

## ORIGINAL ARTICLE

### A COMPARATIVE AUDIT OF PAEDIATRIC AND ADULT TRACHEOSTOMY IN A RURAL BASED HOSPITAL

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#### HOW TO CITE THIS ARTICLE:

Vivek V. Harkare, Sonali P. Khadakkar, Nitin V. Deosthale, Priti R. Dhoke, Kanchan S. Dhote, Parul Sobti, Rakesh Mishra, Suraj Giri. "A Comparative Audit of Pediatric and Adult Tracheostomy in a Rural Based Hospital". Journal of Evolution of Medical and Dental Sciences 2014; Vol. 3, Issue 33, August 07; Page: 8877-8883, DOI: 10.14260/jemds/2014/3137

**ABSTRACT: AIM AND OBJECTIVE:** To identify and compare the indications and complications of tracheostomy in pediatric and adult population. **STUDY DESIGN:** Prospective study. **SETTING:** Department of ENT, Rural based Tertiary Hospital, Nagpur, M.S., India. Duration- 2 years. Material and Methods- All patients of either age and sex who required tracheostomy in our hospital were included in the study. Patients were analyzed in terms of indication of tracheostomy, early and late complications and decanulation time required and compared them between pediatric and adult age group. **RESULTS:** During this period, total 104 tracheostomies were performed out of which 36 were in pediatric and 68 in adult age group. Male to female ratio in pediatric group was 1.8: 1 and in adults it was 1.5: 1. Prolonged intubation for ventilation was the common indication for tracheostomy in pediatric age group (58.33%) whereas in adults it was upper airway obstruction (55.88%). Complication rate in adults (Early 51.47%, Late 13.23%) doesn't differ much from pediatric group (Early 44.4%, Late 11.11%). All patients with temporary tracheostomy in pediatric (75%) and adult group (70.66%) were decanulated successfully. Mean decanulation time was 117.19 days and 62.24 days in pediatric and adult group respectively and the difference was statistically significant ( $p=0.0001$ ). **CONCLUSION:** Pediatric and adult tracheostomies differ in terms of indications and decanulation time but complications are similar.

**KEYWORDS:** Tracheostomy, Airway, Decanulation.

**MESHTERMS:** Tracheostomy, Airway obstruction, Intermittent Positive Pressure Ventilation.

**INTRODUCTION:** Tracheostomy is the most obliging and one of the oldest medical procedures known. The first reference to this comes from the sacred Hindu Book, the "Rig-Veda" in 2008 B.C. It didn't enter routine practice until 19<sup>th</sup> century when doctors became increasingly open-minded towards the procedure as a mean of providing immediate relief to the patients with laryngeal obstruction, the majority of cases at that time being related to diphtheria.<sup>1,2</sup>

There is however a changing trend in indications and outcomes in the use of tracheostomy. The decision of when and how to perform a tracheostomy is often subjective but must be individualized to the patient.

In adults, the indications for tracheostomy have been clearly described and established, but in pediatric population, these indications have been evolving over the last decade. Tracheostomy has been reported to have advantages over endotracheal intubation. The advantages are, easier handling of the airway, greater patient comfort reducing the need for sedation, possibility of oral feeding, improved respiratory mechanism, prevention of ventilator associated pneumonia(VAP) and easier

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weaning.<sup>3</sup> However despite of being a safe procedure, tracheostomy can be associated with complications.

The aim of this study is to identify and compare the indications and complications of tracheostomy in pediatric and adult population.

**MATERIAL AND METHODS:** This was a prospective study conducted at our rural based Tertiary Care Hospital and Medical Institute for two years. All patients of any age and either sex who had tracheostomy in our hospital during this period were included in the study. Patients who had tracheostomy already done before admission to our hospital and those with repeated tracheostomy were excluded from the study. All patients were evaluated in terms of detailed history, thorough examination and relevant investigations. A well informed consent was taken from patients/ relatives explaining about the procedure, its risks, benefits and complications.

All the tracheostomies were performed using a standard technique under necessary anesthesia. Horizontal skin crease incision was given two fingers above suprasternal notch. Strap muscles retracted in the midline. The thyroid isthmus retracted superiorly. After exposing trachea, the surgical technique varies between adults and children. In adults, vertical incision was given at the level of 3<sup>rd</sup> and 4<sup>th</sup> tracheal ring and converted into oval window.

