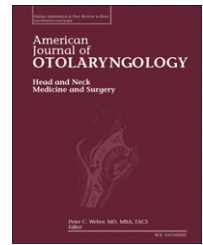


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An innovative approach to tracheotomy in patients with major obstruction of the upper airway

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ABSTRACT

Background: Patients with severe dyspnea consecutive to locally advanced obstructive head and neck squamous cell carcinoma (HNSCC) or subglottic stenosis requiring definitive or temporary tracheotomy are frequently difficult to ventilate and intubate.

Materials and Methods: We describe a new procedure to perform tracheotomy easily and safely in patients with major obstruction of the upper airway. A catheter, specifically designed for cricothyroidotomy, was inserted into the trachea under local anesthesia. Then, general anesthesia was induced and the catheter was used as a guide for dilatation tracheotomy. From November 2009 to March 2013, the procedure was successfully used in 13 consecutive patients. Twelve out of 13 patients presented severe inspiratory dyspnea and stridor.

Results: During and after the procedure, no complications were reported.

Conclusions: The reported technique is quickly performed and is a safe way to ensure short and long time ventilation of patients with major obstruction of the upper airway.

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1. Introduction

Major obstruction of the upper airway is a medical emergency and is associated with high morbidity and mortality [1].

Upper airway obstruction is most frequently related to locally advanced head and neck squamous cell carcinoma (HNSCC), but it can also be due to trauma, infection, edema or foreign bodies [2].

While symptoms such as inspiratory dyspnea or stridor are predictive of upper airway obstruction, nasofibroscope is essential for upper airway assessment before any procedure. While a conscious patient can provide feedback, nasofibroscope enables the medical team to identify the size and cause of the obstruction and the most efficient way to relieve it. When transoral endotracheal intubation is contraindicated or seems impossible, an emergency tracheotomy, performed under local anaesthesia in an awake patient, is typically required to rapidly bypass the

obstruction. Acute obstruction of the upper airway is a very anxiogenic event, not only for the patient but also for the medical team. Awake tracheotomy in these circumstances cannot be guaranteed to be complication free and can be very difficult to perform as some patients are unable to lie in a supine position.

In this report, we focus on upper airway obstruction due to HNSCC and propose a technique to quickly and safely enable tracheotomy using a transtracheal catheter as a guide to perform the procedure percutaneously.

2. Materials and methods

From November 2009 to March 2013, we performed the technique in 13 patients. Twelve out of thirteen patients presented with symptoms of severe inspiratory dyspnea and

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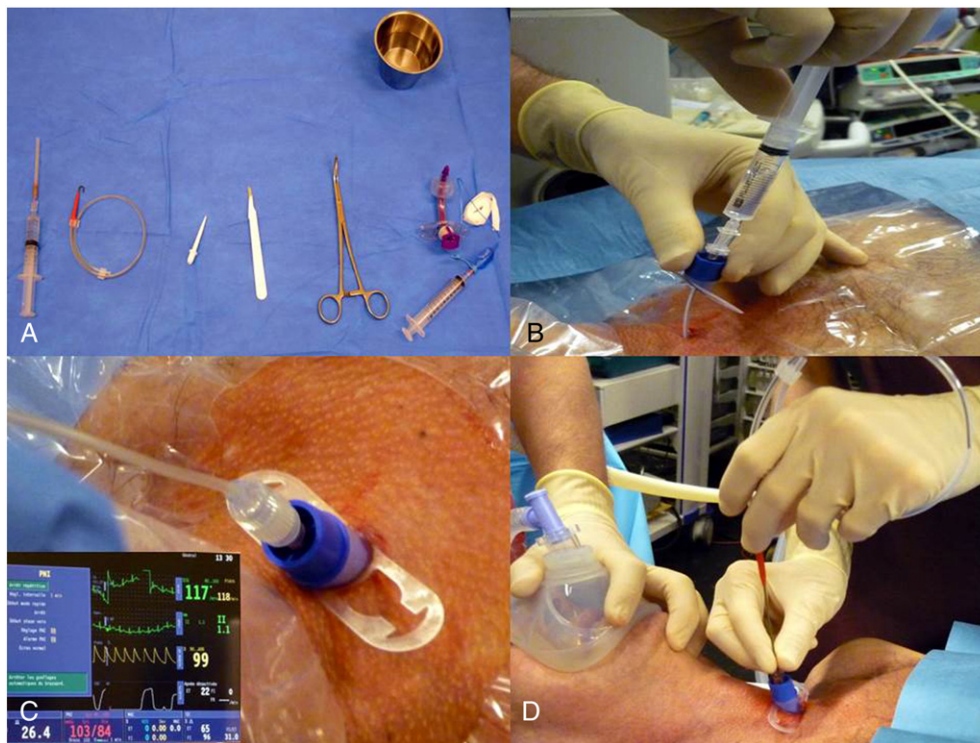


