

# Incidence of Complications of Tracheostomy and their Management

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## ABSTRACT

**Objectives:** To list and classify complications of tracheostomy, to list factors leading to complications and to manage the complications once diagnosed and measure their outcome.

**Study Design:** Cross sectional descriptive study.

**Setting:** ENT Department, Jinnah Hospital, Lahore.

**Duration of Study:** Six months (1<sup>st</sup> April 2009 to 30<sup>th</sup> September, 2009)

**Patients and methods:** The study was carried out on fifty patients who underwent tracheostomy. The complications of tracheostomy were divided into early occurring during the first 24 hours, intermediate occurring from 1 to 14 days and late were seen after 14 days.

**Results:** The early complications are hemorrhage (16%), cardiac arrest (4%), apnoea (8%) and damage to local structures (8%). The intermediate complications include displacement and dislodgement of the tube (20%), surgical emphysema (8%), pneumothorax (4%), scabs and crusts formation (8%), infection (12%) and tracheoesophageal fistula (4%). The late complications observed in this study are tracheal stenosis (2%), difficult decannulation (8%) and tracheocutaneous fistula (2%). The commonest complications observed are displacement and dislodgement of the tracheostomy tube and hemorrhage.

**Conclusion:** The common age group was between 61-70 years. The males were predominantly affected. The majority of the patients presented in the emergency and common symptoms were stridor and dyspnoea.

**Key words:** Complications, Tracheostomy, Management.

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## INTRODUCTION

Tracheostomy is a life saving surgical intervention to make an opening or hole into the trachea. It can be done electively or as an emergency procedure<sup>1-2</sup>.

Tracheostomy is preferred over prolonged intubation because prolonged intubation results in mucosal ulceration, fibrosis and later on stenosis. Intubation granuloma is well documented in patients with prolonged endotracheal intubation<sup>3</sup>.

The procedure of tracheostomy has been known for about 3500 years but it was rarely performed until 1800<sup>9</sup>. During 1546 to 1833 (period of fear), tracheostomies were performed only by a few brave surgeons, often at the risk of their reputation<sup>4</sup>.

The incidence of overall complications of tracheostomy currently ranges from 5-40%. Generally accepted risk of complications is around 15% with most common being haemorrhage, tube obstruction or tube displacement. Besides these, the other known complications are scabs and crusts formation, dysphagia, difficulty with decannulation of the tracheostomy tube and tracheal stenosis<sup>5,6</sup>.

Death occurs in 0.5% to 1.6% of patients and is most commonly caused by haemorrhage or tube displacement.<sup>15</sup> Moreover, emergency tracheostomy carries a two to five fold increase in incidence of complications over an elective procedure<sup>7,8</sup>.

This study was carried out to observe the situation with tracheostomies, follow their progress and assess factors which lead to minor or major complications. This study has also suggested ways of managing such complications. The overall rationale of the study was to minimize the problems associated with tracheostomies.

## MATERIALS AND METHODS

The study was conducted on 50 patients undergoing tracheostomy for a period of six months (1<sup>st</sup> April 2009 to 30<sup>th</sup> September, 2009) in ENT Department, Jinnah Hospital Lahore. Inclusion Criteria are all ages and both sexes, subjects undergoing emergency or elective tracheostomy, surgery under local / general anaesthesia. Exclusion criteria are terminal disease patients, patient with concurrent head and neck surgery, patients not coming for follow up. All the patients undergoing tracheostomy will be admitted in the ward. Detailed history of patient regarding his / her illness will be taken. His / her demographic profiles will be noted and reasons for the surgery will be identified. Clinical examination like indirect

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laryngoscopy (IDL), flexible nasolaryngoscopy, stroboscopy and surgical procedure like direct laryngoscopy (DL) will be done to see the extent of disease and to take biopsy for histopathological diagnosis of the disease. X-rays chest, blood culture and local swab for C/S, bleeding profile will be taken in cases having complications.

The results will be analyzed using SPSS (version 10). Regarding complications, their types, severity, physical site, recovery time, correlation with age / sex, correlation with type of disease and surgery will be noted. The managements procedures adopted for complicated cases will be analysed clinically, subjectively and objectively. Recovery time (quantitative data) will be analyzed by “t” test and types of complications, severity, physical site, correlation with age/sex, correlation with type of disease and surgery will be analyzed by Chi square test (qualitative data).

**RESULTS**

Fifty patients who underwent tracheostomy in the ENT Department, Jinnah Hospital, Lahore are included in this study. The different complications observed can be divided into early (occurring within 24 hours), intermediate (1-14 days) and late (after 14 days). The early complication were haemorrhage (16%), cardiac arrest (4%), apnoea (8%) and damage to local structures (8%). The intermediate complication include displacement and dislodgement and dislodgement of the tube (20%), surgical emphysema (8%), pneumothorax (4%), scabs and crusts formation (8%), infection (12%) and tracheoesophageal fistula (4%). The late complication observed in this study are tracheal stenosis (2%), difficult decannulation (8%) and tracheocutaneous fistula (2%). The commonest complications observed were displacement and dislodgement of the tracheostomy tube and haemorrhage. (Table 1). Maximum number of patients were in sixth decade of life (Table 2).

