

## A study of tracheostomy in paediatric age group

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### **Abstract**

**Background:** Tracheostomy refers to a surgical procedure of creation of a stoma at the skin surface that leads into the tracheal lumen. In recent times tracheostomy is most commonly indicated in patients with prolonged intubation. The aim of this study was to establish data regarding indications, complications and techniques of tracheostomy in paediatric age group.

**Methods:** A retrospective study was done in the patients who had undergone tracheostomy in VS Hospital between age group of 1 month to 16 years.

**Conclusion:** In terms of indications, decannulation and complications the procedure has become safe due to having better equipment's and facilities

**Keyword:** tracheostomy, paediatric, paediatric age group

### **Introduction**

Tracheostomy is a surgical procedure in which an opening is made into anterior wall of trachea and through which a tube is inserted to facilitate breathing.

Tracheostomy in paediatric age group is different from adults. In children it is a more intricate procedure with difficulties in post-operative management and it is common for children to suffer greater morbidity and mortality.<sup>1-2</sup>

There is however a changing trend in the indications and outcomes in the use of tracheostomy in children for airway management.<sup>3-4-5</sup> In recent times prolonged intubation has become the commonest indication.<sup>6-7</sup> Even the age at which tracheostomy is performed is becoming increasingly younger due to improvement in the capabilities of medical technology.<sup>8-9</sup>

The purpose of this study was to highlight our clinical experience with the indications, complications, demographic characteristics, decannulation and other factors involved in tracheostomy in children.

#### • **Aims and objectives**

1. To study indications of tracheostomy in paediatric age group
2. To study outcome of paediatric tracheostomy
3. To study complications of paediatric tracheostomy
4. To determine the best method of tracheostomy

#### • **Materials and method**

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#### **Methodology**

The procedure was done under general anaesthesia via endotracheal intubation, laryngeal mask airway or facemask depending on the presentation of the patient. All patients were placed supine with extension of the neck. Routine painting and draping were done and adrenaline (1:200000 dilution) was injected into the skin of the anterior neck i.e., site of incision, midway between the cricoid cartilage and suprasternal notch. Vertical skin incision was made to the subplatysmal level following which blunt dissection was continued vertically with an artery forceps in the midline as the assistant surgeon retracts the strap muscles until the trachea was approached. Bleeding was controlled by diathermy if necessary. The thyroid isthmus is freed and retracted superiorly, pretracheal fascia was incised exposing the 2<sup>nd</sup> and 4<sup>th</sup> tracheal rings, cruciate or vertical incision was made through these rings. Blood and other secretions in the airway are suctioned if present and an appropriately sized tracheostomy tube (portex cuffed/uncuffed) was inserted and secured to the patient's neck with tie/suturing. All the patients were carefully monitored in paediatric ward/intensive care unit.

Postoperative care:

- Suction clearance to prevent blockage and adequate respiration
- Daily dressing
- Close monitoring for bleeding, breathing pattern, surgical emphysema and falling of saturation
- O<sub>2</sub> inhalation if required

- Cleaning of the tube via instilling diluted sodium bicarbonate drops if required to avoid blockage

All the patients were carefully monitored. Daily suctioning and dressing were done. The patients who were discharged with tracheostomy or after tracheostomy tube removal were asked to follow up in o.p.d

- **Observations and discussion**

Indications, techniques and complications of pediatric tracheostomy have changed over time and due to demographic features. There was no significant difference between emergency and planned tracheostomies in terms of indications, decannulation and complications. These results indicate an increased indication for intubation in paediatric patients.<sup>9</sup>

Total 26 tracheostomies were performed in paediatric age group within two years of period.

**TABLE 1: Sex wise distribution of patient**

	In present study		Brazilian university hospital (2000-2008)	
	Numbers	Percentage	Number	Percentage
Sex ratio				
Male	21	80.77%	33	56.90%
Female	5	19.23%	25	43.10%
Total	26		58	

In present study male: female is 4.2:1 while Brazilian university hospital (2000-2008) it was 1.32:1.<sup>10</sup>

In study of Tucker and Silberman which was conducted up to 1970, male to female ratio was 3:2.<sup>11</sup>

This suggests that male is more affected than female. This increased predominance in male is because they are more susceptible to both congenital and acquired disease of respiratory tract.<sup>12</sup>

**TABLE 2: Age distribution of patients**

Incidence according to age		
AGE	NO OF CASES	PERCENTAGE
Neonate (up to 1 month)	1	3.85
Infant (1 month to 1 year)	2	7.85
1 year to 5 years	10	38.46
Above 5 years	13	50.00
Total	26	

In our study number of patients below 5 years of age undergoing tracheostomy is about 50%. While in study at NIGERIAN TERTIARY HOSPITAL during period of 2000-2008 the percentage was about 21.7%.<sup>12</sup>

In BRAZILLIAN UNIVERSITY HOSPITAL (2000-2008) (up to 16 years of age) study, youngest child was of 1 month and the oldest was 16 years of age. None if the children were operated during neonatal period. Infants (up to 2 years of age) were 25 in number, preschool (2-6 years) were 17 and 12 were of more than 6 years of age.<sup>10</sup>

According to our results, however the ages of patients with tracheostomies were distributed through all age ranges and not clustered as a specific group. This suggests that tracheostomy can be performed in all age groups as a matter of course.

