

Pediatric Tracheotomy: A 5-Year Experience in Düzce University Medical Faculty

Original Investigation

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Abstract

Objective: Tracheotomy is one of the oldest surgical procedures. Pediatric tracheotomy indications have changed in recent decades. Currently, tracheotomy is performed because of prolonged intubation, upper airway obstruction, neuromuscular, and craniofacial anomalies instead of acute airway infections. This study aims to present our experience regarding indications and complications of tracheotomy in pediatric patients.

Methods: We retrospectively evaluated 17 pediatric patients who underwent tracheotomy because of prolonged intubation, increased pulmonary secretions, and upper respiratory tract obstruction from June 2010 to June 2015. The patients' age, gender, tracheotomy indications, duration of intubation, complications, and actual clinical condition were recorded.

Results: Tracheotomy was performed on 17 pediatric patients in our clinic. Discharged patients were followed with a 3-month routine check. Six patients (35.29%)

had died because of a primary disease during follow-up, and one (5.88%) of them was a one-day-old newborn who had anomalies that were incompatible with life. In one patient, emergency tracheotomy was performed because of a tracheal trauma. None of the patients has been decannulated except one (5.88%). One (5.88%) patient had an accidental decannulation, while another had bleeding in the operation field. The total minor complication rate was 11.76%, and no major complication was observed. Two (11.76%) of the discharged patients underwent re-operation for widening of the tracheotomy stoma during their routine visit.

Conclusion: Currently, tracheotomy in pediatric patients is mostly performed for prolonged intubation and upper respiratory tract obstruction for which intubation is not possible. Tracheotomy enables the discharge of these patients after training their families.

Keywords: Pediatrics, tracheotomy, indications, contraindications, complications

Introduction

Tracheotomy is one of the oldest surgical procedures. Pediatric tracheotomy is performed for the indications of providing pulmonary care, removing upper airway obstructions, and providing long-term mechanical ventilation (1-3). Pediatric tracheotomy indications have changed over the past 20 years because of development in intensive care units and the decreased rate of infections causing severe upper airway obstruction (4-7). Tracheotomy is now commonly applied for discontinuing prolonged intubation and for reducing sedation time, respiratory load, and the risk of respiratory tract infection (6). In a study, studies conducted between 2000 and 2011 were reviewed, and it was found that tracheotomies were performed due to prolonged intubation in 35% of patients, due to upper airway obstruction in 28%, and due to neuromuscular diseases and craniofacial anomalies in 12% (7). Moreover, tracheotomy helps mobilization and the development of oropharyngeal coordination in infants by allowing oral feeding (6). The aim of the present study is to report the indications, complications, and results

of tracheotomy applied to pediatric patients in our clinic.

Methods

Seventeen patients who underwent tracheotomy due to prolonged intubation, increased pulmonary secretion, or respiratory distress between June 2010 and June 2015 were retrospectively evaluated. The patients' age, gender, the duration of intubation, the indications, and the perioperative and postoperative complications and their actual clinical conditions were recorded. Ethical committee approval was received from the Non-invasive Clinical Research Ethics Committee of Düzce University Faculty of Medicine (date: 07.07.2015, Decision No: 2015/20). Before surgery, written informed consent, which included that information related to the operation could be used without giving personal information, was obtained from the parents of the patients.

Tracheotomy was applied under general anesthesia or sedoanalgesia in the operating room for all pa-



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tients. The skin incision was horizontally made and trachea incision was vertically made from the midline region. Before tracheal incision, a guiding suture was bilaterally passed in the 4th tracheal ring. A tracheal window was formed by ruling out the trachea bilaterally with guiding sutures, and a tracheotomy cannula was then inserted. Guiding sutures were attached to both sides of the incision. Prophylactic antibiotics were not given to the patients, except for those taking antibiotics for their primary disease. Data obtained were analyzed using SPSS 18 (Statistical Package for Social Sciences; Chicago, IL, ABD). Descriptive statistics (mean, percentage, and frequency) were calculated and presented.

Results

Seventeen pediatric patients whose ages varied from 0 to 14 years (mean age: 50.76 months) underwent tracheotomy in our clinic. Of these patients, nine were males (52.94%, mean age: 67.78 months) and eight were females (47.06%, mean age: 31.62 months).

