TRACHEOTOMY IN CHILDREN

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ABSTRACT

INTRODUCTION: Tracheotomy is one of the most urgent procedures in medicine. It is an operative procedure that creates a surgical airway in the cervical trachea.

AIM: Tracheostomy refers to a surgical incision made into a trachea. Children are often considered "little people", however, in medical sense, that is not completely true. The aim of our paper is to review the tracheostomy procedure in children.

MATERIALS AND METHODS: In this paper, we analysed the tracheostomies in children performed in the Clinical Centre Niš (Serbia) in the five-year period from January 2015 to December 2019 inclusive. At our centre, all tracheostomies were solely performed by otolaryngologists.

RESULTS: A total of 37 tracheotomies were performed in the studied period. There were 25 (67.6%) boys and 12 girls (32.4%). The main reason for this relatively low tracheostomy count in our study is because our practitioners are usually performing tracheostomies only in children that require urgent care. All chronic or complicated cases, if they are stable enough to transport, are referred to a higher specialised institution in Belgrade, Serbia.

The youngest was a newborn, not older than 1 hour, and the oldest was 17 years old. We divided them into groups according to the age. There were 5 (13.5%) neonates, 25 (67.6%) infants, 3 (8.1%) preschoolers, 2 (5.4%) school-aged children, and 2 (5.4%) adolescents. This is in concurrence with other studies, where authors reported that the highest number of tracheostomies (around 65–70%) were performed before 1 year of age.

In most cases, indication for tracheostomies were upper airway obstructions (n=35, 94.6%). Prolonged orotracheal intubation (n=1, 2.7%), and protective tracheostomy (n=1, 2.7%) were the causes in the other two cases.

CONCLUSION: While researching the literature for this paper we found that there is little standardisation associated with tracheostomy, even though it is a procedure that is performed regularly all over the globe. There is evidence that there is a disparity in opinions not only among the practitioners in different countries, but in individual countries as well. With the increasing number of patients that require tracheostomy, we find that this topic should be addressed more carefully with the attempt to establish the best way of action for this procedure, and with that, lower the complication and mortality rates.

Keywords: *tracheotomy, stridor, children*

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INTRODUCTION

Tracheotomy is one of the most urgent procedures in medicine. It is an operative procedure that creates a surgical airway in the cervical trachea. Although the first mentioning of the tracheostomy can be traced back to the ancient Egypt and Greece, it was not standardised until the 20th century by Jackson (1). Not so long ago, paediatric tracheotomy was mainly used as an emergency procedure in treatment of acute upper airway obstructions caused by infections. With the development of the vaccines against *C. diphtheriae* and *H. infulenzae* and the advancement in intensive care treatment, indications for tracheostomy in children started to change noticeably. The number of urgent tracheotomies dropped, but the total number of tracheostomies per year has been rising due to tracheostomies performed in children that need prolonged ventilator support (2). Even though prolonged ventilation is one of the most frequent indication for tracheotomy in children, its definition varies considerably (3).

Children have smaller anatomical structures that may have different positions and relations to one another compared to those in adults (4). Their larynx is not only smaller, but more superiorly and anteriorly placed. All the structures are softer and more pliable, which makes organ differentiation more difficult. Pleural domes can be easily pulled above the clavicle with the extension of the neck, facilitating their potential impairment. Another problem is that young children have low functional residual capacity, which, along with higher oxygen demand, makes them susceptible to respiratory acidosis (5). On top all of that, their airways are continuously developing. All of this makes tracheostomy in children that much harder than in adults.

AIM

The aim of our paper is to review the tracheotomy procedure in children. Tracheotomy refers to a surgical incision made into the trachea. Children are often considered "little people", however, in medical sense, that is not completely true. We describe our institution's experience with tracheotomy in children.

MATERIALS AND METHODS

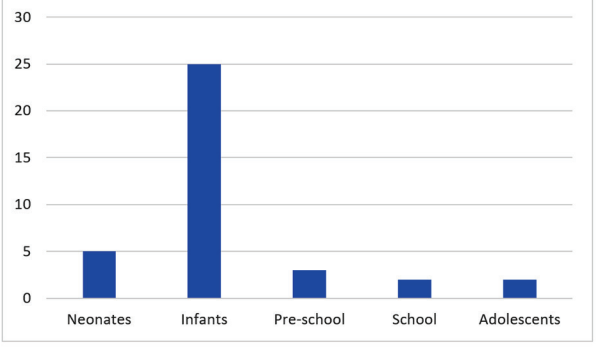
In this paper, we analysed the tracheotomies in children performed in the Clinical Centre Niš (Serbia) in the five-year period from January 2015 to December 2019, inclusive. At our centre, all tracheotomies are solely performed by otolaryngologists.

