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Prefer early tracheostomy: Comparative study of early and late tracheostomy with poor GCS patients in intensive care units in two hospitals

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Abstract---Tracheotomies are commonly performed for the patients with low GCS who needs a respiratory support. Still over the period there existed a controversy when to do tracheotomy? Early or late. Our study aimed at reassessing the complications of delayed tracheotomy versus the advantages of the early tracheostomy. This was a prospective comparative, observational study comprising of 140 patients in 2 different hospitals admitted to the neurosurgery ICU with poor GCS. Group A: Early tracheostomy (2-5 days) and Group B: Late tracheostomy (7-14 days). Both groups were followed ,Early tracheostomy required a mechanical ventilator support for average 5-8 days with early weaning whereas late tracheostomy required 12-20 days of mechanical ventilator, VAP was significant higher in group B with increased financial burden. We concluded that, it's better to anticipate and go for early tracheostomy for the better outcome of the patient.

Keywords---tracheostomy, ventilator associated pneumonia, mechanical ventilation, head injury, glasgow coma scale, intensive care.

Introduction

Prolonged tracheal intubation is frequently required for the patients in an intensive care unit (ICU) for various reasons including assisted ventilation, protection of airway, and tracheo-bronchial toilet^{1, 2} The ideal time to perform tracheostomy has been a controversial topic ever since . Even though this is a commonly performed surgery, there is no definite standard of care as to when it should be done.³ Tracheotomy has a number of advantages in patients requiring prolonged mechanical ventilation.^{4, 5, 6} Some earlier studies in ICU patients suggested that early tracheotomy was associated with better outcomes than late tracheotomy ^{7, 8,9,10}. In 1989, the National Association of Medical Directors of Respiratory Care recommended that translaryngeal (endotracheal) intubation be used only if artificial ventilation is required less than 10 days. Tracheostomy should be placed in patients who require ventilation 21 days or longer.⁷ The five most recent systematic reviews of RCTs comparing early and late tracheotomy yielded conflicting results^{11, 12,13,14,15}. However, these meta-analyses combined studies using different timings of early (within 48 hours¹⁶, within 4 days, and between 6 and 8 days¹⁸ versus late interventions, so that the results were difficult to interpret.

A meta-analysis in which only studies with early tracheotomy performed within 4 days or 7 days were included reported no significant differences between early and late tracheotomy¹⁹. Various studies around the world compared benefits of early tracheostomy, according to the study conducted by Rodriguez, et al.²⁰ and Ahmed N, et al.²¹. Early tracheostomy was conducted on subjects within 7 days, and late tracheostomy after 7 days.^{20, 21} In a study by Bickenback, et al²² found that patients who had early tracheostomy, less than or equal to 4 days, had a shorter length of ventilation, reduced ventilator associated pneumonia, reduced sepsis and shorter length of ICU stay as compared to patients with late tracheostomy (greater than or equal to 10 days)²². Hence, this present study was carried out to find out the advantages and complications of early tracheostomy (2-5 days) versus late tracheostomy (7-14 days) to determine the ideal time for performing tracheostomy.

Methods and Materials

The study was a prospective randomized comparative observational study comprising of 140 patients in two groups in two different hospitals. Patients in the study were cases of head injury with poor GCS ranging between 5-10 were taken. Patients with abdominal trauma, chest trauma, malignancy elderly patients with obstructive and restrictive lung diseases were excluded from the study; informed consent from patient's relative was obtained. The study's subjects were divided into two groups, each group consisting of 70 patients.

Group A: Early tracheostomy (2-5 days) in one hospital and Group B: Late tracheostomy (7-14 days) in other hospital. All patients underwent open

tracheostomy.

Statistical analysis

Descriptive statistical analysis was carried out on this study using a chi-square test, fisher exact test, and a student t test (Two tailed, independent). Data analysis was carried out using statistical software namely, Statistical Package for Social Science (SPSS) 15.0.

Results

This study was comprised of 140 subjects, with ages between 14 to 52 years with a mean age in Group A of 26.25 ± 16.35 years and in Group B being 25.12 ± 17.50 years. There was a male predominance in both groups. In Group A, the male-to- female ratio was (56 to 14) 80% to 20% and in Group B the male-to-female ratio was (60 to 10) 85.71% to 14.29% as shown in the table no 1 along with the APACHE II and GCS scores.

Table 1
Demographic and Baseline Characteristics

	Early Group (n=70)	Late Group (n=70)	P
Male : Female	56 (80.0%): 14 (20.0%)	60 (85.71%): 10 (14.29%)	>0.05
Mean Age (Years)	26.25 ± 16.35	25.12 ± 17.50	>0.05
Mean APACHE II Score	17.0±5.4	16.3±6.2	>0.05
Mean GCS Score	6.1±2.4	6.4±2.3	>0.05

Comparisons between the two groups were made using Pearson Chi-Square Test.

