



A CLINICAL STUDY OF TRACHEOSTOMY IN TERTIARY CARE HOSPITAL

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ABSTRACT The study was carried out in Dr. Shankarrao Chavan Government medical college, Nanded at the department of Otorhinolaryngology for a period of 18 months from Jan 2020 to June 2021, was a prospective evaluation of 65 patients of all ages and both gender presenting in the emergency ward or Intensive Care Unit (ICU) or in ENT Out Patient Department for whom tracheostomy was done for various indications. The study aimed to find out the different indications for tracheostomy, the microbiological study of secretions of tracheostomy stoma or tracheal secretions, and intra and postoperative complications in patients undergoing tracheostomy. The study shows the most common indication for tracheostomy was patients admitted to ICU for prolonged ventilatory support 43% followed by stridor patients presented in the emergency ward about 28% patients. Similarly, the most common complication was haemorrhage followed by stoma infection. This study shows most common organism cultured from tracheal secretion was pseudomonas aeruginosa followed by Acinetobacili barmanni, staphylococcus aureus, Klebsiella pneumoniae, Escherichia coli.

KEYWORDS : tracheostomy, indications, complications, microbiological study

INTRODUCTION

Tracheostomy is a surgical procedure wherein a stoma is created connecting the anterior wall of the trachea to the exterior.

Tracheostomy is a lifesaving procedure and a commonly performed procedure done in emergency and elective. It is one of the oldest surgical procedures on record, dating back as far as 3600 B.C.E. in Egypt.^[1]

The indications of the procedure are increasing day by day. Initially, all tracheostomy was carried out only to relieve the upper airway obstruction, gradually its indication became extensive and now it's being increasingly used as a temporary procedure for airway access, especially for the anaesthetic purpose and artificial ventilation. Similarly, the indication of long-term or permanent tracheostomy as in cases of severe respiratory distress, sleep apnoea syndrome, and terminal malignant neoplasm are also increasing.^[2]

In the 20th century, the indications for tracheostomy widened. In the 1940s tracheostomy was introduced to facilitate aspiration of bronchial secretions and in the 1950s it was used for weaning from ventilatory support and for prolonged artificial ventilation. These two indications popularized tracheostomy in the intensive care unit (ICU) and made tracheostomy a common surgical procedure.^[3] Tracheostomy is normally done in the intensive care unit for patients who require prolonged ventilation. The optimal timing of conversion from trans-laryngeal intubation to tracheostomy in patients with prolonged ventilatory support is controversial. There is a general opinion that tracheostomy has certain benefits over trans-laryngeal intubation in patients with prolonged ventilation.^[4]

The decision to perform a tracheostomy is often based on the concern for airway injury secondary to extended periods of trans-laryngeal intubation. The use of tracheostomy early in the course of respiratory failure may reduce the danger of premature extubation and the complications associated with reintubation. Finally, the timing of tracheostomy has been thought to influence liberation from mechanical ventilation. Patients receiving early tracheostomy are reported to have an overall shorter duration of mechanical ventilation than patients who undergo late tracheostomy. Other workers have found no benefit to early tracheostomy in critically ill surgical patients.^[5]

Tracheostomy has its advantages not without associated risk and complications. The increased use of tracheostomy in recent decades has led to an increase in complications in parallel. Furthermore, little focus is placed on postoperative management of medical and nursing

instruction to avoid complications^[6]. Tracheostomy may be elective or emergency; an elective procedure has enough time for preparation and is done in a well-planned operation set up and an emergency being a lifesaving procedure is done in optimal preparation so carries more complication risks.

In recent years due to recent advancements and proper care of the patient, the major complications of patients can be avoided.

MATERIALS AND METHODS

This is a prospective observational study carried out at our tertiary health care center from Jan-2020 to June 2021 (18 Months).

This study was conducted to find out the different indications for tracheostomy, a microbiological study of secretions of tracheostomy stoma or tracheal secretions, and intra and postoperative complications in patients undergoing tracheostomy. Permission from Institutional Ethics Committee was taken and written informed consent was obtained from the patient or his relatives/parents (in the case of a minor) before starting the procedure.

- **Study population source** - Patient requiring Tracheostomy in tertiary care hospital,
- Patient coming to the emergency ward with stridor, with laryngotracheal injury requiring emergency tracheostomy.
- Patient in Intensive Care Unit under medicine department requiring prolonged ventilatory support.
- Patient with major head and neck surgery, surgeries like maxillectomy, mandibulectomy, glossectomy, etc.
- Total laryngectomy patient requiring elective tracheostomy.
- Patients requiring tracheostomy in cases of difficult intubation.
- Patients with an impacted large-sized tracheal foreign body not able to remove by conventional methods.