The most common indication for tracheotomy was found to be prolonged intubation in 11 patients (64.70%). Other tracheotomy indications were increased pulmonary secretion in three (17.64%) patients, respiratory distress after laryngeal penetrating trauma in one (5.88%), supraglottic stenosis in one (5.88%), and intubation difficulty in one (5.88%). Tracheotomy was performed under emergency conditions in three patients (17.64%) and under elective conditions in 14 (82.36%) (Table 1).

All patients were evaluated with regard to complications and healing during hospitalization. Six patients (35.29%) died during

this period. One of these (5.88%) was a one-day-old newborn with non-vital anomalies and another (5.88%) was a two-month-old baby with a history of previous operations for diaphragmatic hernia and a hypoplastic lung. Two patients (11.76%) with spinal muscular atrophy and Ehlers–Danlos syndrome died due to pulmonary infections and two (11.76%) with hydrocephalus and cerebral tumor died due to intracranial complications. The parents of the discharged patients were taught about cannula care, and the patients were asked to come for control examinations every three months. No exitus occurred as a complication of tracheotomy.

In all patients, the first change of tube was performed without any problem at the bedside on the 10th day. In terms of complications, displacement of the tracheotomy cannula was observed in one patient (5.88%) on the postoperative second day and bleeding occurred in the surgical site a few hours after the operation in one patient (5.88%). Major complications such as pneumothorax, tracheoesophageal fistula, and large vascular injury were not observed. In the patient with bleeding, there was no large vascular injury and bleeding was stopped with local interventions. In the patient with displacement of the cannula, the cannula was placed again using guiding sutures in the trachea. The patient who underwent tracheotomy due to tracheal trauma was discharged from the hospital after decannulation three days later, and no complication was observed during follow-ups. In two patients who were discharged (11.76%), the cannula could not be changed because of stomal stenosis in the routine control. For this reason, both patients underwent an operation for the expansion of the stoma under sedoanalgesia in the operating room and their cannulas were changed.

Table 1. Demographic and clinical data of pediatric patients undergoing tracheotomy

No	Age (months)	Method of Implementation	Primary Disease	Indication for Tracheotomy	Complication	Result
1	0	Emergency	VACTERL syndrome	Supraglottic stenosis	None	Exitus
2	18	Elective	Spinal muscular atrophy	Increased pulmonary secretion	None	Discharged
3	7	Elective	Arthrogryposis multiplex congenita	Prolonged intubation	None	Discharged
4	132	Emergency	Tracheal trauma	Tracheal trauma	None	Decannulation
5	6	Elective	Hydrocephalus	Prolonged intubation	None	Exitus
6	44	Elective	Metachromatic leukodystrophy	Prolonged intubation	None	Discharged
7	132	Elective	Ehlers–Danlos syndrome	Increased pulmonary secretion	None	Exitus
8	10	Elective	Spinal muscular atrophy	Prolonged intubation	None	Exitus
9	16	Elective	Dandy -Walker syndrome	Prolonged intubation	Decannulation	Discharged
10	99	Elective	Post-traumatic tetraplegia	Prolonged intubation	None	Discharged
11	18	Elective	Spinal muscular atrophy	Prolonged intubation	Bleeding	Discharged
12	132	Emergency	Mucopolysaccharidosis	Difficult intubation	None	Discharged
13	17	Elective	Hypoxic encephalopathy	Prolonged intubation	None	Discharged
14	18	Elective	Tay–Sachs disease	Prolonged intubation	None	Discharged
15	168	Elective	Cerebral tumor	Prolonged intubation	None	Exitus
16	2	Elective	Hypoplastic lung	Prolonged intubation	None	Exitus
17	44	Elective	Sandhoff disease	Increased pulmonary secretion	None	Discharged

Discussion

Indications for pediatric tracheotomy have changed over the past twenty years. Until endotracheal intubation was developed, tracheotomy was frequently used for providing airway in infections such as epiglottitis, diphtheria, and laryngotracheobronchitis (8, 9). In studies on indications for pediatric tracheotomy, prolonged intubation ranks first (8-10). Similarly, it was found in our study that tracheotomy was mostly performed due to prolonged intubation. With the development of anesthesia techniques, there has been a decrease in the number of tracheotomies performed for respiratory tract infection because endotracheal intubation is safer and can be applied for a longer time (11). In our study, there was no patient undergoing tracheotomy for upper airway infection.

