Tracheostomy in Children Indications, Results and Complications

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ABSTRACT:

BACKGROUND:

To provide an overview of pediatric tracheostomy, focusing on indications, surgical techniques and complications. The indications for pediatric tracheostomy are changing. Today the most common indication is assisted ventilation. Tracheostomy complications are more likely in children than in adult and more common in children under two years particularly preterm infant.

The general indications for tracheostomy are as follows:

- Relieve upper airway obstruction.
- Prevent complications of prolonged intubation
- Reduce anatomical dead space
- Allow suction toilet of the trachea

OBJECTIVE:

To evaluate the indications and complications of tracheostomies performed in children.

PATIENTS AND METHOD:

This is prospective study of 20 patients for whom tracheostomy was done during a period of two years (from October 2011 to October 2013).

Demographic data and details of the surgical work and the follow up notes were collected.

Descriptive, and analytic statistics were applied to the set of data using the Microsoft excel 2010 computer system.

RESULTS:

Total of twenty patients were included in the study. The age range was 2months – 12 years there were 14 males and 6 females.

Fifty percent of the patients were 5 year old or younger.

Sixty five percent of the operations were performed as elective procedures, and 35% as emergency.

The peak incidence of tracheostomy was at 5 years (25%).

The most common indication was the need for assisted ventilation 60%.

The most common underlying cause behind tracheostomy was the neurological impairment whether chronic or traumatic (n=13; 65%), followed by airway trauma.

No intraoperative complications were reported, and the postoperative complication rate was 25%.

Tracheostomy tube (PORTEX blue line) obstruction was the most common encountered complication.

Fourteen patients were decannulated (70%) with mean duration prior to decannulation 19.7± 18.95 days.

There were no tracheostomy related mortalities.

CONCLUSION:

A ssisted ventilation is the most common indication for traceostomy in pediatric age group. Tracheostomy in children is a safe procedure with negligible intraoperative complications.

KEYWORDS: pediatric , tracheostomy**.**

INTRODUCTION:

Since the advent of modern tracheotomy (a surgical technique for creating a temporary opening in the trachea) [1] to treat patients with respiratory infection induced airway obstruction by the French physician Armand Trousseau in the mid-1800s, [2] tracheostomy (the surgical procedure that produces a permanent tracheal

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stoma by suturing the trachea to the skin) [1] has been regarded as a life-saving procedure in patients with upper airway obstruction. Particularly in children, respiratory distress secondary to congenital or acquired abnormalities of the larynx or trachea pose a problem that frequently requires tracheostomy to achieve a patent airway. [3] In addition, pediatric tracheostomy requires special attention; if it is necessary to change the unique airway anatomy, there are higher risks associated with the procedure, later airway reconstruction is needed, and the procedure has a negative impact on oral feeding and speech development. [4,5] In this regard, pediatric tracheostomy should be performed with the utmost care, and the procedure should be safe and conservative. Techniques specific to pediatric tracheostomy, such as orientation of the skin and tracheal incisions, removal of subcutaneous tissue, and maturation and stay sutures vary from surgeon to surgeon. [6]

PATIENTS & METHOD:

A prospective study of patients aged (2 months-12 years) requiring tracheostomy between October 2011 and October 2013.

Parameters included in the study were: age, gender, indication, duration of intubation prior to tracheostomy, surgical conditions (anesthesia; emergency or elective; with or without endotracheal tube; place), duration ofcannulation, outcome, complications and mortality their causes, and time of occurrence.

Under general anesthesia, pediatric tracheostomy is performed with the upper airway secured by an endotracheal tube. After placing a shoulder roll under the patient to hyperextend the neck and thus expose the laryngeal and tracheal cartilages, the hyoid bone, thyroid notch, cricoid cartilage, and sternal notch are identified with palpation and marked on the skin. In neonates, although identification of the laryngeal landmark by palpation alone is often difficult, the hyoid bone and thyroid isthmus are relatively easier to palpate than other structures. A vertical skin incision is employed in all cases as it run in the line of trachea and is less vascular

The statistical analysis was performed using the Microsoft Excel 2010 computer system. The mean ± the standard deviation (SD), and ranges for continuous variables, proportions and frequency tables were used to summarize categorical variables. Fisher's Exact test was used to test for the significance of association between the variables. The level of significance was considered as $P < 0.05$.

