

PERCUTANEOUS TRACHEOSTOMY IN A PATIENT
WITH MANDIBULO-MAXILLARY INTERFIXATION
WITH MODIFIED APPROACH FOR
BRONCHOSCOPIC GUIDANCE

- Case Report -

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Abstract

Percutaneous tracheostomy has replaced the surgical approach in many intensive care unit patients. In this case report, we present the use of percutaneous tracheostomy on a patient with mandibulo-maxillary interfixation.

A 19-year-old male with severe maxillofacial injuries underwent mandibulo-maxillary interfixation. Percutaneous tracheostomy was planned. Because of the mandibulo-maxillary interfixation, however, neither direct laryngoscopy nor the fiberoptic bronchoscopy through the existing preformed nasal endotracheal tube could be utilized. A modified approach utilizing the fiberoptic bronchoscopy to safely withdraw the endotracheal tube was used. The bronchoscope was introduced from the other nostril and used to inspect the withdrawal of the ETT from outside.

Our case demonstrates the feasibility of percutaneous tracheostomy in the setting of mandibulo-maxillary interfixation. To our knowledge this is the first report of percutaneous tracheostomy in this indication.

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Introduction

Percutaneous tracheostomy (PT) has gained a great popularity becoming an alternative to the standard surgical routine in many intensive care units. The percutaneous tracheostomy procedure involves withdrawal of the endotracheal tube (ETT) under direct vision, through direct laryngoscopy or via fiberoptic bronchoscopy (FOB)¹. We present a patient with pan-facial fracture and mandibulo-maxillary interfixation in whom neither the direct laryngoscopy nor the fiberoptic bronchoscopy could be utilized. We used a modified approach utilizing the fiberoptic bronchoscopy to safely withdraw the endotracheal tube. To our best understanding, this is the first reported case of percutaneous tracheostomy that has been performed in a patient with mandibulo-maxillary interfixation.

Case History

A 19-year-old male patient was presented to Emergency Department following a road traffic accident with multiple trauma including severe traumatic brain injury (TBI) and severe maxillofacial injuries causing pan-facial comminution fractures. The patient was admitted to the Intensive Care Unit for head injury management. Seven days after his ICU admission, his neurologic condition improved, both clinically and radiographically. The maxillofacial team planned his surgical treatment to manage the facial injury through open approach with internal fixation to enable the ICU staff to extubate when patient condition allowed. No plans for tracheostomy were considered at that point.

Intra-operatively, the oral endotracheal tube was switched to nasal cuffed preformed Ring-Adair-Elwayn (RAE) tube (size 7, Mallinckrodt Inc, St. Louis, Mo) to facilitate the surgical intervention. Open reduction and internal fixation of the maxillary fractures was performed.

Additionally, mandibulo-maxillary interfixation (MMI) utilizing elastic bands was performed. Since the dentoalveolar comminution was severe, maximum interocclusion approximation was necessary for a minimum of 14 days. The consensus was to consider extubation within the coming few days and if all possible to maintain the MMI. Elective tracheostomy was deemed unnecessary considering the improving neurosurgical status.

Postoperatively, the patient was weaned off sedation. However, patient was considered unfit for extubation because of several reasons including marginal neurological status (Glasgow Coma Score: 8 to 9/15), copious amount of secretions secondary to the development of ventilator associated pneumonia, and inaccessible airway in the presence of mandibulo-maxillary interfixation. Therefore, the consensus was to proceed for elective tracheostomy. Considering the potential delay related to operating room time scheduling, bedside percutaneous dilatational tracheostomy was planned.

The procedure was performed by two consultant intensivists with extensive experience in PDT, of whom one was responsible for the airway management and the other for the tracheostomy procedure. Backup plans were arranged in case of failed attempts included: reintubation with the existing endotracheal tube, reintubation with fiberoptic guidance with a new ETT and emergency cricothyrotomy. Furthermore, experienced surgeon was asked to stand-by for emergency situations. The most critical step was the safe withdrawal of the ETT which could not be done under direct laryngoscopy because of the intermaxillary fixation. Direct vision by FOB was also not a viable option because of the relatively small size and curved shape ETT with high risk of damaging the FOB and compromising ventilation. Lastly, a blind withdrawal of the ETT was also considered a high risk for extubation with impossibility of reintubation.

An alternative approach to adjust the ETT was decided. In this approach, the bronchoscope was used to visualize the withdrawal of the endotracheal tube from outside the tube rather than from inside. A new size 7.5 ETT was passed over the FOB to be used in case fiberoptic intubation is needed. The bronchoscope was introduced through the other

nostril and advanced to the pharynx. After suctioning of pharyngeal secretions, the cuff of the original ETT was deflated under bronchoscopic guidance. The tube was carefully and slowly withdrawn until the cuff is just under the vocal cords. The cuff of the ETT was gently re-inflated enough to achieve the original tidal volume. Percutaneous tracheostomy was performed using forceps dilatational technique (Grigg's technique)². The FOB was kept in the same position till the end of the tracheostomy procedure and satisfactory placement of the tracheostomy tube was confirmed.

Discussion

Since its introduction in 1985 by Ciaglia¹, percutaneous dilatational tracheostomy (PDT) has gained widespread popularity replacing the conventional surgical tracheostomy in the majority of indication in the intensive care unit. In certain circumstances, however, percutaneous dilatational tracheostomy has been considered contra-indicated, including in patients aged less than 15 years; uncorrected bleeding diathesis; gross distortion of neck anatomy; tracheomalacia; morbid obesity or short neck; and in cases of inability to extend the neck because of spinal fusion³, etc. Mandibulo-maxillary interfixation with inability to perform direct laryngoscopy would also be considered a contraindication. However, with the increasing experience gained with PDT, the procedure has been performed successfully in several situations considered previously to be contraindications. PDT has been reported in patients with morbid obesity⁴, spinal fusion^{5,6}, previous tracheostomies⁷ and pediatric patients⁸. Our report comes to demonstrate that PDT can be performed safely in the setting of intermaxillary fixation.

In preparation for tracheostomy procedure, the endotracheal tube has to be withdrawn to place the tip above the first tracheal interspace¹. Several methods have been used to adjust the position of endotracheal tube including direct laryngoscopy and bronchoscopic guidance. The latter is usually achieved by introducing the bronchoscope through the existing ETT, then withdrawing the tube. Both options, direct

laryngoscopy and “indwelling” bronchoscopy were not possible in this case because of the mandibulo-maxillary interfixation and the presence of pre-formed small-sized ETT. Therefore, the bronchoscope was introduced from the other nostril to the pharynx to visualize the withdrawal of the ETT externally.

It is important to further emphasize that such procedure should be performed after taking the necessary safety measures. In our reported case, the procedure was done by two experienced intensivists in percutaneous tracheostomy and a clear, back-up plan for emergency airway management was made including surgical intervention. Our report demonstrates the feasibility of this procedure in patients with mandibulo-maxillary interfixation when the proper safety precautions are taken.

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