

Indications and Early Complications of Standard Tracheostomy

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ABSTRACT

Objective: To determine the most common indications and early complications of standard tracheostomy observed in patients at Combined Military Hospital, Rawalpindi

Study design: Prospective observational study

Setting: ENT department, Combined Military Hospital, Rawalpindi

Duration: From 1st February 2007 to 31st December 2009

Patients and methods: A series of 127 consecutive patients who had tracheostomy performed over a period of 23 month from 1st February 2007 to 31st December 2009 were included in the study. All the tracheostomies were performed using a standard technique. A cuffed Portex tracheostomy tube was used in all cases during first and subsequent tracheostomy tube insertions. Patients were followed for complications occurring in the first two weeks after the procedure.

Results: Out of 127 patients, 86 were males (67.7 %) with a male to female ratio of 2:1. The mean age was 49.3 years. Elective tracheostomies were performed in 93 (73%) of these patients. Head and neck surgery was indicated in 48.2% of elective cases. Intubation assistance was most common indication for emergency procedures. Most common complication that we recorded was wound infection (24.4%). We observed accidental decannulations in 4 patients (3.1%), false passage intubation in 6 (4.7%) and surgical emphysema in 18 (14%) of the cases. One patient died before the obstruction could be removed.

Conclusion: Current tracheostomy technique is still associated with complications with occasional drastic consequences such as death. Caution on the part of trained staff is important to avoid such incidences.

Key words: Tracheostomy, complications of tracheostomy, Air way

INTRODUCTION

A tracheostomy is like a snake—it can rear up and bite you when you least expect it. The first reference to tracheostomy can be traced to the ancient Indian book of medicine, the *Rig-Veda*, written in 1500 BC. Chevalier Jackson is credited with describing the modern-day tracheostomy which he introduced in 1909¹. Although this procedure has been modified extensively over the period, basic concept remains the same; bypass the nasopharynx, oropharynx and the larynx and achieve direct access into trachea via an iatrogenic tracheocutaneous fistula².

There are several indications for performing tracheostomy. They may be to relieve upper airway obstruction, to facilitate prolonged intubation, to allow staged extubation by reducing the anatomical dead space, and to protect and give access to tracheobronchial tree. Orotracheal or nasotracheal intubation and cricothyroidotomy may be temporary alternatives to or precede tracheostomy. Although most critically ill patients with respiratory failure

tolerate short-term tracheal intubation well with minimal complications, mechanical ventilation usually more than 7 days is associated independently with adverse outcome^{3,4}.

As with any other surgical procedure, tracheostomy is also associated with a number of potential complications⁴. These can be divided for academic and management purpose into intra-operative, immediate post-operative and late post-operative. The intra operative complications include hemorrhage, injury to trachea and larynx or the para-tracheal structures, air embolism and apnoea etc.⁵ The early complications may be subcutaneous emphysema, pneumothorax or pneumomediastinum, accidental decannulation, tube blockade, wound infections, tracheal necrosis, secondary hemorrhages or swallowing problems. Late ones include granuloma formation, trachea-oesophageal fistula, trachea-cutaneous fistula, tracheoinnominate artery erosion, laryngotracheal stenosis or external wound scarring^{4,5,6}.

The aim of the present study was to evaluate the common indications and subsequent complications associated with tracheostomy in our set up.

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MATERIALS AND METHODS

A series of 127 consecutive patients who had tracheostomy performed over a period of 23 months from 1st February 2007 to 31st December 2009 were included in our study. All procedures were performed by either a consultant ENT specialist or a senior resident in ENT department having an experience of at least over two years in the field. No tracheostomies were performed at the bedside. Only patients aged 18 years and over at the time of surgery were included in the study group. All the tracheostomies were performed using a standard technique, with occasional minor modifications based on personal preferences. All tracheostomies were performed using a transverse skin crease incision. Strap muscles were separated in the midline. The thyroid isthmus was retracted superiorly. A vertical tracheal incision was made at the level of the third or fourth tracheal ring. A cuffed Portex tracheostomy tube was used in all cases during first tracheostomy tube insertion. The tube flanges were held in place using silk sutures and retained also by tapes passed around the neck. Apart from those requiring ventilatory support or the protection of the lower airways from an incompetent larynx, the tracheostomy tube was changed on the 3rd to 4th postoperative day. All patients received humidification of their inspired air and regular tracheobronchial suction using a fine sterile catheter during the early postoperative period. This care was administered by ward nursing staff trained in tracheostomy care. The patients were observed in the intensive care unit of the ward for at least twenty four hours. Patients were only managed in a hospital intensive care unit postoperatively if the patient's general condition required it or if ventilatory support was necessary. When the tracheostomy was no longer required, the tube was occluded initially on alternate hours followed by overnight occlusion to confirm the adequacy of laryngeal airway. The tube was then removed and an airtight dressing applied. Operative closure was done only in those cases where a persistent tracheocutaneous fistula was formed.