The maximum number of patients who underwent tracheostomy were males. Thirty four patients were male and 16 patients were female. Thirty six patients were admitted through emergency and 14 patients were admitted through outpatient department. The analysis of the presenting symptoms revealed that stridor was the commonest presenting complaint and was present in 21 patients. Three patients had stridor and dysphagia, 14 patients presented with dyspnoea and trismus was the mode of presentation in 12 patients. (Table 3)

Thirty nine patients (78%) underwent emergency tracheostomy while elective tracheostomy was done in 11 patients (22%). In 42 patients (84%) tracheostomy was performed under local

anaesthesia. General anaesthesia was given to 8 patients (16%). Vertical incision was given in 30 patients (60%) and horizontal incision was used in 20 patients (40%).

The physical site of complication was tracheostome in 26 patients (52%), operation field in 12 patients (24%), chest was the site of complication in 6 patients (12%), lung apex in 3 patients (6%) and cricoid cartilage was the site of complication in 1 patient (2%). In 38 patients (76%) the complications were severe and 12 patients (24%) severity of complications was moderate.

In 25 patients (50%) in whom early complications were observed the recovery time from the complication was found to be 15.56 ± 3.12 minutes and in 10 patients who had intermediate complication the recovery time was found to be 20.15 ± 2.35 minutes. In 15 patients in whom the late complications were observed the recovery time was found to be 22.17 ± 4.49 minutes. When recovery time for early complication was compared with that of intermediate complication, P value was <0.05 and this shows a significant difference between the recovery time of early and intermediate complication. When the recovery time of intermediate and late complication was compared, P value was >0.05 and it is not significant (Table 4).

Thirty one patients (62%) were managed surgically and 19 patients (38%) were managed by conservative measures.

Table 1: Complications of Tracheostomy

Type of Complication	=n	%age
<b>Early</b>		
Haemorrhage	8	16.0
Cardiac arrest	2	4.0
Apnoea	4	8.0
Damage to local structures	4	8.0
<b>Intermediate</b>		
Displacement dislodgement of tube	10	20.0
Surgical emphysema	4	8.0
Pneumothorax	2	4.0
Scabs & crusts formation	4	8.0
Infection	6	12.0
Tracheoesophageal fistula	2	4.0
<b>Late</b>		
Tracheal stenosis	1	2.0
Difficult decannulation	4	8.0
Tracheocutaneous fistula	1	2.0

Table 2: Frequency Distribution of Age

Age (Years)	=n	%age
6-15	6	12.0
16-30	11	22.0
31-45	5	10.0
46-60	13	26
61-70	15	30.0
Total	50	100.0

Table 3: Presenting Symptoms of the subjects

Symptom	=n	%age
Stridor	21	42.0
Stridor and dysphagia	3	6.0
Dyspnoea	14	28.0
Trismus	12	24.0
Total	50	100.0

Table 4: Recovery time of complications

Type of Complication	Mean ± SD	P value
Early	15.56 ± 3.12	P<0.05
Intermediate	20.15 ± 2.35	P>0.05
Late	22.17 ± 4.49	

SD = Standard Deviation

## DISCUSSION

In my study 50 patients, the commonest complications observed were displacement and dislodgement of the tracheostomy tube. This complication was seen in 10 patients (20%), out of which 7(14%) were male and 3(6%) were female. In 8 patients the presenting symptoms was stridor and dyspnoea which was moderate to severe intensity. In other 2 patients, trismus or inability to open the mouth was the presenting symptom. The factors which were seen to be responsible for this complication were the inappropriate length of the tracheostomy tube and postoperative cough and struggling on the part of the patient. Another important factor was postoperative edema, haematoma and emphysema occurring in these patients. They caused an increase in the distance between the skin surface and anterior tracheal wall and resulted in displacement and dislodgement of the tube.

Hemorrhage was the next most common complication observed in this study. This complication occurred in 8 patients (16%), 5 were male and 3 patients were female. In seven patients, the presenting symptoms were stridor and respiratory distress, one patient presented with convulsions.

In another study, hemorrhage during the procedure is rare but even minor bleeding can be life-threatening if it interferes with the identification of the trachea or gaining access to the airway. The incidence of operative and early hemorrhage is reported to be approximately 5%. Bleeding during the performance of a tracheostomy is most commonly the result of errors in surgical technique<sup>9</sup>.

The hemorrhage which occurred was moderate to severe in intensity and was due to damage to the anterior juglar veins and thyroid isthmus. In another study, tracheal stenosis overtook hemorrhage as the leading complication by 2 to 1<sup>10</sup>. Bleeding was controlled by ligation of the bleeding points and cauterization was done by diathermy. Hemorrhage

during tracheostomy can be prevented by gently retracting the vessels in the operation field.

