Anesthesiology 2010; 113:1476–8

Retraction Movement of the Frova Airway Intubation Introducer to Assist Nasotracheal Intubation in Patients with Limited Mouth Opening

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THE Frova airway intubation catheter (Cook Critical Care, Letchworth, United Kingdom) was brought into clinical practice in 1998 and has been shown to have a high success rate for difficult intubations.[1–3] It was designed as a device stiff enough to transform the straightforward-applied force at the proximal end of the instrument into an anterior-upward movement at its tip (the 65° angle, stiffness, and length were designed for this purpose). The impact of the Frova introducer against the interarytenoid notch results in an upward-anterior shift toward the tracheal inlet.[4] Difficult airway management guidelines suggest the use of endotracheal tube introducers early, in case of unanticipated difficult intubations,[5–7] but always for orotracheal intubations.

Nasotracheal intubation using the Glidescope® (Verathon Medical Inc., Bothell, WA) has been described as faster than using direct laryngoscopy, with better glottic exposure and lesser usage of a Magill forceps.[8] Furthermore, it seems likely that the Glidescope® distorts the anterior airway anatomy to a lesser degree, which could potentially create a more direct route from the nasopharynx to the trachea. In some specific cases, however, the trachea may be pulled upward and forward (anterior position) after surgery and radiotherapy (fig. 1, A and B). During intubation, these changes may lead the tube to abut against the posterior commissure. Basic maneuvers such as adjustment of the head position or rotation of the nasotracheal tube may fail, rendering nasotracheal intubation very difficult if not impossible without the help of a fiberscope.

By combining the stiffness of the Frova extremity with proper movement inside the nasotracheal tube (retraction of the Frova leading to an upward movement of the distal extremity of the tube, similarly to the hockey-stick technique[9]) (fig. 2, A–C), intubation of the trachea was successful in cases where the Frova or the nasotracheal tube alone did not succeed.

We present three cases of nasotracheal intubation in patients having an anterior-lying trachea as a result of previous surgery and radiotherapy with limited mouth opening and neck movement. Nasotracheal intubation with usage of a Magill forceps was impossible because of the limited mouth opening and rendered possible with the combination of videolaryngoscopy and proper retraction movement of a Frova airway introducer.

CASE REPORTS

All three patients had a history of oral squamous cell carcinomas that required tumor resection, free flap reconstructions, neck dissections (one unilateral and two bilateral), followed by radiotherapy. Several years after the initial treatment, a new surgery was necessary for different reasons (two osteoradionecrosis and one relapse). They all had a similar clinical preoperative assessment: limited mouth opening (less than 20 mm between the central incisors), reduced tongue mobility, limited neck extension, and severely indurated neck tissues.

Technique

After preoxygenation and application of a vasoconstrictor to the selected nostril, intravenous induction of general anesthesia was provided (propofol 2 mg/kg, fentanyl 2 μg/kg, and rocuronium 0.6 mg/kg) and face mask ventilation was uneventful in all cases. A Glidescope® was introduced first and the epiglottis, the arytenoid cartilage, and vocal cords visualized in an anterior position. In all three cases, nasotracheal intubation with a 6.5-mm nasotracheal tube (Polar Preformed Nasal RAE; Portex, Hythe, Kent, United Kingdom) was then attempted and failed because of the anterior-lying trachea inlet. Attempts to raise the tip of the nasotracheal tube (cuff of the tube inflated with air, mobilization of the head) were unsuccessful and the usage of a Magill forceps was impossible because of the limited mouth opening. A Frova airway intubation catheter was then lubricated with silicone spray (Silkospray, Rüsch, Germany) and passed through the nasotracheal tube but failed to pass into the glottis and did not succeed alone as a guide to intubation. Finally, by positioning the tip of the nasotracheal

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Received from the Department of Anesthesiology, University Hospital Center and University of Lausanne, Lausanne, Switzerland. Submitted for publication July 22, 2010. Accepted for publication August 25, 2010. Support was provided solely from institutional and/or departmental sources.

