

COMPLICATIONS AND SAFETY OF PERCUTANEOUS DILATATIONAL TRACHEOSTOMY WITH GRIGGS METHOD VERSUS SURGICAL TRACHEOSTOMY: A prospective trial with six months follow-up

Kasra Karvandian¹, Ata Mahmoodpoor²
Mohammadtaghi Beigmohammadi³, Sarvin Sanaie⁴

ABSTRACT

Objectives: Percutaneous Dilatational Tracheostomy has been developed all across the world during past two decades and is being performed with different methods in Intensive Care Units. The purpose of this study was to compare the complications of surgical tracheostomy versus percutaneous dilatational tracheostomy with Griggs method.

Methodology: In this prospective clinical trial, 100 cases of Percutaneous Dilatational Tracheostomy (PDT), was compared to surgical method. All PDTs were performed with Griggs method. The patients had been followed up for five months on a regular basis and potential complications were recorded.

Results: In surgical group we had three complications leading to death: Bleeding, Severe Emphysema and Pneumothorax. In five months of follow-up, we had no ventilatory complication in PDT group. Bleeding and infection rate in Tracheostomy place itself, Pneumothorax, Emphysema, duration of procedure, and required time for total closure of tracheostomy place in PDT were significantly less than surgical group.

Conclusion: Percutaneous Dilatational Tracheostomy (PDT) with Griggs method has less complication in comparison to Surgical Tracheostomy. As such it should be recommended as a method of choice for tracheostomy in critically ill patients

KEY WORDS: Percutaneous Dilatational Tracheostomy (PDT), Tracheostomy, Griggs, Complications.

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INTRODUCTION

Since the development of Percutaneous Dilatational Tracheostomy describe by Ciaglia in 1985 the technique has become increasingly popular alternative to standard Surgical Tracheostomy.¹ PDT has been used since 1990 in Europe and US and then gradually spread all across the world.² Griggs method which was introduced by Mr. Griggs from Australia has been considered as a commonly used method in comparison to other methods.³ Considering

Correspondence

Ata Mahmoodpoor,
No. 661,
First Floor,
Next to Hakimian-e-Noor Hospital,
South Shariati Street,
Tabriz, Iran.
Email: amahmoodpoor@yahoo.com

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short and long term complications, this technique is superior to surgical type. Moreover it is less time-consuming, does not require an operation room and can be conducted inside ward.⁴

Some of its limitations are anatomical difficulty, Short Neck, limitation in neck movement and also some conditions in which palpation of anterior part of the neck is difficult (because of thyroid enlargement).⁵ In addition several studies have suggested that PDT is associated with less bleeding and fewer stomal infections.⁶⁻⁹ In many centers PDT is the procedure of choice for critically ill patients. Studies have suggested that patients undergoing PDT have less morbidity than patients undergoing Surgical Tracheostomy.¹⁰⁻¹² In this report, we describe our experience with PDT performed with Griggs method compared to surgical method.

METHODOLOGY

After obtaining informed consent and approval from the Ethics Committee of hospital, 100 cases of elective percutaneous tracheostomy with Griggs method were enrolled in this prospective clinical trial. Tracheostomy was performed in Imam Khomeini Hospital from November 2005 to October 2007. All patients had been intubated and were under mechanical ventilation for at least 7-21 days.

Exclusion Criteria: Tumors with invasion to tracheal tissue, Difficult Anatomy like huge Thyroid and/or trauma to the tissue of trachea, previous neck surgery, Incurable Coagulation Problems, Emergency cases and age less than 12 years old.

Demographic and medical data collected included age, race, sex and indication for tracheostomy, date of tracheostomy and comorbid conditions at the time of tracheostomy (e.g., sepsis, acute respiratory distress syndrome, pneumonia, cardiac disease and acute or chronic renal failure with or without dialysis). The most recent laboratory data were collected and included Blood Urea Nitrogen, Creatinine

and Pao₂ levels, prothrombine and activated partial thromboplastin time, platelet count and hemoglobin level. Abnormal coagulations profile were defined as an international normalized ratio of 1.5 or higher, partial thromboplastin time of 40 seconds or longer and a platelet count less than 20000/nl.

We obtained the fraction of inspired oxygen level and the positive end expiratory pressure required by the patients immediately before the PDT. The amount of bleeding at operation, duration of operation, posterior tracheal wall perforation, surgical wound infection, Pneumothorax, Subcutaneous Emphysema, tracheomalacia and the time required for total closure of tracheostomy place were recorded. All potential complications were closely monitored and recorded until five months. Accumulated Data, for qualitative parameter were analyzed with Chi Square (MacNemar test), and for quantitative parameter through Student T test and eventually P-values lesser than 0.05 were considered meaningful.

RESULTS

Age and sex did not have significant difference between two groups ($p > 0.05$). Pao₂/Fio₂ in PDT group was 273±14 and in surgical group was 283±11 which did not have significant difference between two groups. From 100 patients in PDT group, 54 of them died because of their comorbidities. From 40 discharged patients, three patients after one month follow-up and two patients after three months follow-up passed away. The reason for death mostly was exacerbation of their main problems or cardiovascular events.

