COMPLICATIONS OF OPEN SURGICAL TRACHEOSTOMIES AND THEIR MANAGEMENT- OUR EXPERIENCE

Zeba Ahmed, Khalid Hussain Mahida*, Zill E Huma, Tariq Muhammad*

Dr Ruth Pfau Civil Hospital Karachi Pakistan, *Ziauddin University Karachi Pakistan

ABSTRACT

Objective: To justify the role of open surgical tracheotomy in patients admitted in surgical or medical intensive care units for ventilator support or secretion management.

Study Design: A descriptive study.

Place and Duration of Study: Department of otorhinolaryngology- Head and Neck Surgery, Dr Ruth K M Pfau Civil Hospital Karachi, Dow Medical College- Dow University of Health Sciences and Otolaryngology-Head & Neck Surgery Ziauddin University Karachi Jan 2014 to Jan 2018.

Material and Methods: This study includes all elective and emergency tracheotomies performed in intensive care units (ICU). Patients with cervical spine injuries, bleeding diathesis and patients below 12 years of age were excluded from our study.

Results: We encountered complications in 20 patients out of 534, on whom tracheotomies were carried out in intensive care setting. Hemorrhage during and after tracheotomy procedure occurred in eight patients, which was controlled by pressure, ligation or diathermy. Procedure related surgical emphysema occurred in two patients; it was limited to cervical region and subsided with conservative management. The inadvertent decannulation of tracheotomy tube occurred in two cases. Subglottic stenosis developed in four patients. Tracheo esophageal fistula was encountered in four cases.

Conclusions: A low morbidity and mortality rate in our series justifies the role of open surgical tracheostomy in patients admitted in surgical or medical ICU for ventilator support or secretion management. It is also effective in a situation of unsecured airway.

Keywords: Complications, Intensive care units, Tracheotomy.

INTRODUCTION

Tracheostomy is the surgical procedure to create an artificial opening in the trachea to bypass the airway above it. The procedure's historical perspective revealed that it is an old surgical procedure dating back 3600 BC in Egypt[1] and underwent numerous modifications over the centuries since then. The first elective tracheostomy was done in 100 AD by Aesculapius of Bthynia and the described by Galen in 1312 AD[2]. In early 1600 AD it was an established procedure for airway obstruction. The evolution of procedure of tracheostomy can be divided into five stages. The first spanning roughly three thousand years (from 1500 BC to 1500 AD) begins with mentioning of incisions into the "wind pipe" in the Ebers Papyrus and the Rig Veda. Alexander the Great, Aesculapius, Aretaeus and Galen are all recorded as having carried out this operation. Between 1546 AD and 1883 AD, the procedure was considered dangerous. The third period started with Trousseau's report of 200 cases in the treatment of diphtheria in the year 1833. In 1932 Wilson suggested its prophylactic and therapeutic use in poliomyelitis. Tracheostomy was then recommended for a large variety indications other than obstructive causes. Finally, by year 1965 many steps in procedure became standardized and complications reduced. Complications, indications and interrelation with endotracheal intubation were clearly outlined[3]. It started as just making an opening in the trachea to proper placement of metallic tube to plastic tubes.

Correspondence: Dr Zeba Ahmed, Dr Ruth Pfau Civil Hospital Karachi Pakistan (*Email: ahmed.khanz@hotmail.com*)

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Otolaryngologists dominated the surgical scene in open surgical tracheostomy. Then came the era of percutaneous dilatational tracheostomy and its subsequent modification made by various other specialties[4]. Apart from very rare instances the indication of tracheostomy for upper airway obstruction and to reduce dead space are now the part of history[5]. Current practice of tracheostomy is that it is commonly performed in critically ill patients admitted in intensive care unit (ICU) for prolonged mechanical ventilation. The objectives of tracheostomy in intensive care unit are early weaning from ventilator, decrease need of sedation, and antibiotics, and prevention of complications related to prolonged endotracheal tube placement. There are various potential complications of tracheotomy. Traditionally these complications are described as immediate, early and late[6]. Complications may happen peri-operatively, during surgery and post-operatively. During care of the tracheostomy tube, and those encountered after decannulation. Cipriano *et al* in their review describe these complications as to be procedure, related associated with the surgical procedure; maintenance related, that is during care of tracheostomy, and lastly; after decannulation[8]. The aim of this study is to present the complications of tracheostomy and their management encountered between Jan 2014 to Jan 2018.

