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The impact of early tracheostomy on early weaning off ventilatory support and hospital stay in patients with isolated severe head injury

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Abstract

Aims /Objective: This study was conducted to define the impact of early tracheostomy on early weaning off ventilatory support and hospital stay in patients with isolated severe head injury.

Materials and Methods: A prospective clinical study conducted at Jinnah Postgraduate Medical Centre, Karachi over 7 years from August 2008 to July 2015 after obtaining approval from the hospital ethics committee. A total of 76 patients admitted with severe head injury (GCS <8) were enrolled in this study.

Results: A total of 76 patients were included in the study out of which 56 were male and 20 were female. Most of the injuries 50/76 (%) were secondary to RTA while the rest were due to fall from height18/76 or assault 8/76. All patients underwent tracheostomy on 3rd day of admission and weaning off ventilator support was started from 4th day. Out of 76 patients 50 patients were off vent by day 6, 10 by day 8, 7 by day 9 and 9 by day 12. Patients with early weaning off ventilator showed significant improvement in their conscious level with decreased hospital stay. In contrast patients with maximum days to wean developed complications and no significant improvement in conscious level till discharge from hospital.

3 patients died after termination of ventilator support and 2 developed surgical emphysema post tracheostomy. Out of patients with GCS 3-5, 2 died from respiratory complications and 1 from DVT with an overall mortality of 12%.

Conclusion: In patients with severe head injury who underwent early tracheostomy at day 3 showed significant improvement in prognosis when compared with other studies. Early tracheostomy in selected patients shows improved prognosis, lesser hospital stay and cost and recommended in patients with severe brain injuries.

Key words: RTA (Road traffic accident), ventilatory support, severe head injury, low glasgow coma stale, early tracehostomy

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Objective: This study was conducted to define the impact of early tracheostomy on early weaning off ventilatory support and hospital stay in patients with isolated severe head injury.

Introduction:

With increased standards and better health care, a higher number of the critically ill have improved morbidity and mortality. This has resulted in more patients requiring prolonged airway intubation and respiratory support.[1] Tracheostomy may facilitate weaning from mechanical ventilation and is one of the most common surgical procedures performed in the Intensive Care Unit (ICU). Tracheostomy is performed in 9% and 10% of all mechanically ventilated patients in the United States and the United Kingdom, respectively.[2-5]

As many as 10% of patients requiring at least 3 days of mechanical ventilation will eventually receive a tracheostomy for prolonged mechanical ventilation or airway support.[2] Mortality due to tracheostomy is rare and periprocedural complications requiring fluid or blood replacement occurring in 7% of all cases.[6] Timing of trache-

ostomy is controversial with single center trials showing benefit of early tracheostomy compared with larger multicenter studies failing to replicate such favorable outcomes.[6-10] Substantial debate exists over the indications and timing of tracheostomy in patients with traumatic brain injury. To avoid secondary brain injury from hypoxia and to provide a secure airway, most patients with Glasgow Coma Score (GCS) <8 are intubated and ventilated in the trauma bay during their evaluation and resuscitation.[2,4] In addition to the severity of the brain injury associated injuries, operations, and subsequent pulmonary complications determine the length of time these patients with traumatic brain injury remain intubated and ventilated. Some of these patients require only a secure airway whereas other patients need prolonged ventilatorysupport.

Early and late tracheostomy are both recommended in the literature.[11-14] The time range recommended for conversion to tracheostomy is from 3 days to 21 days[14,15] Broad general guidelines from a consensus conference on artificial airways recommends the use of translaryngeal tubes for airways up to 10 days and if the anticipated need for artificial airway will be greater than 21 days tracheostomy is preferred.[6] Advocates of early tracheostomy (within one and 7 days) claim the advantage of lower incidence of pneumonia and shorter duration of mechanical ventilation, intensive care unit (ICU) stay, and hospital stay.[11-13] Tracheostomy provides a secure airway and facilitates airway suctioning, mouth care, and patient mobility along with damage to vocal cords seen with endotracheal intubation.[15-18]

The decision to perform a tracheostomy in a critically ill patient should be individualized to the patient and pathology, balancing the patient's wishes, expected recovery course, risk of continued translaryngeal intubation, and surgical risks. Tracheostomy offers several important benefits over continued translaryngeal intubation, including improved patient comfort, better oral hygiene, improved ability to communicate, opportunity for oral feeding, and easier, safer nursing care. Less need for sedation and analgesia[11] and lower airway resistance (than through an endotracheal tube) may facilitate the weaning process[12] and help avoid ventilator-associated pneumonia. While prolonged respiratory failure is probably the most common reason for performing tracheostomy, other indications such as decreased level of consciousness, poor airway protective reflexes, and severe alterations in physiology associated with trauma and medical illness are also indications for tracheostomy. This study was designed to identify the impact of ET on the duration of mechanical ventilation, ICU stay and mortality for patients with isolated severe traumatic brain injury.

