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Revealing the needs of children with tracheostomies

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ABSTRACT

Introduction: Small children with tracheostomy are at potential risk and have very specific needs. International literature describes the need for tracheostomy in 0.5% to 2% of children following intubation. Reports of children submitted to tracheostomy, their characteristics and needs are limited in developing countries and therefore there is a lack of health programs and government investment directed to medical and non-medical care of these patients. The aim of this study was to describe the characteristics of these children and identify problems related to or caused by the tracheostomy.

Methods: A retrospective cohort study was performed based on a common database applied in four high complexity healthcare facilities to children submitted to tracheostomy from January 2013 to December 2015. Data concerning children's demographics, indication for tracheostomy, early and late complications related to tracheostomy, airway diagnosis, comorbidities and decannulation rates are reported. Patients who did not present a complete database or had a follow-up of less than six months were excluded.

Results: A total of 160 children submitted to tracheostomy during the three-year period met the criteria and were enrolled in this study. Median age at tracheostomy was 6.9 months (ranging from 1 month to 16 years, interquartile range of 26 months). Post-intubation laryngitis was the most frequent indication (48.8%). Comorbidities were frequent: neurologic disorders were reported in 40%, pulmonary pathologies in 26.9% and 20% were premature infants. Syndromic children were 23.1% and the most frequent was Down's syndrome. The most common early complication was infection that occurred in 8.1%. Stomal granulomas were the most frequent late complication and occurred in 16.9%. Airway anomalies were frequently diagnosed in follow-up endoscopic evaluations. Subglottic stenosis was the most frequent airway diagnosis and occurred in 29.4% of the cases followed by laryngomalacia, suprastomal collapse and vocal cord paralysis. Decannulation was achieved in 22.5% of the cases in the three-year period. The main cause for persistent tracheostomy was the need for further treatment of airway pathology. Mortality rate was 18.1% during this period but only 1.3% were directly related to the tracheostomy, the other deaths were a consequence of other comorbidities.

Conclusion: Tracheostomies were performed mostly in very small children and comorbidities were very common. Once a tracheostomy was performed in a child in most cases it was not removed before a year. The most common early complication was stoma infection followed by accidental decannulation. The most frequent late complication was granuloma and suprastomal collapse. Airway abnormalities were very frequent in this population and therefore need to be assessed before attempting decannulation.

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1. Introduction

The first report of a tracheostomy dates back to 100 BC when Asclepiades described the first case of opening of a trachea, the outcome was not reported. Paul d'Egine was responsible for the first description of a successful tracheostomy performed in the 16th century. High mortality rates related to this procedure restricted its use to critical cases such as the diphtheria cases in the 19th century when this was popularized by Armand Trousseau. It was Chevalier Jackson in the 20th century that finally described the tracheostomy technique, as it is still known to these days [1]. While indications, complications and outcomes have been largely discussed for the adult population, literature is quite scarce in the pediatric population. In the past years a significant change in indications, complications and mortality has been described. Also the indications for reconstructive airway surgeries in the pediatric population have evolved with better care and development of pediatric intensive care units allowing for earlier decannulation and better expectancy for children with tracheostomies [2,3].

In the past, the most common indications for tracheostomy in a child were acute infections or inflammations such as laryngitis and abscesses. Vaccination for *Haemophilus influenzae* and *Corynebacterium diphtheriae* with decreasing number of cases have turned these into a rare indication for tracheostomy [4]. Improvements in material for endotracheal intubation and technology advances in prolonged mechanical ventilation and sedation protocols have decreased the occurrence of obstructive airway lesions modifying the indications for tracheostomy in these patients. As a consequence, nowadays one of most frequently described indications for childhood tracheostomy is the need for assisted ventilation [5].

Profile of children with tracheostomies has also changed in the past decade for other reasons. Evolving technology in neonatal intensive care has allowed the survival of a growing population of premature and extremely low-weight babies with multiple comorbidities and malformations [6]. Endoscopic techniques and miniaturization of surgical instrumentation have evolved and saccular cysts, laryngomalacia, respiratory papillomatosis have become infrequent indications for tracheostomy. Children with hemangiomas and lymphangiomas of the airway have received medical treatment with good response also diminishing the need for tracheostomy as an alternative. Recently, even acquired subglottic stenosis (SGS) has been increasingly treated in its acute stage and tracheostomies have been avoided [3,7,8].

