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Current scenario of tracheostomy: our experience

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ABSTRACT

Background: Tracheostomy is an important surgical procedure done by ENT surgeons. In this study we have assessed the indications and complications encountered during tracheostomy and decannulation.
Methods: 100 patients undergoing tracheostomy by the Department of Otolaryngology and Head and Neck Surgery between 1st January and 31st December 2015 in a tertiary care hospital in Central India were included in the study. The various indications of tracheostomy along with the complications encountered and decannulation following tracheostomy were studied.
Results: In this study, most commonly (22%) tracheostomies were performed in young (31-40) years, male (73%) patients. This included 79% elective and 21% emergency tracheostomies. The indications of tracheostomy were retained secretions 61%, laryngopharyngeal obstruction 21%, and respiratory insufficiency 19%. 21 intra-operative complications included bleeding (18% cases) and apnoea (3% cases). Wound infection 19%; subcutaneous emphysema 10%; tube block 6% and haemorrhage 2% constituted 37 immediate post-operative complications. 17 late post-operative complications included stoma stenosis 9%; granuloma formation 4% and trachea-oesophageal fistula and aspiration 2% each. 33% of total patients were decannulated easily.
Conclusions: In conclusion we found that elective tracheostomy is associated with lower morbidity and mortality and strapping of tracheostomy site is an easy, safe and effective method of tracheostomy closure in properly selected patients.

Keywords: Tracheostomy, Decannulation, Strapping

INTRODUCTION

Tracheostomy is one of the commonest surgeries performed by ENT surgeons in a variety of clinical scenarios. It is done as both emergency and elective procedure. There has been a change in pattern of indications of tracheostomy over the past decade. Previously the commonest indication of tracheostomy was upper airway obstruction due to infective causes, but due to vaccination and antibiotics, infections are on the decline. With the emergence of intermittent positive-pressure ventilation, along with the evolution of intensive care units, tracheostomy is increasingly being done for assisting ventilation in patients with respiratory insufficiency. Tracheostomy, which was predominantly an emergency procedure previously, began to be done electively more frequently. With the advent of newer instruments and elective nature of surgery, there were fewer and less fatal complications associated with the procedure.

Decannulation refers to the process of tracheostomy tube removal once the need for the tube has resolved.[1] Various determinants for decannulation include the ability of the patient to tolerate tube capping >48 hours, maintenance

of oxygen saturation and age of the patient.[2,3] Decannulation becomes a challenge in patients who are tracheostomised for long duration, especially in children and elderly. It requires careful monitoring of patient and teaching them to breathe through the nose. The complications which can interfere with normal decannulation are subglottic stenosis, granulations, trachea-oesophageal fistula and psychological dependence.

METHODS

This prospective, non-randomised study of 100 candidates was carried out in Department of Otolaryngology and Head and Neck Surgery, Netaji Subhash Chandra Bose Medical College, Jabalpur, Madhya Pradesh from 1st January to 31st December 2015. Institutional Ethics Committee clearance was obtained prior to initiation of study. Inclusion criteria was all patients undergoing tracheostomy by our department during the aforementioned period, while the patients who were tracheostomised in outside hospitals or by other departments were excluded from the study. Both elective and emergency tracheostomies in patients of all age groups and either sex were considered. After assessment of general condition of patient, neck examination, and indirect laryngoscopy whenever indicated, patients were selected for tracheostomy. Tracheostomy was performed by Postgraduate residents. Under all aseptic precautions, open surgical tracheostomy was performed in all cases under local anaesthesia. Vertical midline skin incision was used and similar vertical incision was given in trachea as a policy. The tracheal stoma was held in position by two lateral stay sutures. Excision of tracheal cartilage was avoided. Complications were classified as intraoperative complications (during surgery), immediate post-operative complications (after and within 7 days of tracheostomy), and late post-operative complications (after 7 days of surgery). Cuffed Portex tracheostomy tube was kept for a minimum of 5 days to allow maturation of stoma before attempting decannulation. X-ray soft tissue neck - anteroposterior and lateral view, tele laryngoscopy and tracheoscopy was done prior to decannulation to rule out subglottic and tracheal stenosis Decannulation was attempted only in carefully selected patients who were conscious, having good swallowing reflex, good cough reflex and those maintaining good oxygen saturation (99-100%) on room air with no signs of subglottic or tracheal stenosis.

Patients fitting this selection criteria were put on Fuller's tracheostomy tube and observed for 48 hours for any signs of respiratory distress. Partial and full closure was done at an interval of 48 hours each. 48 hours after full closure, strapping was done. The surgical site was reviewed after 21 days for any air leakage or wound site infection. Voice was assessed in subsequent visits upto 3 months. The collected data was analysed using SPSS software.

