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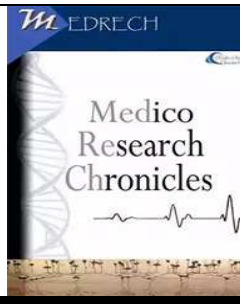

SURGICAL AIRWAY MANAGEMENT IN CRITICALLY ILL PATIENTS-A REVIEW ARTICLE.

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ABSTRACT

REVIEW ARTICLE

Tracheostomy is among the most frequently performed procedures in critically ill patients, being done in medical and surgical intensive care units (ICUs).[1,2,3,4.], there is little agreement on the indications, and timing of tracheostomy in critically ill patients. The most common indication for tracheostomy in the ICU is the need for prolonged mechanical ventilation.[7, 8.] Tracheostomy has several advantages over endotracheal intubation, Recent ACCP (American college of chest physicians) guidelines [22] suggest that tracheostomy should be considered after an initial period of stabilization on the ventilator when it becomes apparent that the patient will require prolonged ventilator assistance. Despite having been known about complications of prolonged ETT institution, the specifics of how, when, and why to perform a surgical airway are still debated. New methods of surgical airway management have to be evaluated against the gold standard, which will always be open tracheostomy. Today we have to evaluate these new procedures not only by their efficacy but also by their cost-effectiveness.

INTRODUCTION:

Tracheostomy is among the most frequently performed procedures in critically ill patients, being done in medical and surgical intensive care units (ICUs).[1,2,3,4.] , there is little agreement on the indications, and timing of tracheostomy in critically ill patients. The most common indication for tracheostomy in the ICU is the need for prolonged mechanical ventilation.[7, 8.] Tracheostomy has several advantages over endotracheal intubation,

Although recent studies have suggested that tracheostomy can be a safe procedure in the ICU,[33] tracheostomies have also been found to lead to serious complications. Many critically ill patients' families have been hesitant in authorizing tracheostomy because of cosmetic issues and speech problems.

Recent ACCP (American college of chest physicians) guidelines [22] suggest that tracheostomy should be considered after an initial period of stabilization on the ventilator

when it becomes apparent that the patient will require prolonged ventilator assistance.

HISTORY OF THE PROCEDURE: Documented references to the procedure include the following

- 2000 BC: The Rigveda described a healed tracheostomy incision.
- Old Testament: Elijah performed mouth-to-mouth resuscitation on a child with heat stroke. This was the first example of assisted respiration.
- 100 BC: Asclepiades described a tracheostomy incision for improving the airway.
- Approximately 100 AD: Antyllus described the first familiar tracheostomy as a horizontal incision between 2 tracheal rings to bypass upper airway obstruction. He also pointed out that tracheostomy would not ameliorate distal airway disease (eg, bronchitis).
- 600 AD: The Susruta Samhita contained a routine acknowledgment of tracheostomy as accepted therapy in India.
- 1561-1636: Sanctorius was the first to use a trocar and cannula. He left the cannula in place for 3 days.
- 1550-1624: Habicot performed a series of 4 tracheostomies for obstructing foreign bodies.
- 1702-1743: George Martine developed the inner cannula.
- 1805: Viq d'Azur described cricothyrotomy.
- 1921: Chevalier Jackson codified indications and techniques for modern tracheostomy.

INDICATIONS [13]

They can be divided into two categories: those that avoid complications of endotracheal intubation and those that have specific clinical advantages over endotracheal intubation.

To understand the first category of indications for tracheostomy, it is important to define accurately the complications of translaryngeal intubation. The two most important complications of prolonged endotracheal intubation are laryngeal edema with subsequent stenosis and tracheal injuries caused by the balloon cuff. Laryngeal injury is caused by direct pressure damage, usually to the cricoid cartilage and the vocal processes of the arytenoids.

