When is Surgical Tracheostomy Indicated? Surgical “U-shaped” versus Percutaneous Tracheostomy

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Objective: Tracheostomy is one of the most frequent interventions for ICU patients. The current trend in performing a tracheostomy is a percutaneous approach because of its popularity and significant advantages. In this study, certain indications of surgical tracheostomy (ST) are suggested and furthermore, ST is compared with percutaneous tracheostomy (PT).

Patient and Methods: We performed a U-shaped ST in 121 patients and PT in 85 patients between March 2003 and December 2006. All of the STs were opened U-shaped in the operating room. In this technique; instead of removing the tracheal ring, it was used to create a flap. The tracheal flap was hung with a suture from middle of the 2nd or the 3rd cartilage rings, as a guide. Also, the PT procedure “Griggs dilatation technique” was performed in the ICU.

Results: PT and ST had similar complication rates: 4.1% for ST [bleeding in 2 patients, stenosis in 2, and stomal infection in 1] versus 3.6% for PT [bleeding in 2 patients, and pneumothorax in 1] (p = 0.08). No significant difference was found regarding mean operation time between ST [12 min (9–18)] and PT [8 min (6–16)] (p = 0.09)

Conclusions: Staff utilization and cost seem like the major advantages of PT. However, our surgical technique has similar complication rates with PT and moreover, using ST still remains favorable for select patients with thyroid hyperplasia, short neck, tracheaomalacia, obesity, neck operation history and for children.

Key words: tracheostomy, percutaneous, percutaneous tracheostomy, surgical tracheostomy

Introduction

Tracheostomy is one of the most frequent interventions for intensive care unit (ICU) patients. Usually, two methods has been compared, which one is superior; percutaneous tracheotomy (PT) or surgical tracheotomy (ST)? The training and experience of the surgeon, the medical condition of the patient, or anatomical structure and stability of the neck should dictate the choice of PT or ST.

Material and Methods

We performed a U-shaped ST in 121 patients and PT in 85 patients between March 2003 and December 2006. All of the STs were opened U-shaped in the operating room. In this technique; the patient’s neck is slightly extended and skin is wiped with alcohol to sterilize the incision area. A 3-cm transverse incision was made over the 2nd or 3rd tracheal rings. This incision was carried down to the level of the trachea, by splitting the muscles.
in the midline and carefully probing around the thyroid gland, when necessary. After providing clear visualisation of the tracheal rings, the trachea was hung with a 2/0 silk suture from the middle of 2nd or 3rd cartilage rings as a guide (Fig. 1). Instead of resection and removal of the tracheal ring, it was used to create a flap, which was attached to the skin.

The Griggs dilatation technique was used for performing the PT in the ICU. This bedside procedure was performed using a one-step dilatation with a set of special forceps, which are modified from Howard Kelly clamps.1)

Statistical comparisons of baseline data between groups were performed by the Mann-Whitney U test. Data were considered statistically significant, if *p* values were smaller than 0.05. All statistical analyses were performed with the Statistical Package for the Social Sciences (version 11.0; SPSS, Inc., Chicago, Illinois, USA).

**Results**

Post-operative bleeding was the most frequent complication for both ST and PT. PT and ST patients had similar complication rates: 4.1% for ST [bleeding in 2 patients, stenosis in 2, stomal infection in 1] versus 3.6% for PT [bleeding in 2 patients, and pneumothorax in 1] (*p* = 0.08).

No significant difference was found for operation time between ST [12 min (range, 9–18)] and PT [8 min (range, 6–16)] (*p* = 0.09) (Table 1). The bleeding that occurred after a ST was a minor hemorrhage from stomal small vessels, and packing controlled the bleeding. However, the bleeding after PT (n = 2) was controlled by surgical revision of the percutaneous tracheotomy field. Also, pneumothorax was observed as a result of the positive pressure mechanical ventilation during the PT utilizing in a patient with COPD, and a tube thoracostomy was required for the treatment.

**Discussion**

Surgical tracheostomy, first described by Bjork,2) creates a stable tract for tube reinsertion. A sharp semicircular incision of the second or third tracheal ring is performed, and a cuffed tracheostomy tube is inserted while the endotracheal tube is removed. The tracheostomy tube is then secured with silk sutures, and an umbilical tape is placed around the patient’s neck. We prefer a U-shaped tracheostomy because it has some advantages over the conventional method; the ratio of tracheal stenosis due to stomal scar is lower, and in the case of accidental, early tube removal, reinsertion can be easily done by using the hanging silk suture.
Several different types of PT techniques have been described. The Ciaglia procedure and the Griggs procedure are the most frequently used techniques. The dilatational technique “Ciaglia” is accessing the airway with a needle guide wire followed by serial dilatations with sequentially larger dilatators. The “Griggs” technique is performed with the use of special dilating forceps. However, no difference in complication rates was found between them. Rapitrac described a percutaneous technique that was performed using a dilating forceps with a beveled metal cone. However, this procedure is not usually preferred because of increased perioperative complications, and a higher mortality rate was documented. We prefer the Griggs PT procedure and perform it in the ICU.

In our series, post-operative bleeding was the most frequent complication that occurred not only after ST but also after PT. PT and ST patients had similar complication rates: 4.1% for ST [bleeding in 2 patients, stenosis in 2, stomal infection in 1] versus 3.6% for PT [bleeding in 2 patients, and pneumothorax in 1] (p = .08). Similar results were documented in other series as well. Khalili and colleagues reported on tracheotomies in patients (49, PT; 252, ST) with similar complication rates: 2.1% for PT versus 2.8% for ST (p = not significant), and bleeding s occurred in 1 PT patients and in 4 ST patients. In our series, for ST, bleeding was observed in 2 of 121 patients (2.7%). Stomal infection is the other frequent complication of ST. Hazard et al., Friedman et al., and Holdgaard et al. reported 33%, 15% and 63% stomal infection in their series, respectively, as the most frequent complication after ST. We observed stomal infection in 5% of our patients as the most frequent complication. Pneumothorax, accidental decanullation and subcutaneous emphysema are rare complications that can occur after a tracheostomy, especially following a ST. In order to minimize these complications, surgeons must avoid unnecessary wide dissection of pretracheal tissues. Bachetta et al. found no significant clinical difference between ST and PT in cardiac surgery patients, during the 3-year study period; however, PT offered significant cost savings. As mentioned before, the complication rates of PT and ST are comparable; and both procedures can be safely and expeditiously performed in the ICU. In the literature, there are three significant differences between PT and ST: time, staff utilization and cost effectiveness. According to some authors, PT was more advantageous than ST. However, in our experience; the complication rate of U-shaped tracheostomy versus PT were similar, with respect to the mean operation time and staff utilization. The major advantages of ST can be seen in selected patients with thyroid hyperplasia, short neck, tracheomalacia and obesity. Also, ST is appropriate for children, because of the delicate structure of the tracheal rings and neck anatomy.

We conclude that U-shaped tracheostomy is a safe, rapid and easy technique. Even if cost effectiveness seems to be the only disadvantage of ST, its advantages for a select group of patients, make this technique superior for the group.

### References

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