PATIENTS AND METHODS

All the electively performed tracheostomies on patients admitted for various treatment in our institution; including the surgical and medical intensive care units (ICU) and the emergency. Convenience sampling technique was used. The indications of tracheostomies were weaning from ventilator, secretions management, difficult intubation or airway obstruction. Patients with cervical spine injuries were not included in study. Patients with bleeding diathesis were not included in this study. Patients below 12 years of age were not included in our study. This descriptive study conducted between Jan 2014 to Jan 2018. Patients admitted in hospital meeting inclusion criteria.

Tracheostomy procedure:

Timing of tracheostomy was decided by the ICU and the physicians responsible for the patient care. The tracheostomies were done in operating room. With patient supine and neck extended. Horizontal incision around 5cm was given between cricoid and suprasternal notch. Trachea was exposed after incising deep cervical fascia and separation of strap muscles. Isthmus of thyroid was divided by monopolar diathermy. Incision was made over trachea between second and third tracheal ring. Tracheostomy tube portex with size according to the age was inserted after withdrawal of endotracheal tube (ETT) by anesthetist. The tracheostomy tube was secured with monofilament non absorbable sutures and dressing done. We transferred the patients back to the original facility for continuous care and tracheostomy care.

Data Collection

We recorded the Biodata, type of illness, length of stay in ICU, and number of days after intubation. Outcome measures noted in terms of successful decannulation, morbidity or mortality. All data collected was tabulated and statistical analysis performed using IBM SPSS 21. Results and demographics are presented as percentages and statistical means.

RESULTS

A total of 534 patients underwent this operative procedure between Jan 2014 to Jan 2018. Out of 534 tracheostomy patients, 370 (69.3%) were males and 164 (30.7%) were females. Ages of the patients ranged from 14 years to 89 years with Mean age 45.8 and Median 41.5. The critical illness for which they were admitted in ICU is shown in table-I. The complications, that we encountered in 20 patients are depicted in table-II. Hemorrhage most frequently found from wound edges, followed by anterior jugular veins and innominate artery. These types of bleeding were evident after the procedure and most commonly after first post-operative day. They were controlled by pressure, ligation or diathermy. The procedure was performed either

on bed side for minor and in operation room in mild event. In one case supraglottic partial laryngectomy was done a week earlier. Another case on whom elective tracheostomy done, met in two patients, it was limited to cervical region and subsided with conservative management. The inadvertent decannulation of tracheostomy tube occurred in two cases; one in ICU and

Table-I: Indications for tracheostomy .

Indications for tracheostomies	Number of cases	Percentages (%)
Prolonged intubation		
Traumatic Brain Injury	128	24.0
Polytrauma	38	7.1
GB Syndrome	7	1.3
Cerebro Vascular Accident (CVA)	29	5.4
Organophosphorpos poisoning	8	1.5
Sepsis	54	10.1
Diabetic ketoacidosis	3	0.6
Pneumonia	51	9.6
Neuromuscular disorders	9	1.7
Brain infarction	21	3.9
Neuroleptic malignant syndrome	1	0.2
Intracranial tumors	6	1.1
Secretion management		
Aspiration pneumonia	45	8.4
Neuromuscular disease	8	1.5
Ventilator associated myopathy	21	3.9
Cervical spine injury	5	0.9
Airways obstruction		
Maxillofacial trauma	3	0.6
Neck trauma	9	1.7
Bilateral vocal cord paralysis	1	0.2
Tetanus	17	3.2
Foreign bodies trachea and larynx	6	1.1
Peri and post-operative air way management		
Head and neck tumor resection	21	3.9
Surgery for akylosis of tm joint	43	8.1
Total	534	100.0

Table-II: Complications of tracheostomies.