Indications for prolonged intubation in children are neuromuscular diseases, congenital anomalies, and metabolic diseases. There are a few contraindications for tracheotomy such as giant vascular masses in the neck, sepsis, hemorrhagic diathesis, and non-stable cervical vertebral fractures (12, 13).

Tracheotomy is performed for patients with upper airway obstruction or prolonged intubation and also for helping easy aspiration of pulmonary secretions. Enteral nutrition is important in pediatric patients. Owing to tracheotomy, oral nutrition can be started; the dead space associated with intubation then disappears, and respiration becomes easier.

Because it is impossible to assure cooperation in children, tracheotomy must be performed under general anesthesia in an operating room after the patient is intubated (12, 14). The trachea is mobile and its palpation is difficult. Therefore, the percutaneous dilatation method is not used, as it is in adults. One cannula size smaller and bigger than the cannula selected considering the age of child and the length and width of the trachea must be kept ready during the process.

In a study, it was reported that mortality in children undergoing tracheotomy was 41%. It was detected that most of these deaths were associated with underlying diseases (15). In our series of 17 patients, the mortality rate was found to be 35.29% and all deaths occurred due to underlying diseases after tracheotomy at the late period.

Fatal complications related to tracheotomy are generally early complications that are seen in the first weeks. In the literature, the mortality rate associated with tracheotomy has been reported to be below 1% (16, 17). In our 17 patients, tracheotomy was successfully performed and no patient died due to tracheotomy in the early intraoperative and postoperative periods.

Early complications, such as displacement of the tracheotomy cannula and pneumothorax, have been reported to occur at high rates ranging from 53% to 61% in various series (18, 19). Owing to performing tracheotomy under general anesthesia in an operating room and due to the decreased number of emergency

tracheotomies performed due to acute infection, serious early complications, such as pneumothorax and pneumomediastinum, have decreased since the 1970s. Displacement of the cannula is one of key complications now. Patients who move too much and inexperienced staff who provide tracheotomy care are among the most important factors in this issue. Guiding sutures placed in the trachea are of vital importance for coping with these complications (20). In our patients, displacement of the tracheotomy cannula was seen in one patient on the postoperative second day and bleeding was observed in the surgical site of one patient a few hours after the operation. The displaced cannula was re-inserted with the help of guiding sutures. Non-serious bleeding in one patient was resolved with local intervention. While monitoring children who have undergone tracheotomy, the development of granulation tissue in the region of tracheotomy or stenosis due to scar tissue in the skin can occur (7). As in two of our patients, the stoma must be expanded. One of the most severe complications associated with tracheotomy is tracheal stenosis, and it can appear at a late period (21). Tracheal stenosis did not develop in any of our patients during monitoring.

In pediatric patients undergoing tracheotomy due to prolonged intubation, the rate of decannulation due to primary disease is lower (8). Because tracheotomy associated with prolonged intubation was performed in our patients, we had no decannulated patient, except one who was decannulated after trauma.

In particular, the parents of patients needing long-term intubation are given education after tracheotomy, and the patients are then discharged. This decreases intensive care costs to a great extent. Moreover, by allowing homecare, it provides an advantage in terms of both the social status of parents and cost of intensive care.

One of the limitations of our study is the small number of patients. However, pediatric tracheotomy is a rare procedure. Multi-center and long-term studies are required for creating large series that support our study.

Conclusion

Tracheotomy is a procedure that will reduce morbidity and mortality rates associated with an underlying disease provided that it is safely performed by an experienced team for providing airway in the case of upper respiratory tract obstructions, in which intubation cannot be performed, and for facilitating patient care in case of prolonged intubation. The rate of complications can be low with careful care and monitoring during the postoperative period.

Ethics Committee Approval: Ethics committee approval was received for this study from the ethics committee of Düzce University Faculty of Medicine (Date: 07.07.2015, document no: 2015/20).

Informed Consent: Written informed consent was obtained from the parents of the patients who participated in this study.

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