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A study on tracheostomy

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ABSTRACT

Background: Last two decades tracheostomy is assumed its rightful place as a safe simple procedure with a wide range of usefulness. Laryngeal obstruction became recognized as the chief indication for tracheostomy. Now a day, this is performed in head and chest injuries and other conditions where in normal respiratory efficiency is impaired. The present study was done to analyze the various indications and study the prevalence of tracheostomy and compare it between emergency and planned tracheostomy.

Methods: This study includes patients who are intubated, that are referred from ICU with prolonged ventilation and those admitted into ENT ward with various indications. In this institute tracheostomy is done between 5th and 10th day for patients on mechanical ventilation.

Results: Out of 80 total tracheostomies horizontal procedure done in 42 cases and 38 cases are vertical procedures. Horizontal procedure has more advantages than vertical procedure. Among 80 total procedures 48 cases are done under general anaesthesia and 32 cases under local anaesthesia. Most of the cases are elective done under general anaesthesia because patients are already intubated. Out of 80 cases 5 cases developed sudden apnea, 5 cases developed haemorrhage, 6 cases developed surgical emphysema and subglottic stenosis is developed in 1 case. Conclusions: It is evident from this study that prolonged mechanical ventilation is more common indication for tracheostomy. Majority of the tracheostomies are done in malignant conditions either carcinoma larynx or carcinoma hypopharynx with stridor and dyspnoea. This indicates not only the prevalence of malignancy in this region but also the dreaded ness of this disease causing air way.

Keywords: Tracheostomy, Stridor, Dyspnoea, Malignancy

INTRODUCTION

The word trachea is derived from the Greek language and originally meant 'rough'. Trachea itself was known as trachea arteria and maintaining a communication of the trachea with the exterior is called tracheostomy. Until the early part of the 19th century the procedure was considered hazardous and rarely performed. Only during the past two decades has the operation assumed its rightful place as a safe simple procedure with a wide range of usefulness. In ancient times the operation was used for a few types of inflammatory obstructions, trauma and foreign bodies of the air way and some disease of the larynx. Laryngeal obstruction became recognized as the chief indication for tracheostomy. 1,2

In recent years there has been a considerable shift in emphasis regarding the indications for tracheostomy with recognition of more physiological and functional indications in addition to those of a strictly obstructive nature.³ Now a day this is performed in head and chest injuries and other conditions where in normal respiratory efficiency is impaired because of patient's inability to maintain normal ventilation and control of secretions. 4,5

Even though the patient is in a stage of impending danger to life, every step of the operation is important for not to injure the important surrounding structures like great vessels of the neck, nerves, thyroid gland, cervical oesophagus. Eminent postoperative care is essential especially in infants and children. In our study on different occasions in which tracheostomy was analyzed various indications and study the prevalence of tracheostomy and compare it between emergency and planned tracheostomy.

METHODS

This study comprises of 80 patients who underwent tracheostomy during 2008-2010. This study includes patients who are intubated, that are referred from ICU with prolonged ventilation and those admitted into ENT ward with various indications. In this institute tracheostomy is done between 5th and 10th day for patients on mechanical ventilation. Investigations include routine surgical profile and coagulation profile.

As patients with CVA will be on thrombolytics, we request for cutting down of thrombolytics for 48 hours prior to surgery. Majority of tracheostomies are elective and done under general anaesthesia in operation theatre. An elective tracheostomy can be performed under local or general anaesthesia. The operating theatre is the safest and most comfortable place in which to perform a tracheostomy and there should always be time, with adequate resuscitative support, to transport a patient to the operating room.

If one elects to do a tracheostomy by the bedside in the intensive care unit, amount of experience with the procedure is recommended prior to such an undertaking. Most ward beds are much wider than the operating table and it is wise to move the patient to the edge of the bed to save bending over. A headlight is recommended for this procedure outside the operating room. A diathermy machine should be connected and ready for use. The patient ought to have at least a pulse oximeter connected for monitoring. The surgeon should check that all the instruments he/she requires are available and laid out in the correct sequence for the procedure. These few points can save the surgeon a lot of frustration during a bedside tracheostomy.

