

THE COMPARISON OF PERCUTANEOUS AND SURGICAL TRACHEOSTOMY IN NEUROSURGERY INTENSIVE CARE UNIT: A CLINICAL RESEARCH

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Abstract

Aim: Tracheostomy is one of the most common procedures performed in trauma patients in the intensive care unit for ceasing from mechanical ventilation. Open tracheostomy involves dissection of the pretracheal tissues, and insertion of the tracheostomy cannula into the trachea under direct vision. Percutaneous dilatational tracheostomy is increasingly popular and has gained widespread popularity in many intensive care unit and trauma centers. Aim of the study was to compare percutaneous dilatational tracheostomy with conventional open tracheostomy in many ways at neurosurgery intensive care.

Patients and Methods: 49 critically ill patients admitted to intensive care unit subjected to tracheostomy and randomly divided into two groups; percutaneous tracheostomy and conventional open tracheostomy. Three separate neurosurgeon who was in charge at neurosurgical intensive care unit performed the process as in bedside.

Results: According to process times, the percutaneous tracheostomy was found to take significantly shorter duration compared to standard tracheostomy ($p=0,0001$). Also, the rate of subcutaneous emphysema and intra-operative bleeding is statistically lower at percutaneous tracheostomy group ($p0.05$). Moreover, postop complications such as wound infection, Tube dislodgement, delayed closure, Tracheal stenosis and unesthetic scar was detected in the lower figure, but it was not meaningful at all. After operation; bleeding, pneumothorax, vocal cord paralysis for both groups were nearly similar without any statistically difference.

Conclusion: Percutaneous technique is effective and safe with low incidence of per and post-operative complication. The risk of complication is significantly lowered after percutaneous than open tracheostomy.

Keywords: Tracheostomy, intensive care, percutaneous, neurosurg

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Introduction

Tracheostomy is one of the more commonly performed procedures in modern intensive care. It is predicted to become more common as demand for intensive care the optimal method of performing tracheostomies in critically ill patients remains unclear (1,2). The traditional method of performing tracheostomies requires transport from the intensive care unit to the operating theatre, where a surgical team performs an open or surgical tracheostomy (ST). This involves a full dissection of the pretracheal tissues and insertion of the tracheostomy tube into the trachea under direct vision (3). Percutaneous dilatational tracheostomy (PT) was first described in 1957 (4), and became increasingly popular after the release of a commercially available kit in 1985 (5). This technique involves the use of some blunt

dilatators to open the pretracheal tissue for insert of the tracheostomy tube. The rate of patients receiving PT and ST varies greatly in different clinics. ST has been performed exclusively in some neurosurgery intensive care unit (NICU), while PT has been performed almost exclusively in others, and some others using a mixture of both techniques (6-9). As such, the question of whether PT or ST is superior for critically ill patients remains unanswered.

Therefore, the goal of the study was to investigate whether the patients who require a PT is superior to ST with regards to the incidence of major per and postoperative complications.

Material and Method

A triple-institution study was conducted on the patients admitted to the neurosurgery intensive care units over three years who underwent tracheostomy. Forty-nine critically ill patients admitted to intensive care unit from February 2008 to June 2012 subjected to the present study either for prolonged intubation, airway protection or pulmonary hygiene. Patients with a history of previous surgery at the neck, bleeding disorder, goiter, neck masses or cervical spine trauma were excluded. The patients with hemorrhagic diathesis were also withdrawn from the study. Patients were divided randomly into two groups; first group (22 patients) subjected to percutaneous tracheostomy (PT group) while the other group (27 patients) subjected to surgical tracheostomy (ST group). The majority of patients were male (66.8%) with a mean age of 41.1 ± 21.7 years.

Results

A total of 27 open and 22 percutaneous tracheostomies were performed. Patients who underwent percutaneous tracheostomy had a statistically significantly lower rate of complication (3.4%) than the open surgery group (7%) ($p=0.04$). According to process times, the percutaneous tracheostomy was found to take significantly shorter duration compared to standard tracheostomy ($p=0,0001$). Also, the rate of subcutaneous emphysema and intra-operative bleeding is statistically lower at percutaneous tracheostomy group ($p < 0.05$). Moreover, postop complications such as wound infection, tube dislodgement, delayed closure, tracheal stenosis and unesthetic scar was detected in the lower figure, but it was not meaningful at all. After operation; bleeding, pneumothorax, vocal cord paralysis for both groups were nearly similar without any statistically difference.

