

PEDIATRIC TRACHEOTOMY: INDICATIONS AND COMPLICATIONS IN THE PEDIATRIC HOSPITAL “LOUIS TURCANU”

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Abstract

Tracheotomy is a surgical procedure in which a direct airway is open in the trachea. Conventional tracheotomy is the procedure of election in pediatric patients. The goal of this study was to assess the indications and complications of pediatric tracheotomies performed in the Department of Pediatric Surgery of the Pediatric Hospital “Louis Turcanu” in Timisoara, from July 2011 to February 2013. Over the studied period 7 tracheotomies were performed. 6 (85.71%) were male and one (14.28%) was female. The age of the patients ranged between 3 months and 10.5 years, with a mean of 24.71 months. 6 of the patients (85.71%) were under one year of age. In 5 of the 7 cases (71.42) the main indication was prolonged orotracheal intubation. In two cases (28.57%) tracheotomy was performed for upper airway obstruction. The overall rate of complications was 42.85%. They were all early complications: intraoperative bleeding in two cases and pneumothorax in one patient. Decannulation was performed successfully in 2 patients (28.57%). The overall mortality rate was 42.85% (3 patients) and was due to the primary diseases with no relation to tracheotomy. The main indication for tracheotomy in our study was prolonged intubation. The incidence of complications was acceptable, comparable with other studies in the literature. The reduced number of patients is a limitation of our study.

Key words: pediatric tracheotomy, indications, complications

Introduction

Tracheotomy is a surgical procedure in which a direct airway is open in the trachea.

Two main techniques are used today: the surgical tracheotomy and the percutaneous dilatational tracheotomy. The procedure of election in pediatric patients is conventional tracheotomy 1. It is a potential life-saving surgical intervention, but literature suggests that the risks associated with it are significantly higher in children than in adults 2.

There are four main indications for tracheotomy: long-term mechanical ventilation, weaning failure, upper airway obstruction and copious secretions 2. During the last 3-4 decades the indications for children have changed

considerably. Previously represented mainly by acute inflammatory airway obstructions, such as acute epiglottitis, croup and diphtheria, they are now replaced by long term intubation and its relevant sequelae 4-7.

The goal of this study was to assess the indications and complications of pediatric tracheotomies performed in the Department of Pediatric Surgery of the Pediatric Hospital “Louis Turcanu” in Timisoara, from July 2011 to February 2013.

Material and method

We performed a retrospective study to identify the pediatric patients who underwent tracheotomy between July 2011 and February 2013. Patient charts were analyzed with respect to age, sex, primary diagnoses and indications for the procedure, the moment for the intervention, the type of anesthesia, the outer diameter (OD) of the cannula and early and late complications.

If the main indication was prolonged intubation, we considered early tracheotomy if the intervention was performed within 7 day from the intubation.

Early complications were defined as those experienced intraoperatively or within the first week following the procedure.

Tracheotomies were performed under local or general anesthesia, after receiving informed consent of the parents. The procedure started with supine positioning of the child, with a rolled-up towel placed under the shoulders. Sternal notch, hyoid bone, cricoid cartilage were identified. A vertical incision was performed between the cricoid cartilage and the sternal notch. After the debulking of the subcutaneous fat, the dissection proceeded in the midline, dividing the strap muscles and the thyroid isthmus was exposed and retracted. After the identification of the anterior tracheal wall and of the cricoid cartilage, the later was suspended with a hook and stay sutures were placed on each side of the proposed tracheal incision. The trachea was incised vertically through the second and third or third and four rings, between the stay sutures. The tracheotomy tube was inserted, the hemostasis verified and if necessary skin sutures performed. Stay sutures were taped on the chest, to be removed once with the skin sutures, one week after the surgery.

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Results

A total of 7 pediatric tracheotomies were performed in the studied time period. 6 (85.71%) were male and one (14.28%) was female. The age of the patients ranged between 3 months and 10.5 years, with a mean of 24.71 months. 6 of the patients (85.71%) were under one year of age. In 5 of the 7 cases (71.42%) the procedure was elective, the main indication being prolonged orotracheal intubation. In two cases (28.57%) emergency or semi-emergency tracheotomy was performed for upper airway obstruction (Table 1).

In the patients with prolonged intubation, early tracheotomy was performed in one of the 5 cases (20%), after 5 days of mechanical ventilation. In the rest of 4 cases, the surgery was performed after an average of 32.5 days (between 19 and 62).

In 6 of the seven patients (85.71%), the intervention was performed in general anesthesia. In one case (14.28%) local anesthesia was used, because intubation has not been possible, due to the important hypertrophy of the tonsils and the modified anatomy of the larynx by the enlargement of the cervical lymph nodes.

