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Original Research Article

Paediatric tracheostomy: a unique situation in a tertiary children's hospital in Sabah, Malaysia

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ABSTRACT

Background: This paper presents our experience in paediatric tracheostomy in a tertiary children's hospital and to describe the unique multi-racial and multi-ethnic social demographics involved. Moreover, we would like to highlight an unusual social concern in the state of Sabah, Malaysia and its challenges when treating illegal immigrant children.
Methods: A retrospective case note review was conducted for all paediatric patients who underwent tracheostomy between January 2014 to December 2018.
Results: Seventy-six patients were recruited. Among them thirteen (17.1%) were illegal immigrant children. The commonest indication for tracheostomy was for prolonged assisted ventilation (60.5%), followed by upper airway obstruction (38.2%) and bronchial toileting (1.3%).
Conclusions: This study reflects the current trend in regards to the indication for paediatric tracheostomy. The challenges in treating illegal immigrant children need to be considered on a case by case basis encompassing the family's economic situation, hospital policies and the child well-being.

Keywords: Tracheostomy, Paediatric, Sabah, Immigrants

INTRODUCTION

Paediatric tracheostomy has modernized, both in the profile of the tracheostomised patients and its indication. It was once regarded as a life-saving operation to resolve acute upper airway obstruction secondary to infections such as diphtheria and haemophilus influenza or foreign body inhalation.[1,2]

Indications have changed with the rapid introduction of comprehensive vaccination programmes and the advent of anesthetic skills complemented by evolved intensive care units. Despite all these improvements, tracheostomy in children has in fact risen in some hospitals due to better survival of assisted patients giving rise to the phenomenon of the term "technology-dependant paediatric patients".[3–5]

This refers mainly to patients with upper airway abnormalities and those on long-term assisted ventilation. Our purpose is to report an unusual experience in one of the largest tertiary children hospital in Malaysia whereby illegal immigrant children represent a significant load in our daily practice.

METHODS

Retrospective analysis was conducted from a consecutive sampling of patients in Sabah Women and Children Hospital during a 5-year period between January 2014 to December 2018. The study was approved by the Medical Research and Ethics Committee, Ministry of Health (MOH) Malaysia.

Inclusion criteria

Paediatric patients of age group under 12 years old of either sex who required tracheostomy due to upper airway obstruction, prolonged assisted ventilation and bronchial toileting.

Exclusion criteria

Paediatric patients of age group above 12 years old when tracheostomy were conducted due to upper airway obstruction, prolonged assisted ventilation and bronchial toileting.

A total of 76 patients during the period were recruited. Few parameters were analysed and findings were entered in Microsoft Excel 2010. This includes age, sex, nationality, ethnic group and its indication for tracheostomy. Data were analysed and presented as mode, percentages and number of cases.

We divided the indications into 3 main groups namely upper airway obstruction, prolonged assisted ventilation and bronchial toileting (Table 1).

All of the tracheostomies were done by an ENT surgeon under general anesthesia with the airway secured by an endotracheal tube. A sand bag was placed under the patients' shoulder in order to properly identify important neck anatomical structures. After which a horizontal skin incision was made along the skin crease. Once the trachea is visualized, a vertical incision was placed through the second and third tracheal rings. The trachea was stitched onto the skin to create a tracheostoma to facilitate easy recannulation whenever needed.

RESULTS

A total of 76 patients had tracheostomy done within the study period. 41 of them were males and 35 were females with a ratio of 1.2:1. The youngest child was 1 month old while the oldest child in our study was 12 years old. Infants (less than 1 year old) accounted for the majority (43.4%) of cases. A total of 13 patients (17.1%) were illegal immigrants. Bajau ethnic group (31.6%) recorded the most number of children who have undergone tracheostomy, followed by Kadazan-Dusun (26.3%), Bugis (7.9%), Brunei (6.6%), Suluk (6.6%), Chinese (4%), Filipino (2.6%), Rungus (2.6%), Sungai (2.6%), Sino Kadazan (2.6%), Indian (1.3%), Malay (1.3%), Murut (1.3%), Tidong (1.3%) and Ubian (1.3%) (Table 2).

Table 1: Conditions included in each indication group.

