Tracheotomy

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KEYWORDS

• Tracheotomy • Trach • Tracheostomy • Inpatient surgery • Critical care

KEY POINTS

- Tracheotomy is a reversible airway surgery performed by many specialists and is indicated for patients at risk for prolonged intubation and airway obstruction.
- Postoperatively, patients should stay in the hospital for at least 3 days for close monitoring of airway and potential postoperative emergencies.
- All tracheotomies require specialty supplies for maintenance and the reference number on the faceplate of the tracheostomy tube guide what supplies to order.

INTRODUCTION

A tracheotomy is a reversible airway surgery commonly performed for various indications and patients with a tracheostomy tube will be encountered in both the inpatient and outpatient settings. Indications for tracheotomy include airway obstruction and the inability to intubate transorally, inability to safely extubate patients due to respiratory failure or upper airway masses, obstructive sleep apnea, and progressive neurodegenerative disease with need for prolonged airway pressure support.[1,2] While the procedure is reversible, the need for the tracheotomy may be either temporary or permanent.[1] A trach (common shorthand term for "tracheotomy" or "tracheostomy tube") does not typically hinder patients from performing functional daily activities. Care for the trach may seem intimidating, but with familiarity and practice, it is quite straightforward. This article presents an overview of the terminology, indications, postoperative expectations, and maintenance of trachs for medical providers to reference when they are managing a patient who needs or already has a tracheotomy.

"Anatomy" OF A TRACH

Tracheostomy tubes can vary in dimension, nomenclature, and material depending on the manufacturer, but many components remain universal between different brands (**Fig. 1**).

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Abbreviations	
ALS	amyotrophic lateral sclerosis
ICU	intensive care unit
PMV	Passy-Muir Valve

The faceplate is the disk-shaped piece of the trach that sits in front of the neck and stops the trach tube from slipping into the airway; it should sit flush against the skin of the neck. There is information etched into the faceplate about the size and features of the trach that can be used for ordering supplies; pay special attention to the universal reference numbers to identify each trach (eg, 6UN75R, 67HA80, and so forth). The most commonly placed trachs are a size 6 and a size 8. These numbers roughly correlate to the diameter of the trach lumen. Additionally, you may encounter patients with an XLT trach. XLT stands for extra-long trach and these trachs have "extra length" in either the proximal limb (from faceplate to curve of tube) or the distal limb (from curve of tube to tip of tube). A patient with a thick/obese neck may need additional length in the proximal limb (XLT-P) for example.

The trach tube, sometimes called the outer cannula, is the curved tube that is inserted into the neck and trachea. The inner cannula is a smaller tube that fits through the trach and can be quickly removed if it is blocked, without needing to remove the entire trach. Inner cannulas are also sized and specific to the size of the trach in place. Cannulas can be single-use or reusable; the box holding the cannula will tell you what type it is. All reusable trach parts can be cleaned using peroxide, water, and a small brush, and then air-dried.

Trachs are secured in the neck using trach ties, which look like shoelace, or a soft foam trach collar around the neck. These need to be tightened so that 2 fingers can be placed between the collar and neck skin, but no more than that—if the tie is too loose around the neck, the trach may slip out.

Each trach comes with an obturator (see **Fig. 1**). The obturator is the nonhollow piece with a tapered tip that is inserted into the tracheostomy tube and allows for smoother, safer placement of the tracheostomy tube into the airway. The obturator should always be with the patient or clearly displayed in their hospital room in case the trach needs to be put back into their neck urgently. You cannot have both the obturator and the inner cannula in the trach tube at the same time. Once the tracheostomy tube is in the proper position, the obturator is removed and the inner cannula placed (see **Fig. 1**).