During the study period, a total of 65 patients underwent tracheostomy for various indications were studied. All patients were thoroughly examined and properly evaluated with regards to age and sex distribution, indications of tracheostomy, whether the procedure was elective or emergency.

Procedure

After proper evaluation, all the patients were subjected to emergency or elective tracheostomy according to indications. All the patients undergoing tracheostomy received an injection of tetanus and an injection of xylocaine for sensitivity.

Patients were operated in the operation theatre or bedside according to

the situation, patients were given a supine position with neck extension using a bolster, cleaning and draping were done. Most procedures were performed in local anaesthesia except in cases of tracheostomy as a part of different surgery and in cases of pediatric tracheostomy were performed in general anaesthesia.

After neck extension and stabilizing head, skin incision was taken, horizontal or vertical according to the procedure, the horizontal was preferred in cases of elective surgeries and the vertical incision was carried out in cases of emergency tracheostomy. Then blunt dissection was carried down through the subcutaneous tissues and the platysma muscles to expose strap muscles. The exposed strap muscles were dissected in the midline and retracted laterally and the thyroid isthmus was exposed which retracted superiorly to expose the trachea. The pre-tracheal fascia over the anterior trachea was bluntly dissected and retracted laterally. Throughout this entire dissection, the trachea was palpated to ensure the midline position of the trachea.

After stabilizing the trachea, injection of 4% lignocaine containing syringe with a needle inserted through tracheal cartilage and aspirated to confirm the needle was in the trachea, on aspiration bubbles visualized which confirms needle in the trachea, then 0.5-1 cc 4% lignocaine injected inside trachea to anaesthetize trachea, which prevents coughing while inserting the tube.

Then incision over the trachea was given after stabilization of the trachea.

There were many ways of tracheal incision as follows:

Horizontal slit incision was given between 2nd and 3rd tracheal cartilage in a young patient in cases of temporary tracheostomy.

Stoma or circular incision over trachea was created by removing anterior part of 2nd or 3rd tracheal ring in old patients with calcified tracheal rings or case of prolonged or permanent tracheostomy.

The proper size and type of tracheostomy tube was then inserted along with the obturator. The position of the tube was then confirmed by the feel of an air blast on the back of the hand, and also by using an AMBU bag and stethoscope to check bilateral air entry after removing the obturator, and the tube was then fixed and cuff was inflated. suctioning was done to remove any blood clots or any secretions in the trachea and tracheal secretions were collected and sent for microbiological study. If required the wound was sutured in layered all the intra-operative complications were managed and dressing was given to the stoma.

After stabilizing, patients were shifted to the ward for observation and post-operative care. Under all aseptic precautions, the tube was covered with moist gauze to prevent crusting, and patient was given nebulization every 8 hourly for 3 days, and daily twice dressing was given betadine-soaked gauze piece to tracheostomy wound.

The tracheostomy tube was deflated for 5 mins every 6 hourly for the first 24 hrs, then the tracheostomy tube cuff was kept deflated except in unconscious patients, in which tube was deflated for 5 mins every 6 hourly to prevent pressure necrosis of the tracheal lumen; along with tracheal suctioning using a suction tube was done, tube position and patency was checked.

The microbiological swab was taken at the time of surgery and on day 5 from tracheostomy stoma or tracheal secretions under all aseptic precautions and sent for microbiological study.

Tracheostomy tube changed on postoperative day 3 to prevent obstruction of tube. Antibiotics, analgesics, mucolytics, and other supportive care were given postoperatively.

All patients were provided with Communication materials notebook, pen, bells.

After the improvement in patients' condition patients were subjected to decannulation in cases of temporary tracheostomy while patients requiring permanent tracheostomy were shifted to a metallic tracheostomy tube.

OBSERVATIONS AND RESULTS

Out of total 65 patients, the minimum age of the patient was 1 year whereas the maximum was 77 years. The mean age of participants was 49 years with a standard deviation ± 17 . The maximum number of

patients i.e., 23.07% belonged to 31-40 years of age group; these contain maximum organophosphorus poisoning, road traffic accident with a head injury, and cut throat injury patients, followed by 61-70 years of age groups majority were presented with stridor secondary to malignancy. The study shows, there were 71% were male and 29% were females with M: F ratio of 2.45:1.