Discussion

The majority of severely ill patients admitted to NICU often require a tracheostomy procedure eventually. The ST technique described in 1909 by Jackson (10) has a various complication rate of up to 66% (11-16). Despite the long experience with ST, the technique still has many complications, with an overall incidence of 6%-66%, including pneumothorax or subcutaneous emphysema (4%-17%), tube dislodgement (0%-7%), bleeding (3%-37%), wound infection (17%-36%) and a mortality rate of 0%-5.3% (17,18). For this reason, a more simple procedure, with a lower rate of complications and that can be performed at the bedside to eliminate the risk of transport to the operating room, has long been desired in addition to surgical technique.

The PT was first described by Sheldon et al. in 1957 (19). In 1969, Toy and Weinstein (20) described a percutaneous tracheostomy system using the guide wire approach of Seldinger. In 1985 Ciaglia et al. described PT, a method based on needle guide wire airway access followed by serial dilatations with sequentially larger dilators (21). In 1989, Schachner et al. reported the Rapitrac (SurgiTech Medical, Sydney, Australia), a dilating forceps device with a beveled metal cone that is designed to advance forcibly over a wire into the airway (22). Griggs et al reported on the GWDF technique in 1990. This method is uses a forceps similar to that of the Rapitrac except for the absence of a cutting edge on the tip of the instrument (23). In the study, this technique was performed as percutaneous approach. The objective of the present study was to compare two tracheostomy systems, ST and PT, in a population of critical care patients.

PT has a number of important advantages over performing a ST in critically ill patients who require an elective tracheostomy. First, PT was associated with a reduction in the incidence of clinically important wound infections compared with traditional ST, secondly and importantly, there was no evidence that PT resulted in an increased incidence of clinically significant bleeding, major peri-procedural or long term complications (18,24). A meta-analysis of studies comparing PT with ST has been published in that PT was found to be associated with an increased incidence of per operative complications and the risk of subsequent stenosis (25). However, the strength and experience of the operator may also influence the formation of tracheal stoma (18). Despite this meta-analysis, many studies stated that the peroperative complications are few and minor at PTs, moreover, have significant advantages when compared with the standard techniques of tracheostomy (25). Delaney et al reported that there was no evidence that PT was associated with an overall increase in the rate of bleeding, other major complications or long-term complications, compared to ST but he mentioned that the PT technique is the choice for critically ill patients who require a tracheostomy (24). Leinhardt et al. recommended keeping this technique in the domain of surgery, and also pointed out that some doctors in non-surgical specialties, such as intensive care and anesthesia, have already been skilled in vascular access using the Seldinger technique, they could also be trained to perform percutaneous tracheostomy (26). Also in his series, Türkmen et al mentioned that the PT was not associated with clinically important hemorrhage, purulent infection at the stoma, or any lethal complication (18). Griggs et al found that the PDT technique was associated with a shorter procedure time and a significantly fewer morbidity, in comparison to the standard ST technique and this is due to the good experience in their technique (23). In agreement with these studies, we found that the mean duration of the procedure is lowest during PT procedure. Also, the rate of subcutaneous emphysema and intra-operative bleeding is statistically lower at percutaneous tracheostomy group. Moreover, postop complications such as wound infection, Tube dislodgement, delayed closure, Tracheal stenosis and Unesthetic scar was detected in the lower figure, but it was not meaningful at all. After operation; bleeding, pneumothorax, vocal cord paralysis for both groups were nearly similar without any statistically difference.

While the mean size of tracheostomy tube used, postoperative infection after 7 days and mean length

of scar tend to be less in PT group compared with ST group with statistically significance difference between two groups. Delaney mentioned that it is not surprising to find reduced incidence of wound infection with the PT technique and stated that minimally invasive surgical techniques is a factor for reduction in the rates of surgical site infections (24). In the study, We also attested low rate of stomal infection in PT group but it was not statistically significant ($p=0,059$).

Finally, results of subgroup analysis suggested that PT was superior to ST when the latter was performed in the operation theatre. Specifically, PT was associated with a reduction in bleeding and overall mortality and a suggestion of decreased duration of trans laryngeal intubation prior to tracheostomy.

It is not surprising that a reduced incidence of wound infection was found with the PT technique. One of the reasons that minimally invasive surgical techniques have become more pervasive in many areas of surgery is the reduction in the rates of surgical site infections. This may be due to minimization of the local tissue damage with a dilatational technique, or may in part be due to a relative preservation of immune functions when minimally invasive techniques are used when compared to an open technique.

Conclusion

We have demonstrated that use of PT is associated with a significantly reduced procedure time, subcutaneous amphysema and incidence of bleeding compared to ST in critically ill patients. PT may yield an overall decreased risk of death when compared with ST. While PT appears equivalent to ST for the overall incidence of clinically relevant bleeding, major peri-procedural and long term complications. However, this finding is inconclusive and before a change in clinical practice could be recommended, this would need confirmation in a larger, adequately powered multi-center randomized clinical trial.

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