

Original Research Article

Five-Years Experience with Tracheostomy at ENT-Khartoum Teaching Hospital in Sudan

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Abstract

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Tracheostomy is an operative procedure that creates a surgical airway in the trachea to bypass an upper airway obstruction and remains a very important life saving procedure worldwide. The present study was conducted to determine the indications and complications of tracheotomy performed among Ear Nose Throat (ENT) patients at Khartoum teaching hospital in Sudan. This was a five-years retrospective study, which was conducted at ENT Khartoum Teaching Hospital in Sudan from June 2002 to September 2007. Data were retrieved from patients' files kept in the Medical Record Department through a well-designed data sheet. A total of 160 cases were studied. The overall male to female ratio among patients who had tracheostomy was 1:2.8. The majority of patients were between 21-60 years of age. The most common indication for tracheostomy was hair dye poisoning leading to angioneurotic edema in half of the patients, followed by head, neck and chest trauma in 15.6% of cases secondary to Road Traffic Accident (RTA) and industrial injuries involving specially the neck, where laryngeal framework was destroyed. The majority of tracheostomies (88%) were performed as an emergency. No significant complications post tracheostomy other than tube blockage or insignificant surgical emphysema. Mortality rate is 7.5% and it was due to complications other than tracheostomy procedures. Hair dye poisoning leading to angioneurotic edema was the most common indication for tracheostomy in our hospital especially among female. Tracheostomy is still an emergency life saving procedure in the surgical management of airway. Mortality rate among tracheostomized patients was high and it was due to the complications other than tracheostomy procedures. Authorities should prohibit hair dye from the local markets, which had been used for intentional suicidal dye poisoning in order to prevent angioneurotic edema. ENT specialist should encourage early tracheostomy whenever indicated and emphasize more in conducting postoperative tracheostomy care by skilled and trained staff. Health authorities should invest more in training all of the doctors in the emergency tracheostomy procedures, in addition to the complications that lead to increase rate of mortality among tracheostomized patients.

Keywords: Complications and Hair dye poisoning, Ear Nose Throat (ENT), Indications, Tracheostomy

INTRODUCTION

Tracheostomy is an operative procedure that creates a surgical airway in the trachea to bypass an upper airway obstruction (Hibbert and Scott-Brown's, 1997).

Tracheostomy is most commonly performed among patients who have had difficulty weaning off a ventilator, followed by those who have suffered trauma or some

catastrophic neurologic insult. Infectious and neoplastic processes are less common in diseases that require a surgical airway (Romaine, 2003). The types of tracheostomy according to its indications include the followings: The first one is an emergency tracheostomy: e.g. acute upper airway obstruction as in road traffic accidents and the second one is elective tracheostomy: e.g. to facilitate bronchial toilet and controlled ventilation (Romaine, 2003). The classification of tracheostomy according to the level of stoma can be: High, Middle or Low (Romaine, 2003).

The complications of tracheostomy may be categorized by the interval from the procedure to the onset of the complications and they include the followings: Firstly, major hemorrhage during the procedure which is rare but even minor bleeding can be life-threatening if it interferes with the identification of the trachea or gaining access to the airway. Frequent sites of bleeding are the anterior jugular veins, and the thyroid isthmus. Other sources of early and operative hemorrhage include a high innominate artery or a thyroid ima artery (Chew and antrell, 1972). Secondly, Pneumothorax, pneumomediastinum and surgical emphysema are well-recognized complications following tracheotomy (Ameye et al., 1994). Thirdly, intrathoracic complications, which occur among children and it is attributed to operative injury of the apical pleura because of their high position (Ameye et al., 1994).

Tracheostomy is predicted to become more common as demand for intensive care services increases (Cox et al., 2004; Needham et al., 2005). Approximately 10% of mechanically ventilated critically ill patients receive a tracheostomy to facilitate prolonged airway and ventilatory support (Esteban et al., 2000; Frutos-Vivar et al., 2005; Kollef et al., 1999; Fischler et al., 2000). It is a life-saving procedure when performed with an appropriate indication and surgical technique (Ilce et al., 2002; Wood, 1996).