Upper airway obstruction (n=29)	Prolonged ventilation (n=46)	Bronchial toileting (n=1)
Infection	Neurological disorder	
Foreign body	Brain tumours	
Laryngomalacia/tracheomalacia	Cerebrovascular accident	
Subglottic stenosis	Traumatic brain injury	
Bilateral vocal cord abductor palsy	Central nervous system infection	
Maxillofacial/neck trauma	Bronchopulmonary dysplasia	
Syndromic child with congenital anomaly	Attempts of failed extubation	
Macroglossia		
Recurrent respiratory papillomatosis		
Huge neck mass		

Table 2: Patient ethnicities involved in the study.

Ethnicity	Total number of patients (%)
Bajau	24 (31.6)
Kadazan Dusun	20 (26.3)
Bugis	6 (7.9)
Brunei	5 (6.6)
Suluk	5 (6.6)
Chinese	3 (4.0)
Filipino	2 (2.6)
Rungus	2 (2.6)
Sungai	2 (2.6)
Sino Kadazan	2 (2.6)
Indian	1 (1.3)
Malay	1 (1.3)
Murut	1 (1.3)
Tidong	1 (1.3)
Ubian	1 (1.3)

Prolonged ventilation formed the commonest indication (60.5%) of tracheostomy with failed extubation being the main underlying cause (18.4%), followed by progression of brain tumour (13.2%), central nervous system disorder (11%), traumatic brain injury (9.2%), central nervous system infection (6.6%) and lastly bronchopulmonary dysplasia (1.3%). Upper airway obstruction (38.2) was the second commonest indication for tracheostomy with

subglottic stenosis (9.2%) being the major cause followed by syndromic child with congenital anomaly (7.9%), laryngomalacia/tracheomalacia (5.3%), bilateral abductor palsy (5.3%), life-threatening upper airway infection (2.6%), foreign body (2.6%), maxillofacial trauma (1.3%), macroglossia (1.3%), recurrent respiratory papillomatosis (1.3%), and huge neck mass (1.3%).

Table 3: Indications for tracheostomy.

Indication	Number of cases		
	Malaysian	Non-Malaysian	Total (%)
Upper airway obstruction			
Infection	2		2 (2.6)
Foreign body	2		2 (2.6)
Laryngomalacia/tracheomalacia	4		4 (5.3)
Subglottic stenosis	7		7 (9.2)
Bilateral vocal cord abductor palsy	3	1	4 (5.3)
Maxillofacial/neck trauma		1	1 (1.3)
Syndromic child with congenital anomaly	5	1	6 (7.9)
Macroglossia	1		1 (1.3)
Recurrent respiratory papillomatosis	1		1 (1.3)
Huge neck mass	1		1 (1.3)
Prolonged ventilation			
Neurological disorder	8		8 (10.5)
Brain tumours	10		10 (13.2)
Cerebrovascular accident	1		1 (1.32)
Traumatic brain injury	7		7 (9.2)
Central nervous system infection	2	3	5 (6.6)
Bronchopulmonary dysplasia	1		1 (1.3)
Attempts of failed extubation	7	7	14 (18.4)
Bronchial toileting	1		1 (1.3)

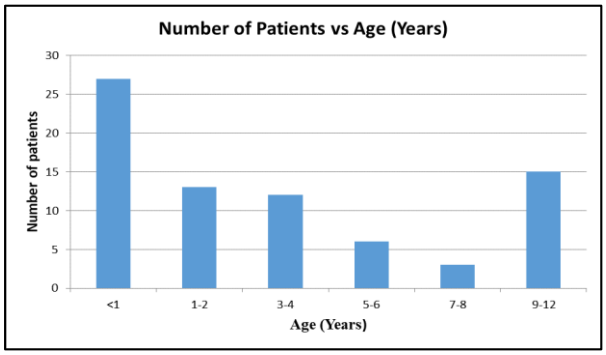

Figure 1: Patient age.

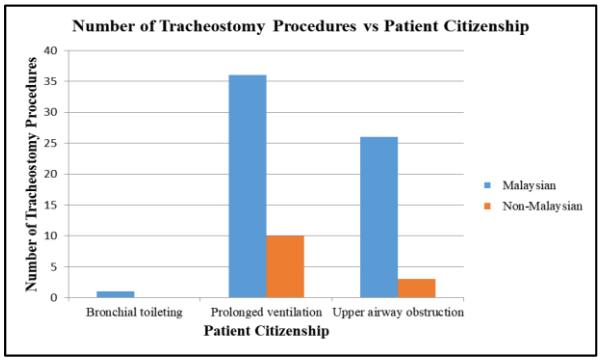

Figure 2: Main indications of tracheostomy procedure according to patient citizenship.

