

## Original Research Article

# Pediatric tracheostomy: indications and outcomes from Indian tertiary care centre

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## ABSTRACT

**Background:** Pediatric tracheostomy has always been more challenging due to various factors. The present study was carried out to assess various indications, complications and outcomes of pediatric tracheostomy.

**Methods:** It was a prospective observational study in a tertiary care teaching hospital conducted over four years. Observations were recorded in form of indication, any surgical challenge, complications and postoperative follow up.

**Results:** Total 29 tracheostomies done in patients less than 12 years were included in the study. Majority of cases were infants (86%). Majority of patients were tracheostomised for lower respiratory infective cause who required prolonged ventilatory support (35%) followed by neurological cause (31%), obstructive cause (24%) and head injury (10%). Two most common complications were tube blockage (10%) and peristomal granulations (10%) which were suitably addressed. There has been no tracheostomy related mortality in the present study. All the patients who were considered for decannulation underwent check endoscopy. Out of 29 patients, 6 patients were lost in follow up. Out of the remaining, decannulation was successful in 16 patients (76%).

**Conclusions:** Pediatric tracheostomies with better care facilities and trained team, there are fewer complications and higher rates of decannulation. The average age of children undergoing tracheostomy has come down. There is changing trends in the indications of tracheostomies from infective causes to causes requiring prolonged ventilation. The complication rates have declined with proper decannulation protocol.

**Keywords:** Tracheostomy, Pediatric airway, Infant tracheostomy, Tracheostomy outcome

## INTRODUCTION

Tracheostomy is a frequently performed procedure for critically ill patients who require prolonged ventilatory support and for airway control in cases of respiratory insufficiency and retained secretions.<sup>1</sup> Pediatric patients are medically vulnerable and reviews have shown substantially higher rates of complications with almost 2–3 times more morbidity and mortality than adults.<sup>2</sup> In past decade, pediatric tracheostomy has become safer with better defined indications. The indications of pediatric

tracheostomy have changed from infective causes to airway obstruction and anomalies, long-term ventilation requirement, and underlying neuromuscular or respiratory problems.<sup>3,4</sup>

The present tertiary care centre, which is also a referral centre for pediatric patients, receive many such patients who are indicated for tracheostomy. The aim of this study is to identify the indications, surgical issues, complications and outcome in children who required tracheostomy.

## METHODS

This was a prospective observational study done in our tertiary care teaching institute (KEM Hospital and Research centre Pune) over 4 years (June 2014 and May 2018). All the children less than 12 years of age who underwent tracheostomy were included. Details of indication for tracheostomy, any specific issues during the procedure, complications, and outcome were noted and analysed. Ethical committee clearance was obtained for performing this study and a written informed consent was obtained from the parents of all the children.

### Surgery

Preoperative counseling and informed consent was taken from the parents. All tracheostomies were performed by consultant ENT surgeon in operation theatre. The upper airway was secured by an endotracheal tube in all cases except in two cases where intubation was not possible.

Neck was hyperextended; local infiltration was done with 2% lignocaine with adrenaline as per weight of the patients. Landmarks were palpated and marked. Below the cricoid, a vertical skin incision 1–1.5 cm in length was made.

Bipolar cautery assisted dissection was done plane-by-plane, strictly staying in midline. Thyroid isthmus was carefully undermined for elevation and then divided with the monopolar electrocautery. The cricoid cartilage is used as a landmark for the tracheal incision. Trachea is confirmed by air aspiration in saline filled syringe. The conventionally used ‘stay suture’ was done away with. The conventional vertical incision on 2<sup>nd</sup>-3<sup>rd</sup> tracheal ring and, in few patients, horizontal intercartilagenous incision between 2<sup>nd</sup>-3<sup>rd</sup> tracheal ring was made. The incision was dilated and tracheostomy tube of appropriate size is then inserted into the trachea and secured.

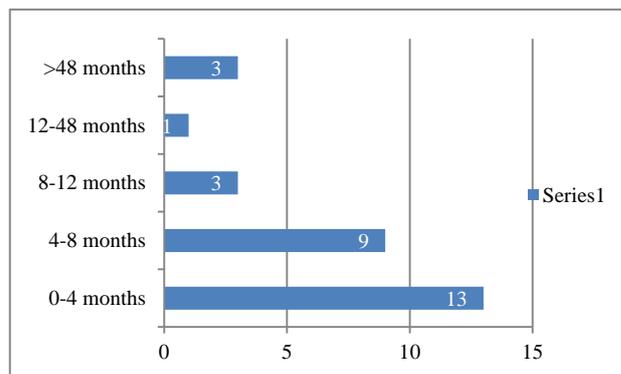
In early postoperative period, the patient was managed in intensive care, under cardiorespiratory monitoring. The X-ray neck and thorax -AP view was done in all patients to check the position of tube with respect to the carina and to rule out any complications like pneumothorax or pneumomediastinum. The tracheostomy tube was changed on seventh post-operative day. Depending on the progress of the child, was either planned for decannulation or was continued on tracheostomy tube.