RESULTS

Out of 127 patients who underwent tracheostomies over a 23 month period at our hospital, 86 were males (67.7 %) and 41 (32.3%) were females with an overall male to female ratio of 2:1. These patients were in ages ranging from 18 years to 83 years with a mean age of 49.3 years. Ninety three (73%) of these procedures were elective, whilst the rest 34

patients underwent this procedure on emergency basis.

Almost a half of the elective tracheostomies (45 patients) were performed for head and neck surgeries. Twenty patients (15.7%) required the procedure to assist during laryngeal surgery where as in 17 cases (13.3%) it was done to assist prolonged ventilation. For emergency tracheostomies, the most common indication in our series was for intubation assistance in 12 patients (9.4%) followed by 8 cases of maxillofacial trauma (6.2%) and 7 cases of neck space infections (5.5%). Other less common indications were for laryngeal trauma and head and neck tumors. (Table 1)

The most common complication that we recorded was haemorrhage (49). In 43 cases it was from skin edges and resolved spontaneously. In 6 patients they were taken to main operation theatre where cautery or ligation was done. In these patients the peritracheal fascia was seen in three while two were from thyroid isthmus and in one patient it was from ant jugular veins on both sides. In the last patient tracheostomy was done under local anaesthesia. The bleeding was so dubious that patient was twice taken to operation theatre and the bleeding site was missed due to retraction compression of vein by retractor. Blood transfusion was done only in this patient. The next common complication was infection, mild to moderate wound infection was seen in 31 cases (24.4%). Out of 31 cases of wound infection, only 3 (10%) were severe enough to be alarming and required immediate removal of tube and drainage. Rest of these wound infections (22.0%) were minor and resolved with regular local wound care. We observed accidental decannulation in 4 patients (3.1%) in the ward settings with successful recannulation by ward staff immediately. False passage was observed in 6 patients (4.7%). In all these cases tracheotomy was done by the junior colleagues under emergency situation and the successful cannulation was done with immediate help of anaesthetist and the senior colleague. Surgical emphysema was observed in 18(14.6%) of the cases, out of which 7 patients (5.5%) has to be admitted to intensive care facility due to seriousness of their condition. Two of our patients (1.6%) presented with pneumothorax although we were not able to identify any predisposing factor. Chest tube was inserted in these cases by the thoracic surgery colleagues. Eleven (8.7%) of these presented with blockade of the tracheostomy tube and crusts in the trachea. For these patients, emergency fiberoptic bronchoscopy was performed to remove mucus plugs and crustings. Unfortunately, one of these was so severe that the patient expired before the plugging

material could be removed. The complications and their frequencies are summarized on Table .2.

Table 1: Indications for tracheostomy and their frequencies.

Elective (n= 93)		
Head and neck surgery	45	35.4%
Prolonged ventilation	17	13.3%
Neurological problem	7	5.5%
Laryngeal surgery	20	15.7%
Miscellaneous inflammatory conditions	4	3.1%
Emergency (n = 34)		
Maxillofacial Trauma	8	6.2%
Intubation assistance	12	9.4%
Laryngeal trauma	2	1.6%
Head and Neck tumors	5	3.9%
Neck space Infection	7	5.5%

Table 2: Frequency of early post operative complications:

Complications	Males	Females	TOTAL
Hemorrhage	37	12	49(38.5%)
Mild wound infection	21	7	28(22.0%)
Moderate wound infection	2	1	3(2.4%)
Accidental decannulation	4	0	4(3.1%)
Pneumothorax	2	0	2 (1.6%)
Tube blockade	9	3	11(8.7%)
False passage	2	4	6 (4.7%)
Surgical emphysema	12	6	18 (14.2%)

DISCUSSION

The procedure of tracheostomy is indeed life saving at many occasions and has been used to bypass upper airway obstruction for many centuries². Historically it was associated with a high risk of complications and a significant mortality rate¹. Over the period, this procedure was extensively modified; whilst retaining the basic concept of the procedure, with retrospective analysis of the surgical technique and observing the long term maintenance of these patients. Several studies have shown that the complication rate is higher in children than in adults^{4,8}, particularly in neonates and infants. The reported complication rates in adults undergoing tracheostomy vary considerably. It is generally held that complications are more frequent after emergency tracheostomy for airway obstruction^{5,9}. There are, however, few studies available where a comparison is made between elective and emergency tracheostomies in adults.

Bleeding tracheostomy is one of the earliest & common post operative complications in our study. This is in concordance with study of Shahabi et al⁷ and Prowse S, Kelly G¹⁰. Although the bleeding site varied in various studies, in our study the commonest bleeding site was from skin edges followed by

peritracheal fascia. Prowse S and Kelly G recommended floseal for this situation but bleeding spontaneously stopped in all our cases by simple pressure packing around the skin edges¹⁰.