Complications	Numbers	Percentages (%)
Hemorrhage	8	1.49
Accidental decannulation	2	0.37
Subglottic stenosis	4	0.74
Tracheo-esophageal fistula	4	0.74
Tracheo-cutaneous fistula	2	0.37
Total	20	3.71

the same complications a week later. In both cases conservative measures were failed to control the hemorrhage, and active intervention was not possible due to shortage of time. Procedure related surgical emphysema occurred another during shifting from operating room to ICU. Both were promptly attended and tubes were replaced without major catastrophe. Subglottic stenosis developed in four patients, the attribution remained uncertain as whether it was

due to prolonged intubation for more than 10 days or isolated complication of tracheostomy. In two cases resection and end to end anastomosis performed. The remaining two were treated with laser. All these patients were successfully decannulated. Tracheo-esophageal fistula was encountered in four cases. Among the four three were noted in immediate post-operative period and were assigned as procedure related. We noticed the last one after 24th post tracheostomy day. Fistula was closed in one case with delayed onset. Two were managed with endoscopic stenting but they died due to pulmonary pathology. Surgical intervention was not possible due to sepsis. The last case was treated with surgical closure of tracheal wound and esophageal fistulous opening. We carried out the esophageal repair with muscle flap. The tracheactaneous fistula following decannulation encountered in two cases. They were surgically closed under local anesthesia.

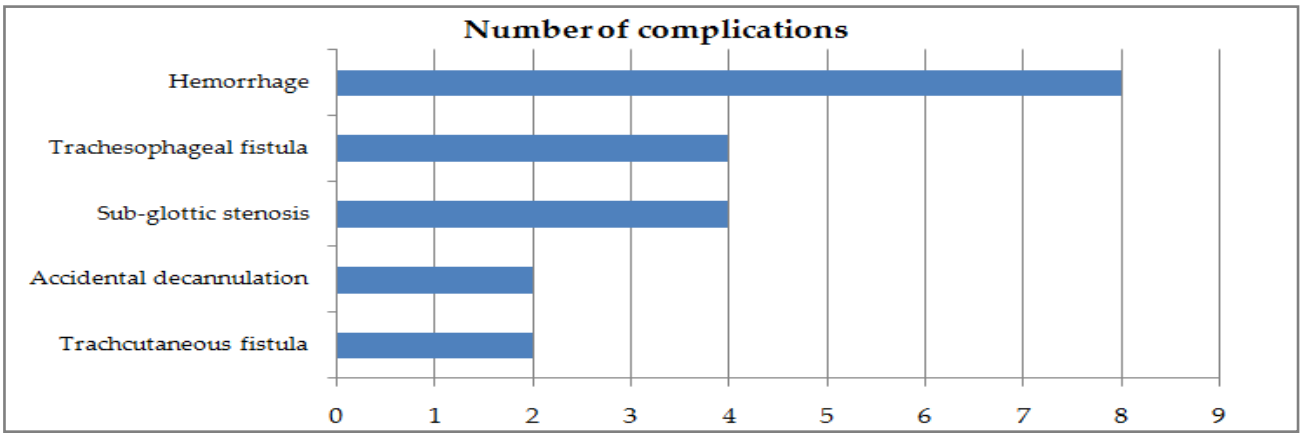

Figure: Number of complictions.

