San Diego: Singular Thomson Learning; 2001: 401–22.
- 6 *Jackson IT.* Pharyngoplasty: Jackson technique. *In:* Bardach J, Morris H (Eds.). *Multidisciplinary Management of Cleft Lip and Palate.* Philadelphia: WB Saunders Company; 1990: 386–92.
- 7 *Ren YF, Isberg A, Henningsson G, Larson O.* Tongue posture in cleft palate patients with a pharyngeal flap. *Scand J Plast Reconstr Hand Surg* 1992; 26: 307–12.
- 8 *Thurston JB, Larson DL, Shanks JC, Bennett JE, Parsons RW.* Nasal obstruction as a complication of pharyngeal flap surgery. *Cleft Palate J* 1980; 17: 148–54.
- 9 *Warren DW, Trier WC, Bevin AG.* Effect of restorative procedures on the nasopharyngeal airway in cleft palate. *Cleft Palate J* 1974; 11: 367–73.
- 10 *Bell CNA, Macintyre DR, Ross JW, Pigott RW, Weller RM.* Pharyngoplasty: a hazard for nasotracheal intubation. *Br J Oral Maxillofac Surg* 1986; 24: 212–6.
- 11 *Becker DW Jr, Bass CB, Williams VL.* An aid to nasotracheal intubation in orthognathic surgery. *Cleft Palate Craniofac J* 1993; 30: 350.
- 12 *Kopp VJ, Rosenfeld MJ, Turvey TA.* Nasotracheal intubation in the presence of a pharyngeal flap in children and adults. *Anesthesiology* 1995; 82: 1063–4.
- 13 *Matot I, Hevron I, Katzenelson R.* Dental mirror for difficult nasotracheal intubation. *Anaesthesia* 1997; 52: 780–2.