Retrieval of a retrograde catheter using suction, in patients who cannot open their mouths

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In difficulty, tracheal intubation can be facilitated by passing a retrograde catheter, but the mouth has to be opened for the retrieval of the catheter from the pharynx. Two patients with ankylosis of a temporomandibular joint were unable to open their mouth, and required general anaesthesia for gap arthroplasty. Because we did not have a flexible fibreoptic laryngoscope, we used a suction catheter to retrieve an epidural catheter from the pharyngeal cavity, which had been passed retrogradely from a cricothyroid puncture. Catheter-guided tracheal intubation was done without complication. A suction catheter can assist retrograde retrieval of a catheter to aid intubation in patients who cannot open the mouth.

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Retrograde passage of a catheter into the pharynx to aid tracheal intubation is an established technique¹⁻³ and has been used with various modifications to secure difficult airways in both elective and emergency cases.⁴⁻⁵ Mouth opening is essential for retrieval of the catheter from the pharynx. We achieved successful tracheal intubation in two patients who had ankylosis of the temporomandibular joint (TMJ), with no mouth opening.

Case 1

A girl of 14 yr (ASA I, weight 32 kg, height 125 cm) presented with inability to open her mouth for several years. She had fallen from a tree when aged 3 yr and gradually developed difficulty in mouth opening. Clinical examination and imaging showed a right-sided post-traumatic ankylosis of the TMJ. She was sent for pre-anaesthetic evaluation regarding a gap arthroplasty for the right TMJ under general anaesthesia. She had been taking a liquid/semisolid diet for several years. She could not open her mouth and had a retrograde mandible and facial asymmetry. The mentothyroid and mentohyoid distances were 2.5 and 2 cm respectively. The neck was mobile; the nostrils were patent, and she had no history of change of voice, breathlessness or snoring during sleep.

We did not have a flexible fibreoptic laryngoscope. The complete closure of the mouth presented a difficult situation for securing the airway. As the patient did not have any breathing difficulty during sleep, we planned inhalation induction with spontaneous breathing followed by blind nasotracheal intubation. We explained to the patient and her parents that a tracheostomy might be necessary, and obtained consent for this as well as consent for surgery and anaesthesia. On the night before and on the morning of surgery, we gave metoclopramide 5 mg and ranitidine 150 mg orally for prophylaxis against acid aspiration. On the morning of surgery, we gave a nasal decongestant (xylometazoline 2%) and glycopyrrolate 0.2 mg i.m. 1 h before the procedure. An i.v. cannula was placed in the left arm. We monitored ECG (lead II), pulse oximetry, non-invasive blood pressure and end-tidal carbon dioxide (FE CO₂). After pre-oxygenation, anaesthesia was induced with nitrous oxide and oxygen (1:1) with progressive increases in halothane concentration, starting with 0.5%. There was no airway obstruction or difficulty with manual ventilation.

We continued inhalation anaesthesia to achieve adequate depth of anaesthesia for nasal intubation. Blind nasal intubation was tried with a 7-mm polyvinyl chloride cuffed tube (SIMS Portex, Kent, UK). The endotracheal tube was
After ensuring bilateral air entry and a satisfactory \( F_{\text{E}} \) \( \text{CO}_2 \), we gave vecuronium bromide 3 mg, meperidine 25 mg i.v., intermittent positive pressure ventilation, and anaesthesia was maintained with nitrous oxide and halothane 0.5–1%. Mouth opening after surgery was 32 mm. On completion of surgery, residual neuromuscular block was reversed with neostigmine 1.5 mg and atropine 0.6 mg i.v. The epidural catheter in the trachea was taken out just before extubation. The epidural catheter was attached to a Bain circuit to help early detection of tracheal intubation and maintain anaesthesia. We failed to intubate the trachea despite multiple attempts.

Before opting for tracheostomy, we considered retrograde passage of an epidural catheter and retrieval via the nostril, by using suction through a suction catheter. We maintained inhalation anaesthesia with spontaneous breathing and obtained consent for the procedure of retrograde intubation from her parents. A cricothyroid puncture was done with a 16-G i.v. cannula and a 90 cm, 18 G epidural catheter (SIMS Portex) was passed into the pharynx. We estimated that the catheter would have to be threaded for a distance approximating the distance from the angle of the mandible to the cricoid cartilage for its tip to lie within the pharyngeal cavity. We therefore threaded the epidural catheter for that distance into the pharynx. To overcome the impedance offered by a narrow nasal passage and the nasal turbinates, we inserted a 7-mm soft nasopharyngeal airway (SIMS Portex) into the left nostril. Next, we introduced a 16 FG, 53 cm long suction catheter with an end opening into the nasopharynx through the nasopharyngeal airway and advanced it forward in an attempt to suck the epidural catheter blindly from the pharynx. While advancing the suction catheter, the person holding the epidural catheter at the cricothyroid puncture site felt and saw a slight backward movement of the epidural catheter. We presumed that the suction catheter must be in contact with the epidural catheter. We then applied a constant negative pressure of –0.4 to –0.6 bar through the suction catheter and started withdrawing it out of the nasopharyngeal airway, while pushing the epidural catheter in at the cricothyroid puncture site to help it pass upwards. As the suction catheter came out, we found the epidural catheter attached to it (with the tip about 2 cm inside the suction catheter) coming out of the nasopharyngeal airway. We removed the epidural catheter for a sufficient length and used it to guide nasotracheal intubation. This took only 1.5 min as we were able to capture the epidural catheter at the first attempt. Before the catheter-guided intubation, we again gave inhalation anaesthesia for 5 min. We kept the catheter in place until the end of the operation. Anaesthetic agents were stopped only for the period of insertion of the suction catheter and retrieval of the epidural catheter through the nasopharyngeal airway.