While in pediatric patients, vertical incision given at 3<sup>rd</sup> and 4<sup>th</sup> tracheal ring, dilated with tracheal dilator without removing tracheal cartilage. Appropriate sized portex tracheostomy tube was inserted in all patients (cuffed/ uncuffed depending on the indication). The tube was secured by taking sutures through the prongs of the tube.

All patients received humidification of inspired air and regular tracheobronchial suction using sterile catheter. Deflation of cuff was done every 1 hourly for 5 minutes if cuffed tube was used. Bell, writing pad and pen were provided to the patient. The patients were managed in a hospital intensive care unit postoperatively only if the patient's general condition required it or if ventilatory support was necessary otherwise were managed in a ward.

The tube was changed first after 7 days and then every 2-3days. When the tracheostomy was no longer required, the tube was occluded initially on alternate hour followed by overnight occlusion to confirm the adequacy of laryngeal airway. Decanulation was done and an airtight dressing applied. Operative closure was done only in those cases where a persistent tracheo-cutaneous fistula was formed. Patient having permanent tracheostomy were followed regularly on monthly basis.

All the patients were analyzed in terms of indications of tracheostomy, early and late complications and time of decanulation and comparison was done between pediatric and adult group on the basis of these variables. Early complications were defined as those occurring in the first week of tracheostomy procedure whereas late complications were those occurring beyond one week after tracheostomy.

**Statistical Analysis:** All the data from case record forms was tabulated in Microsoft Excel sheet. Thorough analysis of the pertaining variables was done, percentages were calculated and comparison among the pediatric and adult groups was carried out using Z score test and Independent Mann-Whitney test. The level of statistical significance was taken as probability value (p value) less than or equal to 0.05.

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**RESULTS:** This was a prospective study of three years, carried out at rural based Tertiary Care Medical Institute and Hospital from Feb. 2010 to Jan. 2013. During this period 104 tracheostomies were performed for variety of indications. Out of 104 patients who underwent tracheostomies, 36 were performed on pediatric patients and 68 on adult patients.

There were 20 males and 16 females in pediatric group with overall male to female ratio of 1.8:1. While in adult group, 41 were males and 27 were females with male to female ratio of 1.5: 1. Age of pediatric patients ranged from newborn to 18 years with a mean age of 3.8 years (SD+ 0.72years). In adult group, age was ranging from 18 years to 75 years with a mean age of 34.3 years (SD+ 8.4 years).

In pediatric group, 69.44% (25 patients) procedures were elective and 30.56% (11 patients) procedures were emergency. While in adult group 70.59% (48) patients underwent to elective tracheostomy and 29.41% (20 patients) to emergency tracheostomy. In pediatric group, 75% (27 patients) tracheostomies were temporary and 25% (9 patients) required permanent tracheostomy. In adult group, 70.06% patients (49) had temporary and 27.94% patients (19) had permanent tracheostomy.

Table no. I Shows, indications of tracheostomy in pediatric and adult patients. In pediatric group, commonest indication of tracheostomy was prolonged ventilatory support in 21 patients (58.33%) followed by upper airway obstruction in 15 patients (41.67%). The primary cause for prolonged ventilation was respiratory failure (10 patients, 27.78%) followed by neuromuscular diseases (8 patients, 22.22%). Most common cause for upper airway obstruction was infection (6 patients, 16.67%).

In adults, most common indication for tracheostomy was upper airway obstruction which was seen in 38 patients (55.58%). Frequent cause of upper airway obstruction in adults was Head and Neck malignancy in 16 patients (23.53%) followed by Trauma (10 patients, 14.70%) & deep neck space infection (8 patients, 11.76%) in decreasing order. Tracheostomy for prolonged ventilation/tracheobronchial toileting was required in 30 patients (44.12%). Neuromuscular disease (13 patients, 19.11%) and respiratory failure (10 patients 14.71%) were the main causes of prolonged ventilation requiring tracheostomy in adults.

Table No. II shows, complications of tracheostomy in pediatric and adult patients. In pediatric patients, early and late complications rates were 44.44% and 11.11% respectively. Accidental decanulation (13.89%) was identified as the most common early complication whereas tracheal stenosis (5.56%) was the common late complication.