This damage is exacerbated by flexion and extension of the neck and by the movement of the tube during manipulations such as suctioning. The edema can cause acute airway compromise with early extubation or can progress to granulation and stenosis with longer periods of intubation. Lindholm [26] devised a grading scale of laryngotracheal damage that is frequently used to report injuries caused by translaryngeal tubes.

The Lindholm Scale of Laryngotracheal Damage

Grade I show erythema and edema without ulceration

Grade II shows superficial ulceration of the mucosa <1/3 airway circumference

Grade III shows continuous deep ulceration <1/3 airway circumference or superficial ulceration >1/3 airway circumference

Grade IV shows deep ulceration with exposed cartilage.

Whited[42] reported that the severity of edema and subsequent stenosis was proportional to the time of intubation. Patients who were intubated for fewer than 5 days had only mild edema of the posterior commissure, whereas those intubated for longer than 11 days had a 12% incidence of severe laryngeal stenosis. Stenosis was significantly greater in those patients who had tracheostomy performed after long-term (>10 days) endotracheal intubation.

Some subsets of patients, such as diabetic women, seem to be especially prone to laryngeal damage and stenosis. This tendency is probably a consequence of the

more narrow airway in women and because of the vascular compromise and immunosuppression intrinsic to diabetes[12.]

Stauffer and colleagues[33] observed an increase in laryngeal stenosis in patients with more than 9 days of endotracheal intubation before tracheostomy compared with those patients who received tracheostomy after fewer than 2 days of intubation.

Many authors speculate that the increased swelling may have been caused by bacterial invasion from the tracheostomy tube and continued inactivity of the cords, which allow fibrosis and scarring. This evidence may suggest that tracheostomy is indicated to decrease laryngeal edema and subsequent stenosis if it is performed before 4 to 5 days. Conversion at a later time may not prevent and actually may exacerbate, edema and scarring of the larynx.

Tracheal injuries are a complication of both endotracheal intubation and tracheostomy. Mucosal damage is a direct consequence of pressure necrosis from the balloon cuff. There has been a significant reduction in this type of injury since high-volume, low-pressure cuffs have been used. [14] Cuff pressures of less than 25 mmHg have been shown to decrease the incidence of mucosal ischemia and subsequent stenosis.[34] There is no specific advantage of a tracheostomy cuff over an endotracheal tube cuff regarding tracheal damage, so this finding cannot be regarded as a specific indication for tracheostomy. [29]

Several clinical advantages have been suggested for tracheostomy. These include

1. Improved patient comfort,
2. Facilitated nursing care, and
3. Decreased risk of extubation.

In addition, weaning may be approached more aggressively, speech is possible, and oral nutrition can be allowed. [29], the patient will be more comfortable without an oral or nasal endotracheal tube. Mouth ulcers and poor oral hygiene are complications of oral tubes that are largely prevented by tracheostomy.

The shorter tracheostomy tube allows more effective deep tracheal suctioning and facilitates bronchoscopy when needed. A well-developed tracheostomy tract provides a more stable airway that can be recannulated easily if a tube is dislodged inadvertently. The ease of recannulation potentially allows patients to be transferred to units with less skilled nursing and physician care. The ability to speak is accomplished readily with a fenestrated tracheal cannula and provides both a practical and psychological advantage for the patient.

Allowing the patient to take nourishment by mouth can solve many nutritional problems in patients who require long-term ventilation. All of these clinical advantages may be acceptable indications for tracheostomy.

It should be mentioned that the indications for tracheostomy are the same regardless of the type of procedure that is planned.

A few additional indications (Common) are

- Facial fractures
- Edema due to
  - Trauma
  - Burns
  - Infection
  - Anaphylaxis
- Prophylaxis (as in preparation for extensive head and neck procedures and the convalescent period)
- Severe sleep apnea not amendable to continuous positive airway pressure (CPAP) devices or other, less invasive surgery to bypass the obstruction
  - Congenital anomaly (eg, laryngeal hypoplasia, vascular web)
  - A foreign body that cannot be dislodged with Heimlich and basic cardiac life support (BLS) maneuvers
  - Supraglottic or glottic pathologic condition (eg, infection, neoplasm, bilateral vocal cord paralysis)

- Neck trauma results in severe injury to the thyroid or cricoid cartilage, hyoid bone, or great vessels.

