

Original Research Article

Early complications of tracheostomy: a study on 100 patients at a single tertiary care centre

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ABSTRACT

Background: Tracheostomy is a life saving procedure, which when performed correctly greatly impacts the final outcome of the patient. Although uncommon, fatal complications have been known to occur. The present study was conducted to observe the incidence of early complications of tracheostomy in a tertiary care centre.

Methods: 100 consecutive patients subjected to tracheostomy were enrolled, and data pertaining to the indication, and intraoperative and early postoperative complications was collected.

Results: The overall incidence of complications was 77%, with 53% cases of intraoperative bleeding and 13% tube obstruction. A higher incidence of complications was noted in emergency procedures and pediatric tracheostomies. No mortality was seen in the present series.

Conclusions: Serious complications may be associated with tracheostomies, many of which can be avoided by meticulous surgical technique and postoperative care.

Keywords: Tracheostomy, Early complications, Bleeding

INTRODUCTION

Tracheostomy is one of the oldest life saving surgical procedures known with a wide range of indications including long-term mechanical ventilation, weaning failure, upper airway obstruction, bronchial toilet, and as part of another operation.^{1,2} It can be performed either as an emergency or as an elective therapeutic procedure.

Although when performed electively complications are uncommon and generally manageable, fatal complications can sometimes occur.³ Complication rates quoted in literature ranges from 6% to 66% for surgical tracheostomy, with pediatric patients being at a higher risk.^{4,5} Early complications include bleeding from the operative site, injury to the larynx or tracheal mucosa, forced insertion of tracheostomy canula resulting in pneumomediastinum, pneumothorax, hemorrhage, wound

complications and misplacement of canula, while tracheal stenosis, laryngeal stenosis and failed reinsertion of canula are some of the late complications.⁶

Our aim was to study the indications and early complications associated with emergency and elective tracheostomy in a tertiary care centre in India.

METHODS

The present study was conducted in the Department of Otorhinolaryngology and Head Neck Surgery at a tertiary care centre in Amritsar on 100 consecutive patients being subjected to tracheostomy. Approval of the Institute Research Council and Ethics Committee was obtained prior to patient accrual. The inclusion criteria were (i) patients with airway obstruction resulting in stridor (ii) prolonged intubation (iii) patients with aspiration of secretions; and (iv) anticipated airway obstruction.

The procedure was explained in detail to the attendant and informed written consent was taken as a part of ethical concern. All procedures were in accordance with the Helsinki declaration. Revision tracheostomy and patients who did not regain consciousness at the end of 1 week for evaluation were excluded from the study.

Surgical tracheostomy was performed in the operation theatre in all patients using conventional open surgical technique with all aseptic precautions, under local anaesthesia or monitored general anaesthesia depending on the general condition of the patient. All procedures were performed by a single surgeon to avoid surgeon to surgeon discrepancies. The choice of incision was randomly selected with half the patients subjected to a horizontal incision, while the remaining half underwent tracheostomy with vertical incision. Electrocautery was not used during the procedure. A cuffed Blue Line Ultra tracheostomy tube PORTEX was used with an inner diameter varying between 7 mm and 9 mm was used in adults. In children the size of tube to be used was calculated using the formula age- 3 ± 3.5 mm. The position of the tube in the trachea was confirmed by air blast and checking bilateral lung air entry by ambu bag ventilation in unconscious patients. At the end of the procedure, the tube was secured in position with sutures and ties.

Intraoperative blood loss was assessed by counting the number of 3 square inch gauze pieces used during the procedure. Each gauze piece was assumed to correspond to 10 ml blood loss, and to it was added the amount of fluid collected in suction. Blood loss more than 15 ml was considered as significant. Chest X-ray postero-anterior view and X-ray neck lateral view were performed within 6 hours postoperatively to look for subcutaneous emphysema, pneumomediastinum and pneumothorax. Tube dislodgement was observed for 24 hours, while tube obstruction and wound infection was observed for 7 days postoperatively. Recurrent laryngeal nerve palsy was assessed clinically by hoarseness and confirmed on 90 degree Hopkins telescope examination. The presence of tracheoesophageal fistula was assessed clinically in all conscious patients by administration of fluids orally and leakage through the tracheostome. These early complications were entered on the proforma as yes or no if present or absent respectively.