Decannulation was planned when child was off assisted ventilation and there was no airway obstruction. The decannulation protocol followed was of laryngotracheal endoscopy to rule out granuloma stenosis, vocal cord palsy and status of airway above the tracheostomy. Decannulation was done by gradually reducing the calibre of the tracheostomy tube.

## RESULTS

A total of 29 tracheostomies were done over a period of 4 years (June 2014- May 2018). It was a prospective study so all records of patients was maintained and a proper follow up was maintained. The number of patients every year ranged from 06-09 each year.

Age wise distribution of patients is as per Figure 1.



**Figure 1: Age wise distribution of patients of pediatric tracheostomy (n=29).**

Out of total 29 patients, 13 patients were in the age group of less than 4 months, 09 patients were between 4-8 months, 03 patients were from 08-12 months, 1 patient was between 1-4 years and 3 patients were more than 4 years upto 12 years. Thus, 25 out of 29 patients were infants (<1 yr).

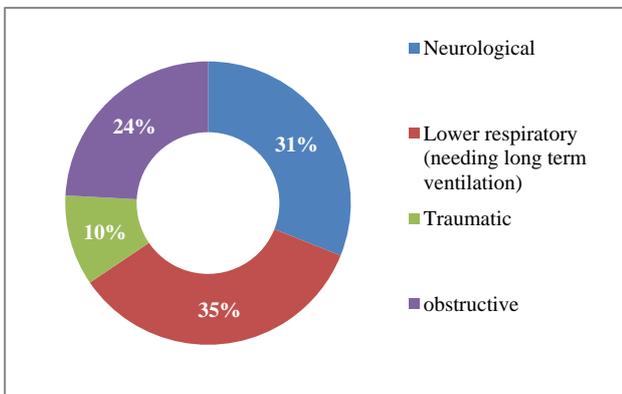
The various indications for pediatric tracheostomy are as per Table 1.

**Table 1: Indications of tracheostomy in our case series.**

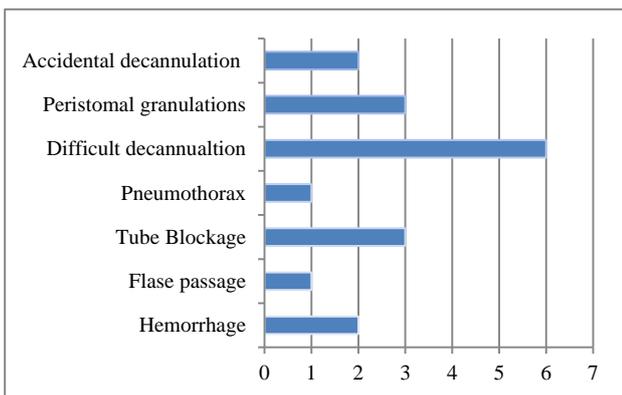
<b>Pneumonia</b>	3
<b>Respiratory failure/H1N1</b>	3
<b>Laryngomalacia</b>	3
<b>Meningitis/encephalitis</b>	4
<b>Seizure disorders</b>	3
<b>Neurological like GBS/pompe’s disease</b>	5
<b>Head injury</b>	3
<b>Sub glottic stenosis</b>	2
<b>Gastric volvulus (prolonged ventilation)</b>	1
<b>Malignancy</b>	1
<b>Craniofacial abnormality</b>	1

Majority of patients were tracheostomised for lower respiratory cause (35%) requiring long term ventilation followed by neurological cause (31%). Obstructive cause constitute 24% and 10% causes were because of Head injury (Figure 2).

Certain complications encountered during the procedure and the follow up period are shown in Figure 3. In early postoperative period, the tube blockage was seen in three patients who were dealt with tube change. In one patient, the tube went in false passage which was detected on-table and reinsertion of tube was done. One child had profuse hemorrhage due to damage to anatomically variant ‘thyroid ima artery’. One child had bleeding in the postoperative period which was managed by a simple suture. One child developed pneumothorax in the post-operative period which resolved after ICD insertion. Three patients had development of granulations around the stoma; out of which one had granulation on the inner wall of trachea. Two patients had accidental decannulation during suction in ICU due to strong cough reflex; this was managed by reinsertion of tube by ICU staff. Out of 29 patients, 25 patients are still on follow up; out of these in spite of recovery from the primary disease, decannulation could not be done in 6 patients.



