



# Modified Long Tracheostomy Tube for Airway Management in Lower Tracheal Obstruction

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**Abstract** Tracheostomy is the primary surgical procedure to overcome acute respiratory distress due to upper airway obstruction. The design of tracheostomy tubes are for management of obstruction usually above the level of the glottis or cricoid cartilage. Infrequently, we come across patients who present with respiratory difficulty due to obstruction at lower levels of the trachea. In such patients, tracheostomy may not alleviate the obstructive symptoms as the limited length of the tube may not bypass the obstruction. There is a dearth of long tracheostomy tubes commercially. They are usually not readily available and costly. We present a method to combine and modify an endotracheal tube and a tracheostomy tube to fashion them into a Long Tracheostomy Tube. We also present two cases where we used the long tracheostomy tubes in an otherwise difficult to manage scenarios.

**Keywords** Emergency airway management · Tracheal tumour · Long tracheostomy tube

## Introduction

Acute airway obstruction produces symptoms of dyspnoea, cough, stridor and may be life-threatening due to impending suffocation [1]. A patient may have obstruction due to primary tracheobronchial tumour, a tumour from adjacent structures compressing the airway or metastatic disease to the airway [1]. Obstruction in the airway caused by malignancies in upper airway including nasopharynx, oropharynx, larynx or hypopharynx usually requires surgical intervention such as tracheostomy or cricothyroidotomy [2]. However, an obstruction at the lower tracheal level, tracheostomy and insertion of a regular tracheostomy tube may not alleviate the obstructive symptoms because the limited length of the tube may not bypass the obstruction [3]. Rigid therapeutic bronchoscopic intervention is increasingly accepted to treat such patients for palliation of the airway obstruction [1], but this procedure requires expertise physician and proper facilities which are not commonly available in the emergency department.

In such case, Tracheostomy is an easy procedure to perform, but in the absence of a long tube, the obstruction cannot be relieved, as the commonly available tracheostomy tube is only around 6–8 cm long [4]. Even though long tracheostomy tubes are commercially available [5], they are usually expensive and are seldom readily found. A feasible way is to use an endotracheal tube in such cases. However, an endotracheal tube is very uncomfortable and cumbersome to manage, as a substantial length of the tube lays outside the stoma, and it cannot be stabilized to the skin. The neck movement and mobility of the patient is severely affected, and the tube can be easily displaced. A modified endotracheal tube refashioned with the parts of a regular tracheostomy tube can easily overcome these disadvantages. For discussion purpose,

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henceforth, we call this tube a “Long Tracheostomy tube” (LTT). In this article, the author describes the method of making a long tracheostomy. We demonstrate the utility of the LTT with the help of two case scenarios.

## Case Report

### Case 1

A 52-year-old man presented to the emergency department with severe respiratory distress. The patient is a known case of chronic smoker since last 15–20 years. He was restless, diaphoretic and not able to lie down. Computed Tomography (CT) scan of the neck showed an obstructing growth in the lower part of the trachea. There was almost complete obstruction of the trachea, and the patient was on severe respiratory distress. We did an emergency tracheostomy and regular tracheostomy tube inserted. However, due to the inferior location of the tumour, respiratory distress was not alleviated. We then passed an Endotracheal tube size 7.5 mm through the stoma into the trachea, which relieved the distress.

Later a modified long tracheostomy tube was used to maintain his airway. The patient was stabilized, and a biopsy was taken. He was diagnosed with Squamous cell carcinoma of the trachea and was able to complete his chemo-radiation treatment. The long tracheostomy tube not only helped the patient during the emergency but also in completing seven long weeks of treatment.

