

A Multidisciplinary Team Required For Prevention and Management of Life Threating Complications Due To Tracheostomy Tube Dislodgement in Critical Care Unit

Research Article

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Abstract

Background: Tracheostomy tube displacement is a major cause of morbidity and mortality related to airway management in critical care unit. The primary aim of this study was to conduct analysis of life threatening complication due to tracheostomy dislodgement and develop a protocol to prevent it.

Place: Nepal Medicit hospital bhaisepati, Kathmandu

Duration of study: 1 year from September 2018 to September 2019

Study type: retrospective analytical study

Result: The incidence of tracheostomy dislodgement was 7 out of 52 (13.4%). 4 out of 7 tracheostomy dislodged patient (42.8%) patient had developed pneumothorax. 4 patients who had tracheotomy tube displacement had died with mortality of 57.1%. Patients undergoing intracranial surgery had higher rate of tracheostomy tube displacement than other patients.

Conclusion: Although tracheostomy tube dislodgement is a rare condition it has a very poor outcome. We found its incidence to be higher in our setup. There is lack of knowledge about tracheostomy tube care and management of its complication among care providers, doctors and nurses. A multidisciplinary approach is required to prevent and manage this dreadful condition. Each institution should have a multidisciplinary team and develop its own emergency management protocol.

Keywords: tracheostomy dislodgement, tracheostomy, tracheostomy care

Abbreviation:

AIC: Aintree airway exchange catheter

ARDS: Acute Respiratory Distress Syndrome

ENT: Ear Nose Throat

FOB: Fiber Optic Bronchoscopy

ICU: Intensive Care Unit

NG: Nasogastric

OT: Operating Table

Introduction

Tracheostomy is a lifesaving surgical intervention which is done as an elective or an emergency procedure [1]. According to study by Esteban et al. [2] its incidence is around 24% among all patients requiring intensive care unit admission. Early tracheostomy reduces hospital stay and cost [3]. Indication for tracheostomy tube placement is broadly divided into 4 group airway protection, airway obstruction, ventilation and secretion [4]. Accidental decannulation, loss of airway, pneumothorax and subcutaneous emphysema are regarded as early postprocedural complication occurring within 7 days of tracheostomy [5]. Tracheostomy tube displacement is defined as self extubation (when patient intentionally removes the tube) or accidental extubation caused by patient or while nursing/caring and by patient's movements [6]. The incidence of accidental dislodgement is reported to be 5 to 15 % [7]. This is a major cause of morbidity and mortality related to airway management in critical care unit(6). Audit report in UK shows half of the patient who had displaced tracheostomy tube died [8]. In Nepal Difficult Airway Society (DAS) guidelines for difficult intubation is widely followed. However National guidelines for tracheostomy related emergencies are not available. Tracheostomy related emergencies are managed by experience, personal skill or lessons learnt from previous errors [9]. Following clusters of tracheostomy related emergency at our critical care unit which is a multidisciplinary unit we felt necessity to address this problem.

Objective

Primary objective

1. is to find out incidence and outcome of tracheostomy tube displacement
2. to conduct analysis of tracheostomy tube displacement and its complication

Secondary objective

Develop a protocol for reduction/management of complication due to tracheostomy dislodgement

Material and Methods

Nepal Medcity hospital is tertiary care hospital in Nepal. In its critical care department critically ill patients from the entire department are admitted. Patients who require prolonged ventilation undergo tracheostomy. Also, patient from various department who undergo tracheostomy are initially admitted in critical care department and discharged/managed according to the patient's progression of the disease. All patients who underwent tracheostomy at our hospital from September 2018 to September 2019 were analyzed. Patients were categorized according to department and data was analyzed. Data was derived from the electronic medical record present of our hospital. A retrospective analysis of cases was done.

Inclusion criteria

Patients of all ages and both sexes who underwent tracheostomy

Both emergency and elective tracheostomy were included

Exclusion criteria

Patients who didn't undergo tracheostomy

Result

52 tracheostomies were performed within 1 year. Among them 42 were male and 10 were female. 10 were female and 42 were male patients. One patient from ENT department had undergone emergency tracheostomy in OT table due to difficult airway other all were performed electively (Table 1). 13 tracheostomies were done by ENT department and 39 were done by Neurosurgery department. 36 patients had undergone surgery before, and tracheostomy was done due to prolonged requirement of mechanical ventilation. 16 patients did not undergo any