RESULTS:

Twenty pediatric patients had tracheostomy within the study period. Fourteen (70%) were males, and 6(30%) were females, with a male to female ratio of 2.3: 1.

Their ages ranged from 2 months to 12 years, with a mean age at tracheostomy 72.75± 43.30 months. Ten (50%) were in the age range 0-5 years. With 3 patients (15%) being one year or younger. The peak incidence of tracheostomy was at 5 years (25%).

Table 1: Age distribution of patients.

Age distribution of patients who had tracheostomy		
Age (years)	No. of patients	%
≤ 5	10	50
6 - 10	8	40
11 - 12	2	10
Total	20	100

Table 2: Contribution of patients younger than 1 year to the sample.

	No. of patients	%
≤ 1 year	3	15%
> 1 year	17	85%
Total	20	100

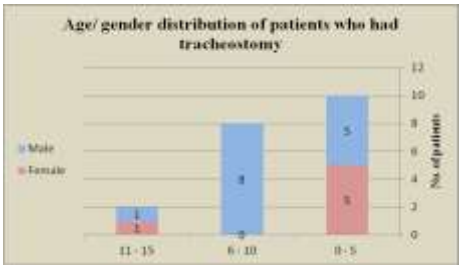

Figure 1: age/ gender distribution of patients

Seven tracheostomies (35%) were performed as an emergency while thirteen (65%) as elective procedures.

The indications of tracheostomy (table (3)) were assisted ventilation (n=12, 60%), and management of airway obstruction (n=8, 40%)

Table 3: Indications of tracheostomy .

Assisted ventilation	No. of patients	Airway obstruction	No. of patients
RTA with loss of consciousness	7	Laryngomalacia +ant.web	1
Brain tumors	2	Retroganthia +adenotonsiller hyperatrophy	1
Meningitis	2	Bilateral vocal cord paralysis	1
Guillain –Barre syndrome	1	Laryngeal oedema	2
		Penetrating neck trauma	2
		Maxillofacial trauma	1
Total	12	Total	8

The most common underlying cause behind tracheostomy was the neurological impairment whether chronic or traumatic (n=13; 65%), followed by airway trauma. (See table 4).

Table 4: The underlying causes behind tracheostomy.

Cause	Total	%
Airway trauma	5	25
Laryngomalacia	1	5
Neurological	13	65
Retrognathia	1	5
Total	20	100

There were no intraoperative complications. Major tracheostomy complications were seen in 5 patients giving an overall complication rate of 25% , tracheostomy tube(PORTEX blue line) obstruction occurred in 3 patients (60%), and accidental decannulation and subglottic stenosis accounted for one patient (20%) each.(figure 2).

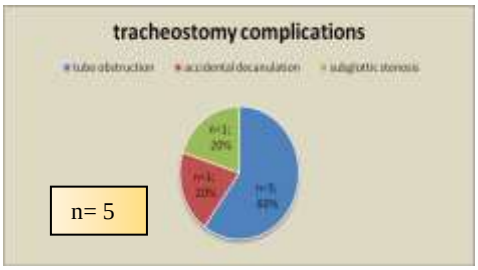

Figure 2: Tracheostomy complications.

Fourteen patients were decannulated (70%) with mean duration prior to decannulation 19.7± 18.95 days (minimum: 5days; maximum: 60day).

Four patients died due to complications of their underlying conditions (20%), one patient is still tracheostomized (5%), and one patient was lost to follow up (5%).

Table 5: Patient Outcome.

Outcome	No. of patients	%
Decannulated	14	70
Died	4	20
Lost	1	5
Still tracheostomized	1	5
Total	20	100

DISCUSSION:

In our series the majority (50%) of tracheostomies were performed in the (0-5 years) group with equal gender components. This is followed by the (6-10 years) group, all in male patients. The sample composed predominantly of males with a male to female ratio of 2.3:1. This is similar to the results of Primuharsa Putra et al. inMalaysia , and Onotai and Etawo in Nigeria with male to female ratio of 5:1 and 2.2:1 respectively[7,8]. On the other hand Adoga and Ma'an reported the (6- 10 years) group as the most prevalent (69.6%) with a male to female ratio of 1.7:1[9]. This might be the result of differences in sample number between the series.

de Trey et al. mentioned a peak incidence at less than 1 year (70%)[10]. This is at variance to our study, where the first year contributed only to 15%, and a peak incidence of tracheostomy at 5 years (25%).

