

Retrograde intubation of the trachea

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Abstract

Successful intubation can be accomplished in the majority of patients via direct laryngoscopy. However, situations frequently arise in which simple orotracheal intubation is contraindicated or impossible. In these situations retrograde tracheal intubation may be of particular use. This technique has been performed by novice physicians in cadavers, without difficulty or major complications. It has proved to be a quick, efficient and simple method to establish an endotracheal airway and should be a valuable adjunct for airway control.

Introduction

The initial step in the resuscitation of the seriously ill or injured patient is the establishment of an adequate airway. Usually this is accomplished by endotracheal intubation. Successful intubation can be performed in the majority of patients via direct laryngoscopy. Yet situations frequently arise in which simple orotracheal intubation is contraindicated or impossible due to trauma or anatomical distortion of the upper airways and the cervical spine. Clearly, expertise in alternative methods for endotracheal intubation is necessary for those involved in emergency airway management. Retrograde tracheal intubation (RTI) requires little operator experience and can be accomplished without direct laryngoscopy or head and neck movement. This has proved to be a quick, simple and effective method to establish an endotracheal airway and can be used instead of cricothyroidotomy or emergency tracheotomy.

Methods and materials

Equipment includes a standard endotracheal tube of appropriate sizes, flexible tip metal guidewire (70 cm long), a 12 G needle curved at its outer tip (alternatively an epidural 16 G needle which has a side hole, or even a regular 12–18 G needle can be used), syringe, and haemostatic forceps.

The larynx is stabilized with the thumb and middle finger of one hand. The cricothyroid membrane is identified and the skin is pierced by the needle (with its convex tip facing caudad) just above the cricoid cartilage in order to avoid injury to the cricothyroid arteries. The needle is then angled 20° to 30° caudad and the inferior aspect of the cricothyroid membrane is punctured while free aspiration of air by the syringe confirms proper placement. The syringe is removed and the needle is angled 20° to 30° cephalad. The wire is fed through the needle into the oropharynx or nasopharynx. The wire

may spontaneously exit via the mouth or nose, but if not, it can be recovered from the pharynx with fingers or forceps. The needle is removed. The wire is clamped at the neck with haemostatic forceps and the endotracheal tube is threaded over the guide into the larynx and trachea. The wire is released at skin level and then pulled from the proximal end of the endotracheal tube. The tube is advanced and proper depth and placement are confirmed by auscultation to both lungs.

Retrograde tracheal intubation was performed by twenty resident physicians in 40 cadavers (each physician performed the procedure twice). None of the operators had prior experience with RTI and they received a short explanation about the procedure. In every procedure we observed whether any difficulties were encountered during each step of the retrograde tracheal intubation. Successful intubation was confirmed by auscultation to the lungs and direct laryngoscopy. We measured the time (seconds) elapsed from initial cricothyroid membrane puncture until placement of the tube into the trachea.

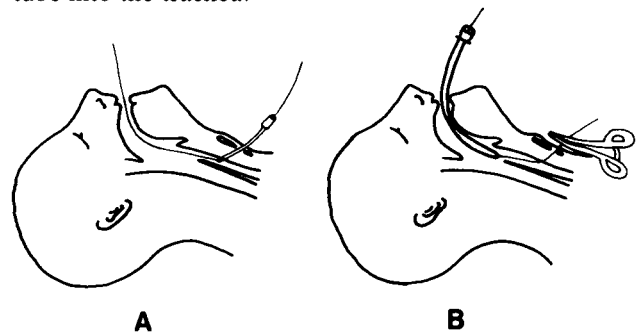


FIG. 1

Retrograde intubation. A. Cricothyroid membrane is punctured with a needle and the guidewire is delivered through the mouth. B. With the guidewire secured at skin level the endotracheal tube is placed over and advanced into the trachea. The guidewire is then released and pulled out proximally.

If the physician could not complete RTI within 150 seconds we defined it as 'failure'. In each cadaver a pathological exploration of the trachea, larynx and pharynx was performed to observe any damages.

Results

We did not observe any major difficulties during most RTI's. In two cases the wireguide was fed caudad into the trachea because the needle was not angled properly.

In some cases the wire was advanced into the nasopharynx and had to be pulled back in order to recover it through the mouth. In 36 cases (90 per cent), RTI was completed within 150 seconds. The mean time was 56 ± 6 seconds. In four cases (10 per cent), RTI was not completed within 150 seconds (failures).

Pathological exploration

In two cadavers, the puncture was done below the cricothyroid membrane (one puncture was done between the cricoid cartilage and the first tracheal ring and the other between the first and second tracheal rings).

In four cases we found minor injuries in the lower margin of the thyroid cartilage or upper margin of the cricoid cartilage. Injuries to the posterior wall of the larynx, epiglottitis and soft palate were observed in three cases. Yet we did not find any posterior perforations.

Discussion

Retrograde intubation was first described by Butler and Carillo (1960) as a means to remove the tracheotomy tube from the operative field during laryngectomies in patients having preoperative tracheotomies. Waters (1963) described RTI in patients with deformity of the jaws. Powell and Odzil (1967) reported a series of 15 patients in whom RTI was used with no significant complications. Barriot and Riou (1988) reported 19 successful RTI in patients with either maxillofacial trauma or cervical spine fracture. In their report no serious complication could be related to this technique. Manchester *et al.* (1972) and Raza *et al.* (1978) described RTI as an emergency procedure in an anaesthetized patient when multiple attempts for direct intubation were unsuccessful. Successful paediatric usage has been reported in children with Pierre-Robin syndrome (Manchester *et al.*

1972), retro-pharyngeal abscess (Pagne, 1980), and micrognathia (Barland *et al.*, 1981). RTI was used also in a patient with epiglottitis (Heslet *et al.* 1985) and in a patient with oral myxoma (Luhrs and Fuller, 1987).

Contraindication may include disability to open the mouth for guidewire retrieval (although in this case the wire may be recovered through the nose), large laryngeal obstruction and anterior neck mass overlying the cricothyroid membrane.

RTI requires little equipment or operator experience. Previous reports, as well as this study, indicate that this method is simple, safe and routinely successful. In our opinion, every physician involved in the care of the seriously injured or ill patient should be familiar with this technique which may become valuable whenever orotracheal intubation is impossible or contraindicated.

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