Table 1: Descriptive statistics

Sex	Male: 42	Female :10	
Age in years	Min: 18	Max:74	Mean: 39.7
Type	Elective:51	Emergency: 1	

kind surgical intervention and tracheostomy was done due to prolonged requirement of mechanical ventilation (Figure 1). All the tracheostomies were performed in OT table under general anesthesia. The incidence of tracheostomy dislodgement was 7 out of 52 (13.4%). 4 out of 7 tracheostomy dislodged (42.8%) patient had developed pneumothorax. 4 patients who had tracheotomy tube displacement had died with mortality of 57.1% (Figure 2). Among 7 tracheostomy dislodged patients 6 were from Neurosurgery department and had undergone intracranial surgery. One was from respiratory department who had developed ARDS due to pneumonia. Incidence of tube displacement among patient who underwent neurosurgery is 6 out of 36 (17.64% as both polytrauma patients too had

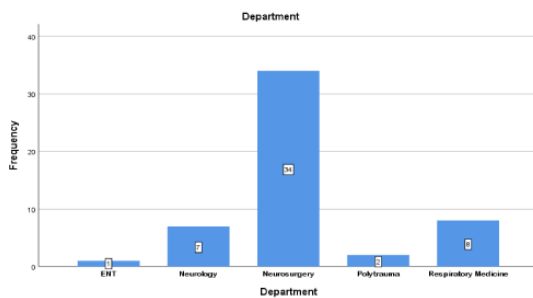


Figure 1: Case distribution according to Department

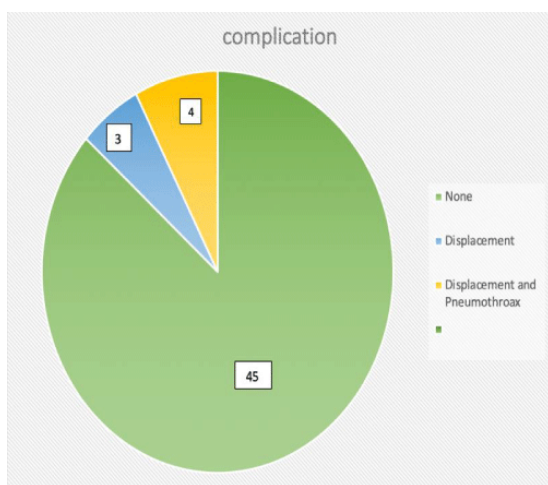


Figure 2: Life threatening complication in tracheostomy patients

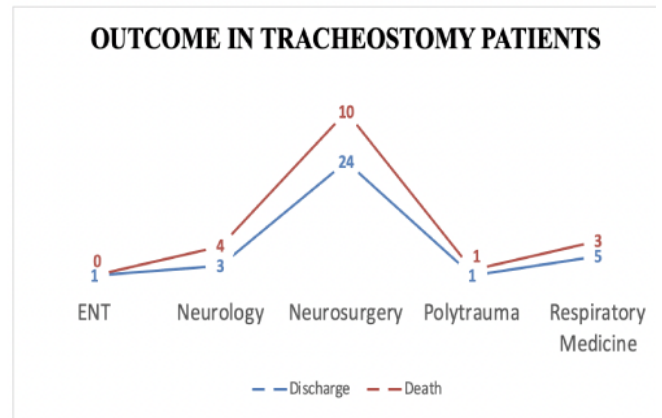


Figure 3: Outcome in tracheostomy patients.

undergone brain surgery). Incidence of tube displacement among patient who did not go any surgical procedure is 1 out of 15 (6.66%). Outcome was measured based on two variable death and discharge (Figure 3). The incidence of death was 34 out of 52 (65.3%). Excluding emergency case, to calculate the length of ICU stay cases were divided into surgical and non-surgical cases. The average difference of days between date of surgery and tracheostomy among 36 neurosurgery patients was 19.66 days. The average length of ICU stay among discharged 33 patients was 32 days (31 days for surgical cases and 33 for non-surgical cases). The average difference between date of tracheostomy and discharge from ICU was 15 days (16 days for nonsurgical cases and 14 days for surgical cases).

Discussion

Tracheostomy tube dislodgement is very serious complication often resulting in increased morbidity and mortality. Risk factors for dislodgement of tracheostomy tube are inadequately secured tube, patients agitation, excessive coughing , morbid obesity, short neck and inadequately trained care providers [10]. Prevention of tracheostomy tube dislodgement is always best approach for its management. Maximum risk for tracheostomy tube displacement is within 7-10 days after which the tracheostomy tract gets matured [11]. However, study by Halum et al. [12] shows accidental decannulation rate of 0.8% within first post-operative week and 1.2% after one week. So, more vigilance is needed in initial two three weeks. Our study shows incidence of tracheostomy tube displacement to be 13.4% which is similar to a review done by Delaney et al. [13] where its incidence is 0-15% for surgically performed tracheostomies whereas 0-5 % for

