

A Cross - Sectional Study of Tracheostomy Complications and its Care in Tertiary Care Centre in Central India

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Abstract: **Background:** The present study was carried out with an objective to study the various indications of tracheostomy and complications arising during and after the procedure and its care. **Methods:** A prospective interventional study was carried out in ENT department during the period from July 2020 to July 2022. Total 237 patients (both pediatric and adult) undergoing tracheostomies for various indications were studied. The details of all participants such as demographic data, indications of tracheostomy, intra and postoperative complications were recorded and management of complications (if any) was done. **Results:** The tracheostomy was performed more commonly in middle age group (15 - 50 years). Males were more commonly subjected to tracheostomy as compared to females. Planned tracheostomies were more frequently performed, as most common indication of tracheostomy was assisted ventilation both in adult and children. The incidence of complications was 29.69% (71 patients), the majority happening during the early postoperative period. **Conclusions:** The main indication for tracheostomy in adult and children was assisted ventilation. Most common complication during emergency tracheostomy was surgical emphysema (9 cases i. e.12.68%) whereas most common complication during elective tracheostomy was tube displacement (8 cases i. e.11.27%). Most of the complications were managed conservatively.

Keywords: Tracheostomy, Indications, Complications, Tracheostomy Care

1. Introduction

The Greek word trakheia arteria, which literally translates to "rough artery," is the source of the English word trachea, which means windpipe. Tracheostomy is the maintenance of the trachea's communication with the exterior. Tracheostomy was seen as a risky procedure until the middle of the 19th century and was infrequently carried out.^{1,2}

All tracheostomies were initially performed just to clear an upper airway obstruction, now done in cases of head and chest injuries as well as other conditions when the patient's inability to maintain regular breathing and control of secretions results in a reduction in normal respiratory efficiency. as in situations of severe respiratory distress, sleep apnoea syndrome, and terminal malignant neoplasm.^{3,4}

The usage of tracheostomies has increased over the past few decades, which has led to a parallel rise in complications. by the procedures themselves, by the patient's age, general health, whether the tracheostomy is the primary procedure or a component of another procedure, the urgency of the procedure, the surgeon's skill, the timing of the procedure and the patient's postoperative care.

The patient's post - tracheostomy treatment requires a big staff that has undergone extensive training, sophisticated equipment, and a significant time and financial commitment. Be familiar with the complications of tracheostomy because prompt recognition and treatment may avoid prolonged unnecessary suffering.⁵

The purpose of the current study was to study the various indications for tracheostomy and various complications of tracheostomy. The other goals included comparing elective and emergency tracheostomies and to look over various post operative tracheostomy care given.

2. Material and Methods

This interventional cross - sectional study was conducted in department of ENT in a tertiary care centre in Central India, during the period from July 2020 to July 2022. Permission of Institutional Ethics Committee was taken. Patients undergoing tracheostomy and receiving post - operative care and giving consent for study were included.

During the study period, a total of 237 patients (both paediatric and adult) undergoing tracheostomies for various indications (presenting to ENT OPD and Emergency, in Wards of medicine, surgery, orthopedic, paediatrics, OMFS, neurosurgery, CVTS, ICUs.) were studied. All patients were properly evaluated including history and physical examination. Radiological investigations in form of X ray neck (AP view and Lateral view), CT head and neck done as and when required. 70 degree laryngoscopy also done wherever indicated. Haematological investigations including routine surgical profile and coagulation profile were done. All patients were subjected to open surgical tracheostomy with standard technique and appropriate sized PVC (polyvinyl chloride) tracheostomy tube used in all cases.⁹

A careful post - operative care was given to every patient including humidification, regular suctioning, cuff care, tracheostomy wound care and followed up till decannulation.

Complications like haemorrhage, apnoea during intra - operative period; tube displacement, tube blockage, surgical emphysema, stoma site infections, difficult decannulation, tracheal stenosis, accidental decannulation were looked during post operative period. The complications were managed accordingly using medical or surgical treatment modalities.