Positioning the patient

The patient is placed supine with shoulders supported and the head tilted backwards on a head ring. This position brings the trachea to the surface of the neck and stretches the neck skin taut. If neck extension is not possible, the surgeon has to rely on pre-and intra-operative palpation and direct manipulation of the laryngotracheal skeleton during the operation.

Procedure

The incision

- A horizontal incision is recommended for an elective tracheostomy as the resultant scar with or without revision is usually cosmetically more acceptable than the blemish after an equally long vertical scar. Nevertheless, in an emergency situation, when cosmesis takes low priority, a long vertical incision provides the shortest route with the least bleeding to the trachea.
- 2. The best position for incision is at the level of the third and fourth tracheal rings, well away from the cricoid. If the tracheal rings are not palpable, the incision can be placed halfway between the cricoid cartilage and the jugular notch and the rings located intraoperatively.
- 3. In the case of a short fat neck, incision should be 1 cm above the medial ends of the clavicles in order to avoid the flanges of the tracheostomy tube abutting on them and then establish the anatomy of the tracheal skeleton intraoperatively.

The development of skin flaps and tissue plans

The incision does not need to extend beyond the anterior borders of the sternocleidomastoid muscles. Incise the skin and stroke the platysmal layer with the scalpel to separate its fibres.

Division of the anterior jugular veins and the separation of the strap muscles

The anterior jugular veins are best divided between clamps and tried. They can be cauterized if they are small or left undisturbed and retracted away from the midline if they are wide apart. Blunt dissection is recommended for the opening of the midline plane.

Division of the thyroid isthmus

This is best done between clamps. If the isthmus is long, more than one clamp can be applied on each side and the division can be done from top to bottom in short segments in the midline. Care should be taken at the lower end to avoid injury to the submanubrial brachiocephalic vessels. The stump on each side after division should be transfixed and firmly tied. Sometimes the isthmus is tiny and may be well out of the way of the third and fourth tracheal rings. This can be safely left but it is best not to mobilize an isthmus if one does not plan to divide it.

Entering trachea

Prior to entering the trachea, the surgeon should check that the appropriate size tracheostomy tube with an inflatable cuff is available for insertion. The anaesthetist should be informed. The trachea can be entered in different ways a midline slit, a cruciate incision, a window or a superiorly or inferiorly based (Bjork) flap.

Insertion of the tracheostomy tube

At this point the secretions in the tracheobronchial tree should be aspirated with a suction catheter. The right-handed surgeon should not insert the tip of a tracheal dilator into the window with the left hand. As it is opened, gentle superior traction brings the trachea to the surface and the lubricated tracheostomy tube can be inserted from the side and gently rotated into the trachea.

Suturing the wound and securing the tracheostomy tube

The wound can be sutured on the two sides but the centre should be left loose around the tube to avoid surgical emphysema. Paraffin gauze dressing is placed around the tube, which serves well to keep the wound clean. The tube flanges can then be sutured with a 2/0 silk stitch to big bites of skin on both sides. The tube should then be further secured with tapes on each side with the patient's head flexed to avoid slack. Secure knots should be used as these tapes can always be cut and replaced. With these simple measures, a dislodged tube in the early postoperative period can be effectively prevented. The tracheostomy tract is well formed by 72 hours and a tube change can be performed safely and comfortable after this time.



Figure 1: Tracheostomy set.



Figure 2: Jackson's tracheostomy tube.



Figure 3: Fenestrated tracheostomy tube.

Statistical analysis

At the end of study all data is compiled and statistically analyzed using diagrammatic representation and data was expressed as mean and percentages.

RESULTS

Total number of tracheostomies performed during the study period was 80.

Table 1: Various indications of tracheostomy.

