Original Article

Urgent tracheostomy: four-year experience in a tertiary hospital

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BACKGROUND: Urgent airway management is one of the most important responsibilities of otolaryngologists, often requiring a multidisciplinary approach. Urgent surgical airway intervention is indicated when an acute airway obstruction occurs or there are intubation difficulties. In these situations, surgical tracheostomy becomes extremely important.

METHODS: We retrospectively studied the patients who underwent surgical tracheostomy from 2011 to 2014 by an otolaryngologist team at the operating theater of the emergency department of a tertiary hospital. Indications, complications and clinical evolution of the patients were reviewed.

RESULTS: The study included 56 patients (44 men and 12 women) with a median age of 55 years. The procedure was performed under local anesthesia in 21.4% of the patients. Two (3.6%) patients were subjected to conversion from cricothyrostomy to tracheostomy. Head and neck neoplasm was indicated in 44.6% of the patients, deep neck infection in 19.6%, and bilateral vocal fold paralysis in 10.7%. Stridor was the most frequent signal (51.8%). Of the 56 patients, 15 were transferred to another hospital. Among the other 41 patients, 21 were decannulated (average time: 4 months), and none of them were cancer patients. Complications occurred in 5 (12.2%) patients: hemorrhage in 3, surgical wound infection in 1, and cervico-thoracic subcutaneous emphysema in 1. No death was related to the procedure.

CONCLUSION: Urgent tracheostomy is a life-saving procedure for patients with acute airway obstruction or with difficult intubation. It is a safe and effective procedure, with a low complication rate, and should be performed before the patient's clinical status turns into a surgical emergency situation.

KEY WORDS: Tracheostomy; Cricothyrostomy; Stridor; Airway obstruction

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INTRODUCTION

Urgent airway management is one of the most important responsibilities of otolaryngologists, often with a multidisciplinary team including anesthesiologist emergency physician and trauma surgeon.^[1] An urgent surgical airway is indicated when there is an acute airway obstruction or there are difficulties to intubate (nasal or orotracheal).^[1,2]

Patients with airway compromise may not have acute dyspnea as a primary symptom, as in slow growth airway tumors, main symptoms may be dysphagia, throat pain, or effort dyspnea.^[1] Stridor may not be evident until there is an airway occlusion of more than 50%.^[1]

Historically, surgical tracheostomy was considered

as a high risk intervention, associated with an increased mortality rate until the Jackson's description of the surgical technique in 1909.^[3,4] Now, it is a safe procedure, done regularly in hospitals.^[5]

Complications associated with surgical tracheostomies may be classified in minor (hemorrhage without hemodynamic instability, small cartilage, soft tissues or skin lesions, unilateral laryngeal recurrent nerve lesion, pneumothorax or pneumomediastinum without need of treatment, subcutaneous emphysema, surgical wound/stoma infection, tracheitis, and small pulmonary atelectasis) or major (hemorrhage with hemodynamic instability, posterior tracheal wall perforation, bilateral

laryngeal recurrent nerve lesion, pneumothorax or pneumomediastinum necessitating thorax drainage, mediastinitis, deep neck abscess, tracheomalacia, trachea-esophageal fistula, tracheal stenosis necessitating surgical therapy, and sepsis).^[6]

Complications may also be classified into immediate (anesthetic complications, hemorrhage, aeroembolism, laryngeal cartilage lesion or laryngeal recurrent nerve lesion), early (in the first post-operative week) (cannula dislodgement, subcutaneous emphysema, pneumothorax or pneumomediastinum, tracheal necrosis, tracheo-esophageal fistula, and wound surgical infection) or late (tracheal stenosis, decannulation difficulties, and tracheocutaneous fistula).^[7]

The complication rate of surgical tracheostomy varies from 5% to 40%, depending on study design and follow up time.^[8] The mortality rate of this procedure is as high as 2%.^[8] In urgent situations, critically ill patients and small children, complications are 2 to 5 times more frequent.^[2,7,8]

The aim of this study is to evaluate indications, complications and clinical evolution of patients who were subjected to urgent tracheostomy in a tertiary hospital.

METHODS

We retrospectively analyzed medical or surgical records of 56 patients who underwent tracheostomy in the operating room of the emergency department by an otolaryngological team at a tertiary hospital from January, 2011 to December, 2014.