In spite of the importance of the tracheostomy as a life saving procedure in the care of critically ill patients, still there is little information in our local setting regarding the subject. A retrospective study to reflect our five-years experience with the aim; to determine the indications, complications and the morbidity and mortality rate of tracheotomy was of high importance especially those targeting patients in the biggest referral ENT setting; thus, more studies were needed to provide evidence based data to health authorities to assist in the design of appropriate strategies in dealing with tracheostomy in the study areas.

Methods

Ethical statement

Ethical clearance was obtained from ENT Khartoum

Teaching Hospital, Federal Ministry of Health, Sudan.

Study design

A retrospective review of patients' files that had tracheotomies performed at Khartoum Teaching Hospital during the five-year period between June 2002 to September 2007 was carried out.

Study site

ENT Khartoum Teaching Hospital is the biggest one of the five-tertiary and referral hospitals in the country and has a bed capacity of 250. It is also a teaching hospital for the Khartoum University College of Medicine. Khartoum is the capital of Sudan, it consist of three cities, Khartoum, Khartoum Bahary and Omdurman.

Study subjects

The study included all patients who underwent tracheostomy at ENT Khartoum Teaching Hospital during the study period. Patients who had incomplete or missed basic information were excluded from the study. Data were retrieved from patient registers kept in the Medical record departments and entered in a preformed checklist before analysis. The checklist included; demographic profile (age, gender and residence), primary diagnosis, indication for tracheotomy, surgical technique, and complications of the tracheostomy, if any, death and its cause. The primary diagnosis was classified based on the etiology, which is divided into hair dye poisoning, Severe head, neck and chest trauma, Infections, Tumors of head and neck, Respiratory insufficiency (failure), Juvenile multiple respiratory papillomatosis, Upper airway foreign bodies and Burn. Complications related to tracheostomy were classified according to the cause of tracheostomy. Tracheostomies were performed in emergency and electively both under general as well as local anesthesia. The procedure was performed under general anesthesia in the operating theatre and bedside tracheostomy was performed in the Intensive Care Unit (ICU) under local anesthesia. The patient is laid flat in a supine position. The neck is extended with a shoulder-roll. The tracheal rings are identified; vertical incision is made between the second and third tracheal rings. After the trachea was entered, suction of the secretions and the blood out of the lumen was done. The lateral retractors were replaced into the trachea before inserting the tracheostomy tube. The tracheostomy tube was secured to the skin with permanent sutures. A tracheostomy collar was attached with the head flexed to avoid unnecessary slack in the collar. To avoid the risk of subcutaneous emphysema and subsequent

Table 1. Shows the numbers and the percentage of patients who underwent tracheostomy age distribution in Khartoum ENT Teaching Hospital, Sudan, 2002-2007. (N=160)

Age group	Frequency	Percentage
(0-20)	25	15.6%
(21-40)	62	38.7%
(41-60)	40	25%
(61-80)	33	20.7%
Total	160	100%
Gender	Frequency	Percentages
Female	118	73.75
Male	42	26.25
Total	160	100

Table 2. Shows the numbers and the percentage distribution of patients who underwent tracheostomy by indications of tracheostomy in Khartoum ENT Teaching Hospital, Sudan, 2002-2007. (N=160)

Indications	Frequency	Percentages
Hair dye poisoning	80	50
Severe head, neck and chest trauma	25	15.625
Tumors of head and neck	17	10.625
Respiratory insufficiency (failure)	10	6.25
Infections	9	5.625
Juvenile multiple respiratory papillomatosis	7	4.375
Upper airway foreign bodies	7	4.375
Burn	5	3.125
Total	160	100

pneumomediastinum, the skin was not closed. Surgeons or registrars carried out all the procedures, while trained ward staff carried out postoperative tracheostomy care. Tracheostomy decannulation was carried out depending upon the etiology and satisfactory maintenance of the airway. The patient was encouraged to occlude the tube with a finger and to begin to phonate. In preparation for decannulation, the tracheostomy tube may be plugged. The patient must be able to remove the plug should dyspnea develop. Education began early to prepare patients for discharge. Before leaving the hospital, all members of the household were trained to feel comfortable with replacing the outer cannula.

