

Paediatric Tracheostomy in Hospital Universiti Kebangsaan Malaysia - A Changing Trend

S H A Primuharsa Putra, MS(ORL-HNS), C Y Wong, MBBS, M Y S Hazim, MS(ORL-HNS), M A R Megat Shiraz, MS(ORN-HNS), B S Goh, MS(ORL-HNS)

Department of Otorhinolaryngology, Head and Neck Surgery, Faculty of Medicine, Hospital Universiti Kebangsaan Malaysia, Jalan Yaacob Latif, 56000 Cheras, Kuala Lumpur

Summary

Indication for pediatric tracheostomy has changed. Upper airway obstruction secondary to infectious disorders is no longer the commonest indication. The aim of this study was to establish data on indications, outcome and complications of pediatric tracheostomy. A retrospective analysis of pediatric tracheostomies carried out between March 2002 to March 2004 was done. Eighteen patients were identified. The commonest indication was prolonged ventilation (94.5%) followed by pulmonary toilet (5.5%). None was performed for upper airway obstruction. Postoperative complications were encountered in six patients (33.3%), the commonest being accidental decannulation notably in children less than six years of age. Twelve patients (66.6%) were successfully decannulated. The mortality rate was 16.6%. All death were non tracheostomy related. The commonest indication for tracheostomy was prolonged ventilation and tracheostomy in children is relatively safe despite complications.

Key Words: Pediatric, Tracheostomy, Changing trend

Introduction

Over the past two decades, there has been a change in the indications for pediatric tracheostomy. Previously the procedure was performed mainly for the relief of upper airway obstruction secondary to infectious disorders like epiglottitis and croup. With the introduction of immunization against common infectious diseases, development of better anesthetic techniques and safer endotracheal intubations, the management of these conditions no longer required tracheostomy. On the other hand, improved survival rates in preterm infants, children with congenital malformations and pulmonary or neurological diseases and critically ill children have broadened the indication of tracheostomy. A recent series review^{1,2,3,4} showed that prolonged ventilation or subglottic stenosis are now the commonest indications. Tracheostomy in children is

technically more demanding than in adults and carries higher mortality and complication rates, particularly in younger children. The adoption of a conservative attitude is understandable in the light of the high complication rates of tracheostomy in young children. Timing of tracheostomy requires thoughtful consideration, flexibility and individualization depending on the age, underlying disease and anticipated outcome.

Materials and Methods

A retrospective analysis of clinical records of children below 18 years of age who had tracheostomies performed in HUKM during a two-year period between March 2002 and March 2004 was carried out. The definition of the term child in regard to tracheostomy

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Corresponding Author: Wong Cheng Yang, Department of Otorhinolaryngology, Head and Neck Surgery, Faculty of Medicine, Hospital Universiti Kebangsaan Malaysia, Jalan Yaacob Latif, 56000 Cheras, Kuala Lumpur, Malaysia

includes patients younger than 18 years of age. A total of 18 children below the age of 18 years who underwent tracheostomy during that period were identified. Parameters included were age, sex, underlying illness, duration of intubation, indication of tracheostomy, method of decannulation, death and complication whenever found. All tracheostomies were done under general anesthesia with endotracheal tube as airway control. A sand bag was placed under the shoulders, care was taken not to over extend the neck to avoid pulling the mediastinal contents into the neck. Soft tissue of the neck was opened in layers. The trachea was incised vertically through the second and third rings or third and fourth rings. The trachea was sutured with silk on either side of the incision and retracted to assist cannulation. It was then stitched onto the skin and to be used later for recannulation if necessary.

Results

In the 18 patients, the youngest child was 1 year old and the oldest was 17 years old. Six of them (33.3%) were five years and below while the other 12 (66.6%) were above five years of age (Figure 1). Fifteen were males and three females. The underlying illness of the children that led to tracheostomy is listed in Table I.

Chronic conditions and trauma predominated with central nervous system disorders being the most common underlying disease that led to tracheostomy. In contrast, in late adolescence trauma was the primary diagnosis that led to tracheostomy (Table II). The commonest trauma was motor vehicle accident with intracranial bleed. Prolonged ventilation for the underlying illness was the commonest indication (94.5%) followed by pulmonary toilet (5.5%). No tracheostomy was performed for relief of upper airway obstruction in our series.