A trach is either "cuffed" or "uncuffed"; patients who need a ventilator or positive pressure ventilation always require "cuffed" trachs to create a closed system between

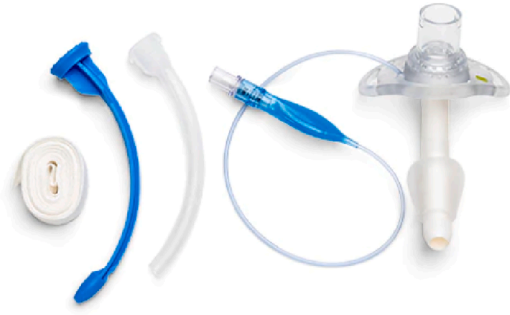

Fig. 1. Shiley cuffed tracheostomy set. (©2025 Medtronic. All rights reserved. Used with the permission of Medtronic.)

the patient's lungs and the ventilator circuit. The pilot balloon inflates or deflates the trach cuff and is typically filled with 5 to 10 mL of air, using the lowest volume to maintain an airtight seal. Once the patient is weaned from the ventilator, the trach cuff can "come down" or be deflated. With the cuff deflated, the patient can breathe both through the trach and around the trach tube. The cuffed trach can then be replaced with an uncuffed trach, which facilitates speaking and ultimately decannulation (discussed later in this article).

A laryngectomy tube (such as the Provox LaryTube by Atos Medical) (**Fig. 2**) can look like a trach tube, but it is not. Laryngectomy tubes are used exclusively for patients after a total laryngectomy, where they have their entire larynx removed and the remaining portion of their trachea is connected to the neck skin. A laryngectomy tube is placed into the stoma to hold a Heat and Moisture Exchanger (HME); an HME restores some of the heat and moisture lost through an open stoma and helps to rehabilitate pulmonary function in patients with total laryngectomy. Laryngectomy tubes do not have an inner cannula, but do need to be cleaned regularly and can be kept in place using straps or special adhesives against the skin. You must NEVER completely block a laryngectomy tube as this is the patient's only airway. Of note, a laryngectomy tube cannot be connected to a ventilator.

INDICATIONS

There are many indications for tracheotomy, including inability to wean from the ventilator in critically ill patients, acute upper airway obstruction, and need for long-term ventilator support due to neurodegenerative or pulmonary illness.[1]

Fig. 2. Laryngectomy tube. (Image(s) © Atos Medical AB.)

In cases of prolonged intubation, the trach acts as a temporary airway to replace the oral endotracheal tube; those with severe lung disease, neurodegenerative disease, known airway stenosis, or poststroke should be considered for earlier tracheotomy due to projected need for prolonged ventilator support. Studies have shown that tracheotomy within 7 days leads to more ventilator-free days, lower need for sedation, shorter intensive care unit (ICU) stays, and reduced long-term mortality compared to later or no tracheotomy.[1,3] Thus, if a patient will likely need to be on a ventilator for more than 7 days, it is beneficial to recommend early tracheotomy when medically stable.

Upper airway obstruction that prevents standard transoral intubation may prompt emergent tracheotomies, performed using local anesthesia alone. This can occur with head and neck cancers, bilateral laryngeal paralysis, laryngeal trauma, facial trauma, airway foreign body, or infections such as epiglottitis. Tracheotomies are also performed in the setting of oral cavity/oropharyngeal tumor resection in anticipation of significant postoperative airway edema. Tracheotomies are indicated in severe obstructive sleep apnea when positive pressure therapy fails, but this is typically a less favored treatment due to patients' self-consciousness about appearance of trach, need for trach supply and maintenance, and slight increased risk of morbidity associated with surgery.[2]

Tracheotomies may be beneficial for patients with chronic aspiration or inability to clear secretions. A cuffed tracheostomy tube can keep secretions in the proximal trachea long enough to be suctioned, but does not entirely prevent aspiration.[4,5] Additionally, a tracheostomy tube can facilitate pulmonary toilet and reduce pulmonary dead space.[4] Finally, neuromuscular conditions such as amyotrophic lateral sclerosis (ALS) and Duchenne muscular dystrophy may require long-term ventilation, and a tracheostomy tube is an option for these patients.[5,6]