Statistical analysis

The statistical analysis was performed using statistical package for social sciences (SPSS) version 15.0 for. The mean \pm standard deviation (SD), median and ranges were calculated for continuous variables whereas proportions and frequency tables were used to summarize categorical variables. Continuous variables were categorized.

RESULTS

Demographic characteristics

A total of 160 patients underwent tracheostomy either emergency or elective within the study period. Of those, (118) (73.7%) were females and the rest (42) (26.3%) were males, with a male to female ratio of 1: 2.8. The patients' age ranged between 2 and 60 years. The mean age of the patients was 31. Most of the patients who underwent tracheostomy were between the age group of 21 - 40 years (Table 1).

Timing, purpose and indications of tracheostomy

One hundred and forty-one tracheotomies (88.1%) were performed as an emergency while only 19 tracheotomies (11.8%) as elective procedures. The most common indication for tracheostomy was Hair dye poisoning in 50% of patients, followed by Severe head, neck and chest traumas in 15.6% of cases (Table 2). Females predominated in the Hair dye poisoning (92.5%) in relation to male. High incidence of Hair dye poisoning was found between the third and fourth decades of life,

Table 3. Shows the numbers and percentage distribution of mortality rate among patients who underwent tracheotomy in Khartoum ENT Teaching Hospital, Sudan, 2002-2007. (N=160)

Cause of Death	Frequency	Percentages
Hair dye poisoning	4	2.5
Head injuries	2	1.25
Bronchopneumonia	2	1.25
Pulmonary TB	1	0.625
Laryngeal carcinoma	2	1.25
Pharyngeal abscess	1	0.625
Total of deaths	12	7.5
Not applicable	148	92.5
Total	160	100

and all of them were emergency tracheotomies. While the male recorded the higher incidence of patients who perform tracheostomy due to severe head, neck and chest traumas which distributed as follows: Head trauma were 12 patients, neck trauma were 8 patients, and chest trauma were 5 patients. The male to female ratio was 5.25:1.

Complications and mortality:

Insignificant complications were reported like tracheotomy tube blockage and surgical emphysema. Most of the complications were due to causes not related to tracheostomy as follows: Three female patient with hair-dye poisoning complicated by acute renal failure and one male with hair-dye poisoning complicated by sudden arrhythmia; two males with head injuries complicated by deep coma; two patients develop severe bronchopneumonia complicated with septicemia; one patient develop pulmonary Tuberculosis; two patients with advanced laryngeal carcinoma and one case with parapharyngeal abscess complicated by mediastinitis. All patients who developed these complications, which were not related to the complications of tracheotomy procedure, were died. The mortality rate among tracheostomized patients in this study was 7.5%.

DISCUSSION

Tracheostomy remains a life-saving surgical procedure commonly performed in critically ill patients. In the present study, the indications and complications of tracheotomy performed among Ear Nose Throat (ENT) patients at Khartoum teaching hospital in Sudan was determined. The highest age of patients who had tracheostomy was in the third decade and female were more affected with a male to female ratio of 1:2.8. This ratio disagrees with a ratio published before in Saudi Arabia by Fadl (Fadl, 2002), who found that the tracheostomy was predominant among males with male

to female ratio of 3:1. This was because of the commonest head and neck traumas indications in his series, which were more common among males. Our findings also disagreed another study done in Houston Texas in the period (2002-2005) by Lewis (Lewis, 2005), who found the ratio of tracheostomy predominate among males, with male to female ratio of 4.5:1. This was because of the peak incidence of head injury and poly-trauma (60%), followed by head and neck tumors in his study area.