**TABLE 3: Indications of tracheostomy**

INDICATIONS		
	No of patients in present study	Dicle university, Turkey
Laryngitis	2	2
Diphtheria	4	5
Tetanus	1	2
Foreign body	0	1
Bilateral abductor palsy	4	2
T.m ankyloses (craniofacial anomaly)	1	4
Ludwig's angina	0	0
Head injury	9	14
Acute spasmodic laryngitis	0	0
Neck swelling	1	0
Faciomaxillary injury	1	0
Unconscious	3	0
Total	26	30

In our study main indication for tracheostomy was prolonged intubation. The causes were respiratory failure due to head injury (9 patients), neuromuscular disease (1 patient), Metabolic disease (1 patient) and postoperative period following major surgery. (2 patients, 1 of vp shunt surgery and 2<sup>nd</sup> of glioma surgery). There were 4 patients in study who had undergone tracheostomy for bilateral abductor palsy.

In BRAZILLIAN UNIVERSITY HOSPITAL (2000-2008) study, major indication was airway obstruction (40 patients). Among them majority (32 patients) were due to laryngotracheostenosis (28 had history of prolonged intubation, 3 laryngeal stenosis and 1 congenital stenosis. Other indications were prolonged orotracheal intubation(n=14,24%), sleep obstructive apnoea (n= 2, 3.4%), pulmonary clearance (n=1,1.8%)<sup>10</sup>

In study which was conducted in NIGERIAN TERTIARY HOSPITAL, major indication for tracheostomies were upper respiratory tract infection due to respiratory papilloma (63.04%). The high incidence of papilloma could be because of mother to child transmission of the papilloma virus during delivery.<sup>12</sup>

In the past tracheostomy was performed for acute upper airway involvement due to infectious disease. The main reason is due to wide use of antibiotics and improvements in

Intubation, increased availability of picu set up. And hemophilus influenza type b vaccine in the treatment of acute epiglottitis or diphtheria have resulted in a major decrease in indications of tracheostomy for acute infectious disease.<sup>9</sup>

Head injury forms 34.62% of the indications for the tracheostomy in paediatric age group and majority were due to road traffic accident. Recommendations have been given to those in government on ways of reducing road traffic accidents and these include the full enforcement of existing laws such as ensuring road worthy vehicles ply our road, proper road maintenance and the enforcement of traffic rules and regulation especially use of helmets and seatbelts.

**TABLE-4: Time of tracheostomy**

Time of tracheostomy (planned/emergency)	
Planned	19
Emergency	7
Total	26

Majority of tracheostomy were performed after proper planning as to reduce the complications related to procedure.

Major indication in our study to perform emergency tracheostomies was diphtheria as patients were in stridor and intubation was difficult.

**TABLE 5: Type of incisions**

Tracheal incision	
Type	
Vertical	19
Cruciate	7
Flap	0
Others	0
Total	25

Majority of tracheostomies in our study were performed with vertical incision.

Cruciate incisions were used in patients above age 10 years as diameter of trachea is more and large opening is required to insert tracheostomy tube.

Vertical incisions were performed in both NIGERIAN STUDY (2000-2008) AND DICLE UNIVERSITY, TURKEY (2006,2013)<sup>9, 12</sup>

**TABLE 6: Complications**

No	Complication	In present study	Brazilian university hospital (2000-2008)
1	Haemorrhage	0	0
2	Blockage	3	5
3	False passage	1	1
4	Displacement of tube	2	3
5	Subcutaneous emphysema	0	0
6	Pneumomediastinum/pneumothorax/pneumonia	0	1
7	Tracheitis/tracheomalacia	1	1