One of the most dramatic and fatal complications of tracheostomy is massive hemorrhage. The cause of massive hemorrhage is usually related to erosion of the innominate artery although erosion of the right carotid artery has also been reported. The incidence of tracheoinnominate artery fistula has been reported to be 0.4 to 4.5%. innominate artery rupture has been associated with tracheal necrosis secondary to infection and from erosion from the tracheostomy tube. While the most frequent site of fistula formation is at the distal end of the tube, low placement of the tracheostomy as well as a high innominate artery is also associated with tracheoinnominate artery fistula<sup>9</sup>.

The third common complication seen was infection. This occurred in 6 patients (12%) in which 4(8%) were male and 2(4%) were female. The stridor and dyspnoea was present in 3 patients and dysphagia and dyspnoea was the presenting symptom in one patient.

In another study conducted by Stauffer<sup>11</sup> sternal infection has been reported to be as high as 36% the incidence of cellulitis and purulence has generally been reported at 3 to 8%.

The complication of infection is avoidable if the procedure is carefully performed together with strict postoperative management. Those patients who require long term tracheostomy must be on regular follow-up and taught home-care of the tracheostomy before discharge from the hospital. This complication was managed conservatively by removing the sloughs and pus. Intravenous antibiotics were given for 7 to 10 days and intravenous fluids were given according to the hydration status of the patient.

Apnoea was another complication observed in this study. This complication was encountered in 4 patients (8%), 2 were male and other 2 were female.

Stridor and dyspnoea was the presenting symptom in 2 patients, 1 patients has stridor and trismus. Dyspnoea and dysphagia was the presenting symptom in the fourth patient.

This was due to the sudden discharge of retained carbon dioxide from within the lungs when the obstruction was suddenly bypassed by making a hole in the trachea.

Pneumothorax is a well-recognized complication following tracheostomy. The incidence in adults has been reported at 2 to 5%. In children, the incidence may be as high as 17% and is the single most fatal complication. The exact cause of this complication is not always readily apparent. The accepted mechanism is that, during the forceful inspiratory movements of the respiratory obstruction, high negative intrathoracic pressures are developed. Through the incision of the skin and cervical fascia,

an initial pathway is established for aspiration of air though the wound edges into the mediastinum. The air is trapped, and as sufficient pressures develop, rupture through the pleura causes a pneumothorax. Less common causes include the rupture of a lung bleb or direct injury to the apical pleura<sup>12</sup>.

Another study done by Rabuzzi and Reed<sup>13</sup> the rate of intrathoracic complications in children was nearly 70%. Prevention of pneumothorax in tracheostomy begins with meticulous operative technique with emphasis on maintaining a midline dissection and minimizing the amount of dissection.

Tracheal stenosis is another recognized complication of tracheostomy occurring in 2% of the patients. Injury to the cricoid cartilage, which is the only circumferential ring in the trachea, can lead to laryngeal stenosis. Stenosis typically occurs at the site of the tracheostomy or at the area irritated by cuff. Friman et al<sup>14</sup> Whereas in this study, the incidence was found 2%, which is comparable with international study.

Tracheoesophageal fistula complicating tracheostomy occurs with an incidence of 0.01%. these fistula complicating tracheostomy occurs with as posterior tracheal wall at the time of surgery or as the result of pressure necrosis of tracheoesophageal wall. It can occur by a stiff nasogastric tube. It may be manifested as marked increase in tracheal secretions or coughing while eating. Patients may develop gastric distention and a paralytic ileus as a result of ventilated air crossing into the esophagus.<sup>15</sup> in the present study, the incidence of tracheoesophageal fistula was 4%.

The complications of tracheostomy may be categorized by the interval from the procedure to the onset of the complication. While these complications do not strictly obey the labels of early and late, this convention is convenient. These complications range from the dramatic to the ordinary and while the incidence of all may be reduced, their elimination is near improbable. With the development of synthetics, improved tubes and low pressure, high volume cuffs have greatly reduced the morbidity associated with this procedure.

## CONCLUSION

The study of 50 patients who underwent tracheostomy provided information that displacement and dislodgment of tracheostomy tube, hemorrhage, pneumothorax, apnoea, cardiac arrest, infection, tracheal stenosis and tracheoesophageal fistula are the commonly observed complications of tracheostomy.

All patients who underwent emergency or elective tracheostomy were admitted and thoroughly investigated. In some patients emergency tracheostomy was done under local anaesthesia. In other elective tracheostomy was performed under general anaesthesia, if possible. There was no mortality related to tracheostomy operation. The complications which encountered during tracheostomy were identified and managed successfully. We can prevent the complications of tracheostomy by recognizing them at an early stage and managing them accordingly. These complications can be minimized by appropriate operative technique of the procedure and comprehensive postoperative care of the patients.

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