Fifteen patients were referred from the general intensive care unit while three patients were referred

from pediatric intensive care unit to the otolaryngology team for tracheostomy. The duration of intubation before tracheostomy was performed ranged from 4 to 58 days with an average duration of 18 days. All tracheostomies were elective and done under general anesthesia with endotracheal tube as airway control at the time of tracheostomy. The duration for which the tracheostomy tube was required in patients who were successfully decannulated ranged from 12 to 180 days, with a mean duration of 40.5 days. This included a child who was lost to follow up and was subsequently decannulated after 180 days. If this child was excluded in the denominator, then the average duration of tracheostomy would be 27.9 days.

Decannulation was accomplished in 12 patients (66.6%)(Table III). Three patients had fenestrated tubes prior to decannulation, four without fenestration and five had spontaneous removal due to dislodgement which did not require reinsertion. In these 12 patients, endoscopic examination by means of rigid bronchoscope was performed in one patient who had failed decannulation. However, no abnormality was found and eventually this patient was successfully decannulated. Three patients needed permanent tracheostomies while the other three patients expired prior to decannulation. There were no cases of intraoperative complications recorded. Post operatively, the most common complication was accidental decannulation which was noted in five patients (27.8%), followed by tube occlusion in two patients (11.1%). One patient had stomal granulation (5.5%). Two patients had more than one incidence of accidental decannulation. Of the four patients who had accidental decannulation, two needed revision tracheostomy due to failure to reinsert the tracheostomy tube (Table IV). All complications occurred in patients six years and below while older children had no reported complications. The overall complication rate was 38.9%. The mortality rate was (16.6%) three patients. The death was due to their underlying illnesses, none had tracheostomy-related death.

Table I: Underlying illness leading to tracheostomy

Diagnosis	Freq. (n)	%
CNS Disorder	11	61.1%
Neuromuscular Disorder	1	5.5%
Trauma	6	33.3%

Table II: Distribution of underlying disease by age

Age	CNS Disorder	Neuromuscular disorder	Trauma
0-5	5	1	-
6-10	3	-	-
11-15	2	-	-
16-19	2	-	5

Table III: Outcome of tracheostomy in 18 children

Outcome	Freq. (n)	%
Decannulated	12	66.6
Permanent tracheostomy	3	16.7
Expired	3	16.7

Table IV: Complications post tracheostomy in 18 children

Complication	Freq. (n)	%
None	13	72.2
Major complications	6	33.3
-accidental decannulation	4	22.2
-tube occlusion	2	11.1
Minor complications	1	5.5
-peristomal granulation	1	5.5
Multiple complications	2	11.1