There are relatively few contraindications to tracheotomy; active soft tissue infection of the anterior neck is an absolute contraindication. Two things to consider before pursuing tracheotomy include goals of care and preprocedure medical optimization. Most tracheotomies are performed electively, giving time to optimize a patient's blood count and pulmonary function. In addition, patients requiring high oxygen and ventilatory pressures may not be safe candidates for tracheotomy due to the brief intraoperative apneic period during the airway tube exchange. Ideally, the fraction of inspired oxygen or Fio_2 is 50% or less and positive end expiratory pressure or PEEP is 10 or lower at time of trach, but the exact numbers are surgeon-dependent.[1]

DISCUSSING TRACHEOTOMY: AN ENT's SCRIPT

The following is a summary of the risks, benefits, and alternatives to tracheotomy that the authors use to consent patients and family for tracheotomy. It is written in a script-like format.

"A tracheotomy is a reversible airway surgery in which we remove the endotracheal tube in the mouth and insert a smaller trach tube through a cut we make in the neck. The surgery takes about 30 minutes and is done under general anesthesia, to minimize discomfort. [Patient] will stay on the ventilator immediately after surgery, but will be woken up to their baseline level of alertness and can continue to wean off of the ventilator. After a trach, patients stay in the hospital for at least 3 more days, but they do not necessarily need to stay in the ICU once they are no longer on the ventilator; they might go to the hospital floor with the trach in place. In addition, the care staff will be doing education on trach cleaning and maintenance with you during this time, so you feel prepared to go home with a trach in place if that is needed. We typically stitch

the trach in place to hold it, and remove the stitches 3 to 7 days after surgery; the exact timing will depend on the recovery course.

After the trach is placed, it is possible to be awake, speak, and eat. When I have spoken with prior patients about what it's like to have a trach, they comment that they feel a piece of plastic on their neck, but it's not painful or bothersome. It will hurt to swallow and talk immediately after surgery, so we will take that slowly; maybe start testing a few days after tracheotomy. Swallowing and talking will not feel exactly the same as before, and we will aim to give [patient] as much practice as they can tolerate safely postoperatively. Other benefits include ease of suctioning fluid out of the lungs through the trach tube, lower rates of Ventilator-Associated Pneumonia, faster weaning off of the ventilator, and fewer days spent in the ICU.

Risks of tracheotomy include the standard risks of surgery - bleeding, pain, infection, scarring, and need for future surgeries - as well as transient or permanent changes in voice and swallow. These risks will be managed before surgery by optimizing the patient as much as possible, and then after surgery by regular follow-up. Tracheotomy does not necessarily change the course of disease of the heart, lungs, or other body system that required the patient to be admitted to the ICU in the first place, but it can allow patients to be more present and active in deciding their next steps in care.

Alternatively, if a trach is not done, the endotracheal tube will stay in place and the ICU will continue breathing exercises on the ventilator until it can be safely removed. It is not certain how long that will be. A potential severe complication of keeping the endotracheal tube is tracheal stenosis, or scarring of the trachea and narrowing of the airway. The trachea is the tube that carries air from the throat into the lungs, and any narrowing inside of it can feel like they are breathing through a straw; this is extremely uncomfortable, sometimes does not allow for adequate oxygen delivery to lungs, and may require emergency airway surgery. Other risks of keeping the endotracheal tube in place include tongue pressure injury and necrosis, and weakness of voice and swallow as these muscles and organs are not getting as much use as they would with a trach in place. If these risks are more acceptable than the risk of surgery, then we do not proceed with surgery."

POSTOPERATIVE EXPECTATIONS

Speech

Immediately after a tracheotomy, patients are not able to phonate because the trach cuff remains inflated; this seals off the airway between the trach and the larynx and does not allow air to pass through the vocal cords. Once the patient is weaned from the ventilator, the trach cuff can be safely deflated and a Passy-Muir Valve (PMV) may be placed over the tracheostomy tube opening. The PMV—or speaking valve—is a purple or Aqua valve and serves as a one-way valve. It allows for air to pass into the trach tube with inspiration, but blocks airflow with expiration, redirecting air around the tube and through the vocal folds, allowing patients to speak. Early PMV use is associated with significant progression of care.[7,8] It is very important not to place a PMV on a cuffed trach with the cuff inflated as this will result in inability to exhale, air trapping, and rapid onset respiratory failure. Most patients using a PMV regularly should have an uncuffed trach in place, unless they require positive pressure at night.

