

Audit on Tracheostomies Performed at the General Intensive Care Unit, Kuala Lumpur Hospital

A S Rao, FANZCA, L Mansor, FRCA, K Inbasegaran, FANZCA

Department of Anaesthesia and Intensive Care, Kuala Lumpur Hospital, 50586 Kuala Lumpur

Summary

During a 6-month period from October 2000 to March 2001, we analysed the indications, methods, waiting period and complications following a tracheostomy at the General Intensive Care Unit (GICU) of Hospital Kuala Lumpur. There were 49 tracheostomies performed during this period. Thirty of them were performed in the GICU using the percutaneous dilatational method while 19 were performed electively in the Operating Theatre (OT) by the ear, nose and throat (ENT) surgeons. The main indications for a tracheostomy were prolonged mechanical ventilation and airway protection for patients with a poor Glasgow Coma Scale. The average waiting time for a tracheostomy after a decision was made to perform one was 1.34 ± 0.72 days for a percutaneous tracheostomy and 3.72 ± 2.52 days for a surgical tracheostomy. This difference was statistically significant ($p < 0.001$). There was excessive bleeding in 3 patients in the percutaneous tracheostomy group and 1 patient in the surgical tracheostomy group. Percutaneous tracheostomy is now the main method of tracheostomy at the GICU in Hospital Kuala Lumpur. Haemorrhage is the most significant complication of this procedure. However the overall complication rate is comparable with that of a surgical tracheostomy.

Key Words: Tracheostomy, Percutaneous, Surgical, Intensive care unit

Introduction

Percutaneous dilatational tracheostomy (PDT) was first described in 1957¹. However it only gained popularity after Ciaglia described his percutaneous technique in 1985². Since then, various modifications to the technique have been made. Among the common techniques available today are the forceps dilatational method (Portex®) as described by Griggs³ and the single dilator method (Ciaglia Blue Rhino® - 1999).

At our GICU, before 1999, patients requiring a tracheostomy were almost always taken to the operating theatre for a surgical tracheostomy performed by the ear, nose and throat (ENT) surgeons. In 1999, we carried out 35 PDT in our GICU. In the year 2000, there were a total of 90 tracheostomies performed for patients in the GICU of which 51 were PDT while 39 of them were carried out in the operating room by the ENT surgeons.

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Corresponding Author: Suresh Rao, Department of Anaesthesia and Intensive Care, Hospital Kuala Lumpur, 50586 Jalan Pahang, Kuala Lumpur

As PDT is being performed more and more frequently at our unit, we decided to do this audit to ensure that the safety profile and complication rate of this technique was comparable with that of a surgical tracheostomy.

Materials and Methods

The GICU at Hospital Kuala Lumpur is a 17-bedded adult intensive care unit. During a 6-month period from October 2000 to March 2001, we did a retrospective analysis on all tracheostomies performed at our GICU. We analysed the indications, methods, waiting period for a tracheostomy and complications in the first 24-hours.

During the period of audit, the first choice procedure for tracheostomy, when indicated, was the percutaneous dilatational method. Exclusion criteria for patients not suitable for PDT included patients with unfavourable neck anatomy, obesity, thyroid swellings and inability to extend the neck e.g. cervical fractures. These patients were taken to the OT for a surgical tracheostomy by the ENT surgeons.

All the PDT's were performed by anaesthesiologists who had some experience in doing them. The PDT method used was the forceps dilatational method as described by Griggs using the Portex® Percutaneous Tracheostomy kit. This method of PDT involved withdrawing the endotracheal tube (ETT) till the cuff of the ETT was just below the vocal cords, locating the trachea with a needle, inserting a guidewire, dilating the trachea with a modified Howell-Kelly forceps and finally inserting the tracheostomy tube via the guidewire.

For demographic data, statistical analysis was carried out using the Student's t-test for parametric data and Chi-squared test with Yate's correction for non-parametric data. The complication rate was analysed using Fisher's exact test.

Results

There were a total of 49 tracheostomies performed during this period of which 30 of them (61% of cases) were PDT while 19 (39% of cases) were performed in the operating room by the ENT surgeons.

There was no significant difference between the two groups in terms of age, gender, duration before a tracheostomy was decided upon, total duration of ventilation in ICU, total duration of ICU stay and mortality (Table I).

The main indications for a tracheostomy were prolonged mechanical ventilation and airway protection for patients with a poor Glasgow Coma Scale (Table II).

The average waiting time for a tracheostomy after a decision was made to perform one was 1.34 ± 0.72 days for a percutaneous tracheostomy and 3.72 ± 2.52 days for a surgical tracheostomy (Table III). This difference was statistically significant ($p < 0.001$).

The complication rate seemed to be higher in the PDT group, however this difference was not statistically significant (Table IV). There was excessive bleeding in 3 patients in the percutaneous tracheostomy group. One of these 3 patients was taken to the OT for surgical haemostasis and a surgical tracheostomy was performed instead. There was 1 patient in the surgical tracheostomy group who had excessive bleeding as a complication.

