

Tracheostomy Complications in Children: Single Center Experience

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Abstract

Background: To evaluate the frequency and the type of complications in children with tracheostomy in our center

Materials and methods: Single-center retrospective study of pediatric patients undergoing tracheostomy between 2017 and 2022. Age, sex, indication of tracheostomy, tracheostomy time, the features of complications and presence of mortality were evaluated.

Result: Fifty children (22 girls, 28 boys) were included the study. The mean age of patients 93.5 months. The tracheostomy time was before one year of age for 27 patients. The most common indication for tracheostomy was long-term ventilation. There were 30 complications for 23 patients.(46%) We did not report any early complication. The most common late complication was the development of granulation tissue. The second most common complication was cannula obstruction. Only one patient died due to massive bleeding associated with tracheostomy. We decannulated 7 patients (14%).

Conclusion: The rates of complication may vary in the literature. The reason for this differentiation may be related to the different study design and population features. Also socio-economic level of the family and the responsibility awareness of the parents may contribute to these factors. Education of parents and caregivers about the appropriate postoperative management is very important for preventing complications rates.

Keywords: Tracheostomy, Children, Complication

Introduction

Tracheostomy is a common procedure in critically ill patients such as for management of upper-airway obstruction or prolonged ventilation. Over the last decade, tracheostomy has been increasingly performed in children with complex and chronic conditions because of the increasing survival rate. In children population, this procedure is technically more difficult and complication rates are higher than adults. Indications, timing and complications of tracheostomy in adults have been well described in the literature but these are still controversial in the pediatric population. Tracheostomy-related complications may occur sometimes during the procedure and sometimes afterwards. Type and rates of complications vary depending on different parameters such as the study design, different patients number, and patient follow-up. These complications can be categorized as early or late. This definition is made according to passed time between procedure and complication. The complications of tracheostomy can be called as early complications such as hemorrhage, accidental tube decannulation and infection.

Late complications include hemorrhage, tracheal stenosis, accidental tube decannulation, and fistula formation (1-8).

There are some studies reported in literature that evaluated the indication and complication of pediatric tracheostomy. The aim of this study is to evaluate the frequency and the type of complications in children with tracheostomy in our institution.

Material and Methods

This study's design was a single-center and retrospective. We evaluated the records of children with tracheostomy who were followed in our palliative care clinic between 2017 and 2022. Age, sex, tracheostomy time, indication of tracheostomy, the type of complication, and presence of mortality were evaluated. Tracheostomized pediatric patients (0-18 years old) were included in the study. Patients with missing records were excluded. Early complications were defined as those within the first week of procedure and late complications were defined as those after one week (8).

Statistical Analyses

Descriptive statistical analysis was performed with Microsoft Excel, and the data obtained were calculated as mean and percentage.

Results

Fifty children were available for analysis. 22 (44%) were girls and 28 (56%) were boys. The mean age of patients was 93.5 months (15-214 mo). Long term ventilation was the most common indication (41, 82%) Primary causes of this indication were cardiopulmonary disease and neuromuscular disease. The indications are shown in Table 1.

Table 1: Indication of tracheostomies

Prolonged ventilation	n=41
Neuromuscular disease	22
Lung disease	11
Metabolic disease	6
Congenital heart disease	2
Airway obstruction	n=9
Subglottic stenosis	4
Craniofacial anomaly	3
Laringomalasia	2

In our study, there were not intraoperative or postoperative early complications. We detected total 30 late complications for 23 patients (46%). 17 patients had only one, 5 patients had two and only one patient had 3 complications. The most common late complication was the development of granulation tissue. The second most common complication was cannula obstruction. All complications are shown in Table 2. Only one patient was death due to massive bleeding associated with tracheostomy. The cause of other deaths were complications from their primary disease..

Table 2: Complications of tracheostomies

	n=30
Granulation tissue	9
Canal obstruction	4
Accidental decannulation	2
Skin lesion (dermatitis)	1
Tracheocutaneous fistula	2
False passage	2
Infection	5
Suprastomal granulation tissue	1
Bleeding	2
Tracheal stoma enlarging	1
Tracheal stoma stenosis	1

We decannulated 7 patients (14%). The tracheostomy time was before 1 year of age for 27 patients (54%). The others were after 1 year of age.

Discussion

Tracheostomy is a relatively common procedure performed on children in tertiary care centers. The prevalence and type of complications is variable in the literature. Complications ranges from 11% to 51%. Published data on both indications and complications of tracheostomy in pediatric population is limited. Indications for pediatric tracheostomy have changed over years. In the past years, before the vaccines development, the most common cause was infections. According to latest data the main indications in children are upper airway obstruction and prolonged ventilator dependence secondary to chronic lung disease or neuromuscular disorders. (1,4,9,10) We found that long term ventilation was the most common indication for tracheostomy. Robert et al., Duymaz et al., as well as other authors reported similar results (4,5). Akdağ et al. reported 56 patients and Itamoto et al. reported 58 patients that upper airway obstruction was the most common indication. (6,7) Recently, due to advancement in diagnosis, treatment and critical care life expectancy in chronic disease such as neuromuscular and chronic lung disease has increased. Thus, it is not surprising that prolonged ventilation is the most common cause.

