

ADULT TRACHEOSTOMY CHANGE IN THE COMMUNITY

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ABSTRACT

A tracheostomy is a procedure involving stoma creation through the skin and into the trachea. It can be done surgically or via a percutaneous dilatational technique.¹ A tracheostomy tube is the piece of equipment that is left in situ. There is an increasing number of patients with tracheostomy tubes living in the community in Singapore. Therefore, it benefits community physicians to be aware of some aspects of tracheostomy tube components and change. This article will cover indications and contraindications, components, complications and provide an overview of tracheostomy tube change in the community setting.

Keywords: Tracheostomy tube change, tracheostomy tube, community medicine

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Tracheostomy Indications and Contraindications

A tracheostomy may be created for patients for acute indications, generally in the inpatient setting, and may subsequently be left in situ for long-term indications. In the community setting, a tracheostomy is utilised for patients for the following long term indications:

1. Prolonged positive pressure ventilation
2. Management of secretions
3. Relieving persistent airway obstruction superior to the tracheostomy stoma²

Though endotracheal intubation may be used in the inpatient setting initially, prolonged use is associated with disadvantages including the need for sedation, discomfort, infections, laryngeal and tracheal damage.³ A tracheostomy attempts to minimise these risks. Absolute contraindications for tracheostomy creation include skin infection and altered anatomy.⁴

Tracheostomy Components

Commonly used tracheostomy tubes in Singapore include those from Shiley, Portex and Tracoe. Different brands differ in material composition, sizing and parts (Figure 1, Table 1).

Figure 1. Tracheostomy tube components. Photographs by Dr Joyce Huang Huixin and Dr Moses Ko

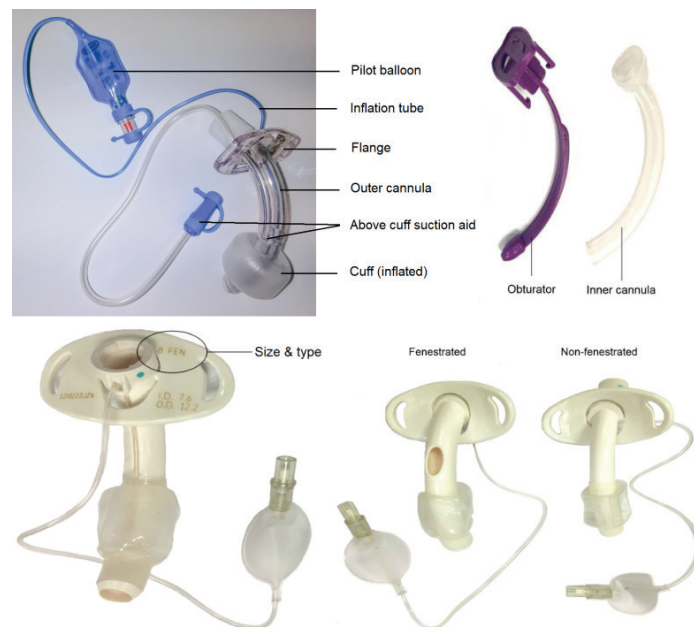


Table 1. Tracheostomy tube size conversion. Reproduced from resources by Austin Health Tracheostomy Review and Management Service

Table 1. Tracheostomy Tube Size Conversion between common manufacturers in Singapore				
	Size	ID (mm)	OD (mm)	Length (mm)
PORTEX® BLUE LINE ULTRA and PORTEX SUCTIONAID TRACHEOSTOMY TUBES	6	6	9.2	64.5
	7	7	10.5	70
	7.5	7.5	11.3	73
	8	8	11.9	75.5
	8.5	8.5	12.6	78
	9	9	13.3	81
SHILEY™ STANDARD TRACHEOSTOMY TUBES	10	10	14	87.5
	4	5	9.4	62
	6	6.4	10.8	74
	8	7.6	12.2	79
TRACOE® TWIST PLUS	10	8.9	13.8	79
	7	7	10.1	85
	8	8	11.1	88
	9	9	12.1	90
	10	10	13.1	92