Statistical analysis was performed using statistical package for social sciences (SPSS) software version 22 for windows. Chi square test was used to test for the significance of association between variables. The level of significance was considered as $p < 0.05$.

RESULTS

Patient characteristics

The present prospective study was conducted on 100 consecutive patients subjected to tracheostomy from January 2014 to June 2015. The study population comprised of a majority of males (72%), while 28% were

females. The mean age of the patients was 46.03 years (range 1.5 to 84 years), with 6% patients in the pediatric age group i.e. 17 years and below, 43% were middle-aged (18-45 years), while 51% were over 45 years (Table 1).

Table 1: Characteristics of patients, incidence of complications, incision and indication of tracheostomy.

Patient characteristics	Total (n=100)
Gender	
Male	72
Female	28
Age group	
1-17 years	6
18-45 years	43
>45 years	51
Incision	
Horizontal	50
Vertical	50
Complications	
No	23
Yes	77
Emergency tracheostomy (n=27)	
Ca oropharynx	2 (7.4)
Ca hypopharynx	5 (18.5)
Ca larynx	14 (51.9)
Trauma	3 (11.1)
Others	3 (11.1)
Elective tracheostomy (n=73)	
Prolonged Intubation	58 (79.4)
Anticipated airway obstruction	14 (19.2)
Aspiration	1 (1.4)

Indications

All cases of emergency tracheostomy were done in patients presenting with upper airway obstruction. Of these, carcinoma larynx was the commonest indication, seen in 14 of the 27 cases (51.9%), while there were 5 (18.5%) cases of carcinoma hypopharynx and 2 (7.4%) cases of carcinoma oral cavity. Three (11.1%) cases had laryngeal trauma, while there was one case (3.7%) each of carcinoma thyroid, sepsis and tracheal stenosis presenting with stridor (Table 1).

Of the 100 cases, majority i.e. 73% were elective procedures, while 27% were emergency procedures. Among the 73 patients operated electively, 58 (79.4%) patients were tracheostomised due to prolonged intubation, of which most of the cases (81%) were of head injury. Fourteen patients (19.2%) were operated on for anticipated airway obstruction, of which 5 (35.7%) patients were of carcinoma oral cavity undergoing surgery, 4 (28.6%) cases of burns and 3 (21.4%) and 2 (14.3%) cases of tetanus and maxillofacial injuries respectively (Table 2).

Table 2: Indications of elective tracheostomy (n=73).

Indication		n (%)
Prolonged intubation (n=58)	Head injury	47 (81.1)
	Cerebrovascular accident	3 (5.2)
	Pneumonia	2 (3.4)
	Gastrointestinal perforation	2 (3.4)
	Others	4 (6.9)
Anticipated airway obstruction (n=14)	Carcinoma oral cavity	5 (35.7)
	Burns	4 (28.6)
	Tetanus	3 (21.4)
	Maxillofacial trauma	2 (14.3)
Aspiration (n=1)	Head Injury	1 (100)

Table 3: Incidence of complications across various groups of patients.

Complication	Elective tracheostomy (n=73)		Emergency tracheostomy (n=27)		Age						Tracheostomy incision			
					<17 (n=6)		18-45 (n=43)		>45 (n=51)		Horizontal (n=50)		Vertical (n=50)	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Bleeding	37	50.7	16	59.3	5	83.3	21	48.8	27	52.9	37	74.0	16	32.0
Pneumo-mediastinum	2	2.7	2	7.4	1	16.7	3	7.0	0	0	2	4.0	2	4.0
Pneumo-thorax	1	1.4	1	3.7	0	0	0	0	2	3.9	1	2.0	1	2.0
Tube dislodgement	5	6.8	0	0	0	0	3	7.0	2	3.9	5	10.0	0	0
Tube obstruction	12	16.4	1	3.7	0	0	5	11.6	8	15.7	12	24.0	1	2.0
p value	0.177				0.337						0.177			

Complications

The present study aimed to evaluate the incidence of early postoperative complications, which included those occurring up to 1 week following the procedure. The overall incidence of complications was 77%, with the commonest being intraoperative bleeding seen in 53% patients. This was followed by tube obstruction seen in 13%, and tube dislodgement, pneumomediastinum and pneumothorax seen in 5%, 4% and 2% cases respectively (Table 3).