Once the condition necessitating tracheostomy was overcome, attempts were made for decannulation. The patients in whom decannulation as impossible were discharged along with the tube with full explanation of condition and limitations. In case of death of tracheostomized patient, during hospital stay or follow up, the cause of death was noted and any association with tracheostomy was analyzed.

Data was recorded and analyzed.

3. Observations and Results

This study included 237 patients who underwent tracheostomy in our institute and evaluated from July 2020 to July 2022. Of the 237 patients, 164 (69.20%) were males and 73 (30.80%) were female, so male: female ratio (M: F) was 2.25: 1 as shown in Table 1.

Table 1: Showing gender distribution and complications encountered.

Gender of the individual	No. of tracheostomies n=237	No. of complications (Percentage)
Male	164 (69.20%)	55 (33.56%)
Female	73 (30.80%)	16 (21.92%)

The age distribution of patients is depicted in Table 2. Most commonly tracheostomy was performed in middle age group (i. e.21 - 50years) (i. e.56.54%). It is also observed that high percentage of complications were noted 0 - 10 years age group (6 cases i. e.46.15%).

Table 2: Age distribution and complications encountered.

Age of the patients (years)	No. of cases N=237 (%)	Complications (%)
0 - 10	13 (5.49%)	06 (46.15%)
11 - 20	18 (7.53%)	07 (38.89%)
21 - 30	39 (16.46%)	15 (38.46%)
31 - 40	48 (20.25%)	16 (33.33%)
41 - 50	47 (19.83%)	11 (23.40%)
51 - 60	30 (12.66%)	08 (26.67%)
61 - 70	21 (8.86%)	04 (19.04%)
71 - 80	12 (5.06%)	03 (25.00%)
81 - 90	09 (3.80%)	01 (11.11%)

The major indication for tracheostomy in our study was assisted ventilation (76.69%). The remaining was due to upper airway obstruction (19.41%) and 5.91% was part of another procedures. While studying underlying medical and surgical conditions that warranted the need for tracheostomy, it was found that most tracheostomies were done in RTA patients (30.80%) followed by malignant upper aero - digestive tumors (14.67%) as shown in Table 3.

Table 3: showing various indications for tracheostomy.

S. No.	Indications	No. of patients	Percentage (n=237)
1	Upper airway obstruction –	46	19.41%
	Tumors	35	14.67%
	Neck trauma	4	1.69%
	Maxillofacial infections	3	1.27%
	Tetanus	3	1.27%
	Subglottic stenosis	1	0.42%
2	Assisted ventilation – (need for	177	74.69%

	prolonged ventilatory support or difficult intubation)		
	Snake bite with neuromyolysis	3	1.27%
	Insecticide poisoning	25	10.55%
	Seizure disorder	10	4.22%
	Trauma (RTA)	73	30.80%
	CVA	16	6.75%
	Respiratory failures	7	2.95%
	Burns	4	1.69%
	Brain tumors	8	3.78%
	Brain haemorrhage	15	6.33%
	Open heart surgery (CABG)	4	1.69%
	Cervical Spine injury	12	5.06%
3	Part of another procedure	14	5.91%

Out of 237 tracheostomies performed, complications were seen in 71 cases (29.96%) as shown in Table 4.

Table 4: showing complications encountered during emergency and elective tracheostomy

Type of indication	No. of cases performed, N=237 (%)	Incidence of complications
Elective	161 (67.93%)	30 (18.63%)
Emergency	76 (32.07%)	41 (53.95%)

Most common complication during emergency tracheostomy were surgical emphysema (9 cases i. e.12.68%) and tube displacement (9 cases i. e.12.68%) whereas most common complication during elective tracheostomy was tube displacement (8 cases i. e.11.27%). Overall the most common complication was tube displacement (17 cases i. e.7.17%) and least common were apnea and tracheal stenosis (1 case i. e.0.42% each) as shown in Table 5.