RESULTS

The study group constituted of 73% males and 27% females. Maximum tracheostomy was done in 31-40 years age group 22% and minimum in >70 years age group 2% (Figure1). Mean age of the study group was 38.5 years ±SD (standard deviation) of 17.5 years.

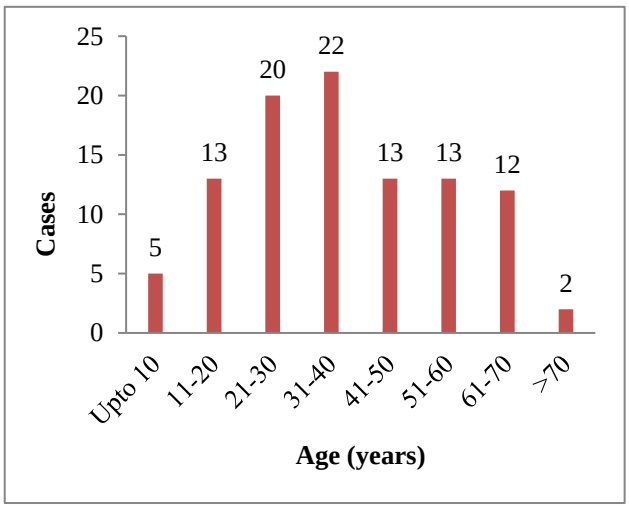

Figure 1: Age distribution of the study group.

In this study, most trachea were central with central to deviated trachea ratio being 5.6:1.0. The ratio of firm trachea soft trachea was 4.88:1.0. Most commonly the skin in this study were normal in appearance (83%) followed by presence of dilated veins (8%) and redness (7%). Scar was present in 2 (2%) cases and no cases of any skin sinus were observed in this study. 12% patients in the study group had swelling in the neck among which 10 were due to malignant cervical lymphadenopathy.

Elective tracheostomies 79% were done more frequently than emergency tracheostomies 21%. Among the 79 patients that were intubated prior to tracheostomy (elective tracheostomies), maximum duration of intubation was 9 days and minimum duration was 2 days with a mean of 4.98 days of intubation (Table 1).

Table 1: Frequency of duration of intubation.

Duration of intubation (no of days)	No of cases	%
2	3	3.7
3	1	1.3
4	29	36.7
5	22	27.8
6	16	20.2
7	4	5.2
8	2	2.5
9	2	2.5
Total	79	100

In our study, the most common indication for tracheostomy was retained secretions 61%, followed by laryngopharyngeal obstruction in 21% and respiratory insufficiency 19% (Table 2). The 19 patients with respiratory insufficiency also required tracheostomy for tracheobronchial toileting while 2 patients 2% had all the three indications for tracheostomy, whereas in the paediatric age group which constituted 7% of our study population, the commonest indication of tracheostomy was respiratory insufficiency.

Table 2: Indications of tracheostomy.

Indication of tracheostomy	No. of cases	%
Laryngopharyngeal obstruction (a)	21	21
Retained secretions (b)	61	61
Respiratory insufficiency (c)	19	19
Both (b) and (c)	19	19
All (a), (b) and (c)	2	2

The 61 patients requiring tracheostomy for tracheobronchial toileting consisted of 43 patients of head injury, 5 cases of cerebrovascular accident (CVA), 4 cases of intracranial space occupying lesion (ICSOL) 2 cases each of hanging, Gullian-Barre syndrome (GBS), and polytrauma and 1 case each of TB meningitis, locally advanced carcinoma lower 1/3rd of oesophagus and organophosphorus poisoning.

Among 21 patients with laryngopharyngeal obstruction, 13 patients had laryngopharyngeal malignancies, 3 patients had penetrating trauma neck (cut throat), 2 patients each of hanging and blunt trauma neck and 1 patient had Ludwig's angina. Therefore, the cause of laryngopharyngeal obstruction in the present study was malignancies followed by trauma and only a single infective cause i.e. Ludwig's angina.

19 patients with respiratory insufficiency included 8 patients of head injury, 2 cases of CVA, 2 cases of ICSOL 2 cases of hanging, 2 cases of GBS, 1 of polytrauma, 1 of locally advanced Ca lower 1/3rd of oesophagus and 1 case of organophosphorus poisoning.

