

Research Article



Outcome of Early Tracheostomy in the Management of Grade II (Moderate) Tetanus Patient

Nukhbat-Ullah Awan^{1*}, Muhammad Sohail², Zeeshan Sarwar³, Muhammad Mustahsen Bashir⁴, Muhammad Abbas Khokhar⁵ and Asad Aizaz Chatha⁶

¹Assistant Professor, Department of ENT, KEMU/ Mayo Hospital Lahore, Pakistan; ²Assistant Professor, Department of Plastic Surgery, KEMU/ Mayo Hospital, Lahore, Pakistan; ³Assistant Professor of Surgery, KEMU/ Mayo Hospital, Lahore, Pakistan; ⁴Associate Professor and HOD of Plastic Surgery, KEMU/ Mayo Hospital, Lahore, Pakistan; ⁵Assistant Professor of Oncology, KEMU/ Mayo Hospital, Lahore, Pakistan; ⁶Assistant Professor, Department of Oral and Maxillofacial Surgery, KEMU/ Mayo Hospital Lahore, Pakistan.

Abstract | The study was carried out in ENT Department of KEMU, Lahore from December 2012 to November 2015 to assess the outcome of early tracheostomy in grade II (moderate) tetanus patients. A total of fifty-six adults of both genders, diagnosed as grade II tetanus patients, were included. Clinical characteristics, mode of trauma, incubation period, vaccination status and investigations were recorded. All patients were managed in ICU and early tracheostomy was performed in addition to standardized medical treatment. A total of 86% males with age 32 ± 8.3 years presented the study participants. Results demonstrated that most common mode of trauma was road traffic accident, and majority (54%) of patients were never vaccinated. Incubation period noted was 7 ± 1 days. Tracheostomy was performed in 16 ± 3 hours of admission and tracheostomy decannulation was performed in 23 ± 3 days. Patients were discharged in 27 ± 3 days. We conclude that early control of airway with tracheostomy in grade II tetanus patients helped in better patient management with early recovery and decreased hospital stay with minimal morbidity.

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***Correspondence** | Dr. Nukhbat-Ullah Awan, Assistant Professor, Department of ENT, KEMU/ Mayo Hospital Lahore, Pakistan; **Email:** Nukhbatawan786@gmail.com

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Introduction

Tetanus is a preventable neurological disease resulting from infection of *Clostridium tetani*. Although tetanus is poorly reported, disease is said to have high mortality especially in developing countries such as Pakistan^{(1), (2)}. Tetanus results from inducement of spores of *Clostridium tetani* into acute wound from farming, surgical intervention, road traffic accidents or skin lesion⁽³⁾. Patient develops unchecked motor neurons activity caused by exotoxin released

by *Clostridium tetani* leading to rigidity and spasm of voluntary muscles of whole body⁽⁴⁾. Generalized muscle spasm usually develops few days after initial symptoms, which may prove fatal. Ablett graded clinical manifestations of tetanus into four grades describing that prognosis of tetanus are directly related to severity of disease⁽⁵⁾ (Table 1).

Airway control has pivotal role in the management of tetanus patients. Definitive airway control by tracheostomy can significantly reduce the morbidity such

as pneumonia and /or respiratory failure and mortality, as retained secretions lead to poor ventilation and respiratory muscle spasm⁽⁶⁾. Tracheostomy is usually performed in Grade III (severe tetanus) patients which hardly ever benefits, as very few patients recover from advanced disease process^{(7), (8)}. On the other hand control of airway with tracheostomy in grade II (moderate) tetanus patients is very rewarding. The timing of performing procedure in grade II tetanus patients varies in literature and is debatable. Tracheostomy in grade II tetanus patients is mostly performed when patient is not improving on routine treatment or develops respiratory complications and is considered as late tracheostomy. However few studies have described that early tracheostomy within 24 hours of admission before development of complications is most beneficial⁽⁸⁾.

Table 1: *Ablett classification of tetanus severity.*

Grade 1 (mild)
Mild trismus, general spasticity, no respiratory compromise, no spasms, no dysphagia
Grade 2 (moderate)
Moderate trismus, rigidity, short spasms, mild dysphagia, moderate respiratory involvement, ventilatory frequency >30
Grade 3 (severe)
Severe trismus, generalized rigidity, prolonged spasms, severe dysphagia, apnoeic spells, pulse >120, ventilatory frequency >40
Grade 4 (very severe)
Grade 3 with severe autonomic instability

This study was planned to describe the clinical course and outcome (hospital stay and complications) of early tracheostomy in grade II (moderate) tetanus patients.

Patients and Methods

This quasi-experimental study was carried out in the Department of Otorhinolaryngology, KEMU, Mayo Hospital, Lahore from December 2012 to November 2015. Fifty-six adults of both genders, diagnosed as grade II tetanus patients (patients with trismus, dysphagia and muscular rigidity), were included. Clinical characteristics, co-morbidities, mode of trauma, incubation period, vaccination status and investigations were recorded. All work described had been carried out in accordance with The Code of Ethics of the World Medical Association (Declaration of Helsinki) for experiments involving humans.

