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Early Tracheostomy is beneficial in critical head injury patients; an institutional experience

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Abstract

Introduction: Tracheostomy is very common but life saving procedure for critically ill head injury patients in Neurosurgery ICU. Early tracheostomy is better in critically ill neurological patients with low GCS (<8) . It reduces ICU and hospital stay, chest infections and prolonged intubation related complication, speed up the recovery chances and reduces overall financial burden.

Material and Methods: This retrospective study was done in Mahatma Gandhi Medical College and Hospital Jaipur India from 1 June 2017 till 31 July 2019, a total of 92 patients included .They were intubated and mechanically ventilated critically ill head injury patients with GCS score below 8. This study included patients who had no previous history chest infection. Early tracheostomy, defined as that performed within 72hours of intubation usually we performed on 2nd or 3rd day of endotracheal intubation predicting prolong stay in ICU and dependency on ventilator

Results: Comparison of continuous clinical outcomes showed significant increase in length of ICU stay (t value= -10.041 , p value < 0.05), length of tracheostomy (t value=-7.019 , p value < 0.05), and length of hospital stay (t value =-4.431 , p value < 0.05) in late tracheostomy group as compared to early tracheostomy group at 5 % level of significance using two sided unpaired t test of difference of means. Comparison of categorical clinical outcomes showed significant increase in proportion of incidence of chest infections (z value=-2.332, p value < 0.05) and incidence of deaths (z value =-2.319, p value < 0.05) in Late tracheostomy group as compared to early tracheostomy group at 5% level of significance using z test for difference of proportions.

Conclusion: In conclusion early tracheostomy in critically ill head injury patients decreases the total days on ventilator ,reduces the length of ICU stay , hospital stay, financial burden and rate of chest infection.

Keywords: Early tracheostomy, Critical head injury, Neurosurgery ICU, Prolonged mechanical ventilation, prolonged intubated patients.

Introduction

Tracheostomy is very common but life saving procedure for critically ill head injury patients in Neurosurgery ICU. Egyptian first performed this procedure 3500 years ago Asclepiades of Bithynia describe it.[1,2]The first successful tracheostomy was attributed to Antonio Musa Brasavola in 1548.[3]Primary indication for tracheostomy in starting was emergency management of upper airway obstruction but now it has become regularly used to clear out pulmonary Secretions and to control airway in prolong mechanically ventilated patients. Timing of tracheostomy is still controversial, however performing early tracheostomy is still better in critically ill neurological patients with low GCS (<8). These patients require prolong mechanical ventilation and longer ICU stay. Hence early tracheostomy reduces ICU and hospital stay, chest infections and prolonged intubation related complications. Ultimately it speed up the recovery chances and reduces overall financial burden of already constrain family. In our hospital, we perform early tracheostomy in such patients within 72 hours of intubation predicting requirement of prolonged mechanical ventilation.

Material and Methods

This retrospective study was done in Mahatma Gandhi Medical College and Hospital Jaipur India from 1 June 2017 till 31 July 2019, a total of 92 patients included .They were intubated and mechanically ventilated critically ill head injury patients with GCS score below 8 but above 3. This study included patients who had no previous history chest infection. Early tracheostomy, defined as that performed within 72hours of intubation usually we performed on 2nd or 3rd day of endotracheal intubation predicting prolong stay in ICU and dependency on ventilator and those performed after three days defined as Late tracheostomy. Both conservative and operated patients were included .Only open tracheostomy was done performed after proper informed consent in ICU under anesthesia (sedation and paralysis) with the help of duty anesthetist. Tube size was kept same as that of ET tube. Step wise weaning off from ventilator was done after stabilization of patient from PCV/VCV to SIMV to CPAP then on T-piece with oxygen supplementation and lastly on room air.

Tracheostomy cultures were sent every third day irrespective of any symptoms and tube was changed immediately if signs of partial or complete obstruction were found. Chest X-ray performed immediately after tracheostomy and then every third day to see chest infection and ventilator associated pneumonia. We changed Antibiotics or upgrade if culture became positive. When patient was no longer dependent on oxygen support, he was then shifted to High Dependency Unit where initially managed with highly trained nursing staff and later on patient’s attendants, they were trained about every aspect of and tracheostomy care and patient care and then patient became finally discharged. Depending on improvement in patient’s general condition and requirement of suction to clear pulmonary secretions tracheostomy tube removed out in next few follow-up visits.

Results

A total of 92 patients underwent tracheostomy over a period of two and a half years, The mean age was 40.42 years (range 16 to 80).