CONTRAINDICATIONS

No absolute contraindications exist to tracheostomy.[11] A strong relative contraindication are noted

1. Tran section of the trachea with retraction of the distal end into the mediastinum.
2. Fracture of larynx /significant damage to cricoid/larynx.
3. Bleeding diathesis
4. Massive neck edema.
5. Acute laryngeal disease.

COMPLICATIONS

Immediate complications

A. Apnea due to loss of hypoxic respiratory drive
B. Bleeding
C. Pneumothorax or pneumomediastinum: These can result from direct injury to the pleura or the cupola of the lung (especially in children) or from high negative inspiratory pressures of patients who are awake and distressed.
D. Injury to adjacent structures: The paratracheal structures vulnerable to injury are the recurrent laryngeal nerves, the great vessels, and the esophagus
E. Post obstructive pulmonary edema: Although rare, transient pulmonary edema can occur after tracheostomy.

Early complications

A. **Early bleeding**: This is usually the result of increased blood pressure as the patient emerges from anesthesia and begins to cough.
B. **Plugging with mucus**
C. **Tracheitis:** To some degree, tracheitis is present in all patients with fresh tracheostomies
D. **Cellulitis:** The wound is colonized quickly; however, infection is unlikely if the incision has not been closed tightly and drainage is allowed.
E. **Displacement** of tube and hypoxia
F. **Subcutaneous emphysema**: This results from a tight closure of tissue around the tube, tight packing material around the tube, or false passage of the tube into pretracheal tissue
G. **Atelectasis**: An overly long tube can mimic a unilateral mainstem intubation, causing atelectasis or collapse of the opposite lung.
H. **Pneumothorax and Pneumomediastinum**: damage to pleura/lung
I. **Hypoxia**: failure to cannulate/ delayed cannulation of the trachea.
J. **Hypercapnia:** potential complication during all forms of tracheostomy, and is especially prevalent during PDT that uses bronchoscopy.

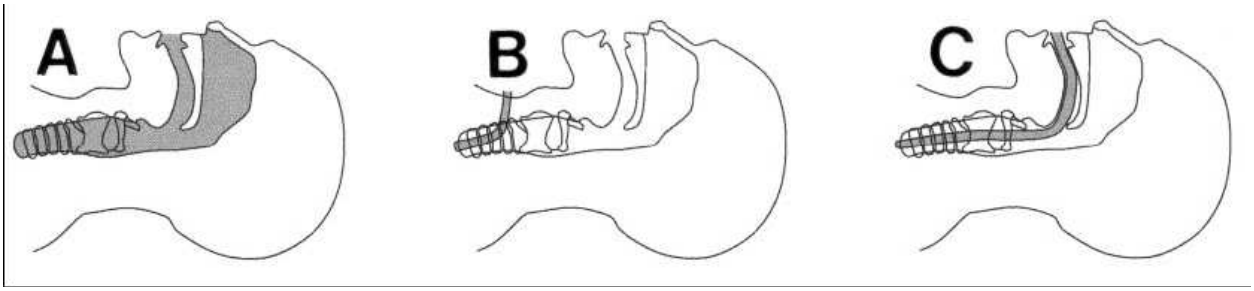
Late complications

A. **Bleeding** more than 48 hours after the procedure may herald a trachea innominate fistula caused by a low tracheostomy or an ill-fitting long tube
B. **Tracheomalacia**: This is usually caused by a tube that fits poorly.
C. **Stenosis:** Injury to the cricoid cartilage,
D. **Tracheoesophageal fistula.**
E. **Tracheocutaneous fistula**.
F. **Granulation**.
G. **Failure to decannulate**: Sometimes, patients fail to plug trials or even decannulation for no apparent reason. Possibilities to consider include obstructing granuloma previously held out of the way with the tube, bilateral vocal cord paralysis, fractured cartilage, and anxiety.