The tracheal incision was placed at the level of the second and third tracheal ring in the majority of the cases. In one patient, with Hodgkin lymphoma, we performed a low tracheotomy (third and fourth tracheal ring).

In 4 of the patients (57.14%) we used 5.5 mm OD cannula, in 2 patients (28.57%) 5 mm OD cannula and in one patient (14.28%) 7 mm cannula (Table 2).

The overall rate of complications was 42.85%. They were all early complications: intraoperative bleeding in two cases and pneumothorax in one patient.

Decannulation was performed successfully in 2 patients (28.57%). The overall mortality rate was 42.85% (3 patients) and was due to the primary diseases with no relation to tracheotomy.

Discussions

Tracheotomy is potentially life-saving procedure in patients with upper airway obstruction. It is also a frequently performed intervention in cases requiring prolonged

intubation, due to its numerous advantages: improvement of respiratory mechanics, reduced laryngeal ulceration, improved nutrition, enhanced mobility and speech, improved patient comfort and better clearance of secretion. Disadvantages include related complications to the surgical procedure, stomal complications, and rarely trachea-innominate artery fistula and trachea-esophageal fistula formation 3.

The main indication for tracheotomy in our study was prolonged intubation, in 71.42% of cases, the result being comparable with the literature. Butnaru et al. reported that prolonged intubation was the main indication in 57% of their series 8, Mahadevan et al. in 70% 5 and Atmaca et al. in 87% 2. In the rest of the patients in our study, tracheotomy was indicated by the upper airway obstruction, due to tumor and genetic disease. These results can be explained by the introduction of the H. influenzae vaccine in the national vaccination program and also by the advancements in the intensive care units.

Conventional tracheotomy is the procedure of election for pediatric patients and most of the surgeons prefer a vertical midline incision, considered to be associated with a lower risk of stenosis, which was also our choice.

A meta-analysis published by Griffiths et al. in 2005 reported that early tracheotomy shortened the duration of mechanical ventilation and length of ICU stay 9. De Leyn et al. consider that early tracheotomy at 7 days of mechanical ventilation is appropriate for patients in whom weaning and extubation are not likely before day 14 3. Tracheotomy has also important benefits compared to prolonged intubation: greater airway security, improved patients comfort, better oral hygiene and easier nursing care. They are balanced by complications of the procedure who include bleeding, wound infection, tracheal stenosis and possibly death and stoma related complications. In our study, early tracheotomy was performed in 20% of the patients with prolonged intubation. The moment of the intervention was decided by the intensive care specialist, taking in account the option of the parents.

Table 1. Tracheotomy indications in the study group.

Type of tracheotomy	Indication	Patients
Elective	Prolonged intubation:	5 (71.42%)
	-neurological	1
	-muscular	3
Emergency/semi-emergency	-infection associated to pulmonary malformation	1
	Upper airway obstruction:	2 (28.57%)
	-Pierre-Robin sequence	1
	-Hodgkin lymphoma	1
Total		7 (100%)

It is considered that paediatric tracheotomy is associated with a higher rate of complications. In our study, the overall rate of complications was 42.85%. Intraoperative bleeding was the most common complication and occurred in 2 cases. It was managed by ligation of the vessels. Pneumothorax occurred in one case (14.28%), an emergency tracheotomy in a patient with Hodgkin lymphoma, important cervical adenopathy and hypertrophy of the tonsils, which altered the local anatomy and made intubation impossible. Inter coastal drainage was done and the pneumothorax subsided. The rate of complications was comparable with literature. Ravi Kumar et al. reported a complication rate of 59% for conventional tracheotomy in adult patients 1, while Atmaca et al. reported a 29.6% complication rate in pediatric patients 2.

Decannulation was performed in 2 cases (28.56%). The low decannulation rate was associated with the high proportion of patients in the prolonged intubation group and the short follow-up period. It was carried out by replacement with a fenestrated tube and using progressively smaller tubes before decannulation. If the patient tolerated the trial without evidence of airway obstruction or respiratory difficulty, the tube was finally removed.

Failure of decannulation can occur. It is reported to range from 2-5%¹⁰. To exclude local causes, Law et al. recommended that all decannulation candidates undergo anatomic examination of the airway¹¹.

Table 2. The OD of the cannula according to the age of the patients.

Age (months)	OD (mm)
12	5.5
7	5.5
5	5
9	5.5
3	5
11	5.5
126	6

Conclusions

The main indication for tracheotomy in our study was prolonged intubation. The incidence of complications

was acceptable, comparable with other studies in the literature. The reduced number of patients is a limitation of our study.

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