Although surgeons that care of children with tracheostomies have noted these changes there is a general lack of knowledge on the profile and characteristics of the population of children with tracheostomies. The fact that this is a procedure performed by various medical specialties (otorhinolaryngologists, general surgeons, pediatric surgeons, thoracic surgeons) makes it difficult to compile epidemiological data. This is even more difficult when the surgeon performing the tracheostomy is not involved in the follow-up treatment of the airway. In Brazil, in 2016, 17,532 tracheostomies were performed in public hospitals [9]. There is, however, no data on the pediatric population included in this number, indication or description of urgent or emergent character of indication. There is a general lack of information on the epidemiological profile of children being submitted to tracheostomy in our country and the only information is restricted to very few studies [3,10,11].

Lack of epidemiological data prevents logistic planning of follow-up care for these patients. There is no rational for patient referral and healthcare facilities lack basic material and professional training to offer appropriate care. Knowledge of the profile of this population may help planning care in referral centers and also designating the basic needs of healthcare facilities that intend to offer care for this population [12]. The aim of this study is to describe the characteristics of children undergoing tracheostomy

and identify problems related to or caused by a tracheostomy in infants.

2. Methods

This study was submitted and approved by the research ethics committee of all the participating institutions.

A retrospective cohort study was performed based on a common protocol for children submitted to tracheostomy applied in four different tertiary university healthcare facilities in three geographical regions of Brazil.

Children aged up to 18 years of age submitted to tracheostomy during the period from January 2013 to December 2015 were included.

Researchers from the four institutions filled out a standard protocol with epidemiological data regarding: age at tracheostomy, indication for tracheostomy, comorbidities, complications, airway diagnosis and outcome. Protocol was based on “yes” or “no” answers for non-numerical categories and more than one alternative could be assigned regarding indication for tracheostomy, comorbidity, complications, airway diagnosis and reason for non-decannulation. Post-intubation laryngitis was clinically defined [13] by: stridor, cough, cyanosis, sternal/costal retractions and nasal flaring in the first 72 hours following extubation. Data that could not be extracted from the protocol and chart review was retrieved by telephone interview of the caregiver. Informed consent was obtained for all patients enrolled in the study.

Comorbidities were categorized as: neuropathies, pneumopathies, cardiopathies, gastrointestinal disorders, prematurity (gestational age below 37 weeks), extreme prematurity (gestational age occurring below 30 weeks) and genetic syndrome. Complications occurring during the first week following tracheostomy were considered early and those occurring after one week were considered late. Definite airway diagnosis was based on airway endoscopy performed during the follow-up period. Outcome was categorized as decannulated or not decannulated. When the child was not decannulated reasons for this were categorized as: “need for ventilator support”, “pulmonary aspiration” or “undergoing airway pathology treatment”. The latter was applied when children were currently undergoing follow-up after reconstructive and/or endoscopic surgery, waiting for scheduled reconstructive surgery and/or endoscopic procedures or undergoing clinical control of comorbidities before planning airway surgery. The time interval in which the child had a tracheostomy was calculated from the day the tracheostomy was performed until decannulation date or last follow-up for children who were not decannulated.

Descriptive data was reported as median and range or absolute and relative frequency. All analyses were performed using SPSS 22.0 (IBM Corp. Released 2013. IBM SPSS Statistics for Windows, Version 22.0. Armonk, NY: IBM Corp).

3. Results

In the 3-year period studied, 181 tracheostomies were performed in the four participant institutions. In this study only 160 were included, 21 cases were excluded due to lack of all epidemiologic data or the minimum six-month period follow-up. The mean age at tracheostomy was 6.9 months (range 2.9–38.2 months). Of the 160 children, 58.1% were boys and 41.9% were girls. Mean follow-up was 435 days (interquartile range: 109.5–644.5). None of the patients in this study were inpatients at the time of the study although this was not an exclusion criteria.

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