21 intraoperative complications were encountered. The most common intraoperative complication observed was minor bleeding in 18 cases (18%) followed apnoea in 3 cases (3%). 3 patients in the study who developed apnoea were a 30 years old male patient with Ludwig's angina, a 9 years old male child with non-Hodgkin's lymphoma and a 4 years old male child with head injury (Table 3).

In our study, the most common immediate postoperative complication observed was wound infection 19% (19 cases) followed by subcutaneous emphysema in 10% (10 cases) and tube block 6% (6 cases). Haemorrhage was least common constituting of 2% cases (2 cases) (Table 4).

Table 3: Intra-operative complications.

Intra-operative complications	No. of cases	%
Bleeding	18	18
Apnoea	3	3
Dyspnoea	0	0
Lung collapse	0	0
Damage to structures	0	0
Air Embolism	0	0
Haemothorax	0	0
Total	21	21

Table 4: Immediate post-operative complications.

Immediate post-operative complications	No. of cases	%
Wound infection	19	19
Subcutaneous emphysema	10	10
Tube block	6	6
Haemorrhage	2	2
Total	37	37

A total of 17 complications were encountered after 7 days of tracheostomy, commonest being stomal stenosis in 9 patients (9%) followed by granuloma formation in 4 patients (4%) and trachea-oesophageal fistula and aspiration in 2 patients each (2%) (Table 5).

Table 5: Late post-operative complications.

Late post-operative complications	No. of cases	%
Stomal stenosis	9	9
Granuloma formation	4	4
Tracheo-oesophageal fistula	2	2
Aspiration	2	2
Total	17	17

33% of the total patients in the present study were decannulated while the rest 67% who were not decannulated either remained tracheostomised, underwent total laryngectomy hence were breathing through the permanent stoma, were transferred to other centres or expired in the follow up period of 3 months. The complication rate was slightly higher in emergency tracaheostomies at 52% as compared to elective tracheostomies at 48%.

Voice recovery following tracheostomy closure was seen in all the 33 patients who underwent decannulation. Patients who were discharged after strapping were reviewed at 21st day for assessment of stoma site. 2

patients were found to have unhealthy wound site which resolved in 2-3 weeks with proper dressing and antibiotic therapy.

DISCUSSION

The present study consisted of 100 patients, we observed preponderance of young males undergoing tracheostomy, with a mean age of 38.5 years ±SD of 17.5 years which was similar to study by Fazal-I-Wahid et al, where the age of the patients ranged from 01-75 years with mean age of 37.61 ±SD of 19.99 years.[4] Paediatric tracheostomies constituted of 7% of total cases in our study. Young males are physically more active making them prone to injuries. Also, in this part of our country males are commonly addicted to smoking and tobacco abuse, therefore laryngeal and hypopharyngeal malignancies are commoner in the male population. This explains the male preponderance in the present study.

In the present study, head and neck trauma cases constituted 65% of all tracheostomies followed by laryngopharyngeal malignancies in 13% and infective causes constituted 2% cases. Remaining 20% cases were other causes like GBS, CVA and ICSOL. This explains the majority 61%, of indication of tracheostomy being trachea-bronchial toileting and respiratory insufficiency in 19% cases. Laryngopharyngeal obstruction requiring tracheostomy 21% in our study was mainly due to malignant cause 13% and trauma 8%. This pattern also correlates with the shift in pattern of indication of tracheostomy from infections to trauma in recent years. Previously infective conditions like epiglottitis and laryngotracheobronchitis were major indications for tracheostomy but the better handling of infections with the use of antibiotics and good conservative management in the intensive care units have reduced the incidence of these indicatios.[5,6] Co-relating with our study Fazal-I-Wahid et al had noted commonest indication for tracheostomy being trauma (65.62%).[4] The other indications they noted were infection (26.25%), inoperable tumours (7.5%) and congenital anomalies (0.6%).

In this study which was done in a tertiary care referral centre, 79% of tracheostomies done were elective procedures and rest 21% were emergency procedures. Since most patients were critically ill and previously intubated with or without ventilatory support, most of the tracheostomies were done as elective procedures. Rest 21% cases were done as emergency procedure where patients presented with stridor.

Japhet et al in their study reported 172 (80.4%) emergency tracheostomies and 40 (19.6%) elective tracheostomies.[7] The most common indication for tracheostomy in their study was upper airway obstruction secondary to traumatic cause. Fazal-I-Wahid et al also in their study performed 148 (92.5%) emergency and 12 (7.5%) as elective tracheostomies.[4] The commonest indication for tracheostomy was trauma (65.62%) followed by infection (26.25%). Elective tracheostomy was performed for inoperable tumours. Therefore recently, there is a shift in pattern in the type of tracheostomy from emergency to elective procedure.