Indications (upper airway	No. of	%
obstruction)	cases	70
Tumors	16	20
Ventilatory support/toileting	15	18.75
Prolonged Intubation	15	18.75
Trauma	14	17.50
Acute upper airway		
obstruction secondary to blunt	5	6.25
laryngeal trauma		
Cutthroat injury	1	1.25
Severe head injury with upper	3	3.75
airway obstruction	3	3.73
Penetrating neck injury with	1	1.25
upper airway obstruction	1	1.23
Foreign body in aerodigestive		
tract with upper airway	5	6.25
obstruction		
Infection	2	2.5
Retropharyngeal abscess	1	1.25
Tetanus infection	1	1.25
Others	1	1.25
Total	80	100

The most common indication for tracheostomy was upper airway obstruction secondary to tumours in the aero digestive tracts (57.5%) among which the most common being tumour in 16 (20%).

Prolonged cause of mechanical ventilation in present study is head injury (22.5%).

Most common groups who need tracheostomy in present study are above 30 years males.

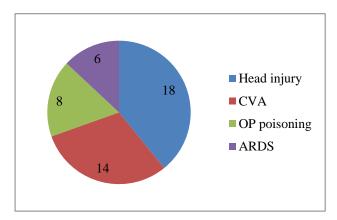


Figure 4: Various causes for prolonged mechanical ventilation.

Table 2: Frequency of tracheostomy in different groups.

Variable	No. of cases	%
Years		
5-10	2	2.5
11-20	5	6.25
21-30	11	13.75
Above 30	62	77.5
Adults		
Males	59	73.75
Females	14	17.5
Children	•	
Males	5	6.25
Females	2	2.5

Frequency of complication is more in emergency tracheostomy done in cases with sudden apnoea.

Table 3: Frequency of complication in elective and emergency tracheostomy.

	Emergency tracheostomy	Elective tracheostomy
Sudden apnoea	4	1
Bleeding	2	3
Surgical emphysema	4	2
Infection	1	0
Accidental injury	1	0
Subglottic stenosis	1	0
De-cannulation difficulties	1	0
Total	14	6

Sudden apnoea (10.5%) is more common complication with vertical tracheostomy (29%).

Table 4: Frequency of complication in vertical and horizontal tracheostomy.

	Horizontal tracheostomy (n=42)	Vertical tracheostomy (n=38)
	N (%)	N (%)
Intra operative bleeding	3 (7.)	2 (5.2)
Accidental injury	0	1 (2.6)
Sudden Apnea	1 (2.4)	4 (10.5)
Emphysema	4 (9.52)	2 (5.2)
Decannulation difficulties	0	1 (2.6)
Subglottic stenosis	0	1 (2.6)
Total	8 (19)	11 (29)

Table 5: Differences between tracheostomized and non tracheostomized ICU patients.

Cases	Tracheost omized ICU patients N (%)	Non- tracheostom ized ICU patients N (%)	P value
Total	27	53	0.43 NS
Male	24 (90)	48 (90.5)	
Female	3 (10)	5 (9.5)	
Mechanical ventilation	25/27 (92)	35/53 (66)	0.05 S
Mean ICU stay	37±31	8.6±10.1	0.0004 S

ICU: Intensive care unit; S: significant; NS: non-significant.

Mechanical ventilation was required in 60/80 (75%) of patients and 25/27 of the tracheostomized patients with significance difference (p=0.05).

DISCUSSION

Tracheostomy is usually a procedure to relieve upper respiratory obstruction in an emergency situation when patients are in respiratory distress. The indications for this operation have been expanded to include not only elective treatment but also emergency procedure. The main causes for high complication rate in emergency tracheostomy appear to be the amount of time required to open the trachea. Therefore simple and fast procedures are mandatory. In this clinical study vertical incision tracheostomy compared with horizontal skin and tracheal incision tracheostomy. The total number of cases included in this study was 80.