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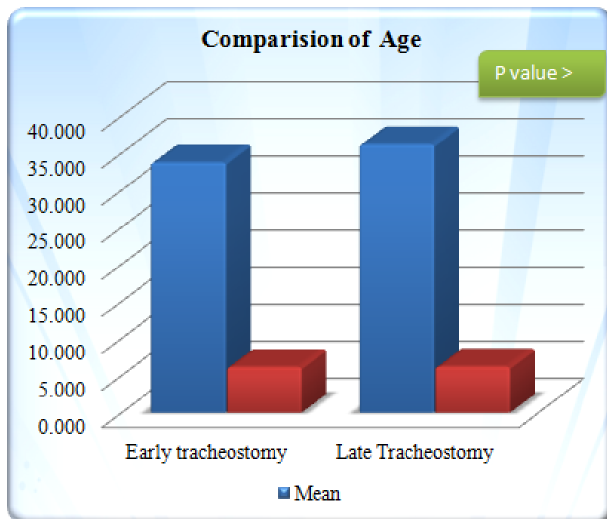
Age

Table 1

Age	No of patients
16-20	08
21-30	21
31-40	28
41-50	14
51-60	09
61-70	07
71-80	05
Total	92

Early tracheostomy was done in74 patients and Late was done in 18 patients. Comparison of General Characteristics in two groups:



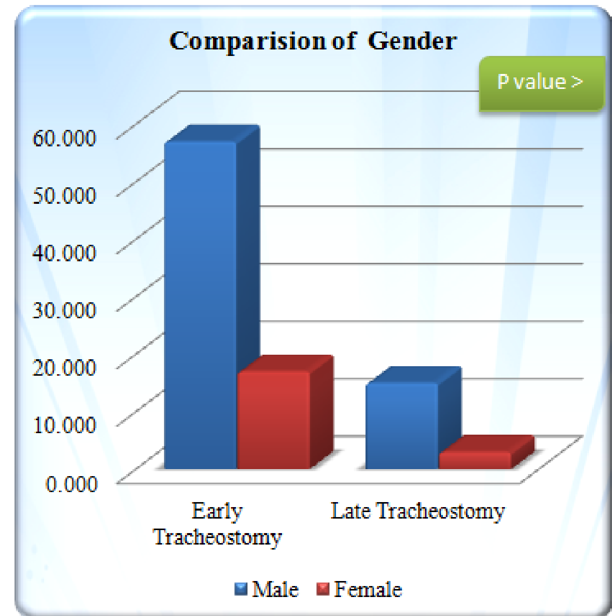
There were 69 males and 23 females with M: F:: 3:1

Gender

Table-2

	Early Intubation	Late Intubation
Male	57	15
Female	17	3

Z value =0.627(p value > 0.05)



Comparison of Clinical Outcomes in our study

Table 3: Continuous variables

Parameters	Early Tracheostomy			Late Tracheostomy			t value	p value
		Mean	Std Dev		Mean	Std Dev		
Length of ICU Stay	3-18 days	11.378	5.509	6-40 days	26.889	7.251	-10.041	< 0.05
Length of Tracheostomy	20-90 days	41.054	10.844	24-98 days	60.944	10.513	-7.019	<0.05
Length of Hospital Stay	15-40 days	26.351	7.899	23-45 days	35.556	7.928	-4.431	< 0.05

Table 4: Categorical variables

Parameters	Early Intubation		Late Intubation		Z value	P value
Incidence of Chest infections	12 pt.	0.108	5 pt.	0.389	-2.332	<0.05
Incidence of Deaths	3 pt	0.067	1 pt	0.333	-2.319	<0.05

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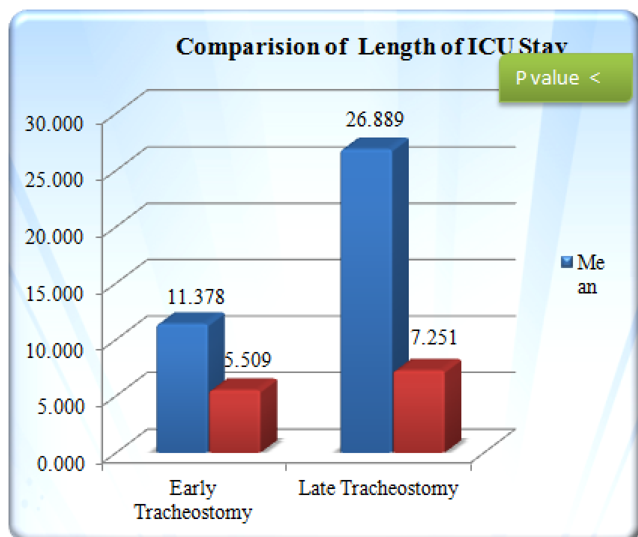