8	Stoma granulation	0	1
9	Trachea-oesophageal fistula	0	0
	Total	7	13

In tracheostomy severe complications may result if the surgical rules are not applied. Complications are reported in 5% to 40% of tracheostomies, depending upon the study design, patient follow up and the nature of complications. The early complication rate in the literature varies between 5.6% and 15% while late post-operative rates vary considerably (7%-63%). This may be due to the different patient numbers involved and to different indications and neonatal care clinic capacities. The most common departments where tracheostomy was performed were paediatric and anaesthesia intensive care units. GOLDENBERG ET AL. reported in their study of 1130 patients that tracheostomy is most frequently required in patients hospitalized in intensive care. If the appropriate indications, surgical rules and strict postoperative follow up are not adhered to, early (haemorrhage, accidental decannulation, pneumothorax and tube/ventilation problem) or late (tracheocutaneous fistulae, suprastomal granulation, tracheoesophageal fistula and subglottic stenosis) complications may develop. In order to avoid early complication, optimal anatomic orientation and access to the trachea are essential. Causes of late complication differ. For example, subglottic stenosis may develop due to laryngeal injuries after traffic accidents. Blunt trauma to the larynx with tracheostomy may lead to stenosis. Suprastomal granulation may result from a foreign body reaction to the tracheostomy tube or from infection. Tracheoesophageal fistula is an uncommon finding. Most tracheoesophageal fistulas are iatrogenic due to erosion by tracheostomy cuff with high pressure.<sup>9</sup>

In our study most common complication was recurrent tube blockage due to smaller diameter of tube and thick secretions. This was managed by frequent suction clearance. Tracheitis was managed by dressing, higher antibiotic and other supportive treatment. Complications like displacement of tube and false passage of tube were immediately managed by reinsertion of tube and checking bilateral air entry. No other complications like subcutaneous emphysema, pneumothorax/pneumomediastinum were observed in our study.

Complications in our study was seen in 26% of patients while the study which was done in DICLE UNIVERSITY, TURKEY between 2006-2013 showed similar result.<sup>9</sup> The most common complication was tube blockage. Tucker and Silberman reported that most common complications were tube blockage and accidental decannulation.<sup>11</sup>

In Brazilian university hospital (2000-2008), also most common complication was tube blockage followed by displacement and false passage of tube. No complications were observed intraoperatively.<sup>10</sup>

Table 7: **Mortality according to age**

Age group	Death
0 to 1	0
1 to 3	0
3 to 5	2(28.57%)
5 to 12	11(84.62%)

As in our study majority of the patients were above 4 years of age and indications of tracheostomies were due to head trauma and diphtheria, majority of mortality were seen in this age group.

TABLE 8: **Mortality rates**

Mortality	present study	Brazilian university hospital (2000-2008)	Everett	R.H NEFFSON
Mortality	percentage	percentage	percentage	percentage
due to complication of tracheostomy	0%	3.44%	11%	7-8%

In our study there was no death due to tracheostomy. deaths were due to primary disease. The cause of death in craniomaxillary injury was due to cardiorespiratory arrest, while the diphtheria it was due to respiratory arrest and cardiac toxicity. Tracheostomy related death in Brazilian university hospital (2000-2008) 3.44%, EVERETT -11%, R.H. NEFFSON 8-7% were reported.<sup>10</sup>

In Brazilian university hospital (2000-2008), 2 deaths due to tracheostomy were observed. In one case accidental loss of cannula occurred in immediate post-operative period which resulted in hypoventilation and death. In 2<sup>nd</sup> case death accidental loss of cannula in post-op period, followed by false course, pneumothorax and cardiorespiratory arrest.<sup>10</sup>

There were no tracheostomy related deaths observed in NIGERIAN STUDY (2000-2008) AND DICLEUNIVERSITY TURKEY (2006-2013)<sup>9</sup>

This suggests the safety of the procedure done in tertiary hospital setting.

**TABLE 9: Decannulation**

Months	Up to 2 months	2-6 months	After 6 months
No of case	5	0	1

This table suggestive of patients decannulated in our study. The decannulation method utilized was by occlusion of the tracheostomy tube after cardiorespiratory assessment of the child. The child was observed for 24 hours with occluded tube and if well tolerated tube was removed. Patient was kept under observation for 24 hours after tube removal. All patients in our study had undergone primary closure of tracheostomy.

5 patients which were decannulated within 2 months were of tetanus, diphtheria, neck trauma, meningitis and fibrosing ankylosis of temporomandibular joint.

1 patient which was decannulated after 6 months having bilateral abductor palsy. Patient has undergone laser guided left arytenoidectomy at the age of 4 years.

**TABLE 10: Final outcome**

	In present study
Follow up	8
Lost in follow up	5
Death	13
Total	26

Patient of bilateral abductor palsy are kept on regular follow up (3 monthly). They are to be considered for co2 laser arytenoidectomy.

• **CONCLUSION**

This study concludes,

Though paediatric tracheostomy carries higher risk if morbidity and mortality, the procedure is safe, if performed in tertiary centre using better medical equipment and facilities (paediatric intensive care unit) in presence of multidisciplinary team of doctors. (ENT surgeon, paediatrician, anaesthetist)

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