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1. Flange
 - a) Allows the tracheostomy tube to be secured to the neck with a tie
2. Cuff
 - a) Manufacturers produce both cuffed and uncuffed tracheostomy tubes.
 - b) A cuff has the advantage of sealing the lower airway.
 - i. Prevents leakage during positive pressure ventilation.
 - ii. Offers some protection from aspiration though does not entirely prevent this, also may allow secretion clearance.⁵
 - iii. May reduce discomfort caused by air leakage.
 - iv. During cough assist, allows manipulation to deliver desired volume, flow and pressure.
 - c) A cuff has the disadvantages of potentially causing tracheal mucosal pressure injuries⁶, impaired swallowing⁷, granulations and adhesions that form between the trachea and the cuff may cause bleeding when the tracheostomy tube is removed.
3. Outer cannula
 - a) The main body of the tracheostomy tube that sits in the tract.
 - b) There are double lumen and single lumen tracheostomy tubes. A single lumen tube has a single cannula, whereas a double lumen tube has an outer and inner cannula.
4. Inner cannula
 - a) This is only present in a double lumen tracheostomy tube.
 - b) Most suited for use in the community as it is easily removed for cleaning, relieving obstruction and managing secretions.
 - c) A potential disadvantage of double lumen tracheostomy tubes is that the inner cannula reduces the internal diameter of the tracheostomy tube.⁸
 - d) The inner cannula is required to connect Shiley, and Tracoe tracheostomy tubes to a ventilator circuit/cough assist circuit. Hence ventilator-dependent patients should have spare inner cannulas easily accessible.
5. Obturator
 - a) It has a round tip to minimise trauma while guiding the insertion of a tracheostomy tube.
6. Fenestration
 - a) Manufacturers produce both fenestrated and non-fenestrated tracheostomy tubes.
 - b) A fenestrated tube allows air exchange through the vocal cords to facilitate speech and can be used for weaning.
 - c) However, there is an increased risk of granulations⁹ over the fenestration site and an increased aspiration risk if there is an impaired cough reflex.
7. Above cuff suction aid
 - a) Some cuffed tracheostomy tubes, such as those manufactured by Portex, have suction above the cuff to reduce, though not eliminate, the rate of ventilator-associated pneumonia¹⁰ by assisting in the removal of pooled secretions that accumulate above the cuff.

Tracheostomy Complications

Complications may be divided into early and late, and they may be attributed to the procedure or the cannula.

Early complications include haemorrhage, wound infection,

false passage and tube obstruction. Initial post-procedural monitoring is important to identify and manage these promptly. The patient should be optimised before the procedure to mitigate these risks, for example, by correcting coagulopathy and ensuring no overlying skin infection.¹¹

Late complications include tracheal stenosis, granulations, localised skin irritation secondary to equipment of secretions, impaired swallowing, fistula formation, de-cannulation failure and the creation of a persistent stoma.⁴

Tracheostomy Change Considerations

Reasons for a tracheostomy change include the need for a different sized tube, tube malfunction, malposition or breakage, change of type of tube - such as fenestrations, cuffed tubes - and routine changes to minimise infection.^{5,12}

Depending on the patient's clinical progress and medical conditions, the type of tracheostomy may be modified to address common indications such as weaning, deterioration and speech. For stable patients, the type of tracheostomy is kept unless for purposes of preference such as for comfort.

For patients who are clinically improving, the tracheostomy tube may be downsized. A fenestrated tube may be used to facilitate speech and weaning. A cuffed tube may be switched to an uncuffed tube as well if ventilation is stable as this minimises some of the associated complications of a cuffed tube such as pressure injuries, bleeding and impaired swallowing.

Conversely, for patients who are deteriorating such as due to a progressive neuromuscular disorder, a previously uncuffed tracheostomy tube may be changed to a cuffed tube to optimise ventilation and for an above cuff suction aid. Likewise, a fenestrated tube may be swapped to a non-fenestrated tube if speech is no longer possible or complications develop.

There are no standardised time frames for tracheostomy change based on empirical guidelines, and these are often based on the discretion of the care provider. The first routine tracheostomy tube change is earlier compared to subsequent routine tracheostomy changes, with conventional practice suggesting for change at least five to seven days after first tracheostomy placement.^{4,12} Manufacturers provide guidelines on routine changes of tracheostomy tubes. Shiley advises changing their polyvinyl chloride tracheostomy tubes every 29 days, and Portex recommends 30 days as the maximum.¹² A tracheostomy change is associated with risks including stretching the stoma, creation of false passages, bleeding and patient discomfort.¹² In Singapore, tracheostomies are often changed every one month for inpatients, one to three months for outpatient settings or as per recommendations by the proceduralist.

Changing the tracheostomy tube in the community should only be made by experienced and trained healthcare professionals. However, in an anatomically complicated trachea (tumour/surgery/fistula), the patient's otorhinolaryngology surgeon should be consulted.