The number of operations done for this state is 46 cases and 57.5% of the total tracheostomies. Out of 46 cases, 18 cases were head injury with low scores of GCS, 14 were CVA cases, 8 were of OP poisoning and 6 were ARDS with sepsis. Tracheostomy was done to relieve the obstruction and for intermittent aspirations from respiratory tract suction done with a catheter. This procedure due to its simplicity is becoming popular and substitute for repeated bronchoscopes for management of secretion obstructions. Secretions in the respiratory tract are formed in a methodical manner and removed by several intrinsic respiratory mechanisms. The most important of which are ciliary activity and protective cough reflex. The positional changes and postural drainage are important adjuvant in removing accumulated secretions. Bronchial peristalsis which is a slow, rhythmic movement of the bronchial musculature from the periphery towards the hilum, undoubtedly assists in maintaining a clear air way. Ciliary action is an important means of propelling secretions along with respiratory tract but its effect is quickly reduced or eliminated by drying or by changes in the viscosity of the bronchial mucus.

During air way obstruction by the secretions which are thickened certain dangerous chemical changes occurs into the blood stream. One minute of O_2 deprivation may be followed by morphological changes in the brain; 3 to 8 minutes lack of O_2 is enough to produce irreversible changes and death. Equally important is a retention of CO_2 in the blood as carbonic acid, it crosses the alveolar membrane more rapidly than O_2 , under reduced alveolar gases exchange it is retained in the blood, while high concentrations produces narcosis, respiratory depression and circulatory collapse (Table 1).

The most common indication for tracheostomy was upper airway obstruction secondary to tumours in the aero digestive tracts (57.5%) among which the most common being tumour in 16 (20%) (Table 1). Higher incidence of laryngeal carcinoma in our series may also support previous report of increase in the incidence of laryngeal cancer in our society. This was followed by UAO due to traumatic causes which is at variance with report from Tanzania that found trauma to be the most common indication but similar to report from the western and eastern part of Nigeria.^{6,7} These variations between series might be due to different patient populations, socioeconomic, and sociocultural difference. Trauma to the head and neck was the leading indications in the 3rd-4th decade of life in our series. This is the economically active age and portrays an economic loss both to the family and the nation and the reason for their high incidence of head and neck injuries reflects their high activity levels and participation in high-risk activities. The fact that the economically productive age group were mostly involved calls for an urgent public policy response. Interestingly, majority of these injuries were from road traffic crashes, Ilorin being strategically located between the North and the Southern states has

high traffic movement and other likely contributory factors are bad roads and human errors.⁸

According to the statistical data collected in our study the highest incidence is among the people above 30 yrs. (Table 2). Whereas in the studies conducted by Carron et al, Ang et al and Ozmen et al the mean age was 3.2, 3.24 and 2.25 years, respectively. Thus, the mean age group in our study was comparatively on a higher side. However, maximum number of patients was in 0 to 2 year age group.

Total number of adult cases is 73 out of 80 total tracheostomies, in which males are more dominant with 59 cases out of 73, about 80.82% of total adult tracheostomies. In case of females 14 cases out of 73 reported i.e., 19.18% in adult population. Total number of paediatric tracheostomies is 7 of which male children are 5 comprising 71.42% and female children are 2 comprising 28.58% of paediatric tracheostomies. The most frequent indication for tracheostomy is the need for prolonged MV in the ICU. In this way the time spent in ICU can be reduced for those patients, because tracheostomy allows them to be transferred to other stepdown units (Table 2). 12

Sudden apnoea (10.5%) is more common complication with vertical tracheostomy (29%) which agrees with study of Ozmen et al showing sudden apnea (Table 3). The complication rate was found to be 29 % which was comparable to study of Munir et al i.e., 30%. 11 In the study, subcutaneous emphysema and peristomal infection were the most common complications. Tracheal stenosis, tracheo-innominate artery fistula and trachea-esophageal fistula were very rarely seen. Complications were more commonly encountered in emergency tracheostomies, compared to planned ones. Thus the present study can be compared with previous studies. Also Soni et al reported subcutaneous emphysema as the second most common complication after infection, but in our study only one case of tracheal stenosis occurred in total of 124 patients.¹³ Similarly Mehta et al reported one patient in 100 cases and Soni et al reported 2 cases in 100. 13,14 This was in sharp contrast to study of Goldenberg et al, who reporter subglottic stenosis as the most common complication (21 cases).15