Table I: Demographic Data

	PDT (n=30)	Surgical (n=19)	p value
Age, years (mean \pm SD)	42.63 (14.78)	51.47 (20.55)	0.11 (NS)
Male / Female	24 / 6	11 / 8	0.18 (NS)
Duration before tracheostomy, days (mean \pm SD)	8.66 (5.14)	10.94 (3.13)	0.11 (NS)
Duration of ventilation in ICU, days (mean \pm SD)	15.7 (11.05)	17.6 (7.09)	0.54 (NS)
ICU stay, days (mean \pm SD)	16.65 (11.33)	20.29 (9.26)	0.31 (NS)
Mortality, %	46.7	42.1	0.57 (NS)

Table II: Indications for a Tracheostomy at the GICU, HKL

Indication	PDT (%)	Surgical (%)
Prolonged ventilation	27 (66)	17 (90)
Airway protection	12 (29)	1 (5)
Tracheo-bronchial toilet	2 (5)	0
Upper airway obstruction	0	1 (5)
Total	41 (100)	19 (100)

Table III: Waiting Time for a Tracheostomy at the GICU, HKL

	PDT	Surgical	p value
Mean (SD) waiting time, days	1.34 (0.72)	3.72 (2.52)	0.001

Table IV: Complication Rate of a Tracheostomy at the GICU, HKL

	PDT (n=30)	Surgical n=19)	p value
Bleeding	3	1	0.49 (NS)
False passage	-	-	-
Pneumothorax	-	-	-
Surgical emphysema	-	-	-
Loss of airway	1	-	0.16 (NS)
Difficult cannulation	1	-	0.61 (NS)
Total	5 (17%)	1 (5%)	0.46 (NS)

Discussion

PDT is now the main method of tracheostomy at our GICU. Bleeding is the most significant early complication. However, most of the cases of bleeding were easily controlled by simple measures such as local compression.

Waiting time for a tracheostomy has reduced significantly with this new procedure. This is because once a PDT is decided upon, it can be done as soon as the patient is fasted, as this is a bedside procedure. This is unlike a surgical tracheostomy where there is a need to wait for the operating theatre and the ENT surgeons' availability before the procedure can be performed.

The other advantage of PDT is the reduction in cost. This avoids the use of valuable OT time^{4,5}, which is necessary for a surgical tracheostomy. The reduction in waiting time for a tracheostomy from 1.34 days for a PDT to 3.72 days for a surgical tracheostomy will also translate to a reduction in ICU costs. It is very costly to manage a patient in the ICU. For example, in the United Kingdom, it is estimated that it amounts to about 700 - 1100 pounds a day to manage a patient in the intensive care unit⁶. As this is a bedside procedure, this avoids the need for the transport of critically ill ICU patients to the OT and return. It is a relatively simple procedure and is easy to perform. Finally, the overall complication rate is comparable to the open method^{7,8}.

The disadvantage of the procedure is that it is not suitable for all patients. Thirty-nine percent of our patients were found to be not suitable for a PDT. However this was partly because as this was a relatively new procedure at our GICU, we were a little conservative in our selection of patients suitable for PDT. Among the long term complications described in the literature are voice changes, which have an incidence of 36 to 48% at 6 months post-tracheostomy^{9,10}.

As a result of our audit, our department has made the following policy changes: -

- (a) PDT is now the technique of choice for tracheostomy, when indicated, at our GICU.
- (b) As bleeding is the most significant early complication, patients who are scheduled for a PDT should have a coagulation screen done and any abnormalities corrected to as near normal as possible.
- (c) All doctors are supervised directly by an experienced colleague when performing the first few PDT's.
- (d) Good patient selection is part of the protocol for identifying patients who are suitable for a PDT.

Conclusion

Percutaneous tracheostomy is now the main method of tracheostomy at the GICU in Hospital Kuala Lumpur. Haemorrhage is the most significant complication of this procedure. The overall complication rate of performing a percutaneous tracheostomy is comparable with that of an open tracheostomy.

References

1. Sheldon CH, Pudenz RH, Tichy FY. Percutaneous tracheostomy. *JAMA* 1957; 165: 2068-70.
2. Ciaglia P, Firsching R, Syniec C. Elective percutaneous dilatational tracheostomy. *Chest* 1985; 87: 715-19.
3. Griggs WM, LIG Worthley, Gilligan JE, Thomas PD, Myburgh JA. A Simple Percutaneous Tracheostomy Technique. *Surg Gynecol Obst* 1990; 170: 543-5.
4. Bowen CP, Whitney LR, Truwit JD, Durbin CG, Moore MM. Comparison of safety and cost of percutaneous versus surgical tracheostomy. *Am Surg* 2001 Jan; 67(1): 54-60.
5. Heikkinen M, Aarnio P, Hannukainen J. Percutaneous dilatational tracheostomy or conventional surgical tracheostomy? *Crit Care Med* 2000; 28: 1399-402.
6. Edbrooke D, Hibbert C, Ridley S et al. The development of a method for comparative costing of individual intensive care units. *Anaesth* 1999; 54: 110-20.
7. Barba CA. The Intensive Care Unit as an Operating Room. *Surg Clin of North Am* 2000 June; 30 (3): 957-63.
8. Scott S. Recent advances in intensive care. *BMJ* 2000; 320: 358-61.
9. Steele AP, Evans HW, Afaq MA et al. Long-term follow-up of Griggs percutaneous tracheostomy with spiral CT and questionnaire. *Chest* 2000 May; 117(5): 1430-3.
10. Leonard RC, Lewis RH, Singh B, Van Heerden PV. Late outcome from tracheostomy using Portex(r) kit. *Chest* 1999; 115: 1070-75.