Swallow/Dysphagia

In general, we recommend that patients undergo a swallow evaluation once they are awake, alert, and off the ventilator. Swallow evaluations can be done bedside or may

require a modified barium swallow, depending on level of concern for dysphagia. If a care team member notices food, liquids, or tube feeds on suctioning through the trach during routine trach care, the patient should have nothing to eat or drink by mouth until a follow-up swallow assessment can be performed.

Tracheostomy tubes can contribute to dysphagia. The presence of a trach tends to limit the upward motion of the larynx during swallow, which is critical for safe passage of food and water boluses into the esophagus. The tracheostomy tube also shortens the duration of vocal fold closure, due to air escape, which can increase the risk of aspiration. Use of a PMV minimizes this effect.[9] The size and type of tracheostomy tube may impact comfort and dysphagia, so changing the trach to an uncuffed or a smaller size may improve swallow. However, this remains debated: Suiter and colleagues[10] saw no impact of cuffed (with cuff down) versus uncuffed trach on swallow with a PMV in place; Ding and Logemann[11] noted increased risk of silent aspiration in patients with cuffed trach in place; Skoretz and colleagues[12] noted the possible decreased risk of silent aspiration with deflation of trach cuff.

Swallow therapy is likely going to be a part of a trach patient's postsurgical care, and it is important to work with speech and language pathologists early to address functional swallowing deficits. Maneuvers such as supraglottic swallow (hold breath prior to swallow, swallow, initiate voluntary cough, and swallow again) can help prevent aspiration and allow for a smooth transition back to a oral diet. Certain patients will need special attention to swallow therapy, such as those recovering from stroke or those with neurodegenerative disease, and we counsel that their swallow may never feel "normal" again. These patients may need a modified diet or even consideration of alternative nutrition via feeding tube, but this is usually due to neurologic deficits in swallow and not a result of the trach itself.

Breathing/Ventilator Support

Tracheotomy offers intubated patients a more comfortable stable airway and ideally facilitates expedited weaning from ventilator. Because the trach is more comfortable than an oral endotracheal tube, sedating medications can be weaned, which promotes liberation from the ventilator. Studies have identified immediate improvement in various measures of respiratory function after tracheotomy.[13] A trach helps pulmonary hygiene due to the ease of suctioning to prevent excess mucus buildup and more directed breathing treatments.

INPATIENT CARE

On the surgical side, it is important to note that otolaryngologists are airway specialists comfortable with trachs, but not the only specialists who perform them. Trauma surgery, cardiothoracic surgery, oromaxillofacial surgery, or general surgery may also perform open tracheotomies, based on the surgeon's breadth of practice. On the medical side, pulmonologists or intensivists may perform percutaneous tracheotomies. There may be some variations in postoperative care based on the doctor, but there are key consensus points for safe postoperative trach care that we detail later.

Fresh Tracheostomy Management (Day 1–7)

For the first 3 to 7 days after surgery, the patient stays in the hospital to monitor for early complications such as tracheal or stomal bleeding, accidental dislodgement, pressure or friction injury of the neck/chest from trach, or overinflation of the cuff.

Postprocedure, display the date the trach was placed, the service who placed the trach, and the size/type of trach clearly in the patient's room. If the trach accidently comes out, it is imperative to replace the trach quickly; the stoma starts to narrow and heal in as soon as 2 hours after the removal of trach, and the patient may require reintubation and a repeat procedure to re-establish the tracheotomy. The obturator is crucial to reinsert the trach if it falls out and should always be clearly visible and easily accessible.

The surgeon may recommend not turning the patient to their side for one or more days after surgery to minimize the risk of the trach becoming dislodged; please confirm with the surgeon if there are any restrictions for moving the patient during the first 7 days after surgery.

