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Incidence of complications of emergency tracheostomy in a rural medical college setting: a prospective study

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ABSTRACT

Background: Tracheostomy done as an emergency procedure for the purpose of saving lives, is mostly associated with aerodigestive tract malignancies, though a few may be associated with foreign body aspiration. The incidences of complications intraoperatively as well as postoperatively are high in emergency tracheostomies. Few studies exist documenting the incidence of these complications .Thus this study was undertaken in a rural Medical College setting to find the incidence of complications associated with emergency tracheostomy.
Methods: After Institutional ethical committee clearance, a prospective study was conducted over a period of 2 years which included 120 patients of all ages and both genders, who presented to the emergency room with stridor. All tracheostomies were performed, using standard techniques, in the emergency operation theatre under monitored anaesthesia care or general anaesthesia. Complications were noted during the procedure as well as in the postoperative period at regular intervals upto one year and were categorized as immediate, intermediate and late.
Results: Though there was no case of mortality, the incidence of complications was 53.3%. The commonest immediate complication was haemorrhage (12.5%) followed by cardiopulmonary arrest (5%) and apnoea (3.3%). The commonest intermediate complications were infection (18.3%), crusting (12.5%), displacement of tube (8.3%) and bleeding (8.3%).Late complications noted were stomal stenosis (8.3%), keloid formation (5%) and tracheocutaneous fistula (3.3%).
Conclusions: Some of these complications can be avoided by early intervention as a semi emergency procedure when you first think about it. This can avoid the hazzle of hurried tracheostomy in a struggling patient thus bringing down the incidence of complications.

Keywords: Tracheostomy, Preoperative complications, Postoperative complications

INTRODUCTION

Tracheostomy is the surgical creation of an opening into the trachea through the neck with the tracheal mucosa being brought in continuity with the skin.[1] Being a lifesaving procedure most of the time, it is associated with high incidence of complications, possibly due to the close relation of trachea to important structures like thyroid, oesophagus, major blood vessels, nerves and superior mediastinum. Elective tracheostomy done for prolonged ventilation, prior to major orophayngeal surgeries, bronchial toilet for comatose patients[2] is not associated with as many complications as that associated with emergency tracheostomy. Complications range from simple apnoea, haemorhage, injury to adjascent structures in the intraoperative period to major complications like cardiac arrest, tube displacement, air embolism and tracheoarterial fistula.[3] Hence the need for a study arose

to evaluate the complications of tracheostomy as most of these complications are preventable.

METHODS

After Institutional ethical committee clearance, 120 patients of all ages and both genders, who presented to the emergency room with stridor due to varied reasons, were included in this prospective study. Tracheostomy attempted at other hospitals and cricothyrotomy were excluded from this study. After taking informed consent, a wide bore cannula was started on the upper limb, simultaneously taking blood samples for baseline investigations. Patient was shifted to the emergency operation theater under oxygen supplementation. Most cases were done under monitored anaesthesia care while some were performed under general anaesthesia. Taking universal precautions, with the patient in supine position with neck extended and after attaching mandatory monitors, the front of the neck was cleaned and draped. 2% lignocaine was infiltrated locally. Skin was incised in the midline, vertically from the lower border of the cricoids cartilage to the suprasternal notch.

The superficial muscles were separated by blunt dissection and thyroid isthmus was exposed and retracted upwards exposing the trachea. Second or third tracheal ring was incised by a midline vertical incision. The incision was dilated by introducing a tracheal dilator and a piece of cartilage was removed from both sides. Jacksons metal tracheostomy tubes were introduced in all cases except in cases which were performed under general anaesthesia where cuffed portex tracheostomy tube was introduced. The tube secured with tapes around the neck was regularly suctioned to remove secretions.

Presences of complications were noted at the time of surgery and in the postoperative period up to one year. Immediate complication was defined as complication occurring at the time of surgery. Intermediate complication were classified as complication occurring during the rest of his/her stay in the hospital and late complication was defined as complication occurring post discharge from the hospital up to one year after the procedure. All complications were treated appropriately.