One child (1.3%) had tracheostomy done for bronchial toileting due to bronchiectasis. Out of the 13 children who were illegal immigrants, 7 of them were tracheostomised because of attempts of failed extubation (53.8%), followed by central nervous infection (23.1%), bilateral abductor palsy (7.7%), maxillofacial trauma (7.7%) and syndromic child with congenital anomaly (7.7%) (Table 3).

DISCUSSION

Our study showed that infants (35.5%) were the largest paediatric age group who underwent tracheostomy (Figure 1). This correspond to previous studies by Gerson et al (60%), Alladi et al (40%) showing a significant increase in this age group due to better survival of preterm babies and rising number of infants with congenital airway obstruction.[6,7] 52.6% of our paediatric patients were less than 3 years old.

Similarly, other series concur with this figure naturally because young patients were more susceptible to airway obstruction.[8-10] This is in relation to Poiseulle's law whereby even a slight compromise in the already small airway diameter of infants and young children, can result in marked reduction in airflow. There were two peaks concerning the age of tracheostomy in our study: less than 1 year old (35.5%) and between 9-12 years old (19.7%). This was also demonstrated in a study which recruited one of the largest patient cohort where the latter

peak resulted from traumatic brain injury in older children who were more active.[11] While a number of studies including Primuharsa Putra et al, Onotai et al and Ngozi et al showed a male predominance of 5:1, 2.2:1 and 1.8:1 respectively, our study had only a slight increase in ratio of 1.2:1.[12-14]

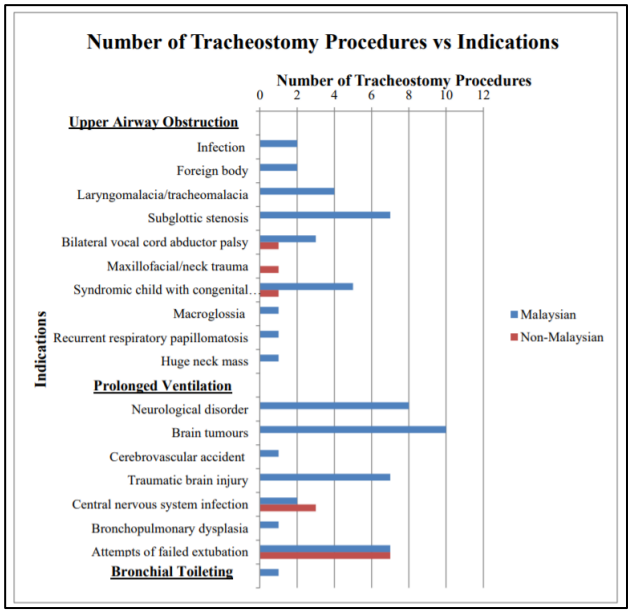

Figure 3: Overall numbers of tracheostomy procedures between Malaysian and Non-Malaysian.

Sabah is the third most populous state in Malaysia with diverse ethnic and indigenous group. Being the two largest indigenous groups in Sabah, Bajau (31.6%) and Kadazan-Dusun (26.3%) recorded the highest number of tracheostomies during our study period. This is followed by Bugis (7.9%), Suluk (6.6%), Brunei (6.6%), Chinese (4%), Sino Kadazan (2.6%), Malay (1.3%), Indian (1.3%) and others (11.8%). The ethnic group classified as others include two Rungus, two Sungai, two Filipinos and a child each from Murut, Tidong and Ubian ethnicities (Table 2). Sabah has the highest number of illegal immigrants in Malaysia. It was reported that about 27% of the population are immigrants due to manipulation by the past controlling political party to maintain racial balance for political gains.[15] A total of 13 patients (17.1%) were illegal immigrants (Figure 2). It is not uncommon for us to treat immigrants in our hospital resulting in difficult situations when they often had financial and social issues. Unlike local citizens where healthcare expenses are greatly subsidized by the government, these immigrants have to bear with the high cost of intensive care support. Unfortunately, most of them come from poor families and were unable to afford the high medical fees.