Figure 1 shows, the most common indication for tracheostomy is patients requiring prolonged ventilatory support (43%), followed by stridor 28% secondary laryngeal malignancy. Out of 43% of patients requiring prolonged ventilation maximum belonged to patients with organophosphorus poisoning 11% out of 65 patients, other causes were respiratory distress, motor neuron diseases, tetanus, meningitis, head injury, etc.

The patients with laryngeal malignancy were presented with stridor in emergency ward were operated as emergency tracheostomy.

Tracheostomy was performed as a part of different surgeries like maxillectomy, mandibulectomy, total laryngectomy, difficult foreign body bronchus removal, etc.

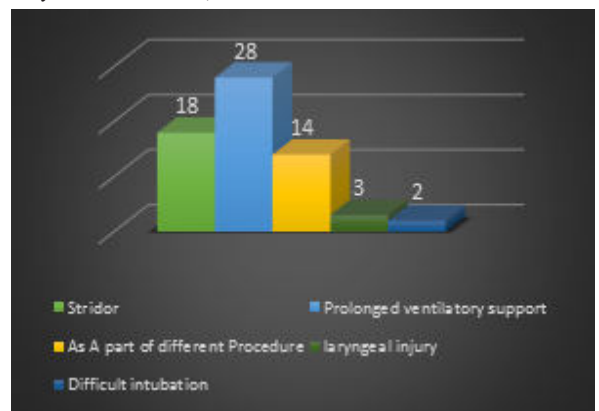


Figure 1: Indications of Tracheostomy

Out of 65 tracheostomies, 43% of tracheostomies were performed in ICU patients requiring prolonged ventilatory support while 28% were elective tracheostomy most performed as a part of different surgeries with proper evaluation of the patient, and 29% were performed as emergency procedures as in cases of stridor patients secondary to malignancy. As shown in Figure 2:

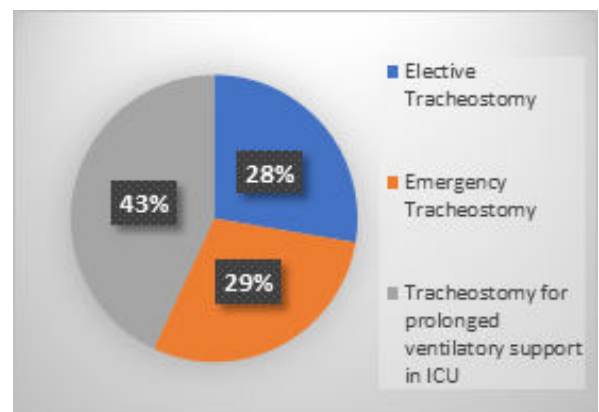


Figure 2: Distributions of patients according to types of tracheostomies.

Table No. 1 shows, overall, the most common cultured organism from tracheal secretion was pseudomonas aeruginosa followed by Acinetobacili barmanni, staphylococcus aureus, Klebsiella pneumoniae, Escherichia coli.

The following table shows, the most common organism cultured on the day of tracheostomy stoma secretions was pseudomonas aeruginosa 15%, which reduced to 6% on day 5 culture of stoma secretions, most probably due to the use of antibiotics; similarly in the case of Acinetobacili barmanni 11% on the day of tracheostomy reduced to 3% on day 5.

Table No. 1 Microbiology Of Tracheal Stoma On Day Of Tracheostomy And Day 5

Organisms	Microbiology of tracheal stoma on Day of Tracheostomy	Microbiology of tracheal stoma on Day 5
No organism	42 (65%)	52 (80%)
Acinetobacili barmanni	7 (11%)	2 (3%)
Escherichia coli	1 (2%)	1 (2%)
pseudomonas aeruginosa	10 (15%)	4 (6%)
staphylococcus aureus	3 (4%)	5 (8%)
Klebsiella pneumoniae	2 (3%)	1 (2%)
Total	65 (100%)	65 (100%)

While Staphylococcus aureus, which was 4% on day of tracheostomy swab increased to 8% on day 5, also 65% of patients had no organism growth on day of tracheostomy which increased to 80% on day 5 tracheal secretions swab report most probably due to antibiotic use.