Our study showed that the majority of patients had their tracheostomy performed under 1 year of age. In the literature studies reported that almost two thirds of tracheostomies are performed on children under 1 year of age similar to our result. The number of male patients were more than female patients. In the literature, this situation is explained as males being more susceptible to both congenital and acquired defects.(2,3,9)

Tracheostomized pediatric patients need a carefully long-term care for reducing the early and late complications risks. In the literature, there are a lot of studies about complications associated with adult tracheostomy. But, in pediatric population there is not enough research about tracheostomy. The complications of tracheostomy can be called as early complications if they occur within the first week following placement. Early complications include hemorrhage, tube decannulation, extratracheal air subcutaneous emphysema, pneumothorax, pneumomediastinum and infection. The critically ill patients who have with multiple comorbidities may have late complications due to presence prolonged tracheostomy tube placement. Late complications include hemorrhage, tracheal stenosis, tube decannulation, and fistula formation. We reported only 30 late complications (17 patients, 34%). Robert et al. evaluated 153 children and identified 16 early postoperative complications occurring in 15 children (9.8%) and 72 late complications occurring in 61 children (40%). Their most common early complication

was tube displacement and the most common late complication was granulation tissue similar to other series (3,4,8). In our country, Akdağ et al. have found that complication rates were 14.2% for early and 11.2% for late complications in their study. Accidental decannulation was the most common postoperative complication in their study (6). Duymaz et al. reported one early and seven late complications who had only granulation tissue.(5) In contrast to other and our reports they had lower rates of complications. In our study, the granulation tissue was the most common complication like Robert et al. (4). We did not see any early complications in our study group. This result may be explained because of the tracheostomy procedure was planned in advance and not an emergency procedure..

Obstruction of the lumen of a tracheostomy tube can result from such as factors dried secretions, mucous plugs, clotted blood, and partial tube displacement. It can be seen at any time.(11) We reported 4 patients who had cannula obstruction because of mucous plugs

The incidence of tracheocutaneous fistula in the series is between 3.1% and 57.3%.(9) In our study, two patients (4%) had this complication. In children, the mortality associated with tracheostomy in the literature varied between 0.7% and 6% depending on patient characteristics and follow-up duration (4). Mortality was due to tracheostomy-related accidents, that included accidental decannulation, hemorrhage from tracheostomy, and mucus plugging. We reported only one patient (2%) who died due to hemorrhage from tracheostomy.

The decannulation rate is reported that ranged between 17% and 78%. It is depending on the variety of tracheostomy indications and associated comorbid diseases. Decannulation chance decreases in patients with multiple comorbidity. Our study group consisted of most patients who had chronic neuromuscular disease.

Study Limitations

The limitations of this study the number of included the patients was low due to missing records. Also, most of the patients had multiple comorbidities. This condition may contribute to the a lack of data.

Conclusion

Regardless of the reason and technique used, several complications have been described. Its prevalence rates may

vary in the literature. The reason for this differentiation may be related to the socio-economic level of the family and the responsibility awareness of the parents. The risk of complications decreases in tracheostomies performed under appropriate care and conditions by healthcare team and patients family. Education of parents and caregivers as to the appropriate postoperative management is very important for preventing complications rates.

References

1. Jain MK, Patnaik S, Sahoo B, Mishra R, Behera JR. Tracheostomy in Pediatric Intensive Care Unit: Experience from Eastern India Indian J Pediatr. 2021 May;88(5):445-449.
2. Dal'Astra AP, Quirino AV, Caixeta JA, Avelino MA. Tracheostomy in childhood: review of the literature on complications and mortality over the last three decades. Braz J Otorhinolaryngol. 2017 Mar-Apr;83(2):207-214
3. Watters KF. Tracheostomy in Infants and Children. Respir Care. 2017 Jun;62(6):799-825.
4. Roberts J, Powell J, Begbie J, Siou G, McLarnon C, Welch A, McKean M, Thomas M, Ebdon AM, Moss S, Agbeko RS, Smith JH, Brodnie M, O'Brien C, Powell S. Pediatric tracheostomy: A large single-center experience. Laryngoscope. 2020 May;130(5):E375-E380
5. Duymaz YK, Sahin Yilmaz A, Onder S, Tarlanova A, Gergin Tinay O. Pediatric Tracheotomy: 5-years of Experiences at a Tertiary Care Center. The Turkish Journal of Ear Nose and Throat 2021;31(3):66-69
6. Akdag M, Baysal Z, Pirinccioglu Gozu A, Gul A, Ozkurt FE, Topcu I. Retrospective Analysis of Pediatric Tracheostomy. Advances in Otolaryngology Volume 2014. Article ID 848262
7. Tamoto CH, Lima BT, Sato J, Fujita RR. Indications and Complications of Tracheostomy in Children. Braz J Otorhinolaryngol. 2010 May-Jun;76(3):326-31
8. Fernandez-Bussy S, Mahajan B, Folch E, Caviedes I, Guerrero J, Majid A. Tracheostomy Tube Placement Early and Late Complications. J Bronchology Interv Pulmonol. 2015 Oct;22(4):357-64.
9. Lubianca Neto JF, Castagno OC, Schuster AK. Complications of tracheostomy in children: a systematic review Braz J Otorhinolaryngol. 2022 Nov-Dec;88(6):882-890
10. Ayvaz OD, Celayir A, Çakmak MH. Tracheostomy Experiences in 37 Children during 12 Years: A Retrospective Study. South. Clin. Ist. Euras. 2023;34(1):91-96
11. Bontempo LJ, Manning SL. Tracheostomy Emergencies. Emerg Med Clin North Am. 2019 Feb;37(1):109-119.