### Case 2

A 59-year-old patient, post Total laryngopharyngectomy with tubed pectoralis major myocutaneous flap repaired presented in the emergency with acute onset difficulty in swallowing and respiratory distress. He was a tracheostomy tube dependent due to stomal stenosis. A quick assessment of the trachea with a flexible bronchoscope through the tracheal stoma showed an obstructing growth in the lower part of the trachea with trachea-oesophageal fistula. An emergency bronchoscopy guided endotracheal tube insertion was possible, and the patient’s respiratory distress was relieved. A biopsy was taken, and an oesophageal stent was inserted to facilitate oral feed and prevent aspiration. The long tracheostomy tube was used subsequently, and the patient was swallowing and breathing normally. The patient was then underwent his further treatment with palliative chemotherapy.

## The Technique of Making Long Tracheostomy Tube

A standard PVC endotracheal tube of suitable size is taken, the connector is removed and the desired length is marked on the tube. If the cuff is to be preserve, the sliver of the plastic tube is meticulously removed along the cuff pilot line above the desired length (Fig. 1). Next, we try to make the flange with the help of a tracheostomy tube. The shaft and the connector of the tracheostomy tube is separated from its flange and the parts of the tube attached to the central part of the flange is removed to properly fit the size of the shortened endotracheal tube (Fig. 2). We then connect the flange to the shortened endotracheal tube and secure in position by tightly reinserting the connector of the tube (Fig. 3). Now the modified LTT is ready to be used. The tube is inserted to the trachea by performing a conventional tracheostomy procedure and creating a stoma in the trachea through which an LTT is to be inserted. The tube can be made of any desired length with or without cuff.

The important measures to be taken during making of this tube are: (1) to prevent dislodgement of the connector from the tube and, (2) to prevent displacement of the flanged from the tube. The connector-tube connection can be properly fixed by tightly inserting the two. Once the parts of the tube has been connected as describe above the flange has the tendency to slip away from the tube. However when it is inserted into the trachea it is supported on both side by the connector on one side (anterior) and the neck on the other side (posterior). Since the size of the connector is relatively bigger than the central hole of the flange, the flange cannot slip away anteriorly. Hence the stability of the flange is fixed as in normal tracheostomy tube once it is inserted in the trachea.



**Fig. 1** Endotracheal tube shortened to a desired length along with the cuff and connector



**Fig. 2** A disarticulated tracheostomy tube along with its parts



**Fig. 3** A modified Long Tracheostomy Tube ready to be use

## Discussion

Tracheostomy is a relatively simple procedure. An endotracheal tube and a tracheostomy tube are commonly available in the emergency department. Endotracheal tube alone can be useful for maintaining the airway patent in lower tracheal obstruction but due to its length, keeping it for longer duration is a concern. Unlike a tracheostomy tube, an endotracheal tube lacks flange to stabilize it to the neck. Hence the tube may accidentally get extruded outside, which may put the patient in catastrophic airway obstruction, or has a high chance of migrating more inferiorly in the tracheal lumen and injured the carina or tracheal wall. An unnecessarily significant length of the endotracheal tube also remains outside. Because of this, frequent suction clearance becomes difficult.

On the other hand, a standard Tracheostomy tube is not effective in relieving lower airway obstruction due to its

limited length. Both the tubes can be combined to make a long tracheostomy tube, which effectively does away with their disadvantage. This long tube can be easily made and kept in the emergency department.

The other advantage of the LTT is it does not require expertise to make the tube. It can be easily made and kept in emergency for future use. Besides being used for emergency purpose, it can also be used for long term maintenance of airway when the patient needs to undergo long duration treatment.

When LTT is used, one has to keep in mind that the connector and the endotracheal tube had to fit tightly to each other. This joint can also be reinforced with glue. Tracheal secretion may make the connection loose and accidental dislocation may cause tracheobronchial obstruction, injury by the dislodged tube, or may present as a foreign body in the airway [5, 6].

Both our patients were successfully managed with the LTT. Till the last day of follow up, there was no complaint from the patient or attendant in using the tube, and they are comfortable with it.

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**Compliance with Ethical Standard**

**Conflict of interest** The authors declare that they have no conflict of interest.

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