It was considered "daytime" when the procedure was performed from 8 am to 8 pm and "night time" from 8 pm to 8 am. It was considered that all procedures were performed under general anesthesia (when it was possible to intubate the patient) or under local anesthesia, and that those preceded by cricothyrostomy.

The analyzed parameters included demographic data, symptoms and signs, cause of airway obstruction, immediate and early post-operative complications, and clinical evolution. Statistical analysis was made with IBP® SPSS® Statistics v22. A *P* value <0.05 was considered statistically significant.

RESULTS

Of the 56 patients, 44 were male and 12 female, with an average age of 55 years (0 to 87 years). Most patients were within 51 and 70 years old. Three pediatric patients were below one year old (Figure 1).

Tracheostomy was indicated for head and neck neoplasm (25 patients, 44.6%). Non-oncological causes included deep neck abscess in 11 patients, bilateral vocal fold paralysis in 6 (one after total thyroidectomy and the other 5 because of an acute cerebrovascular event), subglottic stenosis in 5, cervical haematoma after vascular surgery in 2, deep neck trauma in 2, pharyngolaryngeal edema after surgical treatment of Reinke's edema in 1, and acute supraglottitis in 1 (Table 1).

In the 3 (5.3%) pediatric patients, urgent tracheostomy was due to non-oncological causes: one with congenital multicentric miofibromatosis with bilateral vocal fold paralysis in adduction; one with Pierre-Robin sequence with stridor; and the other with a giant vocal fold polyp.

The symptoms and signs of the patients are shown in Figure 2. Their initial symptoms were collected from

Table 1. Indications for urgent tracheostomies, *n* (%)

Indications/causes	Number of patients (<i>n</i> =56)
Oncological (pharyngeal/laryngeal tumors)	25 (44.6)
Non-oncological	
Deep neck abscess	11 (19.6)
Bilateral vocal fold paralysis	6 (10.7)
Subglottic stenosis	5 (8.9)
Cervical haematoma post vascular surgery	2 (3.6)
Neck trauma	2 (3.6)
Acute supraglottitis	1 (1.8)
Pharyngolaryngeal edema post surgical treatment of Reinke's Edema	1 (1.8)
Pediatrics	3 (5.3)

Figure 1. Patient distribution by age.

Figure 2. Initial symptoms and signs.

the records of 50 patients. Dyspnea (rest or effort) was frequently seen in 80% of the patients and throat pain in 16%. Stridor was frequent in 51.8% of the patients and neck tumefaction in 23.2%.

Laryngeal nasofibroscope was performed in 51 of the 56 patients (Figure 3). Pharyngeal/laryngeal neoplasm was observed frequently in 49% of the patients, bilateral vocal fold paralysis in 19.6% (In 7.8% of the patients it was associated with neoplasm), pharyngeal bulging in 19.6%, pharyngeal/laryngeal edema in 11.8%, and subglottic stenosis in 9.8%.

Surgery was performed under local anesthesia in 21.4% of the patients (11 adults and 1 child). Two (3.6%) patients had a conversion of cricothyrostomy to tracheostomy. The procedure was performed by ENT resident doctors in 60.7% of patients. Tracheostomies were performed during "daytime" in 55.3% of the patients. The average waiting time since ENT observation until surgery was 2.6 hours (maximum 12 hours).

Immediate and early complications were observed in 5 (12.2%) patients: peristomal hemorrhage in 3, which was solved with local compression using hemostatic material (surgicel®) without surgical exploration; surgical wound infection in one patient which was treated with local hygiene measures and intravenous systemic antibiotherapy; and cervico-thoracic subcutaneous emphysema in 1 patient which was treated conservatively. There were no significant differences in complications when the procedure was performed under local vs general anesthesia, or during "daytime" vs "night time" or performed by residents vs specialists. There were no deaths related to the procedure.

Of the 56 patients, 15 were transferred to another hospital (14 adults and 1 child with Pierre-Robin

sequence), and were not followed up. In the remaining 41 patients, 15 patients had no tracheostoma closure because of oncological causes. In the 26 patients who underwent tracheostomy for non-oncological causes, 21 were subjected to decannulation for 4 months on average for stoma closure (compressive wound dressing or surgical closure). We found that non-cancer patients who underwent tracheostomy are more possible to have decannulation than cancer patients (Fisher's exact test, $P=0.00$). In patients tracheostomized for non-cancer causes, we found that those undergoing tracheostomy for infections (deep neck abscess or supraglottitis) are more likely to have decannulation than those who underwent tracheostomy for non-infections (Fisher's exact test, $P=0.007$). All patients who underwent tracheostomy for infections were subjected to decannulation within a month.

