Tracheostomy: from insertion to decannulation

Introduction

The reports on surgical underwriting of the airway date back to antiquity [1]. However, Chevalier Jackson is credited with performing the first clear description of open surgical tracheostomy (TQA) in 1909 [2] and Ciaglia's first percutaneous dilatation tracheostomy (DPT) in 1985 [3].

A procedure that previously required an operating room is now commonly performed in the intensive care unit (ICU). Knowledge of tracheostomy is, therefore, still very important for surgeons; however, it is equally important for those responsible for patient care in the ICU.

This review will focus on tracheostomy as a non-emergency procedure in stable ICU patients with mechanical ventilation. The authors outline insertion techniques, review the literature comparing TQA and TPD techniques and explore the optimal timing for insertion. They also summarize the potential complications and their treatments and the types of tubes and their optimal handling.

Procedures

Both TQA and TPD require similar anesthesia, analgesia, positioning and sterile preparation. The patient is placed supine with a cushion placed transversely behind the shoulders to extend the neck and provide optimal exposure (unless the patient requires cervical spine precautions). The head of the bed is typically elevated 15º-20º to decrease venous engorgement. Antibiotics are not usually given prior to the procedure.

Open Surgical Technique

A vertical or horizontal skin incision of 2-3 cm is made in the midline between the sternal fork and the thyroid cartilage (approximately at the level of the 2nd tracheal ring). After dividing the skin and the underlying platysma, it is continued longitudinally with blunt dissection. The separation of the infrahiodeos (eg, sternohyoid, sterno-thyroid) muscles and lateral retraction exposes the trachea and the overlying thyroid isthmus. The isthmus can be mobilized and retracted up or divided.

The nearby vessels may bleed substantially and hemostasis is achieved with electrocautery or ligatures. The pretracheal fascia and the fibroadiposal tissue are dissected in a blunt form, the tracheal rings 2 to 5 can be visualized. A cricoid hook can provide traction up the trachea, improving the exposure. Lateral tracheal support sutures on the 3rd or 4th rings can provide lateral retraction and stabilization and help define the stoma.

Once haemostasis and exposure have been optimized, the trachea is opened vertically or transversally with the scalpel (the electrocautery is now contraindicated - see next section for complications). A distal base flap of the tracheal wall (Bjork flap) may be created, or a section of the anterior tracheal wall may be removed.

Polar separators in the stoma maintain the opening and the endotracheal tube is withdrawn under direct vision. An aspiration catheter placed within the open area can be used as a guide for insertion of the tracheostomy tube. The correct location is confirmed by direct visualization, CO2 concentration at the end of expiration, ease of ventilation and adequate oxygen saturation [9]. Flexible video-bronchoscopy offers adjuvant confirmation and helps bronchial cleansing.

Percutaneous dilation technique

There are several techniques recorded, but all employ a modified Seldinger technique [12]. Concomitant bronchoscopy adds a "tracheal vision" that helps the replacement of the endotracheal tube (TET) above the incision and helps visualize the site of the needle and subsequent dilatation of the stoma. The **bronchoscopy** may also reduce the damage to the posterior tracheal wall, confirm the location of tube and help clean the air. Therefore, it is strongly recommended.

The cricoid is palpated and a transverse incision in the skin of 2 cm is made at the level of the second tracheal ring. Vertical blunt dissection is followed by tracheal puncture with a 22G "needle finder" and then an adjacent 14G needle attached to a syringe filled with saline solution [3]. The aspiration of bubbles suggests an appropriate tracheal puncture. Continued insertion of a guidewire and removal of the needle. There are now subtle differences that distinguish forms of stoma creation. The Ciaglia technique uses sequential tracheal dilators (Cook Critical Care, Inc.) on the guidewire. Variations of this include the percutaneous Per-fit introducer set (Smiths Medical) and the Percu-Twist (Meteko Instrument).

Alternatively, the Blue Rhino technique (Cook Critical Care, Inc.) employs a single large, tapered dilator. The Portex Griggs technique (Smiths Medical) employs dilating forceps on the guidewire. The Fantoni translaaryngeal technique (Mallinckrodt) requires the retrograde passage of a wire parallel to the TET.

The tube is then attached to the wire and, by pulling the wire and using digital backpressure, the tube is inserted orally and placed through the anterior wall of the trachea [8]. Regardless of the technique, recent observational data suggest that routine radiography has poor performance and rarely modifies p16 management].

Weakness of the tracheostomy

As with TET extubation, the most reliable indication for tracheostomy training decannulation is when there is no need for airway protection or mechanical ventilation. Over time, patients may have reduced the size of their tracheostomy tubes or switched to fenestrated or non-cuffed tubes.

These measures increase the flow of air through or around the tube, respectively. This, in turn, allows sufficient airflow to allow the external tracheostomy to be plugged and to facilitate speech [32]. Speech in patients can increase motivation and speed recovery. This can also be promoted by placing a unidirectional valve on the tracheostomy to allow airflow over the throat during expiration. The most common example is the Passy-Muir tracheostomy valve (Passy-Muir, Inc.). Specific strategies for weaning and decannulation often depend on the institution. Some consider them once the patient has had the tube covered for 48 hours or more, while others consider them when a valve for speech is tolerated.

Closure is usually attempted after confirming the air passage around the deflated cuff. This is assessed by listening at neck level or by measuring the difference between volume at the end of inspiration and expiration. Importantly, a non-fenestrated tube should never be capped without deflating the cuff, nor should a speech valve be applied to a tracheostomy with an inflated cuff: this causes complete obstruction of the airway.

The change of tracheostomy tubes is usually direct but requires trained personnel. Life-threatening complications include rupture of the innominate artery (massive hemorrhage) and displacement of the tube (loss of airway).

A **common error is to** make the caudal gyrus prematurely with the risk of pretracheal emplacement, airway occlusion, pneumomediastinum and cardiorespiratory arrest [51]. When a tracheostomy tube is changed, the patient should be placed supine with the neck in extension. The "classical technique" simply consists of removing and inserting a new tube. The "train track technique" uses a guide, historically an aspiration catheter and a modified Seldinger technique. There are commercial tube exchange products that include a central light to allow ventilation during the process.

Decanulation before a mature tract has formed is potentially disastrous. Rapid loss of airway by stoma closure may occur. In addition, blind reintegration attempts have the potential to deviate pre-fetally.

If inadvertent decannulation occurs before maturation of the tract (typically 7-10 days post-procedure), immediate preparations for orotracheal mechanical ventilation should be made. This is categorically the first and safest approach after accidental decantation. Only if there is an appropriate backing can a reinsertion of the tube be attempted briefly.

The patient's neck should be extended and skin sutures and adhesive tapes cut for better exposure. If the sutures of support are present, a gentle traction of the same can

expose the tract and stabilize the trachea to try a recanulación. A laryngoscope with a pediatric sheet offers a lighted retractor to explore the wound.

Placing the leaf in the trachea and raising it can help reinsertion under direct vision. Alternatively, digital scanning and insertion of a suction catheter or directing a bronchoscope through the stoma, may facilitate tracheostomy reinsertion by the railroad method. Again, trans-pharyngeal mechanical ventilation is recommended.