All Patients were managed in ICU. Tetanus toxoid (0.5 ml I/M) and human tetanus immunoglobulin (3000-IU IM) were injected. Diazepam (5mg IV x6 hourly), Cefradine (500mg x IV TDS), metronidazole (500mg IV x 6 hourly) and Intravenous fluids were also given. Nasogastric tube was passed to provide nutritional support. Wound was washed and debrided as early as possible.

After obtaining informed consent, tracheostomy was performed within 24 hours of admission. All patients were operated under local anesthesia and sedation. Patient was positioned supine with neck extension. Incision was marked 2cm above suprasternal notch horizontally except short-necked patients in which vertical incision was employed. Area was infiltrated with mixture of lidocaine with 1:100,000 adrenaline solution. Skin incision was made 15 minutes after infiltration to achieve homeostasis. Strap muscles were retracted laterally and thyroid is thus upwards. Tracheal opening was made vertically between 3rd and 4th tracheal ring. With tracheal dilator opening was widened and appropriate sized cuffed portex tracheostomy tube was inserted and balloon was inflated. Tracheostomy tube was secured to skin and wound dressed with semi-occlusive gauze.

Deflation of tube was done for 5 minutes after every one hour for first 48 hours and remained deflated after wards. Regular cleaning and suction was performed. Ventilatory support was administered to patients not maintaining their saturation level. Patients were shifted towards when muscle rigidity was under control and patients were conscious and maintained oxygen saturation. Tube was occluded for 24 hours before decanulation to permit respiration through glottis. Stoma was dressed daily till closure. Patients were discharged from hospital when recovered completely and were followed for one year.

Qualitative variables (gender, mode of trauma, co-morbidities, vaccination status, need of ventilation and complications) were presented as frequency and percentage. Complications of tracheostomy were defined as bleeding (profuse ooze of blood which needed exploration and ligation of bleeder), tube blockage (blockage with secretions leading to hypoxia), tracheostomy wound infection (redness, pain and purulent discharge around the tracheostomy tube), subcutaneous emphysema (crepitus over neck and/or chest), disfigured scar (red, raised or depressed scar),

tracheocutaneous fistula (fistulous communication of skin and trachea) and tracheal stenosis (narrowing of trachea causing difficulty in breathing and confirmed on endoscopy). Systemic complications related to disease process were defined as pneumonia (cough, chest pain, difficulty in breathing and fever up-to 102F) tachycardia (heart rate of >100 per min) hypotension (systolic blood pressure < 90 mm Hg.). Quantitative variables such as Incubation period (days from trauma to appearance of first symptom), presentation of patient (days from trauma to hospital admission), tracheostomy decannulation time and hospital stay were presented as mean (SD).

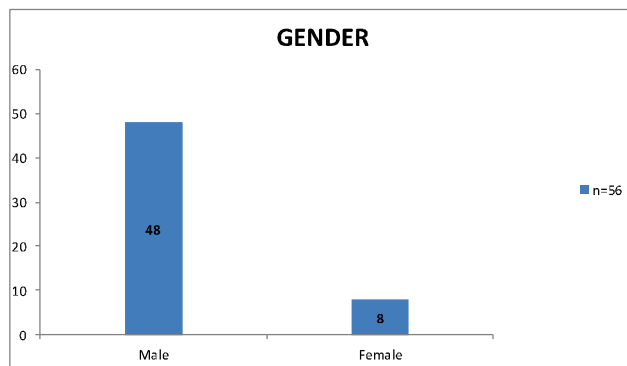


Figure 1:

Results and Discussion

Out of 56 patients included in the study 48 (86%) were male patients with mean age 32 years (range 20 to 52 years) (Figure 1). Seven (13%) patients were diabetic and 5 (10%) were hypertensive. Most common mode of trauma was road traffic accident 25 (45%) followed by farm related injuries in 22 (39%) and surgery in 9 (16%) patients (Figure 2). Regarding vaccination status only 12 (21%) had complete vaccination with 14 (25%) having incomplete vaccination and majority 30 (54%) were never vaccinated. None of patient had booster in last 5 years. Incubation period noted was 7±1 days (range 5 to 10 days). Patients presented to hospital in 7±1.3 days after trauma. Tracheostomy was performed in 16±3 hours of admission. Eight patients had prior endotracheal intubation, which was also replaced with tracheostomy. Nineteen (34%) patients required ventilatory support (four before and 15 after tracheostomy). Patients were shifted toward in 18±2 days. Tracheostomy decannulation was performed in 23±3 days. Patients were discharged in 27±3 (22 to 37) days and were followed for 13±1 months. Two patients expired due to Multi organ failure. Rest of

systemic complications and those related to tracheostomy are detailed in Table 2.