The most common indication for tracheostomy in our study was hair-dye (paraphenylene diamine) poisoning (50%); this can explain that why the ratio was high in female (male to female ration of 1:12). This could be because of that the female had more access to hair-dye (paraphenylene diamine) substance that had been used for Henna (which is a herb used for cosmetic purposes) among females in Sudan. This ratio was agreed with the ratio published by El-Mustafa (El-Mustafa, 2000) in 2000 in a study one at Aljazeera state, central Sudan. Paraphenylene diamine poisoning leads to angioneurotic edema and upper airway obstruction, a known major health hazard and an important cause of death in our hospital. In all patients with (PPD) poisoning, an emergency tracheotomy was performed. This finding agreed with what mentioned by Yagi (Yaji and Hashim, 1991) in 1991 in a study one in ENT Khartoum hospital. The second commonest indication was head, neck and chest trauma (15.6%) secondary to Road Traffic Accidents (RTAs) and industrial injuries involving specially the neck, where laryngeal framework was destroyed. Again the ratio was predominating among males, with male to female ratio of 5:1. This was because males usually at outdoors and use to drive more than females. This finding was in agreement with Fadl (2002). Emergency tracheostomy was done for all patients with head and neck trauma. Those patients with chest trauma underwent elective tracheostomy as an alternative way for mechanical ventilation at Khartoum Hospital ICU. The overall head and neck tumors percentage in our study was 10.6%. Laryngeal tumors alone represented 52.2% of all laryngeal, pharyngeal and thyroid tumors.

Emergency tracheostomy was done for all patients with severe stridor and elective tracheostomy was done for 2 patients with mild stridor after failure of medical treatments. Pharyngeal tumors represented 5 patients; three of them were female and had post-cricoids carcinoma and the remaining two were male and had pyriform fossa carcinoma. All of them underwent emergency tracheotomies. Thyroid tumors represented three patients; one patient underwent emergency tracheostomy due to stridor caused by huge thyroid tumor, while two patients underwent elective tracheotomy because of bilateral abductor paralysis of vocal cords following thyroidectomy. The same incidence of bilateral abductor vocal cords paralysis as post-thyroidectomy complication was reported by Alhadi (Al-Hadi, 2002). The incidence of bilateral abductor vocal cords paralysis was decreasing due to the routine preoperative examination using indirect laryngoscopy (IDL) for all patients undergoing thyroidectomy by ENT doctors at Khartoum ENT Hospital. Respiratory failure accounted for 6.2% due to severe broncho-pneumonia, pulmonary TB and severe bronchial asthma. All patients were under mechanical ventilator when seen at first time by ENT surgeons whom did elective tracheotomy to maintain ventilation and suction of secretions. Their follow up after recovery was at Khartoum ENT Hospital for weaning and caring of the tracheal stoma. Infections accounted for 5.6% of the patients. Most of them presented with parapharyngeal abscess and Ludwig's angina. All underwent emergency tracheostomy because they presented with severe stridor due to late referral from peripheral centers, which might be due to misdiagnosis and unawareness of the treatment. Recurrent juvenile multiple respiratory papillomatosis accounted for 4.3% of all patients; the male to female ratio was (1:6) with female predominance. All patients underwent emergency tracheostomy because of severe stridor as a late presentation and the vague symptom of voice change. Upper air way foreign bodies accounted for 4.3%, four of them presented with severe stridor and cyanosis, so they underwent emergency tracheostomy, then they under-went bronchoscopy to remove the foreign bodies which were found at the glottis region and easily removed. Three pediatric patients with age range of (2-4) years underwent tracheostomy following repeated trails of bronchoscopy, leading to laryngeal edema and Stridor on recovery. Deep neck burns accounted for five patients, with male to female ratio of 3:1. The commonest presentation was stridor and anterior neck edema in all of the cases. Just one case presented with stridor and diagnosed as smoke inhalation. An emergency tracheostomy was done for all patients and then admitted to ENT Khartoum Hospital for decannulation and weaning from the tracheostomy tube.

In this study, 12 patients were died with 7.5% mortality rate. All causes of deaths were not related to the complications of tracheotomy procedure. On the other hand, insignificant complications were reported e.g.

Tracheotomy tube blockage and surgical emphysema.

Limitation of the study

The potential limitation of this study was that, the study was a retrospective one. Also, the study was from a single center and the fact that information about some patients was incomplete in view of the retrospective nature of the study might have introduced some bias in our findings. A similar study in a prospective setting is highly recommended in order to describe our experiences of tracheostomies not only in our center but also worldwide.