As with any other wound, the tracheostomy site also shows propensity to varying degrees of wound infections. Shahabi et al⁷ observed a 4% stomal infection rate in his series, which is much lower than our observation of 24.4%. This significant difference may be justified considering the fact at defining what grade of infection is being considered. Although an overall infection rate of 24.4% was observed in our study but only 3 of these patients (2.3%) had infections of moderate to severe nature.

A total of four patients (3.1%) had problems with accidental decannulation of the tracheostomy. This is significantly lower to the rate reported by Waldron et al whose series reported a 6% decannulation rate⁵. Another study by Shahabi et al⁷ reported a 2% decannulation rate which was lower than our observation. In all cases rapid replacement of the tube was possible, and none of the patients suffered a significant hypoxic episode. The problem of tracheostomy tube displacement highlights the need for close supervision of these patients by nurses trained in the care of tracheostomies^{11,12}. It also draws attention to the problem of securing the tracheostomy tube adequately.

Surgical emphysema is visually graphic complication that occurs when air enters the facial planes^{6,10} Shahabi et al⁷ reported 4% rate of surgical emphysema which was significantly lower than our observation which was at 14%.

Tracheostomy tube causes significant irritation of mucosa of tracheobroncheal tree leading to increased production of mucus^{13,14}. This may cause obstruction of the tube if not attended regularly by suction. We observed a 3.1% rate of complete blockade of tube leading to a life threatening condition. Shahabi et al⁷ reported a 4% rate of this complication in his study. Unfortunately, even with our prompt intervention, one of our patients died before the blockade could be removed.

It should be noted that the complication rate varies widely depending on study design, patient follow up, and definition of the different complications. Numerous studies demonstrate a greater mortality rate and complication rate in emergency situations, ICU patients, and in children and infants.^{9,15,16} Tracheotomy in the pediatric population has consistently been associated with a greater mortality and complication rate as compared to that of adults. Recently there is a surge in the literature of percutaneous tracheostomy but in our set up the procedure is not in routine due to high cost and less availability of the equipment. Furthermore this

procedure is mostly done in the ICU setup by intensivists.

CONCLUSION

Even with an experience of over a century with the current tracheostomy technique, complications still occur and rarely with drastic consequences such as death. Caution on the part of trained staff is important to avoid such incidences. Aggressive nursing care is essential to prevent disastrous complications.

REFERENCES

1. Watts J McK. Tracheostomy in modern practice. *Br J Surg* 1963; 50: 954-75.
2. Dane T E, King E G. A prospective study of complications after tracheostomy for assisted ventilation. *Chest* 1975;67:398-404.
3. Durbin CG. Indications for and timing of tracheostomy. *Respir Care* 2005;50:483– 7.
4. Itamoto CH, Lima BT, Sato J, Fujita RR. Indications and complication of tracheostomy in children. *Braz J Otorhinolaryngol* 2010;76:326-31.
5. Waldron J, Padgham N D, Hurley S E. Complications of emergency and elective tracheostomy: a retrospective study of 150 consecutive cases. *Ann Roy Coll Surg* (1990) vol. 72, 218-20.
6. Tsitouridis I, Michaelides M, Dimarelos V, Arvaniti M. Endotracheal and tracheostomy tube-related complications: imaging with three-dimensional spiral computed tomography. *Hippokratia* 2009, 13, 2: 97-100.
7. Shahabi I, Zada B, Imad, Ali M. Complications of conventional Tracheostomy. *J Postgrad Med Inst* 2005;19(2):187-91.
8. Adoga AA, Ma'an ND. Indication and outcome of pediatric tracheostomy: results from Nigerian tertiary hospital. *BMC Surgery* 2010,10:2.
9. Rana S, Pendem S, Pogodzinski MS, Hubmayr RD, Gajic AO. Tracheostomy in Critically Ill Patients. *Mayo Clin Proc.* 2005;80(12):1632-8.
10. Prowse S, Kelly G, The oozing tracheostomy - a novel application for Floseal; *Clin Otolaryngol.* 2011 Feb;36(1):94.
11. Afessa B, Hogans L, Murphy R. Predicting 3-day and 7-day outcomes of weaning from mechanical ventilation. *Chest.* 1999;116:456-61.
12. Heffner JE. Timing tracheotomy: calendar watching or individualization of care? *Chest.* 1998;114:361-3.
13. Dunham CM, LaMonica C. Prolonged tracheal intubation in the trauma patient. *J Trauma.* 1984;24:120-4.
14. Pena J, Cicero R, Marin J, Ramirez M, Cruz S, Navarro F. Laryngotracheal reconstruction in subglottic stenosis: an ancient problem still present. *Otolaryngol Head Neck Surg.* 2001;125:397-400.
15. Cooper JD. Trachea-innominate artery fistula: successful management of 3 consecutive patients. *Ann Thorac Surg.* 1977;24:439-47
16. Acute Respiratory Distress Syndrome Network. Ventilation with lower tidal volumes as compared with traditional tidal volumes for acute lung injury and the acute respiratory distress syndrome. *N Engl J Med.* 2000;342:1301-8.