Indications and Complications of Tracheostomy in Pediatric Age group in Hilla, Babylon province, Iraq: Cross sectional Study

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Abstract

Background: The procedure tracheostomy involves making an opening in the airways and introduction of tube into tracheal rings in order to bypass obstruction and allowing air to reach the lungs. The survival of neonates and children witnessed substantial improvement following implementation of such procedure; therefore, the rate of performing tracheostomy in children has become high. Little information is available about complications of tracheostomy in Hilla general teaching hospital.

Aim of the study: to highlight the main indications and complications in association with tracheostomy in pediatric age group in Hilla, Babylon province, Iraq.

Patients and methods: The current prospective study included 41 children less than 12 years of age form the pool of patients admitted to intensive care unit at Hilla General Teaching Hospital and the intensive care unit at Babel Pediatric and Maternity Teaching Hospital. The study extended from March 2018 to September 2019. All those children underwent tracheostomy for a variety of reasons. They were followed up for one year for recoding any possible complication in association with tracheostomy procedure.

Results: After one year of follow up, the time until decannulation was ranging between 45 to 365 days with a mean of 61.73 days. Upper air way obstruction was seen in 12 cases while assisting ventilation in prolonged intubation was seen in the majority, 30 cases. Causes of upper airway obstruction were Craniofacial anomaly, Subglottic stenosis, Laryngotracheal stenosis, Vocal fold paralysis and Subglottic hemangioma. The reasons for prolonged intubation included Neuromuscular disease, Postoperative period following major surgery, Respiratory failure, Trauma and Subglottic hemangioma.

Conclusion: The main indications for tracheostomy in children were congenital upper air way obstruction and the need for prolonged mechanical ventilation and the main complications are either intermediate cannula loss or late subglotic obstruction.

Key words: *Indications, complications, tracheostomy, pediatric, Hilla, Iraq*

Introduction

The procedure tracheostomy involves making an opening in the airways and introduction of tube into tracheal rings in order to bypass obstruction and allowing air to reach the lungs [1]. Since ancient times, tracheostomy practice has been reported. Ancient Egyptians had made painting describing this procedure, thereby it can be said that the procedure is known for more than 2000 years [2]. Since infections of the upper respiratory tract, including diphtheria, represented by far the major reason for tracheostomy, great changes have been undertaken in the indications for tracheostomy between the 1980s until around 1995 [1]. Adoption of well organized and systemized immunization programs has made changes in the profile of infection worldwide, thus, the need for tracheostomy in the setting of upper respiratory tract infection have been reduced [3]. Nowadays, the most frequent reasons for tracheostomy performance are "acute

respiratory failure, prolonged intubation, neurological disorders or lesions" [1]. The survival of neonates and children witnessed substantial improvement following implementation of such procedure, therefore, the rate of performing tracheostomy in children has become high [1,2,4]. It should be kept in mind that the hazard of infection is significantly more in children with tracheostomy. The bypass of oral and nasal passages prevents the natural protection of respiratory tract form invading microbes since it will create a direct passage for microorganisms to reach the lower respiratory tract because of loss of filter and immune barrier of upper respiratory passages [1].

The lower respiratory tract is cleared by the effect of coughing and the mucociliary clearance of the nasal mucosa leading to expelling of secretions and possible intruding agents; unfortunately, tracheostomy is associated with lack of these two protective mechanisms. On the other hand, the presence of a tube inside respiratory passages for a long period of time will lead to inflammation and formation of a nidus for infectious micro-organisms and biofilm formation [5-7]. In addition, the tube itself provides a surface for strong adherence of microorganism, thereby, avoiding the immune mechanism and antibiotic attack and making the rate of infection even higher in the setting of tracheostomy [6]. Among common infectious complications accompanying tracheostomy are bacterial tracheitis, aspiration pneumonia and bacterial pneumonia, the later being the most commonly reported in pediatric practice and responsible for significant hospitalization (8). Among micro-organism isolated commonly from tracheostomy cannula, are *Pseudomonas aeruginosa* and *Staphylococcus aureus* [1,9]. Little information is available about complications of tracheostomy in Hilla general teaching hospital. Thus, the aim of the study was to highlight the main indications and complications in association with tracheostomy in pediatric age group in Hilla general teaching hospital, Babel province, Iraq.

Patients and Methods

The current prospective study included 42 children less than 12 years of age form the pool of patients admitted to intensive care unit at Hilla General Teaching Hospital and the intensive care unit at Babel Pediatric and Maternity Teaching Hospital. The study extended from March 2018 to September 2019. All those children underwent tracheostomy for a variety of reasons. They were followed up for one year for recoding any possible complication in association with tracheostomy procedure. The ethical approval was issued by the ethical approval committee of the local health institute and a verbal consent was obtained from all participants following full illustration of the aim and the procedure of the study. The principal outcomes were the clinical presenting features and the type of pathology. Data were transformed into SPSS (statistical package for social sciences) software (IBM, Chicago, USA, version 23) for purpose of statistical description. Categorical variables were expressed as number and percentage, whereas, quantitative data were expressed as range, mean and standard deviation. Chi-square test was used to study association between complication and indication of tracheostomy. The level of significance was set at $p \leq 0.05$.