In the adult group, early and late complication rates were 51.47 % and 13.23% respectively. Hemorrhage from surgical site was the most common early complication and seen in 17.65% cases followed by tubal blockage due to dried secretions in 11.76% cases. Stomal granulations (7.35%) were the most common late complication in adults. On comparing the complication rate in Pediatric and adult group it was not statistically significant.

All patients of temporary tracheostomy were decanulated successfully. Mean decanulation time in Paediatric patients was 117.19 days as shown in Table No III. While in adults it was 62.24 days. Independent sample Mann Whitney U test applied and the difference was statistically significant (p value = 0.0001). No patient in this study died of tracheostomy. Mortality rate was 19.4% (7 patients) in pediatric group and 23.43 (15 patients) in adult group. This was due to the underlying disease and not primarily due to tracheostomy.

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**DISCUSSION:** The term, 'Tracheostomy' from the ancient Greek, means 'cut or section of the trachea'. Tracheostomy is a surgical procedure in which an opening is made into trachea and maintained with a tube in order to establish direct communication with the external environment.

It is indeed a life-saving procedure at many occasions. There are several indications for performing tracheostomy. They may be to relieve upper airway obstruction, to facilitate prolonged intubation, to allow staged extubation by reducing the anatomical dead space and to protect and give access to tracheobronchial tree. As with any other surgical procedure, tracheostomy is also associated with a number of potential complications. Paediatric age group is known to be associated with more morbidity and mortality.

In our study, tracheostomy was performed in 104 patients, in which 36 were of pediatric age group (0-18 years) and 68 were adult age group (18-75years). Mean age in pediatric age group was 3.8 years (+ 0.72) & in adult it was 34.2 years (+ 8.4). Ang A.H. et al<sup>6</sup>, in his study found that mean age of pediatric patient was 3.24 years and in Carron J D et al<sup>7</sup> study, mean age at tracheostomy was 3.2 + 0.6 years. In the study done by Fazal-i-Wahid et al<sup>8</sup> mean age was 37.61+ 19.99 years.

In past, tracheostomy was commonly performed for acute upper airway involvement due to infectious diseases. With the introduction of endotracheal intubation and vaccine for diphtheria, Haemophilus Influenza type B vaccine for acute epiglottitis, the indications of tracheostomy for acute infectious diseases declined dramatically. In our study, in pediatric group, prolonged ventilation (58.33%) was the most common indication for tracheostomy and it was mainly due to respiratory failure in 27.78% and neuromuscular diseases in 22.21%. While in adults, upper airway obstruction (55.88%) was the main indication for tracheostomy.

Laryngeal & other Head and Neck malignancies (23.53%) was the commonest cause of upper airway obstruction requiring tracheostomy. In the study done by Primuharsa Putra SH et al,<sup>9</sup> commonest indication for tracheostomy in pediatric patients was prolonged ventilation (94.5%) followed by pulmonary toilet (5.5%). Atmaca S et al,<sup>10</sup> in his study observed that the most common indication of pediatric tracheostomy was prolonged intubation (87%), followed by upper airway obstruction (13%).

While in the study done by Suslu N et al<sup>11</sup>, prolonged intubation (84.9%) was the commonest cause for pediatric tracheostomy with a primary cause for it having respiratory failure (45.3%) followed by neuromuscular diseases (20.8%). In the same study done by Suslu N et al<sup>11</sup>, commonest indication for adult tracheostomy was upper airway obstruction due to head and neck malignancy (32.5%) followed by laryngotracheal stenosis (12%).

The most common complication that we recorded in pediatric patients in our study was accidental decanulation of tube (13.89%), followed by Hemorrhage (11.11%). In adult patients, hemorrhage (17.65%) from the surrounding area was the most common complication followed by tubal block (11.76%). Early complications were more common in both pediatric (44.44%) and adult (51.47%) patients as compared to late complications (11.11% & 13.29% respectively).

In the study done by Primuharsa Putra SH et al,<sup>9</sup> commonest complication in pediatric patients was accidental decanulation (33.3%). Suslu N et al,<sup>11</sup> in pediatric patients noted early and late complication rates as 22.6% and 5.7% respectively. Accidental decanulation (13.2%) was the most common early complication in his study. While in adult group, he observed, early and late complication rates to be 19.3% and 7.2% respectively.