To manage pulmonary secretions posttrach, the patient needs frequent suctioning by nursing, respiratory therapy, doctors, or family members/caregivers in the room in addition to medical measures such as breathing treatments and/or chest physiotherapy. Aggressive or deep suctioning can lead to bleeding and hemoptysis; a standard cuffed trach is 10 cm in length, so a suction catheter needs to be passed only to 10 cm to be in the airway and should not be passed deeper than 15 cm to minimize risk of tracheal mucosal injury and bleeding.

When assessing the trach, it is important to see the trach faceplate sitting flush against the skin of the neck. Sometimes, the patient may have gauze or another padded material between the faceplate and the skin to absorb secretions and to prevent friction between the skin and the trach; the gauze should be changed when it is soiled or saturated with secretions. If a pressure wound from the trach is noted, the stoma should be cleaned daily and gauze changed to keep the area dry until it heals; this may require further attention from wound care or the service that performed the trach.

Trach cuff pressures should typically be between 20 and 25 mm Hg.[14,15] The ideal pressure is the lowest possible pressure at which an airtight seal with the tracheal wall is achieved. If there is an audible air leak or tidal volume mismatch on the ventilator, it is important to have a thorough conversation with care teams including respiratory therapists on maintaining a safe cuff pressure to prevent tracheal wall injury while adequately ventilating the patient.[16,17] Patients with neuromuscular diseases like ALS are at greater risk for overinflation due to bothersome audible air leaks in the absence of a clinically relevant tidal volume mismatch. Overinflation may resolve the bothersome air leak but causes tracheal pressure injuries and dilation of trachea, which are very difficult to fix.

Prior to discharge, the surgeon may opt to change the trach, most commonly on postoperative day 5. The American Academy of Otolaryngology consensus guidelines recommend that the initial change for open tracheotomies by otolaryngologists on postop day 3 to 7 can facilitate early transfer and progression of hospital care.[18] In patients who are still requiring intermittent ventilatory support, as well as those patients with bleeding concerns, it is reasonable to continue with a cuffed tracheostomy tube for up to 3 months.

When a patient is preparing for possible removal of trach (decannulation), a tracheostomy tube cap may be applied (**Fig. 3**). This prevents all flow of air through the tracheostomy tube and forces the air to flow around the tube. It mimics breathing as if a trach were not in place. In general, if patients have been able to keep the cap on the trach for over 48 hours without shortness of breath or oxygen desaturation, it is safe to remove the trach.[1] If a patient is not able to be decannulated, they are discharged with the trach in place.

After removal of the trach, the stoma heals on its own in about 2 weeks. Keeping an occlusive dressing (gauze/tape) over the stoma promotes healing. Patients are

Fig. 3. Tracheostomy tube cap. (©2025 Medtronic. All rights reserved. Used with the permission of Medtronic.)

instructed to apply pressure to the stomal dressing with their fingers when they talk or cough to minimize air escape through the trach stoma as it heals, promoting closure while also giving them a stronger voice. Change the gauze whenever it becomes soiled.

Patients with obstructive sleep apnea may opt to keep their trach because the trach bypasses obstructive upper airway collapse and results in better quality sleep; if patients prefer this, they will need trach supplies ordered continuously and can wear a trach cap while awake to assist with speaking and swallowing.

Emergencies and Major Complications

Emergencies can happen at any phase of trach care; these include mucus plug, major bleeding (most concerningly, tracheo-innominate fistula), and false passaging of trach. When signs of any of these are noted, it is important to follow protocol and escalate care to the appropriate experts.

Mucus plugging occurs when viscous secretions dry within the trach tube lumen, leading to obstruction and acute loss of ventilation. If suctioning through the trach with the inner cannula in place does not clear the obstruction, the next step is to remove the inner cannula and suction again. Additionally, you can flush 2 mL of saline through the trach tube and suction to help moisten and loosen any mucus plugs.

