

# Retrograde Naso-Tracheal Intubation Using a Cook Retrograde Intubation Set: A Case Report.

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## Abstract

Endotracheal intubation in patients with limited mouth opening always remains a challenge, especially in the absence of flexible fibre optic bronchoscope. The retrograde catheter technique is an accepted option for airway management in cases where oral intubation is not possible because of limited mouth opening or not recommended because of fear of dislodgement of fracture segments or facial bones. We performed retrograde nasal intubation in a patient with complicated bilateral mandibular fracture from gunshot injury, using the Cook retrograde intubation set. This procedure was performed on a 51-year-old farmer victim of gunshot injury with comminuted fracture of the mandible, and consequent limited mouth opening from previous emergency surgery. Difficult airway tray, and the Cook retrograde intubation set was assembled. Retrograde nasal intubation was successfully performed under deep inhalational halothane anesthesia, with preservation of the patient's respiratory effort, using the Cook retrograde intubation set.

**Key words:** Airway Management, Intubation, Mandibular Fractures.

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complicated with bilateral mandibular fracture, limited mouth opening, and extensive soft tissue fibrosis from an initial damage control surgery; planned for mandibular reconstruction with iliac bone graft in the index surgery.

## Case Report

A 51-year-old farmer (ASA physical status I), victim of gunshot injury with comminuted fracture of the entire mandibular, limited mouth opening from an initial emergency surgery under general anaesthetic. He was then planned for an elective mandibular reconstruction with iliac bone graft.

There was history of previous airway management challenges and anaemia from haemorrhage (PCV 21%), requiring optimisation with 4 units of whole blood transfusion pre-operatively; immediately following the gunshot injury.

Preoperative assessment for the reconstructive surgery 4 weeks later revealed: a middle-aged man, mildly pale, malnourished, facial asymmetry, scarified cheek, limited mouth opening, receding chin and dental anarchy. Thyromental distance of 4cm, mouth opening of 2cm, and Mallampati of IV. He had normal chest and CVS findings. The haematocrit was 30% (post-transfusion) and the serum electrolytes (mol/l) were normal- Na 139.5, K 3.7, CL 110.9, HCO<sub>3</sub> 16.9, and Urea 5.9. Two units of ORH-positive fresh whole blood were made available for surgery. Consent for anesthesia was obtained.

During pre-induction, intravenous access was secured with an 18G cannula, and hydration with 500ml normal saline was established. Monitors like pulse oximeter, NIBP, ECG were attached, and baseline vital signs were taken. Difficult airway tray was assembled containing, Macintosh laryngoscope, Maggills forceps, different sizes of Endotracheal tubes (ETT), size 4 laryngeal mask airway, gum elastic boogie and Cook retrograde intubation set (containing a stiff guide wire with a soft flexible J tip, an introducing 18g cannula and a 70cm 11Fr black Teflon catheter).

Induction / Airway management: After pre-oxygenation, anesthesia was induced with halothane

## Introduction

Intubation is one of the most important anaesthetic skills. Endotracheal intubation in patients with limited mouth opening always remains a challenge, especially in the absence of flexible fibreoptic bronchoscope. The retrograde tracheal intubation is an accepted option for airway management in cases where oral intubation is technically impossible, because of limited mouth opening or not recommended because of fear of dislodgement of fracture segments or facial bones.<sup>[1]</sup>

The technique can be performed despite the presence of blood or secretions in the upper airway. It is an alternative to cricothyroidotomy in patients with short, obese, or anatomically distorted necks and limited mouth opening or cervical spine movements.<sup>1</sup> Flexible fibreoptic laryngoscopy is the method of choice for the management of difficult tracheal intubation, a leading cause of catastrophic outcomes in anesthesia.<sup>[2]</sup> However, this method is not always available or feasible.

