Southern African Journal of Anaesthesia and Analgesia 2018; 24(6):168–169
https://doi.org/10.1080/22201181.2018.1523593

South Afr J Anaesth Analg
ISSN 2220-1181 EISSN 2220-1173

CASE REPORT

Oral to nasal endotracheal tube exchange using both video and flexible laryngoscopes

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This case describes the use of a video laryngoscope and flexible intubation scope to facilitate the exchange of an oral endotracheal tube for a nasal endotracheal tube in a patient with a potentially difficult airway.

Endotracheal tube (ETT) exchange has been greatly simplified by the advent of hollow airway exchange catheters (AECs), which are available in a wide variety of sizes and lengths. In the absence of AECs a bougie could be used. Exchange between the oral and nasal routes is less simple but has been previously performed with the use of AECs and long urological guidewires. This case demonstrates a simple, but effective, method to exchange an oral for a nasal ETT using a video laryngoscope and flexible intubation scope (FIS).

Case report

A seven-year-old female was involved in a pedestrian vehicle accident and suffered a closed head injury and significant facial trauma including fractures of the mandible and maxilla. She was intubated with a 6.0 mm internal diameter (ID) endotracheal tube (ETT). The patient was admitted to the trauma Intensive Care Unit (ICU), which provides care to patients referred from primary and secondary levels of care. A level 1 tertiary hospital ICU has capabilities for ventilatory and circulatory support to maintain cerebral perfusion and oxygenation. By day 4 the patient's level of consciousness had improved from a Glasgow Coma Score (GCS) of 7/11T to 10/11T (E4, M6, VT) and a decision was made to repair the facial fractures prior to extubation.

The maxillofacial surgeons requested an exchange of the oral ETT for a nasal ETT to facilitate surgery. The facial trauma had resulted in marked airway oedema with the tongue protruding beyond the teeth and drooling, indicating that secretions were not being swallowed. Due to the anticipated difficult reintubation on removal of the oral ETT an alternative intubation technique was utilised to ensure successful placement of the nasal ETT. This technique has been used previously, described as video laryngoscope-assisted flexible intubation scope intubation for a paediatric case with known difficult airway in the operating room (OR).[1] The procedure that was followed is shown in Figure 1.

The patient was transferred from ICU to the OR where monitoring was re-established, including pulse oximetry and capnography. The OR ventilator was connected and ventilation commenced with similar settings to those in the ICU. FiO_2 was raised to 0.7 and isoflurane introduced to achieve an end-tidal concentration of 0.8–1.2 MAC. Both nostrils were prepared with oxymetazoline. Rocuronium 0.8 mg/kg was administered and the morphine infusion from ICU continued at 2 mg/hour.

The principle that was followed was to ensure that access to the airway was maintained during all phases of the ETT exchange.

Laryngoscopy was performed using a Glidescope (Verathon, Bothell, WA, USA/SSEM, RSA). The oral ETT could be clearly seen entering the larynx. An airway exchange catheter (AEC) (Cook Medical, Wilmington, IN, USA/Marcus Medical, RSA) was passed via a bronchoscope adapter into the oral ETT. The measurements on the AEC were aligned with those on the ETT so that the AEC could be advanced to 2 cm beyond the tip of the oral ETT. The flexible intubation scope (FIS) was advanced through the right nostril. Manoeuvring this scope was difficult as no video monitor was available and the view via the eyepiece was limited to one senior trainee. Fortunately the FIS could be seen clearly on the Glidescope screen and the FIS could be advanced to lie alongside the ETT just above the vocal cords. Saturation of 100% was confirmed. The ETT cuff was deflated and the ETT withdrawn over the AEC. When the ETT had exited the larynx, the FIS could be advanced to lie alongside the AEC in the trachea. Tracheal rings were seen via the FIS and the FIS was clearly seen in the larynx with the Glidescope. The AEC could be left *in situ* and the nasal ETT advanced over the FIS into the trachea. The presence of the Glidescope minimised the risk of ETT 'hang-up'. With appropriate positioning of the ETT, the FIS and AEC were removed. The ETT cuff was inflated and ventilation commenced with a normal capnogram.

The operation proceeded uneventfully and the patient returned to trauma ICU with the nasal ETT *in situ*. After full recovery from the effects of general anaesthesia the patient was extubated on day 7, discharged to the ward on day 9 and home 10 days after the operation on day 14 post-admission.

Discussion

ETT exchange is usually a simple matter of using an AEC so that the airway is always maintained by an airway device, via which oxygenation can be maintained.[2] However, exchanging an oral for a nasal ETT presents the potential danger of loss of the airway device when the oral device is removed, before the nasal device is in place. Previous reports have described the use of long guidewires, typically ureteric guidewires from the urology OR, passed via the suction channel of a nasal FIS into

