

Original Research Article

Retrospective analysis of paediatric tracheostomy in Indian tertiary care centre

Digant Patni*, Vishal R. Munjal

Department of Otorhinolaryngology, Sri Aurobindo Institute of Medical Sciences, Indore, Madhya Pradesh, India

Received: 28 November 2019

Revised: 10 January 2020

Accepted: 31 January 2020

***Correspondence:**

Dr. Digant Patni,

E-mail: digantpatni@gmail.com

Copyright: © the author(s), publisher and licensee Medip Academy. This is an open-access article distributed under the terms of the Creative Commons Attribution Non-Commercial License, which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.

ABSTRACT

Background: Tracheostomy is frequently performed surgical procedure. The present study was carried out to assess data on various indications, surgical issues if any, complications and outcomes of paediatric tracheostomy.

Methods: This study is a retrospective analysis of 32 paediatric patients between 1 to 12 years of age, who underwent tracheostomy at SAIMS, Indore between June 2015 to June 2019. Data was analysed in terms of patient age, sex, emergency or planned procedure, any surgical challenge, complications and post-operative follow up.

Results: Majority of patients were of prolonged intubation due to respiratory and laryngotracheobronchitis (15.6%) each, neuromuscular disease (15.6%), seizure disorder (9.4%), metabolic disease (9.4%) and neurological infection (6.3%). Obstructive causes included head injury (9.4%), sub-glottic stenosis (6.3%), malignancy (6.3%) and craniofacial anomaly (3.1%). Common complication encountered were partial blockage of tube, peri-stomal granulation and accidental decannulation. There was no tracheostomy related mortality in this study. Out of 32 patients, 16 were successfully decannulated, 6 were lost to follow up, 6 could not be decannulated and 4 expired due to worsening of primary disease.

Conclusions: There is a changing trend in indications of tracheostomy and overall complications have reduced due to trained team and better care facility.

Keywords: Tracheostomy, Changing trend, Prolonged ventilation

INTRODUCTION

Tracheostomy is one of the most frequently performed planned or emergency surgical procedure in critically ill patients who are on prolonged ventilatory support, in cases of retained pulmonary secretions and respiratory insufficiency.¹ Trousseau by around mid of eighteenth century performed approximately 200 tracheostomy due to diphtheria with airway obstruction.²

Paediatric patients may have 2 to 3 time more morbidity than adults and have high complication rates. Infantile larynx and trachea have small diameter therefore severe life threatening airway obstruction can develop due to event

mild mucosal oedema. Infantile larynx occupy a higher position in neck. Sometimes cricoid cartilage may not be prominent on palpation and may pose difficulty for surgeon to ascertain level of airway.³ The anatomical differences between adult and paediatric may increase problem during management of such patients. These paediatric patients are medically vulnerable and high risk associated with higher rated of complications.⁴

Previously, infective causes were much more common indication for paediatric tracheostomy however, now indications have changed to airway obstruction, long term ventilatory dependence, neurological impairment and respiratory problems.⁵

This tertiary care centre is a referral centre and receives many such paediatric patients in whom tracheostomy is indicated. The aim of this study was to present our clinical experience with paediatric tracheostomy cases in terms of indications, intra-operative surgical challenges, complications and outcome of procedure.

METHODS

This study is a retrospective analysis of paediatric tracheostomy procedure performed between June 2015 to June 2019 at Sri Aurobindo Institute of Medical Sciences (SAIMS), Indore, Madhya Pradesh. Inclusion criteria consisted of children less than 12 years of age who underwent tracheostomy. Patients records were analysed in terms of indications for tracheostomy, any specific issue during the procedure, complications and outcome. The study was approved by ethics committee and consent was also obtained from parents of all patients.