ADVANTAGES

1. Complications[33] of prolonged intubation including ulceration, granulation tissue formation, subglottic edema, and tracheal and laryngeal stenosis can be prevented.
2. Work of breathing is significantly less through a 6- to 12-cm tracheostomy tube than through a 27-cm endotracheal tube, hence weaning the patient from the ventilator is significant.[23]

3. Tracheostomy provides a more secure airway, is less likely to be displaced, and is more readily replaced than the traditional endotracheal tube.
4. Tracheostomy facilitate weaning[22] such as by making it easier to clear airway secretions, decreasing the likelihood that the tube will become partially obstructed by inspissated mucus, by making the patient more comfortable.
5. Reducing the likelihood of aspiration through improved glottic function.
6. Increased dead space and elevated airway resistance [23,24] can both lead to ventilatory requirements that are excessive for the patient and decreasing them using a tracheostomy makes the difference between ventilator dependence and successful weaning.



Diagrams of the dead-space volume of the upper airway (A), a tracheostomy tube (B), and an oral endotracheal tube (C).

Dead Space Volume in Endotracheal Versus Tracheostomy Tubes.

Inside Tube Diameter (mm)	Type Length (cm)	Dead Space (mL)
7.0 ETT	34.5	15
7.0 TT	12.0	5
8.5 ETT	36.5	24
8.5 TT	12.0	6

ETT = endotracheal tube, TT = tracheostomy tube, (Data from Reference 6.)

It has been established that tracheostomy can be performed with a low rate of complications. The risks of prolonged endotracheal intubation, such as patient discomfort necessitating increased sedation, sinusitis, inadvertent extubation, and laryngeal injury, have become increasingly apparent.

There have been many advantages attributed to converting a translaryngeal endotracheal tube to a tracheostomy tube [7,18] in the critically ill or injured patient, among these are improved patient comfort, facilitation of nursing care such as airway suction and oral hygiene, and psychological benefit.

Mobilization of the patient might allow improved pulmonary toilet and functional residual capacity, as well as avoidance of over-sedation. Decreased airflow resistance and reduced dead space [23,24] following tracheostomy may also contribute to accelerated weaning.

