

Percutaneous tracheotomy: Forceps vs. cone dilatation techniques

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ABSTRACT

Background: Percutaneous tracheotomy (PT) is a minimal invasive procedure alternative to surgical tracheotomy. PT offers an added advantage of enormous decrease of time interval between decision of doing tracheotomy and actually doing it. Moreover hazards of patient transport can be avoided as it can be safely performed at the bedside. We started doing PT in 2003 and performed 100 cases using forceps dilatation. Later we switched over to cone dilatation where we performed 215 cases. This study aims to compare two techniques of forceps vs. cone dilatation methods for PT. **Methods:** A total of 100 cases of PT were performed starting from December 2003 to August 2005 using the forceps dilatation method (group A). Further 215 cases were conducted (group B) from September 2003 to July 2008 using the cone dilatation method. Time of performing both procedures was recorded. Also incidence of complications was also recorded in both groups. **Results:** The incidence of minor bleeding in group A was 9%, whereas in group B was 5.58%. Major bleeding occurred in two patients in group B. Both cases suffered of pneumothorax and emphysema. One patient developed life-threatening tension pneumothorax and required cardio pulmonary resuscitation. This was one case in this series, in which the procedure has contributed to patient's morbidity. Guide wire-related technical difficulties were seen in 2% of the cases in group A, and 3.7% of cases in group B. **Conclusion:** forceps dilatation PT is superior to the cone dilatation technique in terms of safety. Further studies are needed to confirm our results.

Key words: Cone dilatation, forceps dilatation, percutaneous tracheotomy

INTRODUCTION

Percutaneous tracheotomy (PT) is a minimal invasive procedure alternative to surgical tracheotomy. PT offers an added advantage of enormous decrease of time interval between decision of doing tracheotomy and actually doing it. Moreover hazards of patient transport can be avoided as it can be safely performed at the bedside. We started doing PT in 2003 and performed 100 cases using forceps dilatation (Griggs).^[1] Later we switched over to cone dilatation (Ciaglia) where we performed 215 cases.^[2]

This study aims to compare two techniques of forceps vs. cone dilatation methods for PT.

METHODS

A total of 100 cases of PT were performed starting from December 2003 to August 2005 using the forceps dilatation method (group A). Further 215 cases were conducted (group B) from September 2003 to July 2008 using the cone dilatation method. These patients were admitted in medical, surgical, cardiac intensive care units (ICU) and emergency department. Inclusion criteria included patients with high positive end expiratory pressure support, high oxygen concentration, and/or repeat tracheotomy. Exclusion criteria included patients with untreated coagulopathy, neck swelling, and age <14 years.

Preparation

Patients in both groups received midazolam, fentanyl, muscle relaxants (atracurium or rocuronium) and 100% oxygen during the procedure. In supine position neck was hyper extended with placement of a rolled towel under the shoulders. A tracheal tube (TT) was repositioned and cuff was placed just below the vocal cords. The TT was held in position by a staff nurse throughout the procedure. The surgical area was cleaned with iodine and sterile draping

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was applied. A needle was inserted in the trachea at the level of first and second or second and third tracheal rings. A guide wire was inserted and the needle was removed followed by initial dilatation. Main dilatation of the trachea in group A was performed using forceps, and in group B with a cone-shaped boogie dilator as supplied in the commercial kit (Portex, USA). Following tracheal dilatation, the tracheotomy tube was passed over the guide wire and placement was confirmed by expansion of the chest visually and appearance of end tidal capnography waves. At this point the TT tube was removed and ventilation was started through the tracheotomy tube. There was minimal difference in the operative technique in both the groups except the method of dilatation.