Table No. 2 Complications Of Tracheostomy

Complications	Immediate	Intermediate	Late
No complication	44(68%)	43(66%)	55(85%)
Haemorrhage	19(29%)	0	0
Apnea	2(3%)	0	0
Stoma infection	0	7(11%)	0
Surgical emphysema	0	5(8%)	0
Displacement of tube	0	4(6%)	0
Obstruction of tube	0	6(9%)	0
Difficulty decannulation	0	0	4(7%)
Tracheostomy scar	0	0	3(4%)
Tracheostomy stoma granulation	0	0	3(4%)

Table No. 2 shows, different types of immediate, intermediate, and late complications in tracheostomy. This study shows most common immediate complication of tracheostomy is haemorrhage 29% which was managed conservatively during surgery, followed by apnoea 3%, while 44(68%) patients show no immediate complications. The most common intermediate complications of tracheostomy are stoma infection 11% followed by obstruction of tube 9% followed by surgical emphysema 8% followed by displacement of tube 6% while 66% of patients had no intermediate complications, most patients had multiple intermediate complications like obstruction of tube and stoma infection, obstruction of tube and stoma infection. Similarly, the most common late complication is difficulty in decannulation 7% followed by tracheostomy scar 4% and tracheostomy stoma granulation 4%.

Figure 3 shows, the outcome of 65 tracheostomies, 51% of patients were discharged after complete strapping and closure of tracheostomy wound, followed by 28% of patients who were discharged with metallic tracheostomy tube as permanent tracheostomy all were malignancy patients and most of them presented with stridor in the emergency ward and were followed regularly in Out Patient Department.

While 21% of patients' death were recorded which were not associated with tracheostomy procedure but were because of diseased condition and general condition poor of patients.

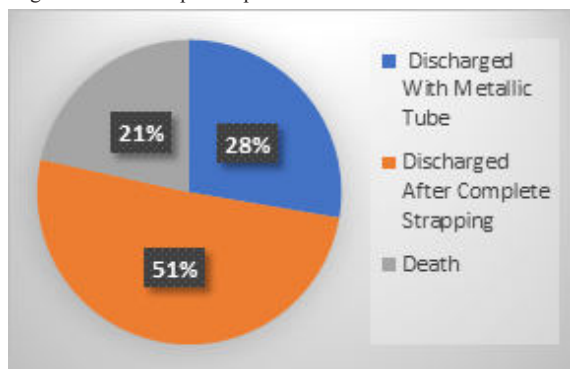


Figure 3: Distributions of patients according to Outcome of Tracheostomy

DISCUSSION

This study shows the minimum age of patient undergoing tracheostomy was 1 year whereas the maximum was 77 years. The mean age of participants was 49 years with a standard deviation ± 17. The maximum number of patients i.e., 23.07% belonged to the 31-40 years of age group followed by the 61-70 years of age group. Similarly, a study conducted by **Tareq Mahafza et al**^[7], shows patients undergoing tracheostomy had age ranging from 2 months to 90 years with a mean age of 46.5 years. **Megha A K et al**^[8] study shows, the most common age group for tracheostomy found was 15-50 years of age i.e., 88 cases (70.96%), and the average age of the patients was 37.8 years. **Ammar hadi khammas et al**^[9] study shows, 67 patients were aged between 18 and 76 years, with a mean age of 47.263 ± 7.581 years.

This study shows out of 65 patients 71% are male patients and 29% were females with M: F ratio of 2.45:1. In a study conducted by **Tareq Mahafza et al**^[7], out of 106 cases, there were 74 (70%) males and 32 (30%) females. In a retrospective study by **Chia-Lin Hsu et al**^[10], 163 patients were included out of which 93 were male and 70 female. similarly, a study conducted by **Megha A K et al**^[8] study shows 124 patients, 93 (75%) were males and 31 (25%) females, so male: female ratio (M: F) was 3:1. while, **Ammar hadi khammas et al**^[9] study shows, Among the 67 adult patients that composed the sample, there were 41 (61.19%) male and 26 (38.81%) female patients.

This study shows, the most common indication for tracheostomy is prolonged ventilation 28(43%) followed by stridor 28% followed by as a part of different procedure 21%, laryngeal injury 5%, difficult intubation 3%, **Megha A K et al**^[8] shows, most common indication for tracheostomy in the study was assisted ventilation (Total 85 (68.60%) tracheostomies were performed for this indication) as maximum cases (79 cases) were prolonged intubation due to respiratory muscle paralysis due to organo-phosphorus poisoning. In a retrospective study of 1130 cases by **Goldenberg et al (1996)**^[11] the most common indication was long-term mechanical ventilation (76%).