Historically, the commonest indication of paediatric tracheostomy was upper airway infection such as epiglottitis and laryngotracheobronchitis.[1,2] With the introduction of vaccines, safer intubation methods and better anesthetic techniques, this indication has declined.[5] Even in the poor state of Sabah, there were only two such cases of upper airway infection (2.6%) requiring tracheostomy. In our study, prolonged assisted ventilation (60.5%) formed the most common indication similar to other studies.[2,12,16,17] The main underlying cause was due to attempts of failed extubation (18.4%). The second commonest reason was paediatric brain tumours (13.2%) possibly due to the fact that Sabah Women and Children Hospital is the only paediatric neurosurgery center in the state of Sabah. This is followed by neurological disorders (10.5%), traumatic brain injury (9.2%), central nervous system infection (6.6%) and bronchopulmonary dysplasia (1.3%).

Sabah Women and Children Hospital has one of the highest maternal delivery rates in Malaysia. Neonatal and paediatric intensive care units were often operating at full capacity due to bed restrictions. Frequently, we get early referral for tracheostomy due to attempts of failed extubation to expedite weaning off ventilator sooner. This is particularly the case in immigrant children whose families cannot afford the high medical expenses associated with prolonged stay in intensive care units. As many as 7 (53.8%) out of 13 immigrant children underwent tracheostomy because of failed extubation in comparison to 7 (11.1%) out of 63 local children (Figure 3).

Upper airway obstruction was the second commonest indication of paediatric tracheostomy in our study whereby subglottic stenosis (9.2%) formed the principal reason. Similar percentage of subglottic stenosis was also reflected by a few series.[18,19] Meanwhile, there were others who reported much higher rates.[16,20] The fact that laryngotracheal reconstruction is advocated nowadays to prevent tracheostomy for subglottic stenosis calls us to reflect on these figures. Syndromic child with congenital anomaly (7.9%) was the second commonest cause of upper airway obstruction followed by laryngomalacia/tracheomalacia (5.3%), bilateral abductor palsy of vocal cords (5.3%), upper airway infection (2.6%), foreign body aspiration (2.6%), maxillofacial trauma (1.3%), macroglossia (1.3%) and recurrent respiratory papillomatosis (1.3%).

Interestingly, there were several series showing a shift back towards upper airway obstruction as the main indication of paediatric tracheostomy. Lawrason et al explained that medical advancement made in managing prematurity and bronchopulmonary dysplasia lead to increased survival of premature infants including syndromic children with congenital anomaly.[3] Mahadevan et al. also reported a high percentage (70%) of upper airway obstruction in their 17-years review.[19] Craniofacial dysmorphism made up 47% of the cases for upper airway obstruction while subglottic stenosis constituted 21%.[19] In comparison, 24% of our patients with upper airway obstruction was caused by subglottic stenosis and 20.1% was attributed to syndromic child

with congenital anomaly. The number of tracheostomy for laryngomalacia has reduced over the period of our study as more interventions i.e supraglottoplasty were done with good outcome. Fortunately, only 2.6% of our paediatric patients underwent tracheostomy because of foreign body inhalation in contrast to Onotai et al and Eziyi et al who reported it being the leading cause of upper airway obstruction.[13,21]

There are several limitations to this retrospective review. Our study did not collect information regarding the outcome of tracheostomy and its complications due to poor patient follow up. This is primarily due to the fact that most of our patients stay far away from Kota Kinabalu. Sabah Women and Children Hospital is the only hospital providing specialized paediatric ENT services with another two hospitals namely Hospital Tawau and Hospital Sandakan delivering core ENT services catering the east coast of Sabah. It would also be useful on hindsight to record the interval between respiratory failure and tracheostomy given that high percentage of paediatric patients had surgery due to prolonged ventilation. Moreover, the number of attempts in failed extubation would be particularly interesting to look at knowing that it is often personalized and variable circumstances often influence the clinical decision.

CONCLUSION

The unusual state of illegal immigrant children will continue to pose serious challenges to our ENT practice especially when we are dealing with airway related events deemed life-threatening irrespective of citizenship. A mutual agreement and understanding between the paediatric team, ENT, hospital management and even those in political power is imperative to address this social impasse so that better services can be forged moving forward.

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