DISCUSSION

Complications may be associated with any surgical operation. Their frequency depends on various factors. Our study shows the complications in 20 out of 534 cases 3.71% which is consistent with the various series reported previously[8,9]. Most common complication that occurred in our study remained hemorrhage. The commonest source of bleeding during surgery was anterior jugular veins and the venous bleeding from wound margin. It was controlled by ligation and diathermy. In two cases we encountered the bleeding from anterior jugular veins one week after the procedure, it was controlled in ICU. The cause of hemorrhage was not clear, erosion of vessels by tracheostomy tube was considered a possibility. Catastrophic hemorrhage from innominate artery resulting in the mortality occurred in two cases. Both the events occurred on 10th day. Though this type of complication is rare[10], are found in various case reports in the literature. Subglottic stenosis was found in 4 cases. It occurred after decannulation and usually presented on 3rd or 4th day as stridor, after re insertion of the tracheostomy tube in emergency. We conducted an endoscopic investigation along with imaging to localize the stenosis and the measurement regarding the length of the stenosed segment. All the four cases were treated later by surgical excision of stenotic segment of trachea and end to end anastomosis with the help of thoracic surgeon and were decannulated successfully afterward. Various risk factors are attributed to the development of stenosis; late tracheostomy, surgical site infection, difficult neck, size of the tracheostomy tube, and tracheostomy tube cuff pressure[11]. It was not clear that whether subglottic stenosis was due to prolonged intubation or tracheostomy. As the stenosed segment of trachea in all these cases were suprastomal and not around or below it, late tracheostomy was probably the factor responsible for it. In analyzing various factors

causing tracheal stenosis. Abode *et al* mentioned the prolonged stay in ICU is a risk factor in developing the stenosis[12]. But their study had focused only the trauma patients. Tracheo-esophageal fistula (TEF) was yet another complication in our series occurred in three cases. All the three were young females, with medical problems. Tracheostomy was performed early in two and late in one case with dengue shock syndrome. The symptoms were excessive secretions and appearance of nasogastric feed in tracheostomy. Surgical closure was done in one case and stenting in another. The third patient died due to uncontrolled sepsis. The surgery for closure of TEF was consisted of neck exploration, esophageal repair and tracheal repair complimented by sternomastoid flap between the fistula site. This was the optimal requirement for this type of repair recommended in the literature[13]. The causes of TEF may be the trauma to posterior tracheal wall during insertion of the tracheostomy tube, nasogastric tube or excessive tracheostomy tube or endotracheal tube cuff pressure. Overall incidence of TEF reported in literature is around 1-4% and is considered universally fatal[14]. As a routine procedure we secured the tracheostomy tube with non-absorbable sutures between flanges and skin of the neck. Despite this tube displacement occurred in two patients in immediate post-operative period. These were managed without any catastrophe by reinserting the tube. Tube dislodgement is considered as most feared complication in terms of loss of airway, and multiple attempts to reinsert the tube. This may result in false passage and TEF. The incidence of tube displacement reported in the literature ranges from 0.35–2.6%[15]. Risk factors associated with accidental decannulation include altered mental status/delirium, patient turning, agitated patient, a poorly secured tracheostomy tube, short neck, obese patient, large goiter, excessive coughing, low tracheostomies, and traction on the tracheostomy tube[16]. Surgical emphysema developed in two patients, one in immediate post-op period and was relieved by removing the wound sutures and change of tracheostomy tube of smaller size. Another patient developed this complications late i.e. after 16 days of tracheostomy. The tubes got dislodged in obese Patients. A new tube of extended vertical length was inserted. The condition resolved within 48 hours. We never encountered pneumothorax and pneumo mediastinum. The causes of such a devastating complications mentioned in the literature are secondary to dissection of air along soft tissue planes, direct damage to the pleura or rupture of a bleb, anterior or posterior tracheal wall injury. Goldenberg in his large series of 100 tracheostomies had mentioned 2 deaths due to pneumothorax.

CONCLUSION

In comparison with the current literature a low morbidity and mortality rate in this series justifies. the role of open surgical tracheostomy in patient admitted in surgical or medical ICU for ventilator support or secretion management. It is also effective in a situation of unsecured airway. This procedure is safe and effective in competent hands and with a good focused nursing care by well-trained supportive nursing staff in ICU. The morbidity incurred during perioperative period can be successfully managed without invasive measures. Though percutaneous dilatational tracheostomy in ICU is now considered as standard but various limitations associated with it, open surgical tracheostomy will remain standard in difficult situations.

CONFLICT OF INTEREST

This study has no conflict of interest to be declared by any author.

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