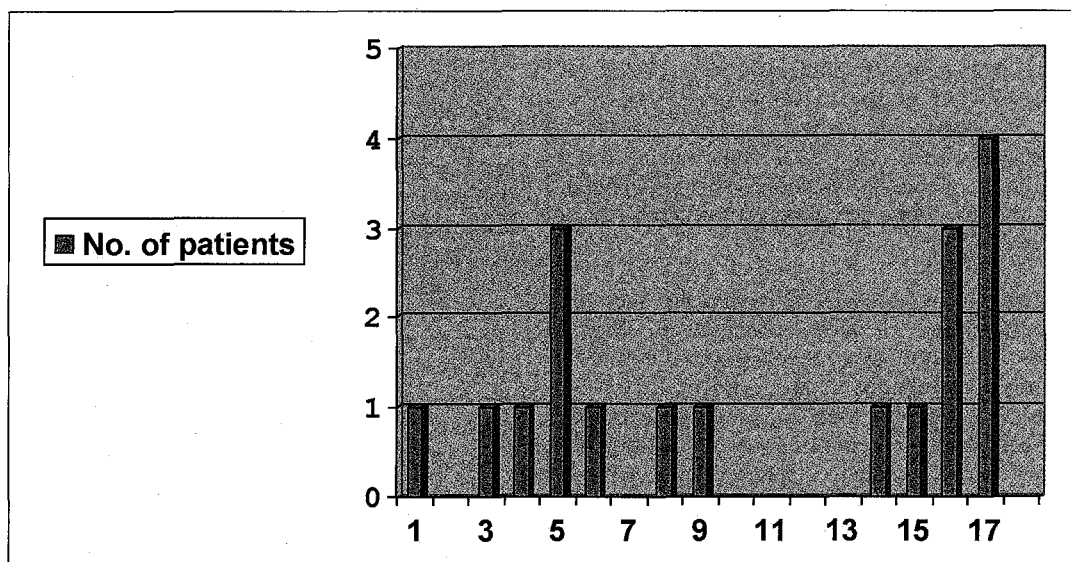


Fig. 1: Age distribution (in years) of children at tracheostomy

Discussion

Tracheostomy is performed in all ages. However, there are significant anatomical differences between a child and an adult. The air passages are both absolutely and relatively smaller in a child than in an adult. The length of cervical trachea varies with body build and the degree of neck extension. In an extended neck, the mediastinal contents may enter the neck resulting in the encounter of a high pleural dome, large vessels crossing the midline or the thymus. Hence it is important not to over extend the neck. The anatomical characteristics of infant trachea requires special surgical technique for tracheostomy.

Vertical tracheal incision is the simplest and the best approach. Special care is needed to avoid injury to the posterior tracheal wall bearing in mind that the diameter of the trachea is much smaller than in adult. Too low an incision will result in the tip of tracheostomy tube lying in the right main bronchus.

There has been a change in the indications of tracheostomy over the past two decades^{1,2,3,5,6}. Tracheostomy performed for epiglottitis and laryngotracheobronchitis has been on the decline due to the development of better anesthetic techniques and safer endotracheal intubation which made tracheostomy no longer necessary in managing these conditions. Furthermore, immunization has decreased the incidence of these infectious diseases. Recently, some series have reported airway obstruction as the most common indication of tracheostomy^{5,6,7,8}. In our series, the most common indication was prolonged ventilation (95.4%) similar to some other series^{1,2,3,4}. Ward *et al*⁴ reported a marked increase from 22% (1980-1985) to 54% (1985-1990) in tracheostomy performed for prolonged ventilation with a comparable decrease in those done for airway obstruction, from 67% to 42%.

Of the 18 patients in our series, 15 were males and only three were females. All tracheostomies were elective procedures, and done under general anesthesia with endotracheal intubation as airway control. Tracheostomy rates were highest in the two extremes of the pediatric age range in our series. CNS disorders predominate in the younger children while in late adolescence, trauma was the primary diagnosis that led to tracheostomy. The most common trauma which indicated tracheostomy in our series was closed head injury. There is insufficient evidence to support that early tracheostomy alters the duration of mechanical

ventilation or extent of airway injury in critically ill patients⁹.

Although endotracheal intubation is safe for a certain period, opinion defers regarding the timing for tracheostomy in a child with prolonged intubation. The mean intubation time in our series was 18 days. The Consensus Conference on Artificial Airways in Patient Receiving Mechanical Ventilation in 1989 recommended that if the need for an artificial airway is anticipated to be greater than 21 days, a tracheostomy is preferred. However, the timing of tracheostomy remains controversial. None of the benefits of early tracheostomy have been demonstrated by any large scale prospective, randomized studies. Hence an anticipatory approach is proposed whereby tracheostomy is considered when it becomes apparent that the patient will need prolonged ventilatory assistance after an initial period of stabilization. There is no hard and fast rule, hence experienced evaluation of the individualized patient by the medical personnel and consideration of the potential patient benefits should form the basis of the timing of tracheostomy^{10,11}. Decannulation was successful in 66.6% of children in our series. A poor decannulation rate was seen in neurologically impaired children. One child failed to be decannulated initially despite absence of anatomical airway obstruction. This was because of 'decannulation panic' which could occur in some children due to psychological dependence⁵. The overall complication rate in our series was 38.9% comparable to other reported series whose complication ranged from 36% to 49%^{1,2,4,5,8}. All complications in our series occurred in children six years and below. The commonest complication was accidental decannulation. No pneumothorax or pneumomediastinum were reported and this may be due to the elective nature of procedures done under full anesthesia in all our patients. Despite accidental decannulation being our most common complication, there were no tracheostomy-related death in our series. The decrease in tracheostomy-related deaths in children with long-term tracheostomy^{2,12,13} probably reflects improvement in post operative care and monitoring of these patients in the hospital. The mortality rate of 16.6% in our series is due to underlying disease and is comparable to other studies which ranges between 7% to 36%⁷.

In conclusion, the trend in the indication of pediatric tracheostomy has changed from infectious disorder to prolonged ventilation. It is a relatively safe procedure despite complications which are seen more commonly

in younger children. Decannulation difficulties were infrequently encountered even in children who had the tracheostomy for extended periods. The outcome of

the tracheostomy is essentially determined by the underlying indication for performing the tracheostomy.

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