During follow-up and after discharge, none of dead or alive patients in this group had any respiratory complication due to tracheostomy procedure. None of the patients in both group had posterior tracheal wall injury. The median time for intubation prior to tracheostomy in PDT group was 15 days and in surgical group; was 17 days which did not have significant difference between two groups. Indications for tracheostomy were respiratory failure that re-

quires long-term mechanical ventilation and airway protection and clearance of secretions which didn't have significant difference between two groups. In all 100 cases of Percutaneous Tracheostomy the amount of bleeding did not exceeded 6cc and in 76 cases it was less than 3cc.

In Surgical Group, we had one case of death after returning from operation room because of uncontrollable bleeding two patients died because of severe emphysema with pneumothorax. In PDT group we had one case with moderate subcutaneous emphysema which was spontaneously absorbed. Sever Upper-airway complication like: dilatation of tracheostomy place and sever leakage from that was more in surgical group in comparison to PDT group (Table-I). During three month follow-up no complication like stenosis or deviation of trachea, problem in closure of tracheostomy and continuation of leakage were noted. In surgical group 22 patients had difficulty to feeling of foreign body inside their throat and seven patients complained of difficulty to swallow. We had one case of transient airway obstruction in PDT group. The patient was a myasthenic woman with respiratory distress during right lateral rotation of neck which has a subglottic stenosis in MRI. Table-I

DISCUSSION

The modern era of PDT began in 1985, when ciaglia introduced a percutaneous tracheostomy procedure that used an easy and straight

forward seldinger technique with progressive dilatation. During past two decades, performance of PDT has increased considerably with development of other techniques like Griggs.^{13,14} Several advantages have been cited for bedside PDT. The procedure can be performed successfully by physicians who have not received surgical training, such as pulmonary and critical care physicians.⁶⁻¹⁰ Studies have shown that procedure time is shorter than that for surgical tracheostomy. The benefits include less anesthesia or sedation time and less time required for physician.¹⁵ The waiting period between making the decision to perform a tracheostomy and its actual performance is considerably shorter for PDT than ST because operating room availability is not a factor.⁶ In addition PDT does not require shifting of potentially unstable patients from the intensive care unit to the operating room.¹⁶

Other benefits include lower costs for PDT than for ST performed in operating room.⁶⁻¹⁰ Many questions have been raised about the safety and superiority of PDT compared to ST. Dulguerov in a meta analysis showed an increase in preoperative complications(10% versus 3%), perioperative death (0.44% versus 0.03%) and serious cardiorespiratory events(0.33% versus 0.06%). Postoperative complications were more common for ST (10% versus 7%). Serious complications that were reported in the meta analysis and in prior reports included death, cardiopulmonary arrest, loss of airway control, pneumothorax, pneu-

Table-I: Early and late complications of percutaneous vs. surgical tracheostomy

<i>Parameters</i>	<i>Surgical</i>	<i>PDT</i>	<i>P value</i>
Bleeding (cc)	32.7±8.6 *	5.1±0.9	0.000
Duration of procedure (min)	47±21.2	32±14.9	0.004
Pneumothorax & Emphysema	11±1.3	1	0.003
Fistula	4±1	1	0.05
Infection & Exudates from procedure place	26± 8.7	8±2.1	0.000
Total time for closure of tracheostomy place (day)	8± 2.1	4±1.7	0.02
Tracheomalacia/stenosis	12± 3.2	1	0.002

*: mean ± standard deviation

momediastinum, posterior tracheal wall injury, false canula passage and difficulty in tube placement. One of problems in this meta analysis was the used techniques which were too heterogenous.^{17,18}

Some studies showed that long term complications like infection, tracheomalacia and tracheal stenosis in PDT are less than surgical style.¹⁹⁻²² In our study short term complications such as bleeding, pneumothorax, emphysema and infection in PDT group was significantly less than Surgical group similar to previous studies. Late complications such as fistula formation, tracheomalacia, stenosis and late onset infection were also significantly less in PDT group. Some cases of tracheal stenosis following Percutaneous Tracheostomy have been reported but they are much fewer than surgical method.²³ Cuff malfunction that leads to decanulation and subsequent difficult reintubation is one of the complications of PDT but we didn't have any. One of the dangers of tracheostomy is cutting off the trachea at the time of procedure and subsequent death.²⁴ Tracheal stenosis is also much less common in percutaneous method in comparison to surgical.²⁵ There is a report with invisible stenosis as a long term complication of PDT because of internal deviation of cartilage that the patient had not any upper airway symptoms.²⁶ Most subglottic stenosis are because of the cuff pressure of tracheostomy tube and care must be taken to avoid high cuff pressures. So in PDT group tracheal stenosis is less than ST and it also has less severity and doesn't need surgical repair.

CONCLUSIONS

For critically ill patients PDT has less short and long term complications due to surgical tracheostomy. If complications are seen their severity is much milder than surgical tracheostomy. Hence in view of numerous advantages including low cost and easy to perform, PDT should be considered as a technique of choice for tracheostomy in critically ill patients.

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Authors:

1. Kasra Karvandian,
Assistant Professor of Anesthesiology,
2. Ata Mahmoodpoor,
Anesthesiologist,
Fellowship of Critical Care Medicine,
3. Mohammadtaghi Beigmohammadi,
Anesthesiologist,
Fellowship of Critical Care Medicine,
4. Sarvin Sanaie,
General Physician,
- 1-4: Department of Anesthesiology and Intensive Care Unit,
Imam Khomeini Hospital,
Tehran University of Medical Sciences,
Tehran - Iran.