We successfully performed, retrograde nasotracheal intubation, in a patient with gunshot injury

## Orilonise; Retrograde Naso-Tracheal Intubation Using a Cook Retrograde Intubation

in 100% oxygen; with progressive increases in halothane concentration, starting with 1%. There was no airway obstruction or difficulty with manual ventilation. We continued inhalational anesthesia to achieve adequate depth of anesthesia for nasal intubation, because conventional laryngoscopy was difficult. Blind nasal intubation was tried with a 7mm polyvinyl chloride cuffed tube. We failed to intubate the trachea despite multiple attempts, before opting for retrograde intubation.

**Table 1: Laboratory tests until in hospital days.**

Day	Hemato crit %	Hemogl obin g.dL <sup>-1</sup>	Platel ets /mm <sup>3</sup>	PT (secon ds)	aPTT (secon ds)
Admis son	42.0	14.2	27400 0	12	32
Third	40.2	13.9	27100 0	18	79
Fourth	41.1	13.9	26600 0	14	39.5
Fifth	41.1	13.6	25800 0	13	37.4
Sixth	42.1	13.8	25600 0	13	37.1

PT – prothrombin time

aPTT - Activated Partial Thromboplastin Time



**Figure 1: Cannulating the cricothyroid membrane.**



**Figure 2: Threading the j-guide wire, cephalad in the sub-glottic area.**



**Figure 3: Maggls forceps used to retrieve, the guide wire & silk thread (loaded on the ETT).**



**Figure 4: The extral-nasal knot connecting the guide wire & the silk thread.**



**Figure 5: The Teflon catheter being manoeuvred into the trachea, via the ETT.**



**Figure 6: The ETT, being connected to the anesthesia breathing system, after intubation.**

We proceeded with retrograde nasotracheal intubation because tracheostomy tube and fiberoptic was not readily available (in a resource poor centre). The cricothyroid membrane was pierced with the aid of an 18G needle/cannula assembly [Figure 1], attached to a 5ml-syringe-containing saline (for aspiration test). After ascertaining correct placement of the cannula in the larynx, the needle was withdrawn and the guide wire was passed through the cannula in the cephalic direction [Figure 2] and the wire was retrieved from the mouth with the aid of Maggls forceps [Figure 3]. A size 7.0 PVC Endotracheal tube (ETT) lubricated with KY-jelly

was passed through the nostril (into the oropharynx) as a conduit for a size 1 silk suture, which was also retrieved from the mouth with the aid of Magglls forceps [Figure 3]. The silk suture was tied to the intraoral portion of the guide wire, and then the extra nasal portion of the suture was used to advance the wire through the lumen of the ETT and out of the nostril [Figure 4]. The guide wire, (having been detached from the suture and the ETT) was used to railroad another size 7.5 lubricated reinforced ETT through the nostril into the trachea. The black Teflon catheter (as bougie) was introduced through the ETT into the trachea [Figure 5], and was used to provide extra stiffness for railroading the ETT into the mid-trachea (which elicited the cough reflex), especially after pulling out the guide wire completely. Lastly, the Teflon catheter was removed, after the ETT had been rail-roaded inside the trachea. The patient was connected via the ETT connector to the anesthesia breathing system [Figure 6] - confirmation of successful intubation was made clinically (from bilateral equal air entry on chest auscultation, airway pressure changes from the visualisation of the patient's spontaneous Ventilatory efforts throughout the respiratory cycle, and carinal reflex elicitation); in the absence of waveform capnography. We administered balanced general anesthesia with controlled ventilation. There was significant bradycardia immediately following intubation, treated with discontinuance of halothane, administration of 100% oxygen and 0.6mg intravenous atropine. The remaining intraoperative and postoperative periods were uneventful.