Tracheostomy Change Pre-requisites and Procedure

Pre-requisites

Complete set of suction equipment:

- Suction regulator
- Suction tubing
- Drainage bottle
- Sterile Water for Irrigation
- Appropriate size sterile suction catheters
- Plastic sterile gloves
- Resuscitator with face mask (appropriate size)
- Suction cup

Tracheostomy box containing:

- Standby tracheostomy tubes:
 - One tube which is the same size as existing
 - Another tube which is one size smaller of the same model
- Tracheostomy tube holder
- Tracheal dilator
- Gauze
- Disposable capnometer
- 10cc syringe
- Sterile lubricant
- Chlorhexidine solution/sterile saline

Clean container for spare inner cannula and spare inner cannula, if required

Obturator of the current tracheostomy tube

Tracheostomy cleaning brush

Procedure

Preparation for tube change:

- The patient is required to fast. Recommendations for fasting duration > six hours for food/milk and > two hours for clear liquids.
- Clear the secretions.
- Suction apparatus and manual resuscitator are available and functioning.
- A new tracheostomy tube is checked and prepared (cuff checked and deflated/lubricated).
- Take one set of vital signs before tracheostomy change. Monitor SpO₂ and Respiratory rate throughout the procedure.

Steps:

- Aseptic technique.
- Remove old tracheostomy tube following the curvature of the tube.
- Clean stoma with aqueous chlorhexidine or sterile saline.
- Insert the new tracheostomy tube smoothly with an obturator.
- Remove obturator and insert the inner cannula

- Check placement (exhaled air/air entry and chest expansion on positive pressure ventilation).
- Gauze dressing and securing of the tracheostomy tube.
- Clear the secretions (expect blood staining x 24 hours).

Post Tube Change:

The team should ensure the following immediately after the tube change:

- Observe the patient for respiratory distress.
- Feel for exhaled air from the stoma.
- Listen for equal air entry to ensure bilateral inflation of lungs.
- Clean stoma site if required, apply a dressing, and secure tracheostomy tube with a trachea tube holder.
- Ensure that patient is comfortable and has no signs of respiratory distress.
- Provide oxygen therapy and titrate according to oxygen saturation.

Subsequent monitoring would include:

- Observe for the following complications and inform the tracheostomy review team immediately if any respiratory distress or general instability is detected.
- Complications to look out for would include:
 - Asymmetrical chest movement
 - Heavily blood-stained secretions
 - Persistent desaturation in the first 48 hours following tube change
 - Subcutaneous emphysema
 - Persistent bleeding from tracheostomy site
- Feeding can be commenced 30 minutes post-procedure, provided that the patient did not develop any complications as outlined above.

Issues encountered during tracheostomy tube change in the community

Stoma conditions

The patient's stoma site may develop inflammation, ulcers or granulation. It should be kept clean and dry to prevent maceration. This may facilitate epithelial tissue formation and reduce the incidence of bleeding and granulation. Sodium chloride impregnated dressing is commonly used.

Infections

Local manifestations of stoma infection include erythema, tenderness, pus or foul-smelling secretions. Systematic signs may include the stability of a patient manifested by pyrexia or derangements of vital signs.

Vomiting

Due to discomfort experienced during the procedure, vomiting may occur and with it comes the risk of aspiration. This is minimised by keeping the patient fasted appropriately before a tracheostomy tube change.

Bleeding

Blood stains may be expected for the first 24 hours, particularly in the presence of coagulopathy or medications which may alter haemostasis. Staining is often from granulation, it should gradually decrease, and it should not last for more than 48

hours. If there is persistent or significant bleeding, possibilities include trauma from insertion or suctioning, infection/tracheobronchitis, other pulmonary conditions or rarely, due to a tracheal innominate artery fistula.

Pain

Analgesia may be served pre-emptively to minimise the discomfort experienced during a tracheostomy tube change.

CONCLUSION

There is a sizeable population of individuals living in the community with tracheostomies. Care of these patients can be optimised by familiarisation of tracheostomy care and ensuring appropriate services are available, particularly for community-dwelling individuals living with tracheostomies and whereby access to tertiary institutions may be challenging. There is room for research with regard to specifics such as tracheostomy change timings and guidelines on timings of suctioning and inner cannula changes.

AUTHORSHIP

Dr Ko Yong Sheng Moses and Dr Tan Kok Heng Adrian conceptualised the article. Dr Moses Ko drafted the manuscript, and Dr Adrian Tan provided input through his involvement in the community Home Ventilation and Respiratory Support Services and resources for the production of the final manuscript.

DECLARATIONS

The authors declare that they have no conflict of interest in relation to this article.

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