Major bleeding most commonly occurs within 1 to 3 or more weeks after trach placement.[1] In the acute phase, the source of bleed is usually peristomal and can be controlled at bedside with packing, local epinephrine injection to induce vasospasm, cautery of bleeding area, or suture ligation of the bleeding vessel.[1] A highly lethal bleeding complication is a tracheoinnominate fistula, characterized by brisk bleeding from the trach due to balloon erosion of the anterior tracheal wall into the

overlying innominate artery. This is often (but not always) preceded by a sentinel bleed—a low volume, self-limited bleed[1]; prompt tracheoscopy is essential for assessment after an episode of self-resolving bleeding from the trach is noted. If there is anterior tracheal wall bleeding at the level of the trach balloon, the cuff should be hyperinflated for tamponade of the fistula and otolaryngology should be called. Other specialists to consider calling are endovascular services (for possible vessel stenting) and cardiothoracic surgery (for sternotomy and ligation).[1]

False passaging of the trach occurs when the trach slides out of place and is forcefully pushed back into the soft tissue of the anterior neck/chest rather than into the trachea. Each repeat attempt at replacement may further dilate the false passage, obscuring the view to the true passage. To quickly test for a false passage, pass a flexible suction catheter through the trach. If you cannot pass the catheter more than 10 cm through the trach, it is either blocked or in a false passage; immediately remove the inner cannula and try to pass the suction catheter again. The gold standard to confirm trach position is tracheoscopy to visually verify placement in the airway. If the patient is in respiratory distress, they may need to be reintubated from above, sedated, and Otolaryngology promptly called to reinsert the trach through the correct passage. After calling Otolaryngology, consider getting a flexible bronchoscope set up at bedside before they arrive so they can promptly evaluate the trach and airway on arrival.

OUTPATIENT CARE

If a patient will need to go home with their trach, caregivers need to be appropriately taught routine trach care such as changing the inner cannula and suctioning. All patients will need a durable medical equipment order for supplies at home; they must have a portable tracheal suction, flexible suction catheters (14-French preferred for adults), replacement trach, replacement inner cannulas, replacement soft collars or trach ties, and replacement gauze sponges. These need to be reordered regularly (especially suction catheters and inner cannulas), so follow-up is essential. The authors recommend sending the patient home with at least 1 month's supply of inner cannulas and suction catheters.

The patient should follow-up within 3 months of surgery, if the trach has not been removed, for routine trach change and to assess for removal. Trach changes should be performed regularly as the trach can break down and stain with time. The timing of decannulation is widely debated and depends on a variety of factors, to be discussed in detail between the patient and their surgeon. Typically, if the condition causing the need for tracheotomy in the first place is resolved and the patient is cognitively intact, they can be considered for decannulation. If there is any concern with a trach, it is always prudent to set up an expedited consultation with an otolaryngologist.

SUMMARY

A tracheotomy is a reversible surgery performed on patients at risk for prolonged ventilator dependence and airway obstruction. The tracheostomy tube may be needed for just a few days, or it may be needed for a lifetime. The internist and hospitalist will encounter many patients with trachs, both outpatient and inpatient. Regular supplies and trach education for the patient and their support system are key for minimal disruptions to their care. If there are concerns about the trach, expedited referral to a comprehensive otolaryngologist or laryngologist is warranted.

CLINICS CARE POINTS

- Display clearly in the patient's room—the date the trach was performed, the service who performed the trach, and the size/type of tracheostomy tube placed.
- Tape the obturator to the patient's wall or bed for easy access in the event of an accidental decannulation.
- Have an additional trach and a trach one size smaller at the bedside.
- If you cannot pass a flexible suction catheter more than 10 cm through the trach, it is either blocked or in a false passage; immediately remove the inner cannula and try to pass the suction again.
- Make sure every patient with a trach has suction set up in their room.
- If you need to replace a trach emergently, place the patient supine with a shoulder roll to extend their neck; this positioning helps immensely with trach replacement.

DISCLOSURE

The authors have nothing to disclose.

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