Table 2
Comparative Assessment of the Early Vs. Late Tracheostomy Group

	Early Group(A) (n=70)	Late Group(B) (n=70)
Total ventilator (days)	5.3 ±3.2	18.2 ±11.4
Post ventilator (days)	9.2 ±5.4	10.5 ±9.4
Admission to decanulation (days)	19.5 ±14.2	24 .5 ±21.8 (Except one patient took 4 months)
Ventilator Associated	4 (5.71%)	22(31.14%)

Pneumonia (patients)		
Tracheostomy complication (patients)	Fistula in one patient	Associated with Mortality in one patient as the patient pulled Tracheostomy tube and died of excessive bleeding.
Mortality (Deaths)	5(7.14%)	14(20%)

Comparing the total days of ventilatory support in group A was 5.3 ± 3.2 day as compared to 18.2 ± 11.4 days , the days from admission to the decanulation in groups were 19.5 ± 14.2 and 24.5 ± 21.8 In A and B groups (we excluded one patient whom was decanulated after 4 months). Ventilator Associated Pneumonia were very high in group B as compared with group A (patients) 22(31.14%) against 4 (5.71%). High rates of Ventilator associated Pneumonia was associated with late group b patients the common organisms were High rates of Ventilator Pneumonia was associated with pathogens causing VAP, their frequency ,Pseudomonas, S. aureus , Klebsiella spp., E. coli, Proteus spp , Streptococcus, Acinetobacter species and others were seen which increased the morbidity of the patient , we had to upgrade our antibiotics increasing the cost of the treatment to the patient.

Discussion

The present prospective study showed that early tracheostomy was associated with a shorter duration of stay , shorter mechanical ventilation, lesser use of antibiotic, lesser cost to the patient. Tracheostomy provides early airway protection and has been found to decrease the need for prolonged mechanical ventilatory support.^{23, 24, and 25}. In our study the subjects who underwent early tracheostomy (2-5 days) recovered earlier in contrast to subjects who underwent late tracheostomy (7 to 14 days). In the early tracheostomy group, the patients required 5.3 ± 3.2 days of average additional ventilatory support, whereas in the late tracheostomy group where 18.2 ± 11.4 days of additional support was required, In another study where poor GCS patients were operated in the 1st center with group A patients the days of ventilation were 4-7 days on average²⁶. We conducted the study in 2 intuitions which showed the results similar to Bouderkha MA et al²⁷. According to single institution reports, early tracheotomies decrease the total days of mechanical ventilation or mechanical ventilation time after development of pneumonia, and the length of ICU stay in patients with severe TBI. Similar findings were observed by Mitka K., et al.²⁹too found a reduction in the duration of mechanical ventilation favoring the early tracheostomy group compared to late tracheostomy. The benefits associated with tracheostomy contributed to better weaning from ventilatory support, improved bronchial suctioning and psychological advantages for the severely ill and recovering ICU patients.³⁰ Ventilator Associated Pneumonia were very high in group B as compared with group A (patients) 22(31.14%) against 4 (5.71%).Whereas most of the studies stated no or minimal differences with the VAP which was against most studies.^{13,14,15,20.}

There are a number of reasons to perform this study in our setup the most

important reason was to maintain the airway in stuporous patients in The ICU so that they should not have VAP. It is postulated that in severe TBI, the airway immune system becomes compromised; thereby increasing the potential for colonization and infection.³¹ Tracheostomy allows deeper suctioning of airway secretions. An early tracheostomy reduces the dead space ventilation and prevents laryngeal complications. Tracheostomy also decreases the work of breathing, airway resistance, and increases minute ventilation.^{32,33} Our study also observed that the length of stay in the hospital was shorter in the early tracheostomy group, the average being 19.5 ± 14.2 for group A and 24.5 ± 21.8 for the group B (Except one patient took 4 months).

This ended up in a lower cost of hospitalization and treatment. This observation has been supported by Brook, et al.⁷ and colleagues who showed that those subjects who underwent early tracheostomy (less than 10 days, mean 5.9 days) with that or late tracheostomy (greater than 10 days, mean 16.7 days) showed a decreased in both duration of mechanical ventilation (28.3 vs. 34.4 days) and ICU length of stay (15.6 vs. 29.3 days). This was reflected in a lower cost of hospitalization for the patients who received tracheostomy within 10 days.³⁶ Opposite to our conclusions Tae Hyung Kim et al. in their study in 2009 stated that early tracheostomy did not reduce total time of mechanical ventilation, ICU stay, pneumonia incidence, and GOS.³⁶ whereas Kapil G Zirpe et al³⁴, in their study in the year 2017 stated that neurotrauma patients might be associated with shorter length of stay in NTU and hospital, and shorter duration of mechanical ventilation however there was no mortality difference.³⁴ Mortality rates in early tracheostomy and late tracheostomy were (35% vs. 29.7%; $P=0.480$) in their study. In our study the mortality rates were 5(7.14%) and 14(20%). Based on the above evidence and literature review, we advocate performance of early tracheostomy within 2 to 5 days after endotracheal intubation, as opposed to late tracheostomy, since it has been observed to reduce the risk of major complications and facilitate early weaning off the ventilator. It also minimizes the duration of hospitalization leading to more cost effective care.

Conclusion

Neurotrauma patients admitted to the ICU whom have undergone early tracheostomy are associated with shorter length of stay in hospital requires shorter duration of mechanical ventilator, decreased rate of ventilator associated pneumonia compared to the patients who had undergone delayed Findings imply that early tracheostomy for severe brain injury should be a routine policy. We would like to conclude that early tracheostomy produces a shorter duration of mechanical ventilatory support. Thus, it facilitates early weaning, a shorter stay in the hospital and decreased cost compared to late tracheostomy.

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