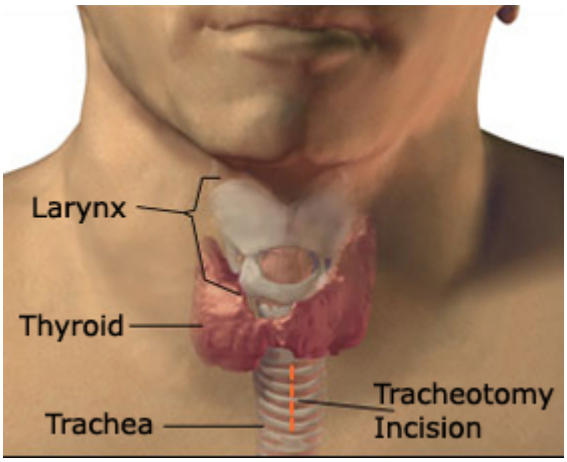
RELEVANT ANATOMY

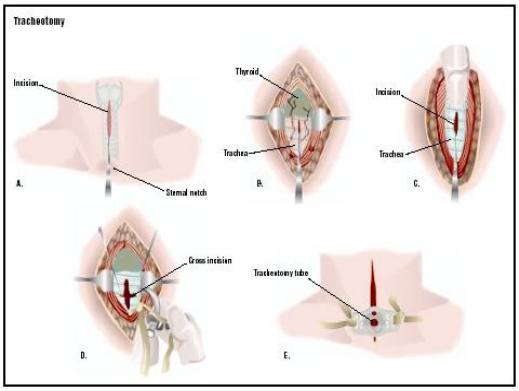
The larynx is composed of 3 large cartilage units: the epiglottis, the thyroid, and the cricoid cartilage. The cricoid cartilage is described as a reverse signet ring just inferior to the thyroid cartilage. The arytenoid cartilages lie on the posterior border of this ring of cartilage. The cricothyroid membrane stretches between the thyroid and cricoid cartilages. The cricothyroid muscle arises from the anterior surface of the cricoid and travels superiorly, posteriorly, and laterally to attach laterally to the surface of the thyroid cartilage. This muscle rotates the thyroid anteriorly and lengthens the vocal cords. The vocalis muscles arise from the inner surface of the thyroid cartilage in the midline and pass superiorly and posteriorly to attach to the length of the vocal cords. They shorten the cords and vary the tension on the cords. These 2 pairs of muscles and the cords are vulnerable to injury during cricothyrotomy.

The innominate artery, or brachiocephalic trunk, crosses from left to right anterior to the trachea at the superior thoracic inlet and lies just beneath the sternum. The trachea is membranous posteriorly and is formed of semicircular cartilaginous rings anteriorly and laterally. The spaces between the rings are membranous.

The recurrent laryngeal nerves and inferior thyroid veins that travel in the tracheoesophageal groove are paratracheal structures vulnerable to injury if dissection strays from the midline. The great vessels (ie, carotid arteries, internal jugular veins) could be damaged should dissection go far afield, which is a real risk in pediatric patients or in those who are obese.

The thyroid gland lies anteriorly to the trachea with a lobe on both sides and the isthmus, which crosses the trachea at approximately the level of the second and third tracheal rings. This tissue is extremely vascular and must be divided with careful hemostasis.





PROCEDURE

Open (Surgical) tracheostomy

The performance of an open tracheostomy is more varied.

1. Position the unconscious or anesthetized patient supine with the neck extended and the shoulders elevated on a small roll. The awake patient does not tolerate this; Overextension of the neck should be avoided. overextension can lead to placement of the tracheostomy too low (toward the carina) and too close to the innominate artery.

2. Palpate the landmarks (eg, thyroid notch, sternal notch, cricoid cartilage), and mark them with an ink pen.
3. Plan a 3-cm vertical incision that extends inferiorly from the cricoid cartilage and infiltrate lidocaine (1%) with 1:150,000 parts epinephrine. This is sufficient anesthesia in awake patients and facilitates hemostasis in all patients. Make the vertical/horizontal incision.
4. Subcutaneous fat removed.
5. Dissection proceeds through the platysma until the midline raphe between the strap muscles is identified.
6. Palpate the inferior limit of the field to assess the proximity of the innominate artery.
7. Midline dissection is essential for hemostasis and avoidance of paratracheal structures.
8. The strap muscles are separated and retracted laterally, exposing the pretracheal fascia and the thyroid isthmus.
9. The lateral retraction also serves to stabilize the trachea in the midline.
10. Although in some cases, the thyroid isthmus, which typically lies anteriorly over the first 2-3 tracheal rings, may be retracted out of the field, it must often be divided.
11. A retracted isthmus may be irritated if it rubs against the tracheostomy tube in the postoperative period, causing bleeding.
12. The division is performed sharply or with electrocautery and suture ligature.
13. Elevate the isthmus of the trachea with a hemostat and divide it.
14. Attention is turned to drying the field.
15. Clean the remaining fascia off of the anterior face of the trachea and warn the assistant of impending airway entry.
16. When preparations for the transfer of circuitry tubes are complete, deflate the endotracheal tube balloon and enter the trachea.
17. Injection of topical anesthesia can stem the cough reflex of an awake patient.
18. Absolute hemostasis before this point obviates the threat that blood could enter the trachea and exacerbate the cough reflex.
19. Securing the cricoid with a hook and elevating it superiorly facilitates control of the tracheal entry.
20. After the trachea is entered, suction secretions and blood out of the lumen and slowly withdraw the endotracheal tube to a point just proximal to the opening.
21. Replace the lateral retractors into the trachea and insert the previously tested tracheostomy tube.
22. After the airway is confirmed intact based on carbon dioxide return and bilateral breath sounds, secure the tracheostomy tube to the skin with 4-0 permanent sutures.
23. Attach a tracheostomy collar with the head flexed to avoid unnecessary slack in the collar.
24. To avoid the risk of subcutaneous emphysema and subsequent pneumomediastinum, the skin is not closed.
25. Place a sponge soaked with iodine or petrolatum gauze between the skin and the flange for 24 hours to deflect infection and anxiety about minor oozing of the skin edge.