RESULTS

Age of the patients in the study varied from 1.5 years to 90 years. The maximum number of patients belonged to the age group 61-70 years (42 patients-35%).There were no patients between age groups 11-30 years. One patient belonged to 81-90 year group. The second most common group of patients belonged to 51-60 years and were 34 in number (28.3%) (Figure 1)

Gender distribution showed that there was a strong male predominance with 112 out of 120 being males (Figure 2).

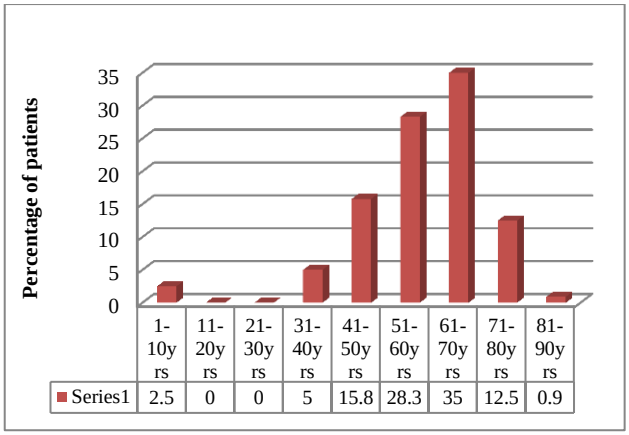

Figure 1: Age distribution of patients.

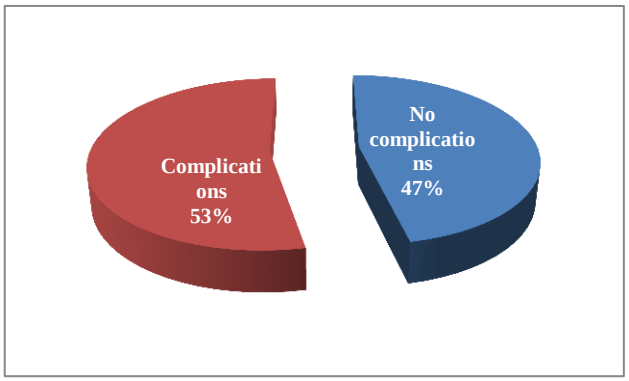

Figure 2: Gender distribution.

Indications for tracheostomy

The most common indication for tracheostomy was malignancy (106 cases out of 120).This was followed by infection (6 cases),trauma(5 cases) ,bilateral vocal cord palsy(3 cases).Of the malignancies ,carcinoma larynx accounted for maximum number of cases (69 cases), followed by hypophayrngeal malignancy(18 cases) ,thyroid malignancies (3 cases) and one case of non Hodgkins lymphoma involving the neck.

Of the 69 cases of laryngeal malignancy, 55 were glottic malignancies and 14 were supraglotic malignancies. There were no case of subglottic malignancies.

Of the 18 cases of hypopharyngeal malignancies, 10 cases were malignancy of the pyriform fossa and 8 cases were postcricoid malignancies (Table 1).

Of the 8 females, one patient presented with malignancy of the larynx, 5 with hypopharyngeal malignancy and 2 presented with infectious causes.

Presenting symptoms

All the 120 patients presented with stridor. In addition 81 of the cases also had change in voice, and 29 had dysphagia.

Table 1: Indications of tracheostomy.

Indications for tracheostomy			
Indications		**Number of cases**	**Total number of cases**
Carcinoma larynx	Glottic	65	84
	Supraglottic	19	
	subglottic	0	
Hypopharyngeal Carcinoma	Pyriform fossa	10	18
	Postcricoid	8	
Infection			6
Trauma			5
Bilateral vocal cord palsy			3
Ca Thyroid			3
NonHodgkins lymphoma			1
Total			120

Table 2: Incidence of complications.

Incidence of complications			
Type of complication		**Number of cases**	**Total number of cases**
Immediate	Haemorhage	15	25
	Cardiopulmonary arrest	6	
	Apnoea	4	
	Injury to adjacent tissues	3	
	Surgical emphysema	2	
Intermediate	Infection	22	64
	Crusting	15	
	Haemorhage	10	
	Tube dislodgement	10	
	Pneumothorax	2	
	Tracheooesophageal fistula	1	
Late	Stomal stenosis	10	20
	Keloid	6	
	Tracheocutaneous fistula	4	

Personal habits

87 patients were found to be addicted to both smoking and alcohol and 15 were addicted to smoking alone. 18 cases gave no history of any addictions. Out of the 8 females, one patient gave history of addiction to smoking.