**Figure 2: Indications for pediatric tracheostomy.**



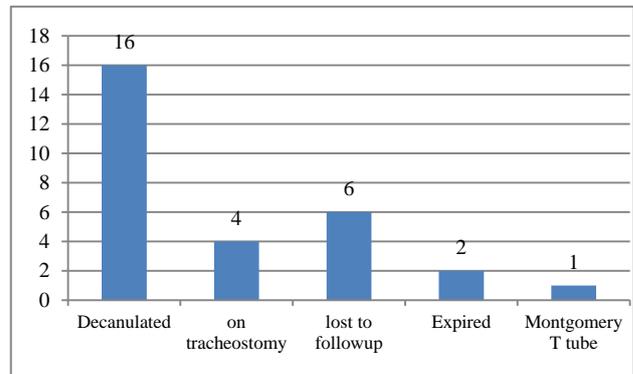
**Figure 3: Complications in pediatric tracheostomy.**

**Follow up of patients**

Out of total 29 pediatric tracheostomised patients, 16 patients were decannulated successfully after the primary condition subsided. 4 patients are still on tracheostomy tube. 6 patients were lost to follow up. 2 children expired in hospital, with the cause of death being the primary

cause and 1 patient of subglottic stenosis is on montgomery T-tube (Figure 4).

The patients on tracheostomy tube are well managed by parents at home with regular suction and monthly follow up at the hospital. The two in-hospital deaths were not related to tracheostomy but due to fulminant pneumonitis and encephalitis.



**Figure 4: Follow up results of pediatric tracheostomy patients.**

For decannulation, we followed the protocol of subjecting the patient to direct laryngoscopy using a ‘0’ degree endoscope in operating room. Vocal cords mobility and any airway narrowing were documented. If the child had all findings normal and did not aspirate during feeds, gradual reduction in tube size was done. Later, progressive daytime and overnight inpatient capping trials were given and decannulation was done. Child was kept under observation for 24 hours after decannulation to determine child’s ability to breathe from nose and detect any early failures requiring re-tracheostomy.

**DISCUSSION**

The decision to perform a tracheostomy remains complex and depends on several factors. Previously, pediatric tracheostomies were associated with higher rate of complications and mortality. The morbidity and mortality has been reported to be 2–3 times that of adults.<sup>5,6</sup> However in recent times, studies have shown that this procedure is safe and carry less risk of complications if carried out by a trained and experienced team at a tertiary care hospital.<sup>7</sup>

The incidence of pediatric tracheostomy has seen a subtle rise in recent times as supported by study by Gerson et al.<sup>8</sup>

Similar to the present study, in study by Alladi et al who published a 13 year data of pediatric tracheostomy had majority of patients within 1 year of age.<sup>9</sup> The probable reason for more number of tracheostomy in this age group could be due to better neonatal care leading to more babies surviving and few requiring prolonged ventilatory support. Besides there is increased awareness

of subglottis stenosis due to prolonged intubation and so any child needing ventilatory support for more than 2 weeks are generally considered for tracheostomy.<sup>10</sup> In present study too, the average number of pediatric tracheotomy is around 10 per year and most of planned cases have been done in the period of 2-3 weeks. In

literature search, it has been found that the infective conditions of upper airway like acute epiglottitis, tracheitis and retropharyngeal abscess have reduced significantly. A major chunk of indication for pediatric tracheostomies consists of neurological causes and causes requiring prolonged intubation.<sup>11</sup>

**Table 2: Comparative chart of complications of tracheostomy.**

Complication	Current study n=29	Alladi et al <sup>9</sup> n=39	Donnelly et al <sup>15</sup> n=29	Kremer et al <sup>16</sup> n=25
	N (%)	N (%)	N (%)	N (%)
Accidental decannulation	2 (6)	1 (3)	3 (10)	
Peristomal granulation	3 (10)	1 (3)	2 (6)	3 (12)
Pneumothorax	1 (3)	-	1 (3)	
Tube blockage	3 (10)	-		
False passage	1 (3)	-		
Hemorrhage	2 (6)	--		3 (12)
Tracheocutaneous fistula	-	1 (3)		

### *Incidence of complications*

The rates of various complications in present study were compared to that in literature. The comparison chart is as per Table 2. There has been no tracheostomy related mortality in the present study. Studies have shown the mortality rate due to pediatric tracheostomy ranges from 0.5% to 5%.<sup>12</sup>

The rate of complications has also reduced significantly and this can be attributed to tracheostomy being carried in operation theatre by trained ENT surgeon and better pediatric ICU care.<sup>9</sup>

Decannulation is considered to be difficult in children. The procedure can be made smooth by following a protocol of pre-decannulation check endoscopy, gradual reduction of size and gradual capping of tube as followed in our institute. Similar method is being followed by various others centre where higher number of pediatric tracheostomies are done.<sup>13,14</sup>

### **CONCLUSION**

Pediatric tracheostomy, if done meticulously, is a safer procedure than considered earlier. The average age of children undergoing tracheostomy has been reduced. There is changing trends in the indications of tracheostomies from infective causes to causes requiring prolonged ventilation. The complication rates have declined and with proper decannulation protocol. Thus in pediatric tracheostomies with better care facilities and trained team, there are fewer complications and higher rates of decannulation.

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