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Bevelling of Tracheal Stents and T-Tubes: How do we do it?

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Abstract

Managing airway in tracheal stenosis is challenging and it sometimes requires stenting, to maintain patency. One of the most popular devices used in maintaining the patency of the tracheal lumen are Montgomery® T-tubes and stents. They are soft and can be cut to size. One of the limitations a trimmed stent are tip granulations due to sharp edges. A simple and effective method of minimizing the same is possible by beveling the ends of the tube. We propose a novel and innovative solution using commonly available sharpener, with a resultant evenly beveled edged tube. The method is both safe and easily replicable with a global scope for implementation.

Keywords: Stents; Tracheal stenosis; Airway management; Complications; Beveling; T-tube; Granulations

Introduction

Airway stents such as tracheal stents and t-tubes have a pivotal role in airway surgery acting as a scaffold for healing trachea and preventing airway collapse ensuring a safe airway. They are helpful in maintaining integrity of the airway lumen [1], allowing healing following laryngo-tracheal injury and reducing incidence of stenosis following airway trauma [2,3]. Commonly used tracheal stents and t-tubes are Montgomery tubes, produced by the Boston scientific®, initially developed by Dr. William Montgomery in 1964 [3]. They come in various sizes and lengths. In most situations, the stents can be used as such to the manufactured length. However, in some situations the length needs to be adjusted to the dimensions of the patient's airway. For this purpose, the tubes are usually customized by trimming to the required size. However, the edges of the cut tube tend to be sharp, increasing the chances of trauma to the airway with resultant chronic granulations. To reduce this, Boston Scientific recommends beveling the edges of the tube. The company also produces a power drill for this purpose, which has to be purchased separately.

Objectives

We discuss an innovative and simpler way to bevel the edges of the tube to reduce the chances of trauma to the air passage. Similar methods have been described previously we have however found an increased chance of sharps injury by this method and it needs dexterity, practice with a definitive learning curve [4]. We discuss a simpler, safer and effective method of beveling tracheal t-tubes and stents using a commonly available large pencil sharpener.

Methods

The materials (Figure 1) required for beveling are the stent or t-tube, large pencil sharpener, a smaller tube, which can be inserted inside the stent or t-tube. The length of the stent or t-tube to be cut is decided depending on the airway assessment findings. The airway stents, t-tubes are soft, if they are directly placed inside a sharpener they bend and a perfect bevel cannot be obtained. Hence the tubes are stiffened by placing a small piece of cut uncuffed endotracheal tube inside the stent (Figure 2). The stiffened stent is placed inside the sharpener and sharpened like a normal pencil to achieve a beveled edge (Figure 3). The inner tube is then removed following beveling. In our experience we found that the bevel of the stent in all situations was acceptable, easy to use, and repeatable and there was hardly any chance of sharps injury unlike method described by Gan et al. [4].

Discussion

The importance of the beveling of T-tube or any tubular structure in the airway is to avoid direct contact of sharp edges with the mucosal lining causing mucosal irritation due to friction, resulting in chronic persistent inflammation and secondary granulations [5,6]. Montgomery T-tube is one of the most popular devices used for high tracheal stenosis [7]. It is very simple to introduce and use with the added advantage of being cheaper than most of the alternatives [7]. The stents

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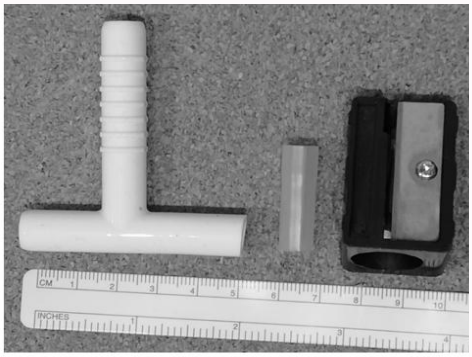

Figure 1: Materials for bevelling the tube.

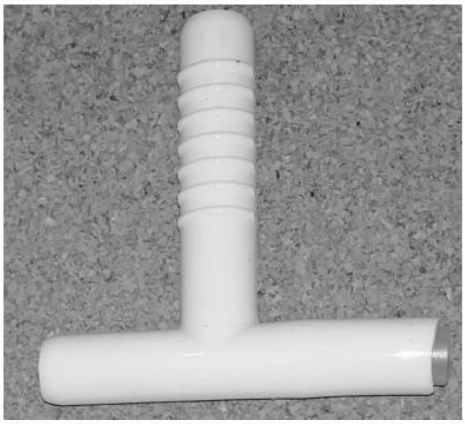

Figure 2: Cut endotracheal tube placed inside the tube.

act as a scaffold over which re-epithelialization of the tracheal wall takes place, and the squamous epithelial metaplasia proceeds along the length of the prosthesis, creating an even healthy mucosal surface over the stenotic segment. Thus, the stent and T-tube decreases the formation of granulation during the stage of recovery as per the findings of Lee [8].

The major complication related to the T-tube is the high incidence of granulations second only to crusting as per the observations made by Prasanna Kumar [6] in their analysis of the use of Montgomery T-tubes in cases with laryngotracheal stenosis. The tendency for granulation formation is usually observed at the ends of the tubes both inside the trachea and at the stoma site which is managed usually with antibiotics and steroids locally. This can be a problem requiring frequent hospital visits and repeated procedures to ensure safe airway, some cases of tenacious granulations may require surgical debridement and replacement of the tube [6]. Beveling is a simple procedure that can circumvent most of these complications effectively. The use of the power drill which can be purchased separately is often costlier and also has the short fall of lack of factory style even bevel edges resulting in a suboptimal result as observed by Gan et al. [4].

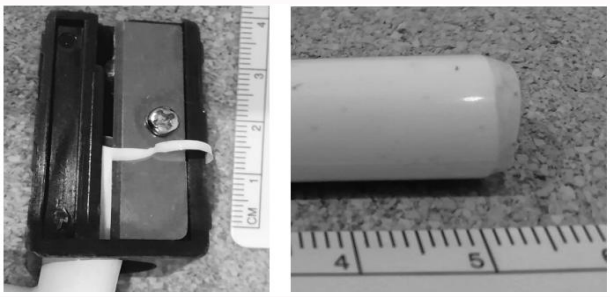

Figure 3: Tube in the sharpener and bevelled edge of the tube.

The senior author has used this method extensively and has found it very useful. Pencil sharpener are freely available, they cost about two pounds. Uncuffed endotracheal tubes are available in any anesthetic department. This can be used on a regular basis in airway procedures to achieve the desired results minimizing the chance of granulation.

Conclusion

The procedure proposed in the article is an easy, non-time-consuming, safe and effective addition to the surgical procedure. It has the added advantage of being easier to replicate with a small learning curve. The fact that it is cheaper also makes it an attractive model that can be utilized for improving airway surgery outcomes with better patient quality of life and reduced morbidity, hospital visits. This can be applied easily in airway surgery with no added strain on the existing infrastructure.

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