Mehta in their study of 100 cases, noted complications in 48% cases. 14 Early and relatively minor complications were encountered commonly. Complications were twice more common in emergency than planned cases. No tracheostomy related deaths were noted. Zeitouni et al studied 281 cases of tracheostomy and found a total complication rate of 24%. 16 A statistically significant increased risk of complications was found both in emergency situation and in ICU patients. Haemorrhage was the most common intra-operative complication common (2.8%).Infection was postoperative complication (7.8%). No tracheostomy related deaths were reported.

Goldenberg et al studied 1130 cases of tracheostomy and found major complications in 49 cases (4.3%) and 8 tracheostomy related deaths (0.7%). The common complications were tracheal stenosis (21 cases), severe bleeding in 9 cases (including 2 cases of tracheainnominate artery fistula), tracheo-cutaneous fistula (6 cases), infection (5 cases) and tracheo-oesophageal fistula (1 case). 8 deaths occurred, which included 4 cases of accidental de-cannulation, 2 cases of severe bleeding and 2 cases of tension pneumothorax. He further stated that complications can be minimized by avoidance of emergency tracheostomy by endotracheal intubation.

Mechanical ventilation was required in 60/80 (75%) of patients and 25/27 of the tracheostomized patients with significance difference (p=0.05). This agrees with the result of other studies about tracheostomy in ICU in teaching hospital in which all the Nigeria's tracheostomies were surgical tracheostomy, in one of the international survey about tracheostomy in ICU. The importance of this study is while it was done in the ICU of a surgery hospital, so it was dealing mostly with surgical cases, which differ from other studies, which may include non-surgical cases, and even data of the met analysis studies involve non-surgical ICUs. At the same time, since study took place in a developing country, in the study by Kluge et al, 86.1% of ICUs routinely perform PDT and only 13.9% of ICUs perform ST; however, in answering a question of "which method is according to your opinion is safer," 50% answered there was no difference between the two methods, 27% answered PTD and 19% answered tracheostomy. 17 Some review studies prefer percutaneous dilatational tracheostomy over ST because there is no need for the operating room (OR), it is less expensive, the reduced time between decision and performance of tracheostomy, and lower mortality rate. 18 In our study, however, the ICU is located in the same floor neighbour as the OR and otolaryngology doctors are freely available 24/7 in the hospital. This overrides the problems from transferring the patients from the ICU to the OR, as well as reduces the time between the decision and the performance of the tracheostomy. In fact, the ST turns out to be cheaper than PDT (no need for the costly disposable PDT set). As for mortality rate, there are many studies that found no difference between ST and PDT in this regard. Because of the significant effect of tracheostomy on the patient's life, it must be included in any learning process undergone by the otolaryngologist.

CONCLUSION

Out of 80 tracheostomies 46 comprising 57.5% of total no cases are done for prolonged mechanical ventilation referred from ICU, admitted with various causes like head injuries with low scores GCS, CVA. Organophosphorus poisoning with intermediate syndrome and ARDS with sepsis. 18 cases comprising 22.5% were done for malignant tumours and 2 cases comprising about 2.50% done for benign tumours. 2

cases comprising 2.50% of tracheostomy cases are done for laryngeal diphtheria complicating respiratory distress. 4 cases comprising 5.0% tracheostomies are done for neck injuries. 2 cases comprising 2.50% of tracheostomy cases are done for bilateral abductor paralysis and 6 cases comprising 7.5% are done for laryngeal stenosis. Therefore the major indication for tracheostomy in this study is prolonged mechanical ventilation and the remaining was due to mechanical obstruction. It is evident from this study that prolonged mechanical ventilation is more common indication for tracheostomy.