PERCUTANEOUS TRACHEOSTOMY

1. The procedure, using the single dilator, is performed with the head extended on the chest, using a standard preparation and drape.
2. The patient is ventilated on 100% oxygen and vital signs are continuously monitored. Local anesthesia augmented by intravenous sedation is required.
3. A 1.5 cm incision is placed one to two fingerbreadths above the cricoid

cartilage, and the subcutaneous fat is separated using a curved hemostat.

4. At this point, a flexible bronchoscope is inserted and aligned with the tip of the endotracheal tube (ETT). The bronchoscope and ETT are slowly withdrawn until the incision is maximally trans-illuminated, allowing continuous visualization of the entire procedure.

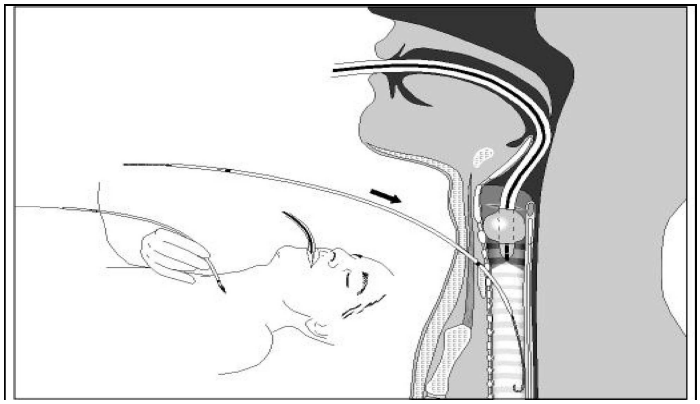


Figure 1-The guiding catheter is placed over the guidewire, forming the unit over which the single dilator is introduced. Note the bronchoscope within the ETT, trans-illuminating the incision and allowing direct visualization of the procedure.

5. A 14-gauge Teflon catheter introducer needle is inserted between the first and second, or second and third tracheal rings.
6. A J-wire threaded through the intricate allows the placement of an introducer dilator.
7. This initial enlargement of the tracheal aperture facilitates the positioning of the guiding catheter over the J-wire (Fig. 1)

Figure 2-The single dilator is introduced in an arc-like motion over the guidewire/guiding catheter unit. Note the expected mild compression of the anterior tracheal wall. The integrity of the posterior wall is verified through the bronchoscope.

8. It is this Jwire guiding catheter unit that forms the backbone over which the single dilator is inserted in an arc-like manner, accomplishing sufficient dilatation in one step (Fig. 2). In contrast, when using the multiple dilator kit, the tracheal aperture is

sequentially enlarged using a series of graduated dilators.

9. The final step in both techniques involves inserting a preloaded tracheostomy tube over the Jwire / guiding catheter unit (Fig. 3)