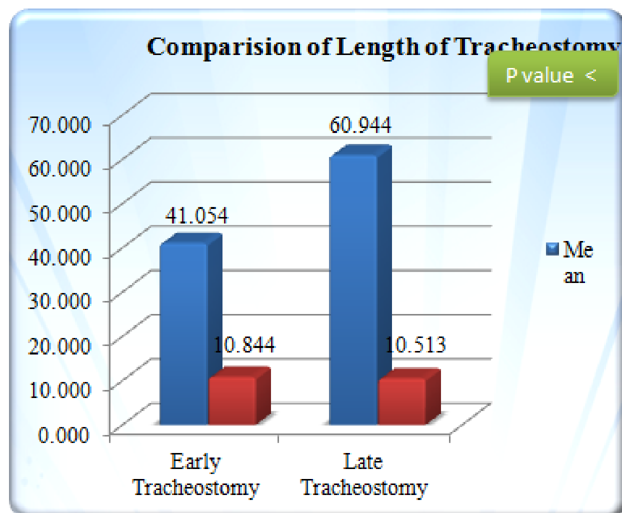

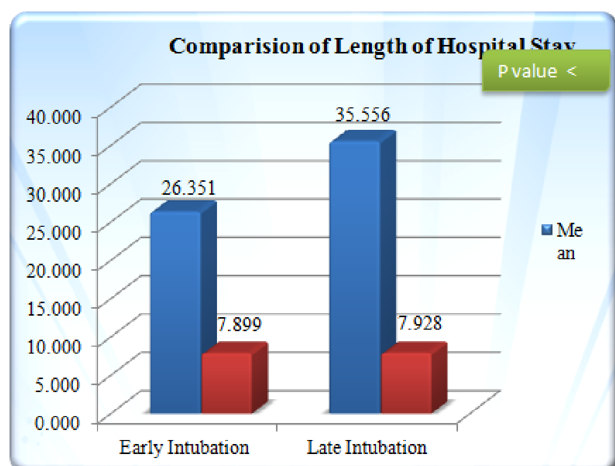

The two groups are created on the basis of time of intubation: Early intubation (< 72 hours, n1= 74) and Late intubation (> 72 hours, n2= 18). The continuous parameters are measured as mean and standard deviations and categorical parameters are measured as proportions. The parameters are compared at 5% level of significance using the MS Excel version 2010.

Comparison of general characteristics showed no significant differences between two groups , age (p-value > 0.05) and gender (p- value > 0.05) at 5% level of significance.

Comparison of continuous clinical outcomes showed significant increase in length of ICU stay (t value= -10.041 , p value < 0.05), length of tracheostomy (t value=-7.019 , p value < 0.05), and length of hospital stay (t value =-4.431 , p value < 0.05) in late tracheostomy group as compared to early tracheostomy group at 5 % level of significance using two sided unpaired t test of difference of means.

Comparison of categorical clinical outcomes showed significant increase in proportion of incidence of chest infections (z value=-2.332, p value < 0.05) and incidence of deaths (z value =-2.319, p value < 0.05) in Late tracheostomy group as compared to early tracheostomy group at 5% level of significance using z test for difference of proportions.

Discussion

Tracheostomy commonly indicated in critically ill head injury patients in which long term mechanical ventilation required in ICU .[4]Prolong ventilation define as approximately 10 days or longer[5] but it can be as short as 24 hour.[6]

Elective tracheostomy is strategy to reduce respiratory injury and undesired consequences of prolonged translaryngeal intubation like ventilator associated pneumonia,[7]sinusitis ,[8]tracheal and subglotic stenosis.[9]There are many other advantages of early tracheostomy like lower airway resistance ,easier tracheal suction, better nursing care, improve oral

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feeding but it has complications also like stomal bleeding, infection, pneumothorax, pneumomediastinum, tracheomalacia, tracheo-esophageal fistula or catastrophic arterial fistula.[10]

Best time to performed tracheostomy is still not clear 4] there are two categories described "early" and "late" for the timing of tracheostomy in various literature There is no predefined cut off duration that defines early or late tracheostomy. [11]Of extremes, Rumbak et al[12] has regarded early tracheostomy as that performed within 2 day, and Mehta[13] et al as that done within 21 days.

In our hospital we usually performed early tracheostomy in critically ill head injury patients with in first 2-3 days for patients in which early recovery is not anticipated . In other patients tracheostomy done later on between 4- 10 days or as when needed considering factors like spontaneous breathing trial, trial of weaning from ventilator , tracheal secretions , chest condition and patient's neurological condition.

According to Bourdeka [10] et al., early tracheotomy decreases the total days in the ventilator patients, length of stay at the ICU and it shorter the hospital stay and lower mortality rates.[14]

In our study we found that ICU stay, hospital stay and total tracheostomy time was significantly shorter in early tracheostomy group and Chest infections incidence also lower in the group of patients who underwent tracheostomy early. Studies reported that tracheostomy is to be the most effective airway for the removal of respiratory secretions[15] and it facilitated easier suctioning of secretions along with it reduces dead space volume so helpful in early weaning.[16]

Chances of ventilator associated pneumonia are higher in prolonged ventilated head injury patients [17] in our study we found that significantly higher chances of chest infection in late tracheostomy group though we didn't compared microorganisms in both group but most common organisms found in our tracheal culture study were Acinetobactor baumanii and Klebsiella pneumonia hence we changed the antibiotic according to sensitivity.

Death rate was also significantly lower in early tracheostomy group. Though we didn't calculated the cost of stay in each patient but due to significantly shorter ICU stay, hospital stay and early recovery indirectly overall financial burden of family reduced.

Conclusion

In conclusion early tracheostomy in critically ill head injury patients decreases the total days on ventilator ,reduces the length of ICU stay , hospital stay, financial burden and rate of chest infection. Judicious decision of early tracheostomy if taken in critically injured patients then It also improves the chances of recovery .

Abbreviations- ICU-Intensive Care Unit, PCV-Pressure Control Ventilation, VCV-Volume Control Ventilation ,SIMV-Synchronized Intermittent Mandatory Ventilation

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