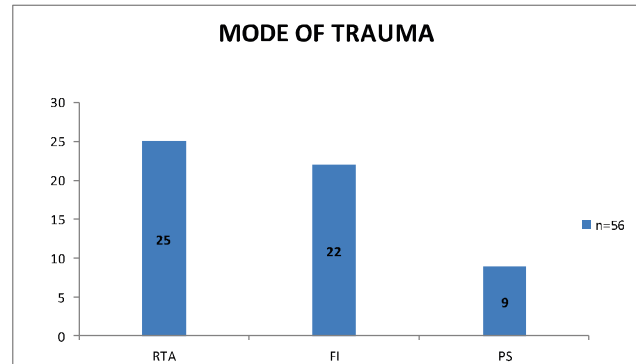


Figure 2:

RTA: Road Traffic Accident; FI: Farm Injuries; PS: Post Surgery.

Table 2: Complications associated with the tracheostomy in tetanus patients.

	No.	%age
Complications related to tracheostomy		
Bleeding	1	2
Subcutaneous emphysema	1	2
Tube blockage	9	16
Wound infection	1	2
Tracheocutaneous fistula	1	2
Tracheal stenosis	0	-0
Disfigured Scar	15	27
Systemic complications of tetanus		
Pneumonia	16	29
Tachycardia	12	21
Hypotension	19	34
Death	2	4

The prospective cohort study described the clinical course and outcome of early tracheostomy in Ablett grade II tetanus (moderate tetanus) patients. In this study we noted that control of airway with early tracheostomy in grade II tetanus patients improves outcome, with minimal morbidity.

Prognosis of tetanus patient is directly related to severity of disease. Ablett classified tetanus into 4 grades describing that with increased severity of the disease, the number of complications increased and the prognosis became poor. Respiratory complications like laryngeal muscle spasm, retention of secretions in alveoli and poor ventilation due to chest muscle rigidity in tetanus patients result in progression of disease and prolong hospital stay. Respiratory failure

and/or aspiration of gastric contents are considered as major causes of sudden death in tetanus patients. Few studies had mentioned that taking control of airway in grade II has positive impact on outcome reducing morbidity and mortality.^{(5), (6), (9), (10)}

Saeed et. al. have mentioned improvement in cure rate from 33% to 60% and decrease in mortality from 66 to 40% with early tracheostomy in grade II tetanus patients.⁽⁶⁾

In this study early tracheostomy was performed within 16 ± 3 hours of admission in grade II (moderate) tetanus patients before development of respiratory complications. We reinforce that early tracheostomy helped in better patient management as more than $2/3^{\text{rd}}$ of patients in this study didn't require ventilatory support and majority of patients did not develop respiratory complications. Also we found decrease in hospital stay and our patients were discharged in 27 ± 3 days (22 to 37) days earlier as compared to duration mentioned in previous studies^{(3), (4)}.

We also observed that young males were most common victims of tetanus and incubation period was approximately one week as mentioned in previous studies^{(4), (11), (12)}. However we found roadside accidents as major mode of spore inducement in our study patients.

Many studies had described that there is no natural immunity for toxin produced by *Clostridium tetani* and only method of prevention is vaccination. Tetanus is commonly seen in individuals who were unvaccinated, inadequately vaccinated and/or had no booster dose to maintain adequate protective level of antibodies over time⁽¹³⁾. In this study less than a quarter (21%) of patient had full course of vaccination with majority (54%) unvaccinated and not a single patient had booster in last 5 years reinforcing findings of previous studies.

Complications of tracheostomy observed in our study were comparable to what has been already reported in literature^{(7), (14)}. In one patient, wound was explored due to wound site bleeding and a bleeder was found which was ligated. Tube blockage was easily recognized and managed conservatively. Only one patient developed wound infection and was treated with antibiotics for one week. One patient developed persistent tracheo-cutaneous fistula, which was secondarily closed after excision of fistulous tract.

In this study 16 (29%) patients developed pneumonia, which was managed with systemic antibiotics and chest physiotherapy. There were two deaths noted in patients with uncontrolled diabetes and ischemic heart disease and cause of death was sudden cardiac arrest. In contrast to previous studies low rate of complications with resultant low mortality was observed in our study population. This is attributed to early control of airway with tracheostomy before development of complications along with ICU management. We propose that members of team treating tetanus should have low threshold to secure airway and tracheostomy should be performed early (within 24 hours) in all grade II (moderate) tetanus patients.

We fortify that tetanus can be prevented with primary routine vaccination of all age groups and booster doses at intervals.^{(7), (13), (14)}. This can be achieved by availability of effective health care facilities in rural areas, public awareness programs and an improved health care referral system.

Limitations of this study include small sample size and that we were unable to measure the tetanus antibody level of patients in our study because of non-availability of facility. However, these findings highlight essential predisposing factors of tetanus in humans.

Conclusion

We conclude that early control of airway with tracheostomy in grade II tetanus patients helped in better patient management with early recovery and decrease hospital stay with minimal morbidity. Additionally, owing to road-accidents as leading cause of disease, focus on One Health is recommended in the country.

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