Type of anaesthesia given and kind of tube used

114 cases were performed under monitored anaesthesia care and 6 cases were performed under general anaesthesia. Jackson's metal tube was inserted in all cases under monitored anaesthesia care, while portex tube was inserted in all cases performed under general anaesthesia.

Complications encountered

Out of the 120 cases, 56 cases (46.7%) had no complications at all. Of the 64 cases which showed complications, all showed more than one complication. (Figure 3)

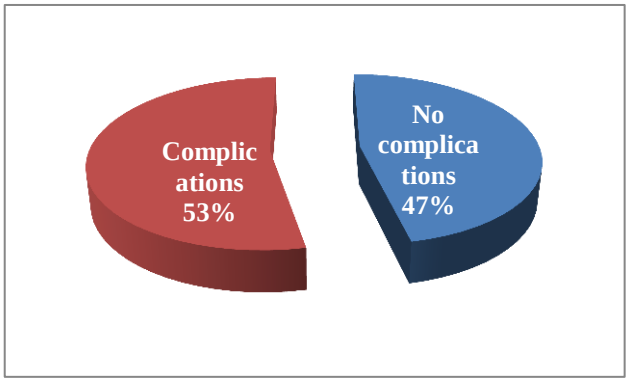

Figure 3: Incidence of complications.

In 25 cases immediate complications were encountered, the commonest being hemorrhage (15 cases), followed by

cardiopulmonary arrest (6 cases), apnoea (4 cases), injury to adjacent tissues (3 cases) and surgical emphysema(2 cases).

Out of 64 cases, 36 cases showed intermediate complications with most cases showing more than one complication. The commonest complication was infection (22 cases), crusting (15 cases), hemorrhage (10 cases), tube dislodgement (10 cases), pneumothorax (2 cases) and one case of tracheooesophageal fistula.

20 cases showed late complications. None of these cases showed more than one complication. Out of the 20 cases, stomal stenosis accounted for 10 cases, 6 cases showed keloid formation and 4 cases showed tracheocutaneous fistula.

Decannulation was done in 11 of the 120 cases which included all cases of infection and trauma.

Statistical analysis showed no significant difference in the incidence of complications between males and females, between adult and paediatric patients and between patients of age group 1-50 years and 51-90 years.

DISCUSSION

Tracheostomy became a common occurrence as a treatment of diphtheria and poliomyelitis in the 18th centuary.[4] Tracheostomy is a psychologically traumatizing surgery and not all patients are compliant to the procedure when first suggested to them.[5] This may be due to the fear of loss of voice, and disfigurement in appearance. Thus these patients present to us in the emergency room in a dire state of distress, which makes us have to perform the procedure in a hurried manner in a struggling patient. Because of this dire predicament that we have to face, the incidences of complications are also high in emergency tracheostomy cases.[6]

In this prospective study, maximum number of patients belonged to the age group of 61-70 years with males predominating females by the ratio 14:1. The increased incidence of tracheostomy in males may be attributed to occurrence of laryngeal malignancy more in males[7] and all trauma cases were males.[7,8]

The most common indication for tracheostomy was malignancy (88.3%) out of which laryngeal malignancy accounted for 79% (84 cases), followed by hypopharyngeal malignancy. Glottic carcinomas accounted for 78% of laryngeal cancers and the remaining were supraglottic cancers. The increased incidence of malignancy in this study is due to the fact that this institution is a major referral center in this region. In our study of 120 emergency tracheostomies, the incidence of complications was 53.3% which is much higher compared to studies by Chew John Y and Robert Cantrell of the Naval Hospital, Santiago who had an incidence of complication of 15.8% and a mortality of 1.6%.[9] Arola et al reported a complication rate of 46% in a retrospective study of 794 tracheostomised patients.[3] Gaudet et al showed a complication rate of 33% in a retrospective study of paediatric tracheostomies.[10] In our study we had no cases of mortality inspite of the incidence of complications being high.