Vertical tracheal incision was done in the present study as a policy. Majority of the patients in the present study were head injury patients without laryngopharyngeal obstruction. Their full recovery was anticipated, so removal of a piece of tracheal cartilage was avoided. This method also ensured ease of decannulation and closure of tracheostomy.

The mean duration of intubation in patients in our study was 4.98 days. Similar observations were made by Zias et al where the mean duration of intubation was 5.5 days.[8] Since this is a tertiary care referral hospital, most patients were already intubated on arrival. Good multidisciplinary team effort ensured early (within 7 days of intubation) tracheostomy in the patients likely to require prolonged assisted ventilation or those requiring tracheobronchial toileting. Previous literature suggests that early tracheostomy is associated earlier decannulation and shorter ICU and hospital stay. Hsu et al reported that tracheostomy done later than 21 days of intubation is associated with a higher rate of failure to wean from mechanical ventilation, longer ICU stay and higher ICU mortality.[9] However in the present study, outcome of patients of tracheostomy after prolonged intubation could not be studied as all the tracheostomies in our studies were done within 9 days of intubation.

The total number of intraoperative complications encountered were 21. The most common intra-operative complication observed was bleeding in 18 cases (18%) and apnoea in 3 cases (3%). No cases of lung collapse, damage to other neck structures, embolism or haemothorax were encountered in intraoperative period. Bleeding encountered in 18 cases (18%) was of minor nature, of venous origin and controlled intraoperatively with compression. 3 patients developed apnoea intraoperatively. First was a 30 year old male patient with Ludwig's angina who developed cardiac arrest intraoperatively. Second was a 9 year old male child with non-Hodgkin's Lymphoma. Both were resuscitated and put on ventilatory support in immediate postoperative period. The third patient who developed apnoea was a 4 year old male child with head injury whose probable cause of death was cerebral oedema. The critical nature of illness of patients like NHL, head injury and delayed presentation of Ludwig's angina attributed to complications like apnoea in our study. In literature, complication rates of between 6-66% have been quoted previously in the 1980s.[10,11]

The immediate post-operative complication rate was 37%. The commonest immediate postoperative complication was wound infection, in 19 out of 37 cases (19%). In such cases culture was taken from the wound

site and culture sensitive antibiotics were started. The infection responded to treatment. Subcutaneous emphysema was seen in 10 out of 37 cases (10%). All the cases subcutaneous emphysema was limited to the neck region. Strapping was done immediately. Subcutaneous emphysema resolved with strapping the neck for 3-4 days. 6 patients (6%) developed partial tube block in immediate postoperative period as most patients were comatose and on ventilatory support with thick bronchial secretions. These patients were treated with nebulization, use of carbon dioxide moisture exchanger and dilute sodium bicarbonate lavage. We used 1ml of 10% sodium bicarbonate diluted in 9 ml distilled water for lavage. This solution was introduced along the tracheal wall followed by suctioning. In 2 patients (2%) where haemorrhage was encountered, it was limited to slight oozing from the tracheostomy site. Both patients had altered coagulation profile and were on ventilatory support. Oozing was controlled with mild pressure dressing around tracheostomy site.

Shlugman et al in 2003 had encountered acute fatal haemorrhage during precutaneous tracheostomy.[12] Differing from our observations, Hsu et al in their study reported bleeding as the commonest early complication of tracheostomy moderate bleeding in 11 (6.7%) and minor bleeding in 46 (28.2%) followed by subcutaneous emphysema 3 (1.8%) and obstruction to tracheostomy tube 3 (1.8%).[9]

Stomal stenosis was encountered in 9 out of 17 cases (9%) of complications presenting in the late post-operative period. These were in patients with oropharyngeal malignancies with metastatic neck disease who were receiving radiotherapy. This was attributed to uneducated patient not turning up for reinsertion of tracheostomy tube after radiotherapy sessions. Stenosis in such cases was confined to the skin and dilation of skin stoma by tracheal dilator followed by reinsertion of tracheostomy tube sufficed. None of the cases required surgical dilation of the stoma. Granuloma formation at stoma site was encountered in 4 out of 17 (4%) cases. This is due to frequent friction of the tube on the skin. Granuloma resolved with frequent proper dressing. Trachea-oesophageal fistula was seen in 2 out of 17 (2%) cases. One was secondary to penetrating neck trauma. Other was due to prolonged intubation with fully inflated cuff in a patient on mechanical ventilation. Overall, the complication rate was higher in emergency tracheostomies than elective tracheostomies.