Materials/Methods:

A prospective clinical study conducted at Jinnah Postgraduate Medical Centre, Karachi over 7 years from August 2008 to July 2015 after obtaining approval from the hospital ethics committee. A total of 76 patients admitted with severe head injury (GCS <8) were enrolled in this study

The inclusion criteria was:

- Patients with Diffuse Axonal Injury (DAI) only without any surgical lesion

The exclusion criteria was:

- Age < 14 or >55 yrs
- Patients who had traumatic brain lesion(s) requiring surgery
- Prior CVA
- Pregnancy
- Patients who expired before tracheostomy was done

All patients were intubated and electively ventilated on admission. Initial diffuse axonal injury on CT scan wasconfirmed by repeat imaging at 24 and 48 hours. All were sedated and paralyzed, keeping O2, CO2 and FiO2 at recommended levels. Injection mannitol and anti convulsants were started on day 1 and mannitol was taperedoff gradually from day 3 after CT scan. Patients underwent tracheostomy at 3rd day of

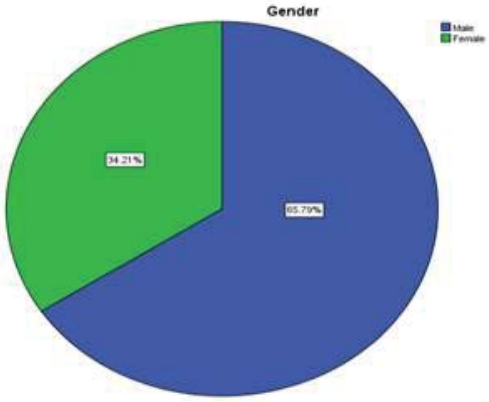
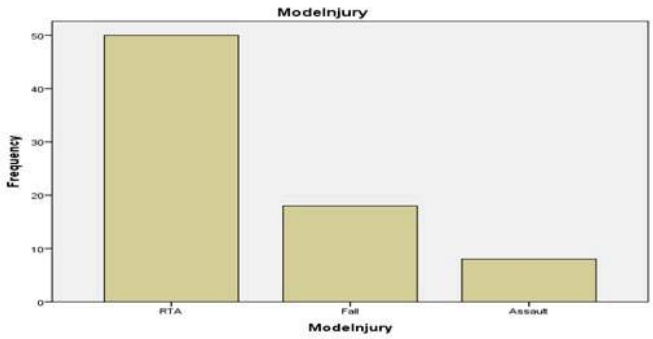


Figure I:



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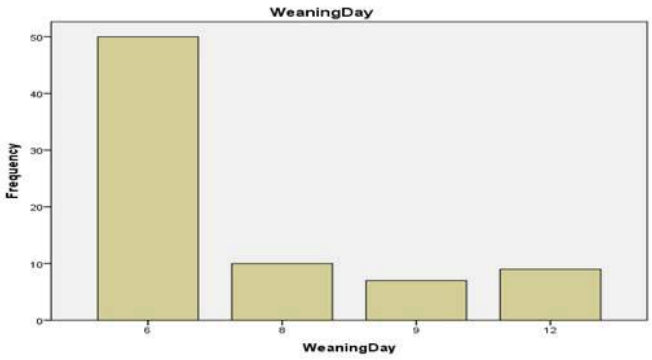

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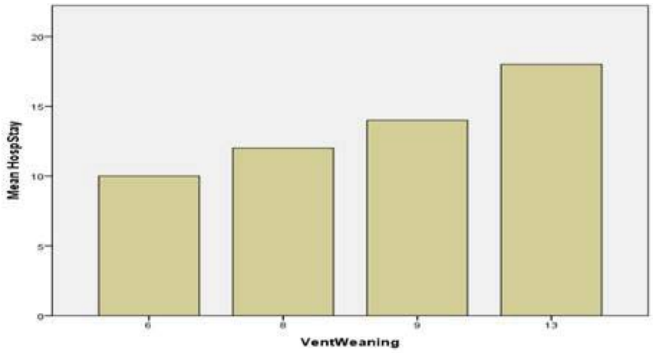

Figure 4:

admission and weaning of ventilator was initiated from day 4.

All patients were monitored closely till discharge for complications and the mean follow up period was 3 months. The data was collected via performas and analyzed using SPSS version 23.

Results:

A total of 76 patients were included in the study out of which 56 were male and 20 were female (Figure1). Most of the injuries 50/76 (%) were secondary to RTA while the rest were due to fall from height18/76 or assault 8/76 (Figure 2). The GCS was monitored daily till outcome in form of discharge or mortality. All patients underwent tracheostomy on 3rd day of admission and weaning off ventilator support was started from 4th day. Out of 76 patients 50 patients were off vent by day 6, 10 by day 8, 7 by day 9 and 9 by day 12 (Figure 3). Patients with early weaning off ventilator showed significant improvement in their conscious level with decreased hospital stay (Figure 4). In contrast patients with maximum days to wean developed complications and no significant improvement in conscious level till discharge from hospital.