After our previous success, we planned to use the same technique for tracheal intubation. We planned to use airway block for better control of the airway during the procedure. Details of the procedure were explained to the patient and her parents, with the option to go to another centre where fibreoptic intubation facilities were available. Informed consent for the procedure and surgery was obtained from her parents. Pre-anaesthetic preparation and intra-operative monitoring were similar to those for Case 1.

Because the mouth was closed we could not anaesthetize the oral and pharyngeal mucosa with lignocaine spray; instead, lignocaine 2%, 3 ml was nebulized over 10 min. The patient was then asked to gargle and swish around 10 ml of lignocaine viscous 2% without swallowing. The cricothyroid puncture site was infiltrated with lignocaine 2%, 0.5 ml. After block of the superior laryngeal nerves and transtracheal injection of the local anaesthetic, we did a cricothyroid puncture with a 16-G i.v. cannula. The subsequent procedure was similar to that used in Case 1. The anaesthetist again observed the contact of the epidural catheter as a backward movement of the epidural catheter at the cricothyroid puncture site. The epidural catheter, attached to the tip of the suction catheter (with a 3 cm segment inside the lumen of the suction catheter), came out
at the first attempt at suction, with a negative pressure of −0.4 to −0.6 bar. Catheter-guided nasotracheal intubation was then done easily. After confirmation of the position of the tube, anaesthesia was induced with thiopentone 150 mg i.v. and maintained with nitrous oxide and halothane 0.5–1%. Thirty-five millimetres of mouth opening was present at the end of surgery. Neuromuscular paralysis was reversed with neostigmine 1.5 mg and atropine 0.6 mg i.v. Extubation, recovery and subsequent hospital stay were uneventful. She left hospital 8 days after the operation.

Discussion
As well as restriction of mouth opening, TMJ ankylosis in growing children can deform the airway, often contributing to failure of blind nasotracheal intubation.5 6

In developing countries, patients often present late, usually when mouth opening has either become very small or absent (as in these two patients). Without a fiberoptic laryngoscope, the retrograde catheter method is an accepted option for management.4 5 For oral intubation using this method, the catheter is retrieved from the mouth with Magill’s forceps. For nasotracheal intubation, the catheter is first retrieved through the mouth and later pulled through the nose with another nasal catheter. The endotracheal tube is then placed inside the trachea by sliding it over the catheter. The tracheal tube, instead of being slipped over the catheter, can also be pulled into the trachea by tying one end of the catheter at the Murphy’s eye of a tracheal tube.7 8 Unfortunately, some mouth opening is essential for all these manoeuvres. If mouth opening is limited, a pharyngeal loop can allow successful retrograde intubation.6 Our two case reports describe a novel way for the retrieval of a pharyngeal catheter through the nostril in patients with absolutely no mouth opening.

The fiberoptic laryngoscope is a reliable method of aiding intubation in patients with a difficult airway. However, in developing countries the flexible fiberoptic laryngoscope is a rarity. Even when present it is often not working (because of high maintenance costs). Patients continue to present for surgery and cannot afford to travel to centres with these facilities, as with our second patient. To manage a difficult airway, a fiberoptic laryngoscope alone is not sufficient. Expertise may not be readily available. In the casualty room or in the emergency operating room, a junior anaesthetist may not be proficient in its use. Bleeding in the oropharynx can obscure the airway with a fiberoptic laryngoscope even for an experienced anaesthetist. Alternative methods may be needed.

Insertion of a nasopharyngeal airway is very important. The main site of nasal narrowing is at the nasal valve, formed by the anterior portion of the inferior turbinate and the corresponding nasal septum. To overcome this obstruction, we introduced a lubricated airway for easy and smooth retrieval of the epidural catheter. The distance from the angle of the mandible to the cricothyroid puncture site was taken as the approximate length for initial insertion of the catheter into the pharynx. Introduction of more catheter could cause coiling of the catheter inside the pharynx, or the catheter could pass the tongue and enter the mouth. A straight catheter would be retrieved more easily than a coiled one. If the catheter is in the oral cavity, then it could fold at the place it makes contact with the suction catheter. Removing a folded catheter requires more traction than a straight one. Thus, it would be prudent to have a more or less straight length of catheter in the pharyngeal cavity to allow successful retrieval.

Once we had applied negative pressure on the suction catheter from above, we threaded the epidural catheter upwards from the cricothyroid puncture site. We presumed that the suction at the suction catheter tip not only sucked the epidural catheter out but also guided the tip of the epidural catheter towards the suction catheter, besides maintaining its desired direction, and made the push on the catheter at the cricothyroid puncture site more effective in propelling it upward. If the direction of movement were not guided by the suction catheter, it might have coiled in the pharynx.

We suggest that if a fiberoptic laryngoscope and a skilled user are not available, a suction catheter can assist passage of a retrograde catheter to aid intubation in patients with no mouth opening. For safety, we suggest an airway block for the technique, with general anaesthesia only after the successful catheter-guided tracheal intubation.

References