Table 5: Comparison between complications during elective and emergency tracheostomy

Sr. No.	Type of complications	Total N=71	Elective	Emergency
	Intra - operative			
1.	Hemorrhage	09	4 (5.63%)	5 (7.04%)
2.	Apnea	01	-	1 (1.41%)
	Early Post - operative (within 1 - 10 days)			
1.	Surgical emphysema	14	5 (7.04%)	9 (12.68%)
2.	Stoma site infections	13	6 (8.45%)	7 (9.81%)
3.	Tube displacement	17	8 (11.27%)	9 (12.68%)
4.	Tube blockage	11	5 (7.04%)	6 (8.45%)
	Late post – operative (> 10 days)			
1.	Difficult decannulation	02	-	2 (2.82%)
2.	Tracheal stenosis	01	1 (1.41%)	-
3.	Accidental decannulation	03	1 (1.41%)	2 (2.82%)

Most tracheostomies were done in ICU settings i. e.203 cases (85.65%) in comparison to non ICU settings i. e.34 cases (14.35%). Whereas complications encountered were more in non ICU settings i. e.14 cases (41.18%) in comparison to ICU settings i. e.57 cases (28.08%). In ICU Settings i. e. OTs and ICUs we had a sterile environment, proper sterile instruments and a proper tracheostomy care giving team whereas in non ICU settings like wards and casualties, we used sterile instruments with maximum aseptic environment that could be possibly achieved in emergency situation.

Table 6: Follow up and decannulation status

Decannulation	No. of cases (n=237)	Percentage
Decannulated	143	60.34 %
Long term tracheostomy	35	14.77 %
Lost to follow up	11	4.64 %
Expired before removal	46	19.41%
Difficult decannulation	02	0.84 %

4. Discussion

In our study, 237 tracheostomies were performed where 164 has been performed in males and 73 in females showing male preponderance with male: female ratio of 2.25: 1 which is comparable to study done by **Imran munir et al**⁷ and **Megha et al**⁶ where male: female ratio found to be 2: 1 and 3: 1 respectively.

Most common indication for tracheostomy in our study was found to be assisted ventilation (74.69%) where trauma (RTA) being the most common. Upper airway obstruction (19.41%) was 2nd most common cause, where tumors (14.67%) involving upper aero - digestive tract being most common. Studies done by **Goldenberg et al**⁸, **Megha et al**⁶ and **Satna et al**⁵ also found assisted ventilation being the most common indication for tracheostomy.

In our study, incidence of complication was high among younger age group which is comparable to study done by **Mehta and Chamyal et al**¹¹.

Complication rate found to be 29.96 % in our study which is comparable to study done by **Zeitouni and Kost et al**¹⁴, **Imran Munir et al**⁷ and **Megha et al**⁶ where complication rate found to be 24%, 30% and 29.81% respectively.

AK Mehta and Chamyal et al¹¹ found that the rate of complications with emergency tracheostomy was two times as high as with elective operation. In present study, also complications were encountered more during emergency tracheostomy than elective tracheostomy. This is usually due to haste, inadequate lighting, equipment or assistance and a patient who is struggling for breath equipment or assistance and a patient who is struggling for breath.

Hemorrhage (9 cases) was most common complication occurred during intra - operative period. In the review of 1928 cases evaluated by **Chew et al**¹² in 1972, the most common complication was hemorrhage.

Tube displacement (17 cases) was overall the most common complication and also during post operative period. **LT John Y. Chew et al**¹² In the cases reviewed, this event occurred 29 times, 1.5%, and resulted in seven deaths. This is likely to occur if the tracheostomy is too low or not in the midline. When this complication occurs a very careful rapid reexploration of the wound must be made, the edges of the trachea spread and the tube carefully reinserted. **Goldenberg et al**⁸ this study also suggest as a general rule, the ties should be secured snugly but allow passage of a finger between the ties and the neck to prevent neck constriction. Also suggest suturing the tracheal tube's plastic plates to the peristomal skin. In particular patient groups—obese patients and patients who are constantly moved and turned to prevent

decubitus ulcers—a major concern about tube dislodgment exists. In these cases the operative technique can be altered accordingly by means of a Bjork flap (an inferiorly based, U - shaped flap) or creation of a superior - based tracheal flap “permanent” tracheotomy, as described by **Eliachar et al**¹³.