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Postoperative hemorrhage from surgical wound (9.6%) was the most common early complication and trachea-cutaneous fistula (4.8%), was the most common late complication<sup>11</sup>. Primuharsa Putra SH et al,<sup>9</sup> in his study found overall postoperative complications as 33.3% with accidental decanulation being commonest in it. Wahid FI et al<sup>8</sup> observed early complications in 37.5% as compared to late complications (7.5%). Carron JD<sup>7</sup> found overall complications in 44% pediatric patients.

In our study, decanulation was done successfully in all temporary tracheostomies in both pediatric (75%) and adult patients (70.59%). In the study done by Suski N et al,<sup>11</sup> decanulation success rate in pediatric patients was 34.6% and in adult, it was 40.2%. Primuharsa Putra SH<sup>9</sup> found decanulation rate in pediatric patients as 66.6%.

**CONCLUSION:** Based on our study, pediatric and adult tracheostomies differ in terms of indications and decanulation time. Prolonged ventilation was the common indication in pediatric group while it was upper airway obstruction in adult group. Decanulation time was more in pediatric than adult patient and the difference was statistically significant. Complication rate, both early and late was more or less same in both groups.

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Sr. No.	Indication	Paediatric(n= 36)		Adult (n=68)		Z Score	P value
		No.	%	No.	%		
<b>I</b>	<b>Upper Airway Obstruction</b>	<b>15</b>	<b>41.67</b>	<b>38</b>	<b>55.88</b>	<b>0.96</b>	<b>0.33</b>
1.	Infection – Acute epiglottitis	2	5.56	1	1.47		
	- Ac laryngo- tracheobronchitis	3	8.33	0	0		
	- Deep neck space infection	1	2.78	8	11.76		
2.	Craniofacial Anomalies	2	5.56	1	1.47		
3.	Laryngeal/Head & Neck Malignancy	1	2.78	16	23.53		
4.	Laryngeal papilloma	2	5.56	1	1.47		
5.	Vocal cord palsy	0	0	1	1.47		
6.	Trauma- Head injury	1	2.78	6	8.82		
	- Maxillofacial fractures	1	2.70	3	4.41		
	- Post intubation subglottic/ tracheal stenosis	2	5.56	1	1.47		
<b>II</b>	<b>Prolonged ventilation/ tracheobronchial toileting</b>	<b>21</b>	<b>58.33</b>	<b>30</b>	<b>44.12</b>	<b>0.98</b>	<b>0.32</b>
1.	Neuromuscular diseases	8	22.22	13	19.11		
2.	Cerebrovascular accidents	0	0	3	4.41		
3.	Respiratory feature	10	27.78	10	14.71		
4.	As a part of other surgery	3	8.33	4	5.88		

Table 1: Indications of tracheostomy in Paediatric and Adult patients

Sr. No.	Complication	Paediatric (n= 36)		Adult (n=68)		Z Score	P value
		No.	%	No.	%		
<b>I</b>	<b>Early</b>	<b>16</b>	<b>44.4</b>	<b>35</b>	<b>51.47</b>	<b>0.48</b>	<b>0.62</b>
1	Hemorrhage	4	11.11	12	17.65		
2	Surgical emphysema	2	5.56	5	7.35		
3	Accidental decanulation	5	13.89	6	8.82		
4	Aspiration pneumonia	3	8.33	4	5.88		
5	Tubal block	2	5.56	6	11.76		
<b>II</b>	<b>Late</b>	<b>4</b>	<b>11.11</b>	<b>9</b>	<b>13.23</b>	<b>0.29</b>	<b>0.77</b>
1	Stomal infection	1	2.78	1	1.47		
2	Stomal granulations	0	0	5	7.35		
3	Tracheal stenosis	2	5.56	1	1.47		
4	Tracheocutaneous fistula	1	2.78	2	2.94		

Table 2: Complications of Tracheostomy in Paediatric and Adult patients



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Mean Decanulation Time in days	Paediatric	Adult	P value* (Independent Mann- Whitney Test)
	117.19 days	62.24 days	0.000

**Table 3: Mean Decanulation Time in Paediatric and Adult Patients (in days)**

\*p value less than 0.05- statistically significant

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Date of Submission: 21/07/2014.  
Date of Peer Review: 22/07/2014.  
Date of Acceptance: 31/07/2014.  
Date of Publishing: 05/08/2014.