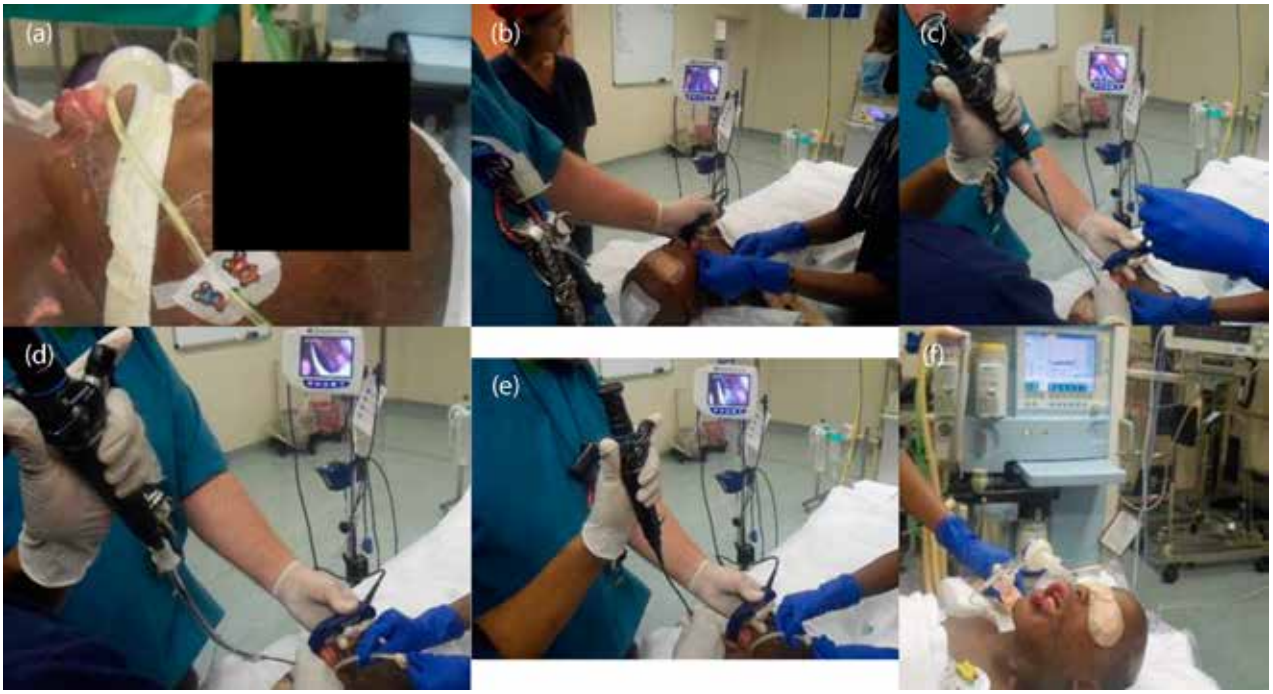

Figure 1: Sequence of exchange of an oral for a nasal ETT using a video laryngoscope and a flexible intubation scope (FIS). (a) Swollen tongue protruding beyond the teeth with drooling, predicting a probable difficult direct laryngoscopy. (b) Video laryngoscopy using a Glidescope (Verathon, Bothell, WA, USA/SSEM, RSA), which confirmed correct placement of the oral ETT. A paediatric airway exchange catheter (AEC) (Cook Medical, Wilmington, IN, USA/ Marcus Medical, RSA) was advanced through a bronchoscope adapter into the oral ETT until the tip protruded into the bronchus by 2 cm. the AEC was seen on the Glidescope screen passing down the lumen of the ETT and the protrusion measured against the ETT measurements. (c) The replacement nasal ETT was loaded onto the AFIS, which was then introduced via the right nostril and advanced until the tip was seen on the Glidescope screen. (d) After a period of pre-oxygenation, the cuff was deflated and the oral ETT was withdrawn leaving the AEC *in situ*. The FIS was then advanced into the trachea whilst simultaneously watching the Glidescope screen, to lie alongside the AEC. (e) The nasal ETT was then railroaded over the FIS into the trachea as normal while watching the larger Glidescope screen. Tracheal rings could be seen via the FIS eyepiece, which also confirmed correct placement. The AEC was then removed, and the nasal ETT cuff inflated, and FIS removed. (f) The nasal ETT *in situ* with removal of both the oral ETT and gastric tubes.

an AEC placed via the oral ETT.[3,4] There is considerable coiling of both the wire and AEC during this process, with the potential for pharyngeal trauma and knotting of the devices.

The use of video laryngoscopy has been compared to FIS for nasal intubation.[5] Video laryngoscopy has been used in a very similar way to exchange small ETTs inserted into difficult airways for larger ETTs to facilitate ventilation.[6]

The case under discussion illustrates the usefulness of combining both a video laryngoscope and a FIS as a means to safely perform the ETT exchange. The narrow field of view provided by the FIS may limit usefulness in cases of upper airway swelling where normal anatomical landmarks may be obscured. Two skilled operators are required to perform this technique with the most senior placing the video laryngoscope and directing the placement of the FIS.

The paediatric airway may be too narrow to allow passage of both the FIS and exchange catheter as was possible in this case but having both devices on the video screen minimises the risk of airway loss if the AEC is withdrawn and the FIS advanced.

The FIS has the additional advantage of allowing real-time confirmation of accurate placement of the ETT in the mid-trachea.

Exchanging an oral for a nasal ETT in a patient with a potentially difficult airway is a challenging procedure. Combining the AEC with a FIS allows safe exchange while maintaining a device within the trachea to facilitate rescue.

Consents

Consent for publication of anonymised clinical photographs was obtained from the University of KwaZulu-Natal Biomedical Research Ethics Committee. Verbal consent was also obtained from the patient's mother.

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Received: 30-08-2017 Accepted: 11-09-2018