Results

The current study included 42 children subjected to tracheostomy for a number of indications. The age range was 1 to 12 years and the mean age was 5.03 ±3.72 years. The proportions of males and females were 23 (54.8 %) and 19 (45.2 %), respectively. After one year of follow up, the time until decannulation was ranging between 45 to 365 days with a mean of 61.73 days, as shown in table 1. The indications of tracheostomy are shown in table 2. Upper air way obstruction was seen in 12 cases while assisting ventilation in prolonged intubation was seen in the majority, 30 cases. Causes of upper airway obstruction were Craniofacial anomaly, Subglottic stenosis, Laryngotracheal stenosis, Vocal fold paralysis and Subglottic hemangioma. The reasons for prolonged intubation included Neuromuscular disease, Postoperative period following major surgery, Respiratory failure, Trauma and Subglottic hemangioma, as shown in table 2. Hemorrhage as an immediate complication was seen in a single case. Intermediate complications included Pneumothorax, Surgical emphysema, Accidental decannulation and Suprastomal granulation; whereas, late complications included Subglottic stenosis and Tracheocutaneous fistulae, as shown in table 3. There was no significant association between indications and complications (p = 0.791), as shown in table 4.

Table 1: General characteristics of study sample

Characteristic	Value
Number of cases	42
Age (years)	
Range	1-12
Mean ±SD	5.03 ±3.72
Gender	
Male, n (%)	23 (54.8 %)
Female, n (%)	19 (45.2 %)
Duration of cannulation (days)	
Range	45-365
Mean ±SD	61.37 ±101.03

n: number of cases; **SD**: standard deviation

Table 2: Indications of tracheostomy

Indication	Number of cases	%
Upper airway obstruction		
Craniofacial anomaly	5	11.9
Subglottic stenosis	2	4.8
Laryngotracheal stenosis	2	4.8
Vocal fold paralysis	2	4.8
Subglottic hemangioma	1	2.4
Assisting ventilation in Prolonged intubation		
Neuromuscular disease	9	21.4
Postoperative period following major surgery	3	7.1
Respiratory failure	14	33.3
Trauma	3	7.1
Subglottic hemangioma	1	2.4

Table 3: Complications

Complication	Number of cases	%
Immediate		
Hemorrhage	1	2.4
Intermediate		
Pneumothorax	3	7.1
Surgical emphysema	1	2.4
Accidental decannulation	6	14.3
Suprastomal granulation	6	14.3
Late		
Subglottic stenosis	3	7.1
Tracheocutaneous fistulae	1	2.4
Total	21	50.0

Table 5: Association between complications and indications

Complication	Total n = 42	Indication		p
		UAO n = 12	AV n = 30	
Immediate and intermediate	17	4	13	0.791 C NS
Late	4	1	3	
No complication	21	7	14	

n: number of cases; **UAO**: upper airway obstruction; **AV**: assisted ventilation; **C**: Chi-square test; **NS**: not significant at $p > 0.05$

Discussion

Tracheostomy is life saving procedure since it maintains adequate air flow to lung in critically ill patients by making an opening in the trachea [10]. In adults, this procedure is quiet frequent accounting for 10-24 % of patients on ventilation [11]. However, the procedure is increasingly used in children in various regions of the world with substantial improvement in survival of those critically ill and chronically affected children [10]. In one study, performed in Canada, the rate of tracheostomy in ventilated children was 1.5 % [12]. Several other previous studies have come up with close rates of tracheostomy

in pediatric age group [13-15]. Parallel to changes occurring in managing critically ill children over the last 30 years, the reasons and indications for performing such procedure in child age group have also transformed [16,17]. In the current study, it has been shown that the main indications of tracheostomy in children were either due to obstruction of upper airway by one or more of congenital abnormalities, craniofacial anomaly, subglottic stenosis or laryngotracheal stenosis, or to assist ventilation in children with neuromuscular disease, respiratory failure and trauma. In line with this observation several previous reports have demonstrated that tracheostomy in children is performed when there is a need for prolonged mechanical ventilation in case of respiratory failure in addition to children with upper respiratory tract anomalies and chronic disorders such as congenital heart disease, lung disorders and neurological impairment (10). The most common indication for tracheostomy in Can *et al*'s study was prolonged mechanical ventilation (18). Neurological and respiratory causes have been shown to be more frequent than cardiovascular disorders in one previous study and the most frequent diagnoses were brain trauma and obstruction of upper airway [10]. The later observations support the findings of the current study.

In previous reports, favorable outcome has been shown to correlate with performing tracheostomy during the first two weeks in mechanical ventilation [19,20]. However, the best time for performing the procedure in critically ill children is not clearly known and in most of occasions it follows the decision made by the treating physician based on patients available clinical data [10]. In developed countries, it has been shown that the time for performing tracheostomy in children is in the range of 14.4 to 21 days [21]. Some previous reports have shown that a mean time of hospitalization of 64 days has passed before performing tracheostomy [22]. This time average was a s short as 18 days in another series [10]. Several factors are blamed to explain this variation between onset of hospitalization and time of performing tracheostomy including anticipated complications in association with tracheostomy and variation of children disorders. It should be noted that early tracheostomy for children in intensive care units are associated with better outcome in terms of shorter hospital stay and lower mortality rate [23].

In the current study, the main complications in association with tracheostomy were either intermediate in form of accidental decannulation and suprastomal granulation or late in form of subglottic stenosis. In previous reports, stromal granulation and tube blockage were among main complications encountered in addition to wound infection and chest infection [24]. In another study performed in 2010, the main complications were decanulation and cannula obstruction [25] supporting the findings of the current study. Tube occlusion and accidental decannulation were also the most common complications seen by another author [26].

Conclusion

The main indications for tracheostomy in children were congenital upper air way obstruction and the need for prolonged mechanical ventilation and the main complications are either intermediate cannula loss or late subglotic obstruction.

Acknowledgement: Indeed, the authors of the current study feels grateful toward all children and their care givers for their kind participation in the current work which will be a baseline information for indications and complications of tracheostomy in Iraqi pediatric age group.

Financial Disclosure: There is no financial disclosure.

Conflict of Interest: None to declare.

Ethical Clearance: All experimental protocols were approved under the Department of Surgery and all experiments were carried out in accordance with approved guidelines.

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