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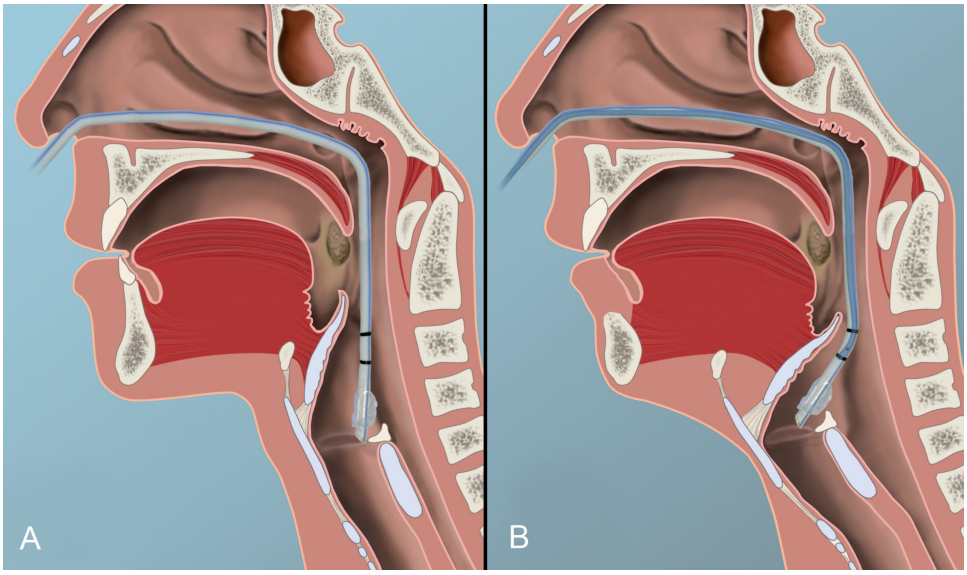

Fig. 1. Comparison of nasotracheal tube (NTT) intubation in a normal anatomy and anterior larynx. (*A*) Normal anatomy with NTT tube. (*B*) Anterior larynx after surgery and radiotherapy with angulation necessary to achieve NTT intubation.

tube in front of the glottis opening and retracting the Frova by a few centimeters, we obtained an upward movement of the distal extremity of the tube (figs. 1B and 2C). This maneuver rendered intubation of the trachea possible where the Frova alone or the nasotracheal tube alone could not succeed. The whole procedure was undertaken with clear vision of the pharynx and larynx and all patients were successfully intubated. The surgical procedures were uneventful, and at the end of the operations, all patients were extubated without problems while they were awake. Recoveries were uneventful.

Discussion

Nasotracheal intubation is necessary for specific surgeries and may need the usage of a Magill forceps to guide the tube inside the laryngeal inlet. In case of limited mouth opening, poor visibility or neck immobility, using of a Magill forceps to grasp and tilt upwards the extremity of the tube may be impossible. Furthermore, the usage of the forceps may cause direct pharyngeal mucosal trauma or injury to the tip of the tube, including the cuff, resulting in equipment failure.

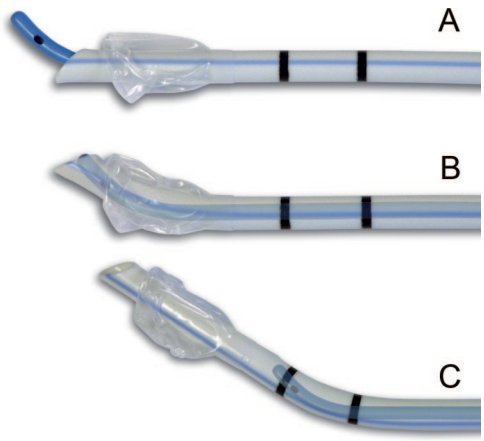

Fig. 2. Movement of the nasotracheal tube (NTT) tip depending on the Frova position. (*A*) Frova outside NTT. (*B*) Frova at NTT extremity. (*C*) Frova further retracted inside the NTT.

Intubating introducers are essential difficult airway management tools, dedicated to advance beneath the epiglottis to allow the tube to slide over them into the trachea. The association of videolaryngoscopy (Glidescope® for example) and different types of introducers as intubation guides have been described as successful but were rendered impossible in our cases because of the anterior-lying trachea inlet, although excellent visibility was provided by the Glidescope®.

Proper retraction movement of the Frova inside the tube under visualization allows nasotracheal intubation without the Magill forceps in cases of an anterior-lying trachea. In contrary to a fiberoptic bronchoscope, the apparatus is readily available, quick, and cheap.

However, caution must be exercised when using the Glidescope® or the Frova, as injuries have been described for each device alone, such as pharyngeal and airway trauma. By combining these two instruments, there is a visual control of the movement of the extremity of the tube, and correct placement of the Frova inside the nasotracheal tube should reduce injuries. A cautious airway assessment and definition of rescue plans must always be available in the management of patients with limited mouth opening and nasotracheal intubation. When mask ventilation is considered difficult,[10] awake fiberoptic intubation should be considered.

The successful completion of three cases in the face of an anterior lying trachea with limited mouth opening necessitating a nasotracheal intubation illustrates the potential role that the combination of videolaryngoscopy and proper retraction movement of intubation catheters inside the tube may play in the management of difficult airways.

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