2 out of 17 patients (2%) developed aspiration on attempting oral feeding. Both the patients had vocal cord palsy and history of aspiration of liquid food prior to tracheostomy also, thus added to morbidity in the post-operative period. Ryle's tube feeding was started in both patients. Following tracheostomy, swallowing is altered due to fixity of larynx. A partially inflated tracheal cuff, inadequate oral suctioning, presence of Ryle's tube, and absence of swallowing reflex in patients with altered sensorium explains aspiration in tracheostomised patients.

Once the need for tracheostomy no longer existed, decannulation was attempted. In this series, 33% of patients were decannulated successfully as most patients were critically ill and only one third of the study group satisfied our decannulation criteria. Rest of the 67% patients could not be decannulated. Among them, 2 patients underwent laryngectomy thus were permanently tracheostomised, 12 patients remained on metallic tracheostomy tube in the 3 months follow up period, and 43 patients expired during the study period of 3 months and 10 patients were discharged (transferred to other hospitals) with Portex tracheostomy tube in situ. While considering a patient for decannulation, the patient's swallowing reflex, cough reflex, level of consciousness and oxygen saturation in room air were assessed and X-ray soft tissue neck, tele laryngoscopy and tracheoscopy were done. After placement of Fullers tracheostomy tube for 48 hours, nasal breathing was assessed. Partial closure of tracheostomy tube was done for 48 hours followed by full closure for another 48 hours. Oxygen saturation was monitored during this time with other parameters like increase in respiratory rate and increased effort of breathing were noted. None of the patients developed respiratory distress in this period, hence strapping of the neck wound was done with adhesive tape after freshening the stoma edges and approximating them. Care was taken to prevent any air leakage through the stoma. Strapping of neck wound was done in all cases. This method was chosen because majority of tracheostomised patients were admitted in other wards and the patient himself or the attendant could remove the strapping in case the patient developed respiratory distress. Asymptomatic patients were discharged after strapping and reviewed after 3 weeks. Other alternative for closure of stomal wound is suturing of the wound which requires careful monitoring in the ward, hence avoided in our case.

Pierachille et al reported cough effectiveness and ability to tolerate tracheostomy tube capping as the most considered parameters in clinical practice, while Stelfox et al in 2009 assessed cough effectiveness (strong vs weak), the ability to tolerate tube capping, secretion (scan thin vs moderate thick) and level of consciousness (alert vs drowsy but arousable) before decannulation.[13,14]

33% of patients in the study were decannulated. The interval between tracheostomy and decannulation varied between 12 days to 26 days with an average of 18.39 days. Since all the elective tracheostomies were done within 9 days of intubation, the correlation between timing of tracheostomy and ease of decannulation could not be studied. Hence, no direct co-relation between timing of tracheostomy and ease of decannulation could be ascertained. Literature however suggests that early tracheostomy within 1 week is associated with earlier and easy decannulation as demonstrated by Hsu et al, who

reported that tracheostomy after 21 days of intubation is associated with a higher rate of failure to wean off from mechanical ventilation, longer ICU stay and higher ICU mortality.[9] Arabi et al also stated that early tracheostomy in trauma ICU patients is associated with shorter duration of mechanical ventilation and ICU length of stay, without affecting ICU or hospital outcome.[15]

After closure of tracheostomy tube, patients were kept on regular follow up for 3 months. Their voice was assessed. All the 33 patients whose closure was done, regained their voice. However, their voice was breathy. They were advised speech therapy and steam inhalation with Tincture Benzoin. Improvement in voice was noted in subsequent visits but their voice was still far from normal till the follow up period of 3 months. The stoma wound site was also inspected for any infection and residual defect in closure. 2 patients were found to have unhealthy wound site. Regular cleaning and dressing of the wound was done and the wound infection subsided over a period of 2 weeks. All the 33 patients whose tracheostomy closure was done, healed well at stoma site, recovered their voice and are leading an active social life.

CONCLUSION

Tracheostomy is an emergency life-saving procedure. In this study we came to the conclusion that, complication rates are higher in emergency tracheostomies and therefore, planned elective tracheostomies should be done whenever possible. Proper assessment of tracheostomised patients before attempting decannulation is of utmost importance and properly selected patients can be decannulated successfully. The closure technique used by us i.e. strapping is an easy, safe and effective method tracheostomy closure in properly selected patients. Although there has been improvement in recovery of patients following early tracheostomy the overall outcome is nullified by deaths in critically ill patients.

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