The same surgical technique was used in every case, under general anaesthesia in the operating room. Patients were put in the supine position with the neck in the extended position. A midline vertical skin incision and plane-by-plane dissection was performed. Finger palpation was used regularly to determine the position of the trachea. After exposing the trachea, two stay sutures were placed, one on each side. Vertical incision of the trachea was placed between the stay sutures, at the 3rd and 4th tracheal ring, when possible. Additional sutures were placed when needed. Endotracheal cannula was chosen adequately to the patients age, according to the known formulas (6).

RESULTS

A total of 37 tracheotomies were performed during the studied period. There were 25 (67.6%) boys and 12 girls (32.4%). The main reason for this relatively low tracheostomy count in our study is because our practitioners are usually performing tracheotomies only in children that require urgent care. All chronic or complicated cases, if they are stable enough to transport, are referred to a higher specialised institution in Belgrade, Serbia.

The youngest was a newborn, not older than 1 hour, and the oldest was 17 years old. We divided them into groups according to the age (Graph 1). There were 5 (13.5%) neonates, 25 (67.6%) infants, 3 (8.1%) preschoolers, 2 (5.4%) school-aged children and 2 (5.4%) adolescents. This is in concurrence with other studies, where authors reported that the biggest



Graph 1. Number of children in different age groups.



Fig. 1. One of the patients after successful tracheotomy and placement of endotracheal cannula.

number of tracheotomies (around 65-70%) were performed before 1 year of age (7,8).

In most cases, indication for tracheostomies were upper airway obstructions (n=35, 94.6%). Prolonged orotracheal intubation (n=1, 2.7%) and protective tracheotomy (n=1, 2.7%) were the causes in the other two cases.

All the diagnoses are deed in Table 1. The biggest group consisted of patients with congenital stridor (n=19, 51.3%), followed by stenosis (n=13, 35.2%), diaphragm of the upper respiratory tract (n=3, 8.1%), recurrent papillomatosis (n=1, 2.7%), and bilateral vocal cord paralysis (n=1, 2.7%).

Table 1. Diagnoses of the patients that were submitted to tracheostomies.

Diagnosis	n (%)
Congenital stridor	19 (51.3%)
Stenosis	13 (35.2%)
Diaphragm of the upper respiratory tract	3 (8.1%)
Recurrent papillomatosis	1 (2.7%)
Bilateral vocal cord paralysis	1 (2.7%)
Total	37 (100%)

Other studies reported long-term ventilation as the number one indication for tracheotomy (20-61%), with subglottic stenosis in second place (14-36,8%). (7,9,10)

In our study, complications occurred in 12 (34.4%) patients. The complications were: 2 (5.4%) aspirational pneumonias, 2 (5.4%) pneumothoraxes, 1 (2.7%) tracheomalacia, 2 (5.4%) cannula obstructions, 2 (5.4%) granulations/stenosis, and 3 (8.1%) deaths (Table 2).

Table 2. Types of complications and their prevalence.

Complications	n (%)
Aspirational pneumonia	2 (16.7%)
Pneumothorax	2 (16.7%)
Tracheomalacia	1 (0.83%)
Cannula obstruction	2 (16.7%)
Granulation/stenosis	2 (16.7%)
Death	3 (25%)
Total	12 (100%)

Other authors reported complication rates that vary from 7.4% up to 51%, depending on the study (11-15). Our reported death rate regarding tracheotomy was the same as the one reported by other authors (15-39.2%) (7,9,16).

DISCUSSION

The average age of the patients has not changed much in the last decades. Children under the age of 1 year are still the predominant group in need of tracheotomies. Complication rates are also stable, and vary from 18 to 64%, depending on the study. Reported mortality rates in the literature range from 0 to 4%, with accidental decannulation as the number one cause of death (17).

Sioshansi and colleagues studied paediatric tracheotomy practice patterns. They indicated that most of the practitioners used stay sutures with or without maturation sutures, with older practitioners being the ones who used maturation sutures more often than not. Almost all of them preferred sending patients to intensive care postoperatively. The first endotracheal tube change was usually done between the 5th and 7th postoperative day. The length of stay was dependent on the indication for tracheostomy. However, this paper has also shown that there is a lot of variability amongst surgeons' preferences, supporting the fact that there is a lack of hard evidence regarding this topic (18).

CONCLUSION

While researching the literature for this paper, we found that there is little standardisation associated with tracheotomy, even though it is a procedure that is performed regularly all over the globe. There is evidence that there is a disparity in opinions not

only among the practitioners in different countries but in individual countries as well. With the increasing number of patients that require tracheotomy, we find that this topic should be addressed more carefully with the attempt to establish the best way of action for this procedure, and with that, lower the complication and mortality rates.

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