Surgical emphysema (14 cases) was second most common post operative complication in our study. **Soni et al**¹⁵ reported subcutaneous emphysema as the second most common complication after infection. **Goldenberg et al**⁸ states it result from excessive dissection of tissue planes at the time of tracheostomy, blockage of the cannula, or assisted ventilation with excessive pressure causing dissection of air along the pretracheal fascia. The above conditions may be exacerbated by tight wound closure at the tracheotomy site, which should be avoided.

Stoma site infections seen in 13 cases in our study. **Goldenberg et al**⁸ - tracheotomy is considered a clean - contaminated wound. Severe wound infection following tracheotomy is rare, most likely attributable to the fact that the wound is left open, facilitating the draining of secretions. All fresh tracheotomies should be attended to with strict local hygiene. During the early period, dressings need to be changed frequently because blood and secretions accumulate and are rapidly colonized by hospital flora. **LT John Y. Chew et al**¹² - Infection, 3.3%, is second only to hemorrhage as a complication of tracheostomy. Staphylococcus aureus, Pseudomonas, and Monilia are the organisms most frequently found. Antibiotic coverage should be started and modified according to the culture and sensitivity.

Tube blockage was seen in 11 cases in our study. **Goldenberg et al**⁸ states that obstruction of the tracheotomy tube on the first postoperative day is likely to result from blood clot, partial displacement, or tube impingement on the posterior tracheal wall.

Apnea was seen in only 1 case in our study. **LT John Y. Chew et al**¹² states that in a patient with chronic obstructive pulmonary disease high levels of carbon dioxide in the blood stream decrease the sensitivity of the respiratory center to carbon dioxide stimulation. Respiration is then dependent upon the anoxic drive. Upon correction of the anoxia by tracheostomy, the respiratory drive diminishes or ceases. It is not advisable to give a patient with chronic lung disease high levels of oxygen immediately following tracheostomy. They may be given room or compressed air. Should their respiratory efforts cease altogether, assisted respiration by a mechanical ventilator is required.

In our study, tracheal stenosis was seen in one case only. **Goldenberg et al**⁸ states that tracheal or subglottic stenoses are complications predisposed by previous endotracheal tube intubation, high tracheostomy or cricothyroidotomy, and trauma to the airway. Patients at increased risk for tracheal stenosis include children. It has been demonstrated that direct pressure damage by high - pressure cuffs or overinflated low - pressure cuffs is responsible for most postintubation or post tracheotomy tracheal injuries and secondary stenosis. Meticulous surgical technique, aggressive treatment of postoperative infections, and use of

the high - volume, low - pressure cuffed tube help minimize the risk of tracheal stenosis.

Difficult decannulation as late complication was seen in 2 cases in paediatric age group. **AK Mehta and Chamyal et al**¹¹ reported one case in paediatric age group.

Accidental decannulation as a late complication seen in 3 cases in our study where stoma refreshing done under local anaesthesia and tracheostomy tube reinserted. **William S. Crysdale et al**¹⁰ reported accidental decannulation as a late complication in 5 cases and stated it as less threatening at this stage, as the tracheocutaneous tract is well established.

In our study of 237 tracheostomies, it was found that complication rate was quite high when tracheostomies were done in non ICU settings like ward and casualty in comparison to ICU settings like OTs and ICUs. Proper tracheostomy care, effective and prompt management of complications and better availability of life support facilities being major cause for the same.

Out of total 237 tracheostomies performed, 143 patients were successfully decannulated. 46 patients succumbed to primary disease before removal of tube, cardiac arrest and cardio - respiratory failure being the major cause.

5. Conclusion

Due to availability of advance improved healthcare and ease of providing ventilation, tracheostomy is preferred now for varied indications like upper airway obstruction, prolonged assisted ventilatory support or part of another procedure. Although it may have complications, but all complications are preventable. The chances of complications increase in an emergency set up. So the best method of prevention is to actively look for them and intervene early. Moser dictum is valid that "the best time to do tracheostomy is when you first think about it". Careful and correct surgical technique with meticulous postoperative tracheotomy care by the surgeon and nursing staff could reduce complications to great extent. It is therefore essential that all physicians and nursing staff in the hospital setting be familiar with the possible complications of tracheostomy because prompt recognition and treatment may avoid prolonged unnecessary suffering to patients.

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