DISCUSSION

At present, tracheostomies are performed electively in intubated patients from intensive care units.^[8,9] However, acute airway obstruction^[9] and/or impossible oral/nasotracheal intubation is one of the most important indications for tracheostomy because of the presence of volumous pharyngeal/laryngeal tumor, neck trauma or deep neck infection.^[9-11]

Cricothyrostomy is a fast and simple method for creating a surgical airway,^[2,9,12] with a success rate of 88%–100%,^[2] especially in adult patients with trauma.^[9] Because subglottic stenosis has long-term morbidity,^[9,12] this is why some doctors prefer to convert to tracheostomy.^[2,12]

Urgent tracheostomies, especially those performed under local anesthesia, are a challenge for a surgical team due to many factors, for instance, patients are usually hypoxic and impossible to lie in a supine position with neck extension, thus making the procedure more difficult and increasing the risk,^[9] as compared with those who received the procedure electively. Goldenberg et al^[8] reviewed 1 130 tracheostomies in a 10-year period, and concluded that only 6% of them are done due to acute obstruction of the superior airway.

Urgent tracheostomy is frequently indicated for head and neck neoplasm,^[1,9] in which pharyngeal/laryngeal tumors contribute to the obstruction of the superior airway (44.6%). Deep neck infection accounts for 19.6%, as reported by Bobek et al.^[13] Symptoms and signs in these patients include dyspnea, trismus, hemoptysis, dysphagia, dysphonia, odynophagia and stridor.^[13]

The complication rate of surgical tracheostomies

Figure 3. Laryngeal nasofibrosopic results.

Table 2. Complication and mortality rates

Literature	Complication rate	Mortality rate
Halum et al, ^[5] 2012	1.4% –immediate 5.6% –early	0.85%
Yuen et al, ^[9] 2007	8.2%	0%
Straetmans et al, ^[6] 2010	21.5%	0%
Bobek et al, ^[13] 2011	25.0%	0%

varies from 5% to 40%.^[8] In emergency situation, this rate may be increased by 2 to 5 times.^[2,8] In our study, however, the immediate and early complication rate was 12.2%.^[5,6,9,13] We conclude that urgent tracheostomy is a safe procedure (Table 2).

Hemorrhage is the most frequently reported complication.^[5,6] In all tracheostomy techniques, the learning curve is essential to the incidence of complications.^[6] However, we did not find differences in the complication rate for tracheostomies performed by residents as surgeons or by specialists. Therefore, we emphasized the importance of training of this type of surgical intervention during the otolaryngology residency. There were no deaths related to this procedure as reported elsewhere.^[6,9,13]

Only three pediatric patients underwent urgent tracheostomies, neither for cancers nor acute airway inflammatory diseases. In the 1970s, the most common indication for tracheostomies in children was acute obstructive inflammation of the upper airways, such as acute epiglottitis, croup, and diphtheria.^[14] Vaccines against *Haemophilus influenzae* and *Corynebacterium diphtheriae* combined with modern treatment protocols in the neonatal intensive care unit have certainly limited the use of tracheostomies. At present, long-term intubation and its sequelae have become one of the most important indications for tracheostomies in children as in adults.^[14]

As reported, the global decannulation rate is 51.2%. When patients were divided into oncological and non-oncological groups, it was not possible to decannulate any patient from the first group, which may be related to an advanced stage of patients with pharyngeal/laryngeal tumors presenting acute airway obstruction (as the tumor may be growing slowly without symptoms). In infectious patients (deep neck abscess or acute supraglottitis), the resolution of the infection allows earlier stomal closure.

This study has some limitations: 1) lack of clinical information in patients' records (initial symptoms, degree of airway obstruction); and 2) a relatively small number of patients in spite of descriptive and inferential statistical analysis.

In conclusion, urgent tracheostomy under general or local anesthesia is a life-saving procedure for patients with acute airway obstruction or with intubation difficulties. We

conclude that it is a safe and effective procedure, with a low rate of complications, and it must be done to prevent evolution to a surgical emergency. The patients may have a better prognosis after an urgent tracheostomy for infections.

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Conflicts of interest: There are no conflicts of interest related to any financial organizations regarding the AEDs discussed in this study.

Contributors: Costa L proposed the study and wrote the first draft. All authors read and approved the final version of the paper.

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