There were 22 cases of infection in the postoperative period which accounted for the highest cause of complications which was followed by immediate haemorhage and crusting in the intermediate period. This was at par with the study by Arola et al where the commonest complication was infection.[3] In the study by Chew John Y et al the commonest complication was haemorhage.[9] The high rate of infection may be due to the hurried procedure and struggling patient predisposing to lack of proper asepsis.

Haemorrhage during the procedure accounted for complications in 15 cases. This may also be due to the noncompliant, struggling patient presenting as an emergency with severe respiratory distress.

Crusting leading to tubal occlusion also accounted for 15 cases of complications. The most frequent cause was obstruction with a mucus plug. Loss of humidification and subsequent thick pulmonary secretions may have contributed to this. This was at par with findings in a study by McClelland RM.[11] Crusting occurred as an intermediate complication while the patient was still admitted in the hospital. This can be prevented by humidifying inspired air with wet gauze placed over the tracheostomy and instillation of sodium bicarbonate 1 ml per hour. Also proper educations of care givers regarding care of tracheostomy may help to a great extend in preventing this complication.

Haemorhage in the intermediate period and tube dislodgement found third place in the incidence rate of complications. Haemorhage in the intermediate period is usually associated with infection. In our study infection was the commonest complication seen. This may account for 10 cases of heamorhage as an intermediate complication.

Tube dislodgement occurs as a result of improper tying of the tape connecting the tube around the neck. This should ideally be done with neck in flexion. If done with neck in extension the tapes loosen once the head is flexed leading to slipping of the tube in the postoperative period. Well trained nurses in tracheostomy care and properly securing the tape around the neck will help prevent this complication.[12] In our study we could replace the tube immediately thus preventing further problems.

Cardiopulmonary arrest occurred in 6 cases in the intraoperative period. Monitored Anaesthesia care, early detection and immediate intervention helped resuscitate these patients successfully without any sequelae. Studies

have shown that cardiac arrests inside the operation theater are successfully resuscitated in 90% cases.[13]

Apnoea occurred in 4 patients during tracheostomy. The main cause of this is the immediate wash out of carbondioxide which is the main stimulant of the respiratory center.[14] This responded well without any active intervention.

Pneumothorax, though rare is a known complication of tracheostomy.[15,16] Pneumothorax is a complication which is usually seen in children. In our study pneumothorax was seen in 2 adult patients both of whom were struggling for breath during the procedure. Closed intercostal chest tube drainage had to be put to treat the condition. Persisting dyspnoea in a patient even after tracheostomy should arouse suspicion of pnuemothorax .In these cases post procedure chest radiograph is mandatory.[17]

Subcutaneous emphysema is not a common complication of tracheostomy.[18] The common causes for this are mechanical ventilation at high pressures and extensive dissection into tissue planes and use of fenestrated tracheostomy tubes.[19,20] Our study showed 1.6% incidence of subcutaneous emphysema. The most probable cause for this may have been extensive tissue dissection.

Tracheooesophageal fistula is seen to form in prolonged cases of tracheostomy or tracheal intubation, where the cuff of the tube presses the anterior wall of the oesophagus against the rigid nasogastric tube causing ischemic necrosis of the oesophageal wall.[21] Our study showed one case of tracheooesophageal fistula. Here the cause of formation of tracheooesophageal fistula was progression of the malignancy.

Dulguerov et al in their study cited an incidence of 0.22% of keloid formation.[22] In a study by Waldron et al the incidence of keloid formation was seen to be 1.3% They attributed infection as the culprit for keloid formation in these cases.[12] In our study we encountered 5% incidence of keloid formation. This may be due to the high incidence of infection in our patients.

Tracheocutaneous fistulae form as a result of epithelialisation of tracheostomy orifice due to delayed healing.[23] In our study we had 4 cases of tracheocutaneous fistula. This may be due to the poor nutritional status of these patients. All 4 patients had history of tracheostomy site infection.

10 cases of stomal stenosis were noted but this was as a result of excessive scar tissue formation. No active intervention was needed for these cases.

Infection is an attributing factor to intermediate haemorhage, keloid formation and tracheocutaneous fistulae which put together attributed to 35% of complications in our study. Thus bringing down the rate of infection may significantly reduce the incidence of complications. The best way of controlling infection is early intervention in a semi-emergency situation. Moser's dictum that it is best to do tracheostomy when you first think about it thus becomes valid.

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