All tracheostomies were performed by consultant ENT surgeon in operation theatre. Patients airway was secured by endotracheal tube in all cases except in two cases where intubation was not possible. Patient neck was hyper extended and local infiltration with 2% lignocaine with adrenaline was done as per weight of patient. Thyroid cartilage, cricoid cartilage and tracheal ring were palpated and marked. Tracheostomy performed at our institution consist of vertical skin incision below the level of cricoid cartilage measuring 1 to 1.5 cm in length. Dissection of underlying strap muscle performed layer by layer by staying strictly in the midline and were retraced laterally to expose the trachea. Thyroid isthmus encountered was carefully dissected off and retracted above with retractors. Bipolar assisted dissection was done when needed for haemostasis. The cricoid cartilage identified and used as landmark for tracheal incision. Trachea was confirmed by air aspiration in a saline filled syringe and conventional stay suture was applied on anterolateral wall of trachea for traction and were fixed. A vertical incision was placed on 2nd and 3rd tracheal rings and in few patients, horizontal inter cartilaginous incision between 2nd to 3rd tracheal ring. Tracheal incision was dilated and tracheostomy tube of appropriate size was then inserted in trachea and secured.

Patients in early post-operative period were managed in paediatric intensive care unit (ICU) under cardio-respiratory monitoring. All patients had undergone X-ray chest with thorax (anteroposterior view) to ascertain position of tube and condition of lung. Post-operative care involved endotracheal suction of mucous, blood clot, debris to prevent occlusion of tracheostomy tube. Change of tube was performed seven days after surgical procedure. Patients were planned for decannulation or continued on tracheostomy tube depending on their clinical condition and progress. Process of decannulation was started once patients were off ventilatory support and with no airway obstruction. Laryngotracheal endoscopy was performed prior to decannulation procedure to

ascertain status of airway above tracheostomy and to rule out any vocal cord pathology or palsy. Decannulation included gradually reducing calibre of tracheostomy tube.

RESULTS

A total of 32 patients underwent tracheostomy during period of 4 years from June 2015 to June 2019. Out of 32 patients, 2 patients were in age group 1 to 4 years i.e. 6.3%, 14 patients were between age group of 5-8 years i.e. 43.7% and 16 patients were between age group of 9-12 years i.e. 50% (Figure 1). About 20 patients i.e. 62.5% were male and 12 patients i.e. 37.5% were female. The number of patients every year ranged from 6-8 each years (Figure 2). Out of 32, two patients underwent emergency tracheostomy whereas rest tracheostomies were planned.

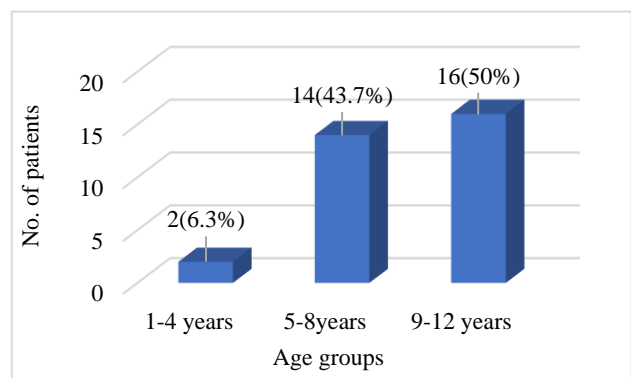


Figure 1: Age wise distribution of patients (n=32).

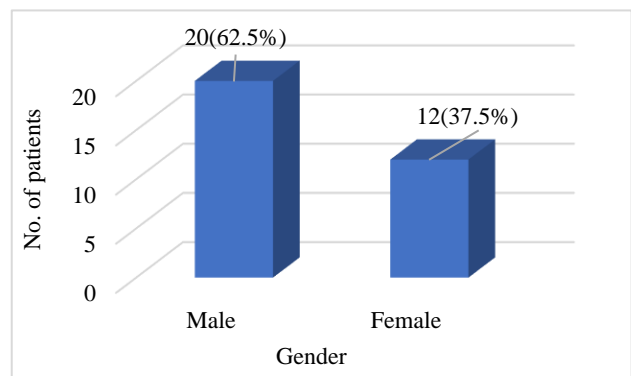


Figure 2: Gender wise distribution of patients.

The various indications for paediatric tracheostomy in our study are as per Table 1.