CONCLUSION

Poisoning with PPD leading to angioneurotic edema still remains the most common indication for tracheostomy in our center. Tracheostomy was mainly among females in the third and fourth decades. Emergency tracheostomies were generally performed more than elective tracheostomies and still a life saving procedure in the surgical management of airway. No significant complications were reported in this study other than tracheostomy tube blockage or insignificant surgical emphysema, which could be avoided by meticulous surgical technique and postoperative tracheostomy care by skilled and trained staff. The mortality rate was (7.5%) in all cases and causes of deaths were due to complications other than the known complications of tracheostomy procedure. Hair-dye (PPD) should be prohibited from the local markets and a healthy alternative should be promoted for cosmetic and body decoration when using Henna. ENT specialist should encourage early tracheostomy whenever indicated and emphasize more in conducting postoperative tracheostomy care by skilled and trained staff. Health authorities should conduct more workshops for training of all doctors in the emergency tracheostomy procedures, in addition to the post tracheostomy care, which might decrease the rates of mortality among tracheostomized patients, even for causes other than tracheostomy complications.

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Competing Interests

The authors declare that they have no competing interests.

REFERENCES

- Al-Hadi M (2002). Tracheostomy in the surgical department. Thesis in clinical MD of Surgery University of Khartoum; 16-17.
- Ameye F, Mattelin W, Ingels K, and Bardwell R.,(1994). Bilateral Pneumothorax after emergency tracheotomy: two case reports and a review of the literature. *J Laryngol Otol*; 108:69-70.
- Chew JY, Cantrell RW (1972). Tracheostomy, complications and their management. *Arch Otolaryngol*; 96:538-545.
- Cox CE, Carson SS, Holmes GM, Howard ABS and Carey TS. (2004). Increase in tracheostomy for prolonged mechanical ventilation in North Carolina, 1993-2002. *Crit Care Med*; 32:2219-2226.
- El-Mustafa OM (2000). Indications for emergency Tracheostomy, *Saudi Medical Journal*, 21:12-3.
- Esteban A, Anzueto A, Alía I, Gordo F, Apezteguía C, Pálizas F, Cide D, Goldwaser R, Soto L, Buggedo G, Rodrigo C, Pimentel J, Raimondi G and Tobin MJ. (2000). How is mechanical ventilation employed in the intensive care unit? An international utilization review. *Am J Respir Crit Care Med*; 161:1450-1458.
- Fadl A (2002). Tracheostomy: Hospital Experience. *Saudi Journal of Oto-Rhino- Laryngology Head and neck surgery*; 2:26-28.
- Fischler L, Erhart S, Kleger GR, Frutiger A (2000). Prevalence of tracheostomy in ICU patients. A nation-wide survey in Switzerland. *Intensive Care Med*; 26:1428-1433.
- Frutos-Vivar F, Esteban A, Apezteguía C, Anzueto A, Nightingale P, González M, Soto L, Rodrigo C, Raad J, David CM, Matamis D and D'Empaire G. (2005). International Mechanical Ventilation Study Group: Outcome of mechanically ventilated patients who require a tracheostomy. *Crit Care Med*; 33:290-298.
- Hibbert J, Scott-Brown's (1997). *Otolaryngology, Laryngology and Head and Neck Surgery*. 6th edition. Butterworth- Heinemann. 5:6-7.
- Ilce Z, Celayir S, Tekard GT, Murat NS, Ercogan E and Yeker D. (2002). Tracheostomy in childhood: 20 years experience from a pediatric surgery clinic. *Paediatr Int*; 44:306.
- Kollef MH, Ahrens TS, Shannon W (1999). Clinical predictors and outcomes for patients requiring tracheostomy in the intensive care unit. *Crit Care Med*; 27:1714-1720.
- Lewis RJ (2005). Tracheotomies, indications, Timing and complications. *Clin chest med*; 13:137-149.
- Needham DM, Bronskill SE, Calinawan JR, Sibbald WJI, Pronovost, PJ and Laupacis, A. (2005). Projected incidence of mechanical ventilation in Ontario to 2026: Preparing for the aging baby boomers. *Crit Care Med*; 33:574-579.
- Romaine FJ (2003). Adult Tracheostomy. *Baylor College of Medicine*; (Internet communication available at: http://www.bcm.edu/oto/grand/03_06_03.htm)
- Wood DE (1996). Tracheostomy. *Chest Surg Clin N Am*; 6:749.
- Yaji. H, Hashim S (1991). Acute poisoning from hair dye. *East African medical journal*; 68:40-41.