Majority of the tracheostomies are done in malignant conditions either carcinoma larynx or carcinoma hypopharynx with stridor and dyspnoea. This indicates not only the prevalence of malignancy in this region but also the dreadness of this disease causing air way obstruction.

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REFERENCES

- 1. Van Heurn LW, Brink PR. The history of percutaneous tracheostomy. J Laryngol Otol. 1996;110(8):723-6.
- 2. Peumery JJ. Armand Trousseau (1801-1867), French physician par excellence. Hist Sci Med. 2003;37(2):151-6.
- 3. Parcy P. Tracheostomy. In: Scott-Brown's Otolaryngology, Head Neck Surg, eds.Michael Gleeson. 7th ed. Hodder Arnold; 2008: 2.
- Bradley PJ. Management of the obstructed airway and Tracheostomy. In: Scott-Brown's Otorhinolaryngology, Head Neck Surg. Watkinson JC, Clarke RW, eds. Head and Neck Surgery, Plastic Surgery. 6th ed. Butterworth-Heinemann; 1997.
- 5. Bailey BJ, Karen H. Calhoun. Tracheostomy and intubation. Head and Neck surgery, Otolaryngology. 3rd ed. NY: Lippincott; 2001;677(84):917-24.
- 6. Okhakhu AL, Emma-Nzekwue NH, Afolabi OA. Changing indications for paediatric tracheostomy in a Nigerian tertiary hospital. Port Harcourt Med J. 2012;6:264-8.
- 7. Eziyi JA, Amusa YB, Musa IO, Adeniji AO, Olarinoye OT, Ameye SA. Tracheostomy in south Western Nigeria: Any change in pattern? J Med Med Sci. 2011;2:997-1002.
- 8. Alabi BS, Ologe FE, Dunmade AD, Segun-Busari S, Olatoke F. Acute laryngeal obstruction in a Nigerian hospital: Clinical presentation and management. Niger Postgrad Med J. 2006;13(3):240-3.
- Carron JD, Derkay CS, Strope GL, Nosonchuk JE, Darrow DH. Pediatric tracheostomies: changing

- indications and outcomes. Laryngoscope. 2000;110(7):1099-104.
- Ang AH, Chua DY, Pang KP, Tan HK. Pediatric tracheotomies in an Asian population: the Singapore experience. Otolaryngol Head Neck Surg. 2005;133(2):246-50.
- 11. Ozmen S, Ozmen OA, Unal OF. Pediatric tracheotomies: a 37-year experience in 282 children. Int J Pediatr Otorhinolaryngol. 2009;73(7):959-61.
- 12. MacIntyre NR, Cook DJ, Ely EW, Epstein SK, Fink JB, Heffner JE, et al. Evidence based guidelines for weaning and discontinuing ventilator support. A collective task force facilitated by the American college of chest physicians, the American association for respiratory careand the American college of critical care medicine. Chest. 2001;120(6):375-95.
- 13. Soni NK, Chatterji MS, Thind SS. Tracheostomy in chindren. Indian J Pediatrics. 1984;51(408):45-7.
- 14. Mehta AK, Chamyal PC. Tracheostomy complications and their management. Med J Armed Forces India. 1993;55(3):197-200.

- Goldenberg D, Ari EG, Golz A, Danino J, Netzer A, Joachims HZ. Tracheostomy complications: A retrospective study of 1130 cases. Otolaryngol Head Neck Surg. 2000;123(4):495-500.
- 16. Zeitouni AG, Kost KM. Tracheostomy: a retrospective review of 281 cases. J Otolaryngol. 1994;23(1):61-6.
- 17. Kluge S, Baumann HJ, Maier C, Klose H, Meyer A, Nierhaus A, et al. Tracheostomy in the intensive care unit: a nationwide survey. Anesth Analg. 2008;107(5):1639-43.
- 18. De Leyn P1, Bedert L, Delcroix M, Depuydt P, Lauwers G, Sokolov Y, et al.. Tracheotomy: clinical review and guidelines. Eur J Cardiothorac Surg. 2007;32(3):412-21.

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