percutaneous dilatational tracheotomy. Study by Kapadia et al. [14] showed its incidence to be much lower which is 1%. We had mortality of 57.1 % in patients who had displaced tracheostomy tube. Our result is similar to the one by Cook et. al. [8] who have mortality rate of 50 percent. We also found dislodgment to be higher among patients who have undergone intracranial surgery. Agitation in ICU is found to be much higher among patients who undergo intracranial surgery than others [15]. This could be the possible cause for higher incidence of displacement among these patients. All the tracheostomies in neurosurgery cases were done by neurosurgery team difference in surgical technique may be another possible cause. Study by Espinel et al. in pediatric population showed tracheotomy tube manipulation to be around 2.5 to 11 times a day. 95 % of this action is conducted by bedside nurses and respiratory therapist [16]. According to them bedside nurses are key player in handling of tracheostomy tube. Espinel et al. [16] say reduction in manipulation may reduce complications. After few incidences of dislodgment, we also noticed lack of knowledge about proper tracheostomy care among critical care nurses. Thus, we decided to have a multidisciplinary team approach for tracheostomy tube care and management.

Preventive of complication

Daily dressing of tracheostomy site, tube ties to be changed weekly should be done to take care of the tracheostomy tubes [17]. All the essential information about tracheostomy and a tracheostomy kit should be always present at patient's bedside [18]. Morris et al. suggest to move these kits along with the patient whenever he/she is away from the ICU [4]. Studies recommend change of plastic tubes every 1 to 2 months and change of metallic tubes in every 6 months. Percutaneous tube should be changed within 10 to 14 days and by surgery should be changed within 3 to 7 [19]. Weight loss is very common among patients admitted in critical care. Omokayne et al. [20] highlights reduction in neck circumference due to weight loss as one factor predisposing to accidental decannulation. Therefore they suggest suturing the flanges to the skin as a preventive measure to reduce accidental decannulation. A multidisciplinary team involving doctors, nurses and other staffs has to be developed with each knowing their own part during tracheostomy emergency. Stimulation training has to be conducted for proper handling of the situation.

Tracheostomy care training program

As mentioned earlier proper training about tracheostomy care and management of its complication is the best way to reduce morbidity and mortality that occurs due to tracheostomy tube dislodgment. Most of the critical care nurses in our hospital said they were inadequately trained and inexperienced to provide tracheostomy care and manage its complications. McGrath [21] points out untrained nursing staff who lack basic and emergency airway management skills can lead to suboptimal management of tracheostomy patients. Piromchai et al. [17] too say having untrained staff can lead to higher number of complications. Hence, we decided to conduct tracheostomy care training program for critical care nurse in every 3 months. It is a one-day program organized by Nepal Medical Association in association with Critical Care Nurses Association of Nepal. As highlighted by McGrath the importance of multidisciplinary expertise our program involves expertise from Critical care, Emergency and ENT department. All trainees are trained how to care for patients with tracheostomy and what to do in case of complication.

Multidisciplinary approach for management of displaced tracheostomy tube

Tracheostomy tube displacement is a life threatening but rare which makes this condition unfamiliar event to a very experienced specialist. It has high mortality rate and delay of even few seconds can make a difference in outcome. Therefore, all patients with tracheostomy in situ must have a written, patient specific, emergency orotracheal intubation and tracheostomy re-cannulation plan prepared in advance. If a patient previously breathing spontaneously, non-sedated, non-paralyzed with tracheostomy tube has any respiratory distress, breathing of the patient should be checked. In absence of spontaneous breathing, patient's pulse should be checked and "code blue" should be activated. If the patient is breathing other signs of tracheostomy tube dislodgment should be looked for like, hypoxia, respiratory distress, increase work of breathing, noisy breathing, subcutaneous emphysema, visible cuff in the tracheal stoma, absent breath sounds on auscultation, inability to pass a suction catheter, patient speaking around an inflated tracheostomy tube cuff, tracheostomy tube flange elevated above skin level, loss of end-tidal carbon dioxide (ETCO₂) measurements or loss of exhaled tidal volume. Immediately high flow oxygen should be applied to