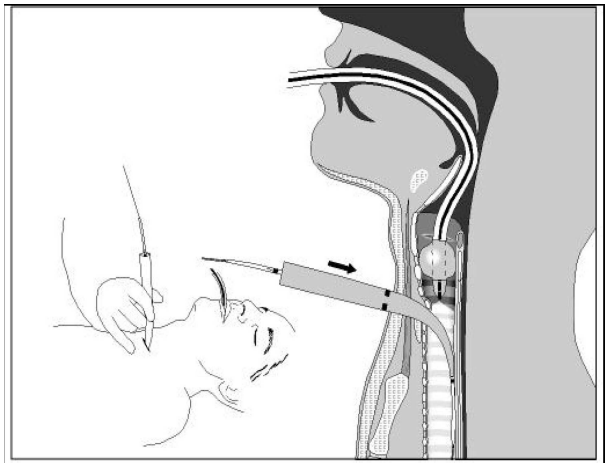


Figure 3-The tracheostomy tube, preloaded with the appropriate dilator, is inserted over the guidewire/guiding catheter unit. The guidewire, guiding catheter and dilator are removed and replaced with the tracheostomy tube inner cannula. The patient is now ventilated through the tracheostomy tube.

OXY CATHETER GUIDE PERCUTANEOUS TRACHEOSTOMY PROCEDURE DONE IN OUR INSTITUTION.

1. After informed and written consent and basic coagulation profile, one person is dedicated for airway management.
2. Continuous hemodynamic and SPO2 monitoring done pre, per, and postoperatively.
3. All the patients were positioned for the procedure with neck extension (Sniffing position).
4. The neck was painted with iodine, and surgical spirit and draped with sterile drapes.
5. A vertical skin incision was put in with no: 15 surgical blades, rest of the dissection was done as blunt dissection till the trachea was reached using small hemostat forceps as done in open tracheostomy, any bleeding is controlled if vascular it was ligated and diffuse bleed controlled with topical coagulant feracryllum solution.
6. Complete hemostasis is attained before opening the trachea.
7. The trachea opened between the second and third ring by putting a small nick with the surgical blade dilated using the tracheal dilator, an appropriate size tracheostomy tube premounted on a suction catheter was passed into the tracheostomy and the tracheostomy tube was threaded into the tracheostomy by Seldingers technique.
8. The suction catheter served the purpose of oxygen insufflation into the trachea which is done to prevent hypoxia till the tracheostomy tube is in place.
9. It also acted as a guide to thread the tracheostomy tube into the tracheostomy.
10. Bilateral air entry is confirmed and the tube is secured in place with bilateral slings.

11. Postoperative chest x-ray was taken to confirm tube position and to diagnose any structural damage and surgical emphysema, pneumothorax etc.

Timing of Tracheostomy.

Most tracheostomies are elective. There are several reports that attempt to define the best timing for tracheostomy in critically ill or injured patients. A prospective trial by Rodriguez and colleagues[32] randomized trauma patients to either early (< 8 days) or late tracheostomy (8 days). The authors reported a decrease in the number of days the patient required ventilator support and in the overall length of stay in the hospital for patients that underwent early tracheostomy.

Early tracheostomy can be performed in patients manifesting ongoing hemodynamic instability, respiratory failure, or multiple system failure, and also Patients with severe head injuries, a preexisting severe respiratory disease with multisystem trauma, high spinal cord injuries, or significant maxillofacial trauma are considered for early tracheostomy within the first few days of admission.

CRICOTHYROIDOTOMY

Indications

Cricothyroidotomy is the procedure of choice for the establishment of an emergency surgical airway. Easily identifiable anatomy, simple dissection, and the paucity of overlying vascular structures all make this approach the fastest and most effective way to establish an emergent surgical airway.

The use of cricothyroidotomy as an elective airway has gained popularity. The procedure has been widely used only in the last 30 years after the Brantigan report in 1975.[5] The original and currently most popular indication for elective cricothyroidotomy is to provide a long-term airway for patients who have had a median sternotomy. A high airway allows separation of the sternotomy wound from the airway incision; potentially decreasing sterna wound contamination.

Technique

The key attraction of cricothyroidotomy is its simplicity.