Similar to the change in indications mentioned earlier, the most common indication for tracheostomy in our series was the need for assisted ventilation (60%) with the majority of these contributed by RTA with its associated craniofacial trauma, a finding that is shared by Primuharsa Putra et al. in their study of 18 patients with prolonged ventilation being the commonest indication (94.5%) [7].

Neurological impairment was the most common cause necessitating tracheostomy in general in our series (65%), this is similar to the findings by Primuharsa Putra et al., Perez et al., and Funamura et al. where the neurological impairment contributed to 61.1%, 50.6 % and 38.9% respectively[7,11,12]. This is at variance to Zenk et al. and Adoga and Ma'an who reported upper airway obstruction as the most common cause accounting for 27%, and 63% respectively [13,9] . Zenk et al. reported neurological causes in only 25.9% [13]. This difference might be due to the variation in the classification of the reported causes, and from reporting airway obstruction as the most common indication from the start.

Most of the procedures were elective (65%) and performed in the RCU, with the duration of endotracheal intubation prior to tracheostomy ranging from 6 to 14 days (mean: 10± 2.4 days). This is at variance to the Nigerian series with 87% and 90.9% emergency operations respectively [8,9]. This is the effect of predominance of acute airway obstruction in these two series.

Dursun and Ozel found similar to our series that elective tracheostomies prevailed (90%) [14].

All elective operations and two of the emergencies were done under GA, the other 5 emergency were done utilizing mask ventilation and sedation. A vertical skin incision is employed in all casesas it runs in the line of the trachea and is less vascular, and that" both vertical and horizontal incisions heal with small but visible scars that can be revised if bothersome to the patient. Onotai and Etawo.in their series performed all operations under general anaesthesia employing vertical skin incision similar to our series [8]. This is at variance to Adoga and Ma'an [9] who applied horizontal skin incision in all cases for their better cosmetic results.

Similar to our series Primuharsa Putra et al.Adoga and Ma'anand Onotai and Etawodid not report any intraoperative complication [7, 8, and9].

The most common complication encountered in our patients was the tracheostomy tube obstruction due to mucous plugging in 3 patients (60%) which is similar tothe finding by Adoga and Ma'an (57%) [9]. On the other hand, Primuharsa Putra et al reported accidental decannulation as the most common complication occurring in 27.8% [7]. The lower rate of accidental decannulation in our series is probably due to the routine suturing of the tube to the skin

in our hospital. The majority of the complications occurred in elective procedures (60%), and in younger patients (60%), with an overall complication rate of 25% in our series. This is a better figure compared to that by Primuharsa Putra et al. (overall complication 38.9%) with all complications occurring in those 6 years or younger [7]. Different complication rates were reported by different authors and this is probably the effect of the differences in the complications reported, the sample size, type of intervention, and the duration offollow up.

Successful decannulation was achieved in 75% of the patients in our series which is higher than those by Primuharsa Putra et al., Zenk et al. Funamura et al, and de Trey et al. with decannulation rates of: 66.6%, 50.6%, 31.9% and 60% respectively[7,13, 12,15].

Lower decannulation rate was reported by Perez et al. (23.7%) [11]. this is probably due to the prevalence of chronic conditions in this series that required permanent tracheostomy.

Funamura et al. in his study of 124 patient found that the time to decannulation was significantly shorter for trauma patients compared to neurological patients (P=0.001) [12]. This is similar to our finding but our result lacked the statistical power (P> 0.05) this may be due to the small number of our sample (20) compared to the above mentioned series.

In our series the overall mortality was found to be 20% all non- tracheostomy related with most of these occurring in the youngest age group and mostly in emergency surgeries.

This figure is higher than those reported by Dursun, and Ozel, and Al-Samri et al. (17%, and 15% respectively) [14, 15]. This reflects the severity of the underlying cause behind tracheostomy in our series.

CONCLUSION:

Assisted ventilation is the most common indication for tracheostomy in the pediatric age group. Tracheostomy in children is a safe procedure with negligible intraoperative complication

Recommendation

We recommend the routine use of stay sutures to overcome the risk of accidental decannulation or dislodgement of tracheostomy tube during the early postoperative period.

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