face and tracheostomy stoma. After confirming a displaced tracheostomy tube, the first and most important question to answer is: Does the airway need to be re-secured (immediately) or is a tracheostomy decannulation trial appropriate? This can be clinically assessed and if the patient has no respiratory distress or minimal respiratory distress that can be managed without re-securing the airway, tracheostomy decannulation trial can be attempted by continuing high flow oxygen and monitoring. If airway needs to be re-secured immediate multidisciplinary team which has been formed has to be called. Important information about the tracheostomy procedure like date of tracheostomy, type of tracheostomy (percutaneous/surgical), any stay sutures or complications during the procedure, type and size of tracheostomy tube used should be quickly assessed. If the duration of tracheostomy is more than 7-10 days, the tracheal stoma and tracheostomy tract is usually well formed and mature, and reinserting the tracheostomy tube through the stoma may be attempted. Tracheostomy duration less than 7 days cannot be re-cannulated easily. In these cases, if upper airway is patent tracheal stoma is manually closed and ventilated with face mask and then airway should be secured by orotracheal intubation before replacement of tracheostomy tube. If upper airway is obstructed or patient had laryngectomy, oxygenation is not possible through the trans laryngeal route. In these cases, oxygen may be delivered by applying face mask, tracheal mask or supraglottic airway over the stoma. In recently formed stoma and tract, re-cannulation may be facilitated by guide passed via the stoma or the displaced tube. The soft guides (suction tube /NG tube) may too flexible to negotiate, and stiff guides (bougie/airway exchange catheter) may damage friable peritracheal tissue and may create false passage if advance blindly. Aintree airway exchange catheter (AEC) (Cook Medical, USA) over a fiberoptic bronchoscope (FOB) is recommended for re-cannulation of a tracheal stoma with a poorly formed tracheostomy tract. The AEC is a flexible, disposable, hollow ventilation/exchange catheter has a length of 56 cm and an internal diameter of 4.8 mm which can be lubricated and mounted on a FOB with an outer diameter up to 4 mm and can be used to facilitate insertion of tracheostomy tubes with an internal diameter of at least 7.0 mm. This technique to replace tracheostomy tubes has several potential advantages. The directional control of the FOB assists passage into the trachea, and correct placement within the trachea can be confirmed immediately. The risks of forming a false passage in the peritracheal space or losing

the airway are thereby vastly reduced. Surgical airway in the form of another tracheostomy or cricothyroidotomy should be considered if above attempts fail.

Algorithm for management of displaced tracheotomy tube (Figure 4)

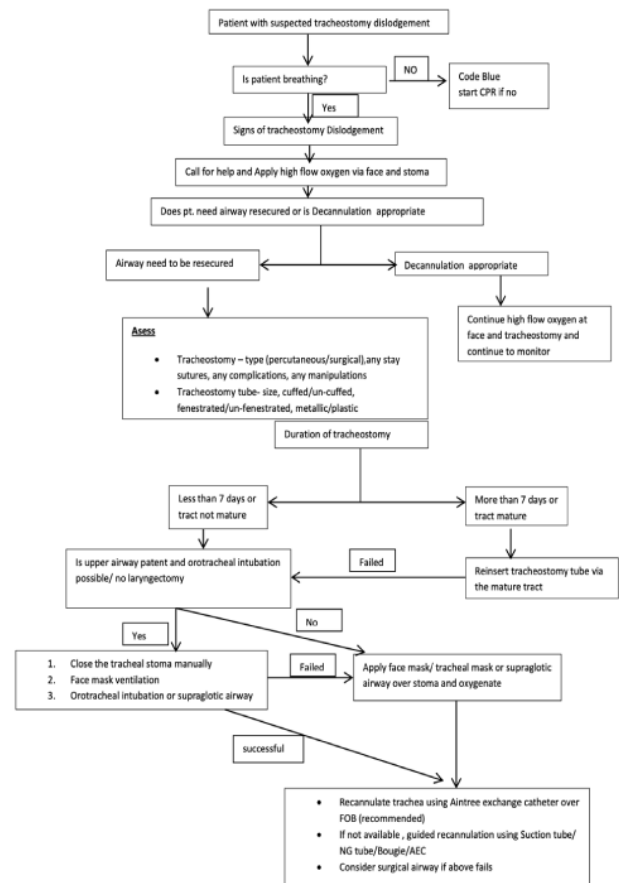


Figure 4: Management of tracheostomy dislodged patient table

Conclusion

Although tracheostomy tube dislodgement is a rare condition it has a very poor outcome. We found its incidence to be higher in our setup with much higher rate among patients undergoing intracranial surgery. There is usually lack of knowledge about tracheostomy tube care and management of its complication among care providers, nurses and even doctors. A multidisciplinary approach is required to prevent and manage this dreadful condition. Each institution should have a multidisciplinary team and develop its own emergency management protocol. Multidisciplinary team should also conduct training and stimulation programs at certain intervals for prevention and management of this problem. **References**

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