Bleeding

The incidence of intraoperative bleeding was slightly higher among emergency procedures i.e. 59.3% (16 of 27 patients) compared to 37 of the 73 elective procedures (50.7%). On comparing the incidence among different age groups, children had the highest incidence of intraoperative hemorrhage seen in 5 of the 6 cases (83.3%), while it was comparable in the middle-age and elderly groups with 48.8% and 52.9% respectively. There was a significantly higher incidence in patients subjected to a horizontal skin incision with 37 (74%) patients, while only 16 (32%) patients with a vertical skin incision had significant intraoperative bleeding.

Pneumomediastinum and pneumothorax

Both these complications were more commonly seen in the emergency group with 7.4% and 3.7% incidence of pneumomediastinum and pneumothorax respectively, compared to 2.7% and 1.4% in the elective group respectively. Looking at the age groups of the 4 cases of pneumomediastinum, one was among the 6 pediatric tracheostomies (16.7%), while 3 belonged to the middle-age group (7%). None of the cases of pneumomediastinum were among the elderly age group, while both the cases of pneumothorax were from the elderly age group. Pneumomediastinum and pneumothorax were equally distributed among patients with horizontal and vertical incisions with 2 cases (4%) each, and 1 case (2%) each of pneumomediastinum and pneumothorax respectively.

Tube dislodgement

All 5 cases of tube dislodgement belonged to the elective group and patients given a horizontal skin incision. Three of the 5 cases were in the middle-age group (7%), while 2 (3.9%) were in the elderly age group. No case of tube dislodgement was seen in the pediatric age group or in patients with a vertical skin incision.

Tube obstruction

Twelve of the 13 cases (92.3%) of tube obstruction were seen in the elective group, with an incidence of 16.9% and in patients with horizontal skin incision with an incidence of 24%, while only one case was seen among the emergency cases (3.7%) and in patients with vertical skin incision (2%). Looking at the age distribution, 5 (11.6%) were in the middle-age group, while 8 (15.7%) were in the elderly age group. No case of tube obstruction was observed in pediatric patients.

There were no cases of wound infection, recurrent laryngeal nerve palsy or tracheoesophageal fistula seen in the present study. Also, no mortality was attributed to tracheostomy in our study.

DISCUSSION

Tracheostomy is a life-saving procedure commonly performed in critical patients, and involves creating an opening in the trachea and exteriorizing it to the cervical skin.^{7,8} In the present study, majority of patients belonged to the elderly group over 45 years and middle-age group (18-45 years), while only 6 patients were 17 years and below. Also, a significant male preponderance was observed with 72% cases being male. This could be due to the increased susceptibility of males belonging to middle-age and elderly age group to laryngopharyngeal malignancy with airway obstruction, and cerebrovascular accidents and trauma, necessitating prolonged intubation with assisted ventilation and hence subsequent tracheostomy. A similar demographic picture was also seen in other studies.^{7,9}

Most of the tracheostomies are performed electively, while few are done as an emergency procedure.¹⁰ In our series of 100 cases too, 73% were elective and 27% were performed as an emergency procedure. Common indications for elective tracheostomy include prolonged ventilator dependence, tracheal toileting and foreign body aspiration, while emergency tracheostomy is performed for upper airway obstruction due to laryngeal neoplasms, maxillofacial or laryngeal trauma, burns and upper airway infection.¹¹ A similar picture was seen in our study, wherein the commonest indication for elective tracheostomy was prolonged intubation (79.4%), while upper airway obstruction was present in all patients undergoing emergency tracheostomy.