Patients tracheostomised due to prolonged intubation included cases with respiratory infections and laryngotracheobronchitis (15.6%) each followed by neuromuscular disease (15.6%), seizure disorder (9.4%), metabolic disease (9.4%) and neurological infections (6.3%). Airway obstructive causes included cases with head injury (9.4%) followed by sub-glottic stenosis (6.3%), malignancy (6.3%) and craniofacial; anomaly (3.1%).

Table 1: Indications of tracheostomy in our study.

Indications	N (%)
Respiratory infections (Pneumonia or H1N1)	5 (15.6)
Laryngotracheobronchitis	5 (15.6)
Meningitis or encephalitis	2 (6.3)
Metabolic disease	3 (9.4)
Neuromuscular disease	5 (15.6)
Seizure disorders	3 (9.4)
Sub-glottic stenosis	2 (6.3)
Trauma or head injury	3 (9.4)
Malignancy	2 (6.3)
Electric shock	1 (3.1)
Craniofacial anomaly	1 (3.1)

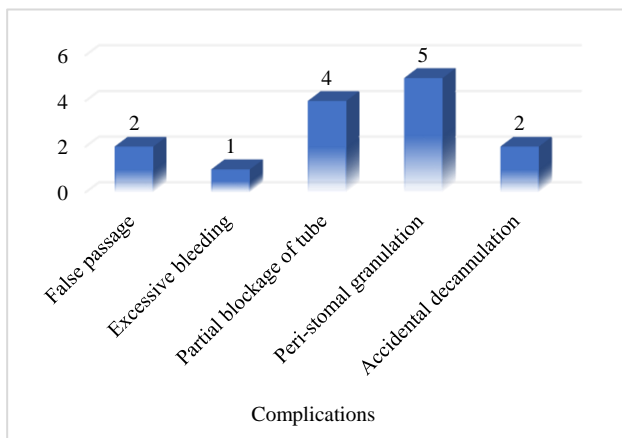


Figure 3: Complications of paediatric tracheostomy.

During the surgical procedure and in follow up period, certain complications were encountered which are as follows. In two patients, tracheostomy tube was inserted in false passage which was detected on table and reinsertion of tube was done. One patient had excessive bleeding from region of isthmus which was controlled on table by cautery and ligature. In post-operative period i.e. 4th-5th post-operative day, partial blockage of tube was noted in four patients which was treated by change of tube. Five patients had developed granulations around stoma; out of which one had excoriation of peristomal skin. In paediatric ICU, two patients had accidental decannulation due to strong cough reflex which was managed by re-insertion of tube by ICU staff (Figure 3).

Twenty-two patients out of 32 are still on follow up. Out of these patients, six could not be decannulated in spite of recovery from primary disease. Out of 32 patients who underwent tracheostomy, sixteen patients were successfully decannulated after recovery from primary illness. About six patients were lost to follow up. Patients who are still on tracheostomy tube are six and four patients expired in hospital due to fatal worsening of primary illness (Figure 4).

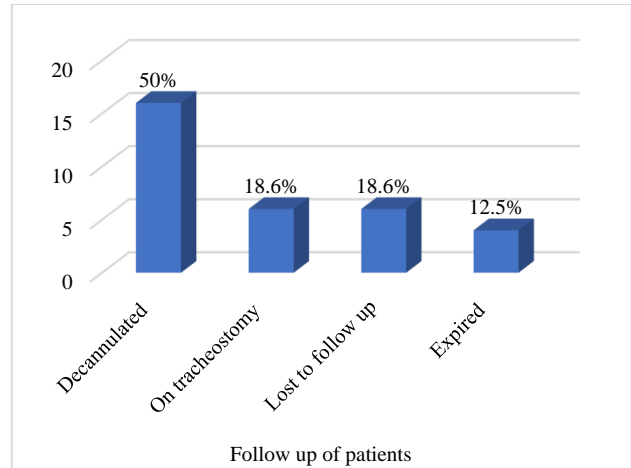


Figure 4: Follow up results of paediatric tracheostomy patients.