RESULTS

There were 67 males and 33 females in group A, and 128 males and 87 females in group B. There was no significant difference in the demographic characteristics of the patients in both the groups [Table 1]. These patients were located in different ICUs of the hospital. In group A, 54 procedures were performed in the surgical ICU, whereas in group B, 110 were performed in the medical ICU [Table 2]. In group A head injury and neurosurgical patients predominated and in group B most of the patients were under medical and pulmonology care [Table 3]. The mean time taken for the procedure in groups A and B was 7.5 ± 1.2 and 6.02 ± 1.8 minutes respectively. In all patients, the procedure was completed successfully except in one morbid obese patient in group A. The tracheotomy tube was inserted in this patient next day. Most frequently encountered problem in both groups was minor bleeding. We defined minor bleeding as a <50 ml blood loss. Major bleeding is defined as a blood loss >50 ml during the procedure and/or continued oozing for more than 24 hours. The incidence of minor bleeding in group A was 9%, whereas in group B it was 5.58%. Major bleeding occurred in two patients in group B. Both cases suffered of pneumothorax and emphysema. One patient developed life-threatening tension pneumothorax and required cardio pulmonary resuscitation. This was one case in this series, in which the procedure has contributed to the patient's morbidity. Guide wire-related technical difficulties were seen in 2% of the cases in group A, and 3.7% of cases in group B [Table 4].

DISCUSSION

The purpose of this study was to compare on the basis of up to date papers currently applied methods of PT. There are two main PT methods by Griggs and Ciaglia. In these methods a wire is introduced into the trachea serving as a

Table 1: Demographic data of patients in both groups

	Group A (forceps)	Group B (Cone)
Number M/F	67 M+33 F=100	128 M+87 F=215
Mean age	59 ± 12.8	61 ± 11.6
Mean weight	72.7 ± 11.7	75.1 ± 10.6

Table 2: Patient location

Area where the procedure was performed	Number of patients	
	Group A (forceps)	Group B (Cone)
Surgical ICU	54	85
Operating room	36	04
Cardiac surgical ICU	07	08
Coronary care unit	02	04
Medical ICU	00	110
Emergency department	01	04

Table 3: Specialty distribution

Specialty	Number group A (forceps)	Number group B (cone)
Neurosurgery	37	67
Medical, pulmonology, etc.	36	108
General surgery	10	19
Cardiac surgery	07	10
Thoracic surgery	05	07
Orthopedic surgery	02	04
Vascular surgery	01	04
Plastic surgery	01	00
OBG	01	00

Table 4: Complications during the procedure and/or during the first 24 hours

	Group (A) forceps	Group (B) cone
False passage	1	0
Failed procedure	1	0
Retrograde movement of the guide wire toward vocal cords	2	8
Minor bleeding	9	12
Major bleeding	0	2
Pneumothorax and surgical emphysema	0	2
Desaturation	4	9
Surgical assistance required	0	0

guide for special forceps or series of dilators of increasing diameter to dilate the wall and allow cannulation of the trachea. In the literature authors found a low incidence of complications after PT. Acute complications were documented in 6-18% and late complications in 1-3% of the patients. Follow-up showed no late obstructive complications at the level of stoma and very low (0.3-0.36%) mortality risk.^[3] Tracheotomy is considered the

airway management of choice for patients who require prolonged mechanical ventilation. The development of percutaneous techniques offers many advantages including the ability to perform the procedure in the intensive care unit. Recently a study was published on comparison between the controlled rotating dilation method (Percu Twist) and the Griggs' forceps dilational tracheostomy where the author concluded that the Percu Twist technique is safe despite the longer duration of the procedure. Nevertheless the forceps dilational technique remains their routine procedure,^[4] although PT is a safe method under proper patient selection, increased technical experience and bronchoscopy- or ultrasound-guided procedure. However, a life-threatening complication after unsuccessful attempt of the guidewire dilating forceps tracheostomy in one trauma patient with a cervical spine injury was reported.^[5,6] With this case report the author emphasized on the importance of continuously bronchoscopy- or ultrasound-guided PT in trauma patients, especially with cervical spine injury. In the present report we found that the forceps dilatation method of PT was safer and carries low incidence of complications vs. the cone dilatation method. Minor and major bleedings following cone dilatation method were reported with high incidence compared to the forceps dilatation technique. Also two cases of pneumothoraces were reported in the cone dilatation group vs. the forceps dilatation method. In terms of safety we proved that the forceps dilatation method is much safer than the dilatation PT technique. That was in accordance with another published report which enforces our conclusion that forceps dilatation PT is safe.^[7]

In conclusion, forceps dilatation PT is superior to the cone dilatation technique in terms of safety. Further studies are needed to confirm our results.

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