1. The surface anatomy allows easy location of the cricothyroid membrane in most individuals.
2. In emergencies, a generous vertical incision is made that can be extended quickly down to the membrane.
3. A vertical incision is optimal because of the paucity of vascular structures in the midline, and because it can be extended easily to improve exposure.
4. The cricothyroid membrane is punctured by the scalpel, and the hole is enlarged slightly.
5. There is a natural tendency for the thyroid and cricoid to separate when the membrane is cut, and it is not necessary to hold the hole open with an instrument.
6. A common mistake is to try to cannulate the small cricoid space with a large cannula. Either a 6-mm tracheostomy tube or a 6-mm endotracheal tube should be used.
7. Bleeding is controlled after the tube position is confirmed in the trachea.
8. Percutaneous cricothyroidotomy is possible as an emergency technique or as an airway adjunct.
9. Percutaneous minitracheostomy is a device that is used to place a small caliber (12-Fr) cannula into the trachea through the cricoid membrane.
10. The cannula is introduced directly through the membrane over a percutaneously placed introducer.
11. The minitracheostomy can be used as an emergency airway but most often serves as a port for frequent deep tracheal suctioning.
12. Because of its small diameter, patients can breathe normally around the cannula and do not have to remain intubated.

13. A minor complication rate of 10% has been reported, and no major complications occurred in more than 50 procedures.
14. The minitracheostomy has been shown to help decrease postoperative atelectasis and to decrease the need for therapeutic bronchoscopy in patients undergoing thoracotomy.[30]

Complications

Complications of emergency cricothyroidotomy must be viewed within the context of it being a life-saving maneuver.

1. Bleeding,
2. Misplacement of the cannula,
3. Fractures of the cricoid or thyroid cartilage, and failure to cannulate the trachea can occur.

The procedure is best performed by experienced physicians. Unfortunately, most clinicians find themselves performing the procedure for the first time. Thus, failure rates and complications are high. In a retrospective review of 65 patients who underwent cricothyroidotomy, cannulation of the trachea was successful in only 66%.[19] Bleeding is often a significant problem, but usually can be controlled after the establishment of the airway. Fractures of the thyroid or cricoid cartilage are uncommon, occurring in fewer than 1% of attempts.

The two most serious complications were acute subglottic stenosis (3%) and chronic subglottic stenosis (1%). Groups at high risk for subglottic stenosis include patients with laryngeal pathology, previous endotracheal intubation for longer than 7 days, airway obstruction after previous intubation, and patients younger than 12 years.

Voice changes may be the most common and most underreported complication of cricothyroidotomy. Extensive work by Holst and colleagues[17] found that 52% of patients had significant voice changes on 6-month follow-up after cricothyroidotomy. The changes were attributed to scarring of the cricothyroid space and joint. The voice changes can be subtle, which may be the reason for underreporting of the complication in earlier reports.

Conversion to Tracheostomy

Controversy remains as to whether emergency cricothyroidotomies need to be converted to formal tracheostomies. Conventional practice has been to perform conversion as early as possible, although it is difficult to validate this practice objectively. Damage done while performing a cricothyroidotomy will not be rectified by conversion to a tracheostomy. Some authors have argued that early conversion will decrease cricoid scarring and subsequent stenosis; however, conversion, in effect, forms a second hole in the trachea, doubling the risk of stenosis at a stoma site.

One study has prospectively randomized patients who received emergency cricothyroidotomy to conversion or continuation of the original airway.[10] There were three minor complications in the group of 11 patients whose airways were not converted. In the group of 9 patients whose airways were converted to tracheostomy, complications included two cases of granulation at the cuff site, one carcinoma at the stomal site, and one stomal stenosis that required tracheal resection. Stomal site complications were all at the tracheostomy stoma site, not in the area of the cricoid.

CONCLUSION

Despite having known about complications of prolonged ETT in situ, the specifics of how, when, and why to perform a surgical airway are still debated. New methods of surgical airway management have to be evaluated against the gold standard, which will always be open tracheostomy. Today we have to evaluate these new procedures not only by their efficacy but also by their cost-effectiveness.

Author's opinion: Early tracheostomy should always be considered in a critical

patient to prevent or reduce complications associated with prolong endotracheal intubation.

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