Fig. 1 – (A) Percutaneous tracheotomy set. (B) Air bubbles observed into the syringe after aspiration confirm the position in the airway. (C) The capnograph also confirms the position of the catheter in the airway. (D) Insertion of the guide wire into the transtracheal catheter.

stridor. Upper airway obstruction was related to advanced tumors of the head and neck in 11/13 patients. One patient had an isolated regional recurrence and another presented with severe proximal laryngeal subglottic stenosis. Most patients (7/13) had previously been treated with (chemo) radiotherapy.

The procedure was performed in the operating room in the presence of an experienced anesthesiologist and head and neck surgeon using a Portex® percutaneous tracheotomy kit incorporating the Griggs™ guide wire dilating forceps (Smiths Medical International Ltd, Ashford, Kent, UK) and a Ravussin catheter (VBM Medizintechnik GmbH, Sulz, Germany). The Ravussin needle is a specifically designed cannula-over-needle for cricothyrotomy, but our technique did not introduce it through the cricothyroid membrane.

The anesthetic technique was explained to each patient prior to surgery. Monitoring (ECG, pulse oxymetry, capnography, automatic blood pressure) was started in the operating room and the lungs were fully pre-oxygenated with 100% FiO₂. Anatomical landmarks were carefully taken before the procedure in order to perform the tracheal puncture as low as possible (between the cricoid cartilage and the first tracheal ring or ideally between the first and second tracheal ring). After local anesthesia, the 13 G Ravussin catheter was introduced into the trachea. Correct placement was confirmed by the presence of air bubbles (by aspirating into a syringe filled with water), and capnograph CO₂ readings taken directly out of the catheter. Fibroscopic confirmation was not possible due to the pathology (Fig. 1).

After verification of the position of the Ravussin cannula, induction of general anaesthesia was started with an IV anesthetic (propofol) only. Once the patient was satisfactorily

anesthetized, percutaneous tracheotomy was immediately performed. The guide wire of the Portex® percutaneous tracheotomy kit was inserted into the Ravussin cannula, followed by the first dilator, then the Griggs dilating forceps, the Portex® tracheotomy tube and lastly the cuff was inflated. The procedure takes only a few minutes in experienced hands.

3. Results

The tracheotomy procedure was successfully performed in all 13 patients. No preoperative or postoperative complications were reported.

4. Discussion

In patients with advanced HNSCC obstructing the upper airway, conservative management may be useful to delay intervention and includes intravenous and inhaled corticosteroids, nebulized oxygen, nebulized adrenaline and/or heliox and antibiotics [1]. Some patients will, however, rapidly deteriorate and require a more aggressive approach.

Endotracheal intubation and adequate ventilation are the main challenges in patients with major airway obstruction. The most common anesthetic techniques include conventional endotracheal intubation with inhalational induction, allowing the patient to continue spontaneous respiration, and awake fiberoptic intubation with topical anesthesia in a collaborative (awake or sedated) patient. However, since bleeding occurs

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