Tracheostomy is a procedure with uncommon but serious postoperative complications which have an impact on the final outcome of the patient. Complication rates varying between 6 and 66% have been reported in literature, depending on the patient population. The rate of complications in our series was 77%, with 53 (68.8%) patients of intraoperative hemorrhage more than 15 ml. This is in concurrence with other series in which bleeding from the surgical wound was the most common early complication observed.^{12,13}

Tracheostomy is a procedure with uncommon but serious postoperative complications which have an impact on the final outcome of the patient.¹² Complication rates varying between 6 and 66% have been reported in literature depending on the patient population, while the mortality associated with the procedure ranges from as low as 0-5% to up to 14%.^{7,13} Although no mortality was observed in the current study, the rate of complications was 77%. The majority i.e. 53 (68.8%) patients were of intraoperative hemorrhage more than 15 ml. This is in concurrence with other series in which bleeding from the surgical wound was the most common early complication observed.^{12,13} The high rate intraoperative bleeding noted in our study could be since we did not use electrocautery for hemostasis even though all procedures were performed in the operation theatre. Bleeding was more commonly seen in patients subjected to a horizontal skin incision probably due to injury to the anterior jugular veins encountered in this approach, and also was present in 5 of the 6 pediatric tracheostomies. This can be explained by the fact that pediatric tracheostomies are more technically challenging and difficult, resulting in higher rates of complications.

The incidence of pneumomediastinum and pneumothorax in our study was 4% and 2% respectively. This typically occurs due to the dissection of air along a tract anterior to the trachea by positive pressure ventilation. In literature, the incidence ranges from 0-5%, although many of these are not clinically significant. In view of this, Smith et al recommended a chest x ray only in patients with clinical signs and symptoms of pneumothorax, or after a difficult tracheostomy.¹⁴ In our study, both pneumomediastinum and pneumothorax were more commonly seen in emergency tracheostomies than elective tracheostomies since these were done in sick patients in less than optimal conditions. This is consistent with studies which report a higher incidence of complications in emergency tracheostomies.¹⁵

Tracheostomy tube dislodgement and tube obstruction are two extremely hazardous and potentially fatal complications of tracheostomy, especially so in the early postoperative period. Tracheostomy tube dislodgement can be prevented by securing the flanges of the tracheostomy tube by means of sutures or ties.¹⁶ In our study, despite securing the tracheostomy tube with sutures and ties, inadvertent tube dislodgement was noted in 5%. In a study by Süslü on 136 tracheostomies, accidental decannulation was the commonest complication in children.¹² However contrary to this, all 5 cases of tube dislodgement in the present study were observed in adults.

Obstruction of the tracheostomy tube usually occurs due to inspissated secretions, blood clots, insertion of the tracheostomy tube into a false tract anterior to the trachea, or due to impingement of the tube orifice against the tracheal wall due to faulty tube selection. The incidence of tube obstruction in the present study was 13%, while Trotter et al observed tube obstruction of

>25% of the tube in 57% of their patients.¹⁷ None of the cases of tube obstruction in the present study were children, probably due to more attention to humidification and periodic suctioning of the tracheostomy tube in them.

It can be observed from Table VI, that all the three intraoperative complications viz. bleeding, pneumo-mediastinum and pneumothorax were more frequently observed in the emergency group compared to the elective group, though this difference was not significant. This is in concordance with most studies reporting an incidence of complications as high as five times in emergency cases compared to elective cases.^{18,19} However, conflicting results were observed in the study by Waldron et al on 150 consecutive tracheostomies which did not find any significant difference between both groups, and the study by Khan et al on 106 cases in which the complication rates were in fact higher in the elective group due to poor patient optimization and deranged clotting and biochemical profiles.^{20,18}

CONCLUSION

Tracheostomy is a procedure which when performed correctly can dramatically improve the outcome in critically ill patients. However, serious and potentially fatal complications have been known to occur. The overall rate of complications in the present study was 77%, and was higher for emergency tracheostomies and in children. Bleeding was the most common complication observed. All complications are preventable by meticulous attention to technique intraoperatively and adequate care postoperatively.

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