For decannulation, patients were subjected to direct laryngoscopy using endoscope in operating room. Endoscopic evaluation included vocal cord mobility and airway narrowing if any. Those patients who had normal laryngoscopy findings and no features suggestive of aspiration of feeds were decannulated. The decannulation was done by gradual reduction in size of tube. The tracheostomy site was strapped with sticking bandage once patients were decannulated. They were kept for 24-hour observation following decannulation to determine their ability to breath from nose without distress and to detect need of re tracheostomy if any due to breathing difficulty.

DISCUSSION

Tracheostomy is a common surgical procedure performed in all age groups. Significant anatomical differences exist between paediatric and adult airway. The air passage is relatively small in children’s than adults. To perform tracheostomy in children’s, ENT surgeon require good expertise and exposure of paediatric cases when compared to adult tracheostomy. Paediatric tracheostomies are associated with high rate of complications and mortality.⁶ There is about 2 to 3 times higher rate of morbidity and mortality as compared to adults.⁷ However, studies have suggest that paediatric tracheostomy is relatively safe and carry less risk of complications if performed by trained experienced team at tertiary care centre.⁸

Out of 32 patients in our study, 62.5% were male and 37.5% were females. Except two, all other tracheostomies were planned elective procedure done with oral intubation as airway control. Similar to present study, in astudy by Putra et al had majority of male patients than females and performed all planned tracheostomy.⁹ On contrary, study published by Alladi et al had majority of patients within 1 year of age.¹⁰

In last 2 to 3 decade, there has been change in indications of tracheostomy. Tracheostomy performed for infective conditions like epiglottitis, laryngotracheobronchitis and retropharyngeal abscess has been on decline due to development of better anaesthetic technique and safer endotracheal intubation. Furthermore, immunization has reduced incidence of these infectious disease.^{9,22}

In our series, prolonged intubation was common indication for tracheostomy as compared to airway obstruction, similar to other studies.^{12,17,18} Carter et al reported neurological causes and causes requiring prolonged intubation as major indication for paediatric tracheostomy.¹¹ Ward et al reported an increase from 22% (1980-85) to 45% (1985-90) in tracheostomy preferred for prolonged intubation as compared to those done for airway obstruction from 67% to 42%.¹²

Decannulation in paediatric patients is considered difficult process. At our institution, we follow a protocol of pre-decannulation check endoscopy, gradual reduction of size of tube and gradual capping of tube. Similar protocol is being followed at centres wher higher number of paediatric tracheostomies are done.^{14,15}

In our study, 51% patients were decannulated successfully. Similar to present study Putra et al had 66.6% successful decannulation.⁹ However, Carr et al reported decannulation rate of 34% in 142 children's where as Dursum and Ozel reported successful decannulation in 5 out of 30 paediatric tracheostomy.^{12,13} Decanulation rate at our institution is reasonably good when compared to others.

The overall complication rate in our study was 43.7% which is comparable to other reported studies whose complication ranged from 36% to 49%.¹⁷⁻²⁰ No pneumothorax, tracheocutaenous fistula, trachea-esophageal fistula were reported in our series. Early complications mainly included partial tube blockage and accidental decannulation while late complication consisted of peri-stomal granulations. There was no tracheostomy related death in our study. Various studies have shown mortality rate in paediatric tracheostomy range from 0.5% to 5%.²¹ As such overall complications in paediatric tracheostomy has reduced significantly and mainly attributed to tracheostomy carried out in operation theatre by trained ENT surgeon and better paediatric ICU care.¹⁰

CONCLUSION

In conclusion, based on our experience, there is a changing trend in indications of paediatric tracheostomy from infective causes to those causes requiring prolonged ventilatory support. Paediatric tracheostomy is relatively safe procedure than compared earlier, if carried out meticulously by trained ENT surgeon preferably in operation theatre. The complication rate have declined in

paediatric tracheostomy, in improvement in better care facilities, trained team and proper decannulation protocol.