3 patients died after termination of ventilator support and 2 developed surgical emphysema post tracheostomy. Out of patients with GCS 3-5, 2 died from respiratory complications and 1 from DVT with an overall mortality of12%.

Discussion:

The primary aim of the study was to define the impact of early tracheostomy in patients with isolated severe head injury in early weaning off ventilator support and duration of hospital stay.

RTA remained the major causative factor in head injury followed by falls and assault as occurs in the developed countries. Though a lot of patients present with polytrauma, our focus was on isolated severe head injury.

All patients underwent tracheostomy on 3rd day of admission and weaning off ventilator support was started from 4th day. Out of 76 patients, 50 patients were off vent by day 6, 10 by day 8, 7 by day 9 and 9 by day 12. Patients with early weaning off ventilator showed significant improvement in their conscious level with decreased hospital stay. In contrast patients with maximum days to wean developed complications and no significant improvement in conscious level till discharge from hospital.

Good quality single center studies[7] and larger methodologically less rigorous studies have suggested a reduction in the duration of mechanical ventilation, nosocomial pneumonia, and hospital length of stay (LOS) in patients undergoing early tracheostomy.[19] Several multi center randomized controlled trials and meta-analysis in mixed intensive care populations, however, failed to show a statistically significant reduction in the duration of mechanical ventilation.[7]

Multiple single center prospective and retrospective studies have shown an association of early tracheostomy with decreased use of sedation facilitating early weaning from mechanical ventilation.[20,21] Tracheostomy may reduce translaryngeal stimulation facilitating patient comfort, encourage patient autonomy, communication and has been associated with improved mobility and decreased length of intensive care stay.[22,23]

Small prospective and large retrospective studies in patients with brain injuries have shown that early tracheostomy reduced the duration of mechanical ventilation by reduced usage of sedation. This translated to a reduction in the length of stay in critical care and hospital after stroke and traumatic brain injury.[24-28] Despite these improvements after tracheostomy, there was no significant difference in long-term mortality, attributable to the diffuse nature of brain injury.

Patients with brain injury are at a higher risk to develop venticular associated pneumonia (in mechanically ventilated patients after traumatic brain injury up to 60%), and it is associated with significant morbidity[29] and mortality. While it is controversial, tracheostomy may reduce the secondary insults associated with a reduction in the incidence of VAP and unscheduled extubations after a brain injury.Tracheostomy is a safe and well-tolerated procedure in patients with brain injury, but caution should be exercised to reduce the incidence of periprocedural secondary neurological insults. When performed in an appropriate setting, there was no evidence of periprocedural insults during percutaneous tracheostomy in patients with brain injury.[30]

3 patients died after termination of ventilator support and 2 developed surgical emphysema post tracheostomy. Out of patients with GCS 3-5, 2 died from respiratory complications and 1 from DVT with an overall mortality of 12%. The risks of continued translaryngeal intubation need to be balanced with the acute surgical risks of performing tracheostomy and its long-term complications. One of the serious problems of balancing the risks and benefits of tracheostomy is that all studies of tracheostomy outcomes include a variable period of translaryngeal intubation prior to tracheostomy. This makes it impossible to separate the risk contributions from the endotracheal tube versus the tracheostomy. The risks of translaryngeal intubation undoubtedly increase with duration of intubation, but the magnitude and speed of the risk increase are influenced by patient, disease process, and environmental factors. Thus, optimal timing (early vs late tracheostomy) remains controversial.

Recent evidence suggests that early tracheostomy is not associated with a lower mortality in the ICU than late or no tracheostomy. But early, in comparison with late or no, tracheostomy might be associated with a lower incidence of

pneumonia.[31] This finding potentially challenges the practice of delaying tracheostomy beyond the first week after trans-laryngeal intubation in mechanically ventilated patients. However, further trials are needed before consensus and guidelines can be established.

Conclusion:

In the light of our study we conclude that patients with severe head injury who underwent early tracheostomy at day 3 showed significant improvement in prognosis when compared with other studies. Early tracheostomy in selected patients shows improved prognosis, lesser hospital stay and cost and recommended in patients with severe brain injuries.Expected intubation for more than 14 days is considered a common reason to consider a tracheostomy. But a clinician's ability to accurately predict this duration is poor early in the course of the complex disease process.

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Role and contribution of authors:

Dr Ali Afzal, resident, Department of Neurosurgery, JPMC, Karachi, collected the data and did the initial writeup.

Dr Muhammad Nadeem Munir, Assistant Professor, Department of Anaesthesiology, JPMC, Karachi, collected the references and helped in introduciton, methodology and discussion writing.

Dr Shoaib Malik, Assistant Professor, Department of Anaesthesiology, JPMC, Karachi, helped in collecting the data and references, critically review the article.

Dr Syed Raza H Rizvi, Associate Professor, Department of Neurosurgery, JPMC, Karachi, gave the final touchup and summerize the discussion and conclusion writing.

Dr Lal Rehman, Associate Professor, Department of Neurosurgery, JPMC, Karachi, mange the patients in collaboration with ICU team and helped in methodology, results and conclusion writing.

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