## **Discussion**

In the absence of a fibreoptic bronchoscope, the techniques/options for endotracheal intubation in patients with limited mouth opening are restricted. These techniques include blind nasal intubation, retrograde intubation and the time-tested tracheostomy. Because of the frequently associated airway anomaly, failure of blind nasal intubation is not uncommon.<sup>[3]</sup> The technique of retrograde intubation was originally described by Butler and Cirillo in 1960.<sup>[4]</sup> There have been several modifications in this technique throughout this years.<sup>[5]</sup> In adults; this can be done in the anesthetized or conscious patient. In the conscious patient, this should be preceded by transtracheal topicalization and airway nerve block. In adults, this can be done with a long arm central venous catheter or epidural catheter passed through the accompanying needle.<sup>[6]</sup> A customised kit for this procedure, is the Cook retrograde intubation kit (containing a stiff j-guide wire), was used in the management of our patient.<sup>[6]</sup> For surgical access, we desired a nasal tube; the tip of the guide wire coming out of the mouth, was tied to a nasally passed silk suture (emerging through the oral cavity), [Figure 4]. The Endotracheal tube is then inserted into the larynx over the wire, which is held with mild

tension.<sup>[6]</sup> We passed the Teflon separate and beyond the guide wire because the stiffness was adjudged sufficient to guide the ETT into the mid trachea, even after removal of the guide wire, [Figure 5]; unlike the practice of the Teflon over or (through) the guide wire technique, recommended by Thomas.<sup>[6]</sup> The tip of the tube may catch on the anterior commissure and therefore not passed, but our ETT passed successfully the very first time, confirming the findings of Weksler and colleagues that retrograde intubation is minimally invasive airway management technique with a flat learning curve and a high level of skill retention.<sup>[2]</sup> Turning the tube, loosening the wire, or threading the tube onto the wire by means of the Murphy eye may facilitate passage.<sup>[6]</sup>

For nasotracheal intubation through this technique, the catheter is first retrieved through the mouth and later pulled through the nose with another catheter.<sup>[6]</sup> We used nasally passed size 1 silk instead of another catheter to pull up the guide-wire; if there is some mouth opening as in our case, the guide wire can be retrieved from the mouth with the help of a finger, Magglls forceps or suction catheter.<sup>[7-9]</sup> The stiff guide-wire used for our patient can also be substituted with an epidural catheter.<sup>[9]</sup> Fluoroscopic assisted retrograde passage of guide wire can also be helpful for wire guided tracheal intubation.<sup>[10]</sup> Pharyngeal loop can also be used for tracheal intubation in such patients.<sup>[11]</sup> In our case, as the patient had 2cm mouth opening, we could retrieve the guide wire with the help of Magglls forceps. Our first attempt at rail roading the endotracheal tube succeeded.

Ideally, a flexible fibreoptic bronchoscope should be used for tracheal intubation in such patients; unfortunately, because of high cost of purchase and maintenance of fibreoptic devices, few centres have such facilities.<sup>[6]</sup> Also in cases of airway bleeding, fibreoptic bronchoscopy may fail and a suitable alternative is required. Thus in an emergency scenario, retrograde nasal intubation with a gliding knot and pull through technique could be a suitable alternative when fibreoptic bronchoscope is not available.<sup>[7,8]</sup> The complications were brief period of hypoxaemia shortly before securing the airway, bradycardia and insignificant bleeding at the point of cricothyroid puncture. However, potential complications included hypoxaemia, sorethroat, cough, laryngospasm / bronchospasm, haematoma, incorrect site of tube placement, unsuccessful tube placement, laryngeal fracture with permanent dystonia, subcutaneous emphysema, pneumomediastinum, infection, bleeding, retained wire and epistaxis from nasal mucosa injuries.<sup>[12-14]</sup> Our patient went home uneventfully within three weeks post-operatively, with full restoration of function.

In the absence of fibre-optic bronchoscope, and when blind nasal intubation fails or tracheostomy is not immediately possible; retrograde nasal intubation using a guide-wire is a feasible and safe alternative for

airway management in patients with limited mouth opening or difficult airway.

## Conclusion

In the absence of fibre-optic bronchoscope, and when blind nasal intubation fails or tracheostomy is not immediately possible; retrograde intubation using Cook retrograde intubation set (or a guide-wire), is a feasible and safe alternative for airway management in patients with limited mouth opening or difficult airway.

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