Funding: No funding sources

Conflict of interest: None declared

Ethical approval: The study was approved by the Institutional Ethics Committee

REFERENCES

1. Workman JK, Bratton SL. Pediatric tracheostomy: perhaps good things come to those who do not wait. *Minerva Anesthesiol.* 2017;83:787-9.
2. Rajesh O, Meher R. Historical review of tracheostomy. *Int J Otorhinolaryngol.* 2005;4(2):1-4.
3. Wetmore RF, Handler SD, Potsic WP. Pediatric tracheostomy-experience during the past decade. *Ann Otol Rhinol Laryngol.* 1982;91:628-32.
4. Gallagher TQ, Hartnick CJ. Pediatric tracheotomy. *Adv Otorhinolaryngol.* 2012;73:26-30.
5. Yaneza MM, James HL, Davies P, Harrison S, McAlorum L, Clement WA, et al. Changing indications for paediatric tracheostomy and the role of a multidisciplinary tracheostomy clinic. *J Laryngol Otol.* 2015;129(9):882-6.
6. Kenna MA, Reilly JS, Stool SE. Tracheotomy in the preterm infant. *Ann Otol Rhinol Laryngol.* 1987;96:68-71.
7. Gerson CR, Tucker GF. Infant tracheotomy. *Ann Otol Rhinol Laryngol.* 1982;91:413-6.
8. Fraga JC, João CK, de Souza, Krue J. Pediatric tracheostomy *J Pediatr (Rio J).* 2009;85(2):97-103.
9. Putra SHA, Wong CY, Hazim MYS, Megat Shiraz MAR, Gob BS. Paediatric Tracheostomy in Hospital University Kebangsaan Malaysia - A Changing Trend. *Med J Malaysia.* 2006;2:209-13.
10. Alladi ÆS, Rao ÆK, Das ÆA, Charles RA, D'Cruz J. Pediatric tracheostomy: a 13-year experience *Pediatr Surg Int.* 2004;20:695-8.
11. Carter, P, Benjamin, B. Ten-year review of pediatric tracheotomy. *Ann Otol Rhinol Laryngol.* 1983;92:398-400.
12. Ward RF, Jones J, Carew JF. Current trends in pediatric tracheotomy. *Int J Pediatr Otorhinolaryngol.* 1995;32:233-9.
13. Carr MM, Poje CP, Kingston I, Kielma D, Heard C. Complications in pediatric tracheostomies. *The Laryngoscope.* 2001;111(11):1925-8.
14. Dursun O, Ozel D. Early and long-term outcome after tracheostomy in children. *Pediatric Int.* 2011;53(2):202-6.
15. Knollman PD, Baroody FM. Pediatric tracheotomy decannulation: a protocol for success. *Curr Opin Otolaryngol Head Neck Surg.* 2015;23(6):485-90.
16. Prickett KK, Sobol SE. Inpatient Observation for Elective Decannulation of Pediatric Patients With Tracheostomy. *JAMA Otolaryngol Head Neck Surg.* 2015;141(2):120-5.

17. CarronJD, Derkay CS, Strobe GL, Nosonchuk JE, Darrow DB. Pediatric tracheostomies: changing indications and outcomes. *Laryngoscope* 2000;110:1099-104.
18. Wetmore RF, Marsh RR, Thompson ME, Tom LWC. Pediatric tracheostomy: a changing procedure? *Ann Otol Rhinol Laryngol.* 1999;108:695-9.
19. Donnelly MJ, Lacey PD, Maguire A. A 20 year (1971-1990) review of tracheostomies in a major paediatric hospital. *Int J Pediatr Otorhinolaryngol.* 1996;35:1-9.
20. Midwinter KI, Carrie S, Bull PD. Paediatric tracheostomy: Sheffield experience 1979-1999. *J Laryngol Otol.* 2002;116:532-5.
21. Pérez-Ruiz E, Caro P, Pérez-Frías J, Cols M, Barrio I, Torrent A, et al. Paediatric patients with a tracheostomy: a multicentre epidemiological study. *Eur Respir J.* 2012;40(6):1502-7.
22. Yellon R, Maguire R, Tuchman J. Paediatric tracheotomy. In: *Tracheotomy Management: A Multidisciplinary Approach.* Cambridge University Press, New Delhi. 2012: 72-86.

Cite this article as: Patni D, Munjal VR. Retrospective analysis of paediatric tracheostomy in Indian tertiary care centre. *Int J Otorhinolaryngol Head Neck Surg* 2020;6:533-7.