This study shows, the most common organism isolated from tracheostomy stoma was pseudomonas aeruginosa followed by Acinetobacili barmanni. Pseudomonas aeruginosa was the most common 10 (15%) organism cultured from secretion collected on day of tracheostomy followed by Acinetobacili barmanni 7 (11%), staphylococcus aureus 3 (4%), Klebsiella pneumoniae 2(3%), Escherichia coli in 1(1%) patient. While, staphylococcus aureus was the most common 5 (8%) organism cultured on day 5 microbiological study of tracheostomy stoma followed by pseudomonas aeruginosa 4(6%), Acinetobacili barmanni 2 (3%), Klebsiella pneumoniae 1(2%), Escherichia coli in 1(2%) patient.

In a recent study by **Pignatti et al**^[12] in the microbiological analysis performed on tracheal aspirates, Pseudomonas aeruginosa was the most predominant bacteria identified. **Guimbellot et al**^[13] similarly noted increased development of gram-negative bacterial infection predominantly by pseudomonas in children undergoing tracheostomy. **Sakurai et al**^[14] studied 15 patients with long-term tracheostomies and noted persistent colonization with pseudomonas in them. A study conducted by **Acharya et al**^[15] studied on respiratory infection due to colonization of microorganisms from tracheostomy tubes in hospitals to identify the common pathogen causing LRTI in their study they found that Pseudomonas aeruginosa to be the most common organism and Acinetobacter being the second most common. **Gotsman et al**^[16] found Staphylococcus to be the most common organism causing respiratory infection due to contamination from tracheostomy tube.

This study had described, immediate (during the procedure to 24 hrs), intermediate (24-72 hrs), late (after 72 till 7-14 days) complications. The most common complication of tracheostomy was haemorrhage about 29%, followed by stoma infection (11%) followed by obstruction of tube (9%) followed by obstruction of tube (9%), followed by surgical emphysema (8%) followed by difficulty in decannulation (7%). Other complications were displacement of tube, tracheostomy scar, and stoma granulation.

Incidence of complications varies in different author's series.

in a retrospective study by **Chia-Lin Hsu et al**^[10] the most common immediate complication of tracheostomy was bleeding (moderate bleeding in 11 [6.7%] and minor bleeding in 46 [28.2%]), followed by

subcutaneous emphysema (3 [1.8%]; in two patients this occurred together with bleeding and in one patient it occurred together with air leakage) and tube obstruction in 3 patients [1.8%]. **Megha A K et al**^[8] study shows Surgical emphysema (18 i.e., 14.51%) was the most common complication followed by peristomal infection in 5 cases. Major complications like tracheoesophageal fistula, trachea-innominate artery fistula, and tracheal stenosis were less, as only one case of each was found in the study. In the review of 1928 cases evaluated by **Chew and Cantrell et al**^[17] in 1972, found that the most common complication was haemorrhage. **Zeitouni & Kost et al**^[18] studied 281 cases of tracheostomy and found Haemorrhage was the most common intra-operative complication (2.8%). Infection was a common postoperative complication (7.8%). No tracheostomy related deaths were reported. **Goldenberg et al**^[11] studied 1130 cases of tracheostomy and found the common complications were tracheal stenosis (21 cases), severe bleeding in 9 cases, tracheo-cutaneous fistula (6 cases), infection (5 cases), and tracheo-oesophageal fistula (1 case).

Yellon et al^[19] reported 7 cases of totally obstructing tracheostomy associated suprastomal granulation tissue. **Carr et al**^[20] studied 142 cases and found granulations as the most common complication in paediatric age group (44 cases i.e., 26%).

CONCLUSION

Tracheostomy has been traditionally considered as an emergency lifesaving procedure to secure the airway in the events of stridor, neck injury with involvement larynx and trachea, and in certain cases of respiratory failure with difficult intubation.

However, in the current study, it was observed that tracheostomy has an appreciable role as an elective procedure to assist the airway in cases of prolonged ventilatory support, as an alternative airway preparation for various head and neck surgeries by adequate assessment and evaluation of the condition of the patient.

Most of the complications were because of hurrying procedure and improper post-operative care, these complications can be managed promptly through thorough anatomical knowledge of trachea and neck vessels, meticulous surgery, sterile technique, the skill of a surgeon, good post-operative care of a patient, good humidification and intermittently suctioning of a tube.

The timing to decide for tracheostomy remains debatable and is purely based on the circumstances of the clinical status of the patient and the attending clinician and should follow Moser's dictum that "the best time to do tracheostomy is when you first think about it".

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