Original Research Article

Benefits and challenges associated with the timing of tracheostomy in critically ill patients: experience at a tertiary intensive care unit

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ABSTRACT

Background: Prolonged intubation in intensive care units (ICU) leads to damage to the airways. Tracheostomy is performed with an aim to facilitate pulmonary toileting and also protect the upper airways from the associated ill effects of prolonged endotracheal intubation. The timing of this procedure is a matter of considerable debate and varies according to different centres.
Methods: 50 patients were assessed. 34 belonged to the early group and 16 belonged to the late group. The study was carried out in the ICU of a tertiary care referral centre. The timing of occurrence of ventilator associated pneumonia (VAP), duration of ICU stay and duration of tracheostomy and the was compared between the early and late groups respectively.
Results: It was found that early tracheostomy leads to reduced ICU stay and delayed occurrence of VAP. The results were statistically significant. Additionally, it was also observed in this study that early tracheostomy leads to reduced duration of tracheostomy as compared to the late group although not statistically significant.
Conclusions: Due to large clinical heterogeneity amongst cases admitted to the ICU, the timing of tracheostomy is different in different centres. Hence, guidelines need to be formulated in order to perform tracheostomy in critically ill patients in order to prevent the demerits associated with late tracheostomy such as prolonged ICU stay, early occurrence of VAP and late decannulation. In addition to this, economic advantages also need to be considered as most of the population in developing countries do not have universal health insurance.

Keywords: Tracheostomy, Ventilator associated pneumonia, Intensive care units

INTRODUCTION

Admission to the ICU happens due to a variety of reasons. Often patients are critically ill and require aggressive monitoring. Ventilation of the airways is one parameter which is constantly looked after by the team of intensivists, admitting doctor and the nursing care providers. Many a times patients are intubated in order to facilitate pulmonary ventilation. According to the guidelines by the French expert panel, in conditions of chronic respiratory failure, a multidisciplinary team discussion has to be done in order to perform tracheostomy.[1] However, prolonged intubation has its own disadvantages. This is wherein tracheostomy has proven to be advantageous to the patient.[2] It aids in early recovery of the patient in the form of early weaning off mechanical ventilation, early resumption of speech and swallowing besides aiding in easy pulmonary toileting. Also, it avoids oropharyngeal and laryngeal injury thus, minimising laryngeal granulomas and stenosis.[3-5]

The timing as to when to perform the tracheostomy is debated. Also, on an average the procedure should be performed after 4 days of ICU stay.[1] A lot of centres have devised their own protocols. According to McWhorter AJ in 2003, by convention, a patient undergoes tracheostomy if he is mechanically ventilated for more than two weeks.[6]

However, according to a consensus conference held in 1989, it was recommended that for those who require ventilation for more than 10 days, it is recommended to perform intubation and alternatively it was also suggested that for more than 21 days of translaryngeal intubation, a tracheostomy is recommended.[2] But various studies and systematic reviews have been performed assessing the benefits of early versus delayed tracheostomy. According to the Cochrane review done in 2015 on early versus late tracheostomy, the data was analysed from various studies carried out at different centres and 'early' tracheostomy was defined if the procedure was done within 10 days of translaryngeal intubation and 'late' tracheostomy was considered if the procedure was done after 10 days.[7] Due to vast differences in the types of cases admitted to the ICU in different centres and also the timing of referral of the patient for an elective tracheostomy by the treating doctor, there is a lot of difference among various centres in assessing the benefits of early versus late tracheostomy. This study is an attempt to find out whether early tracheostomy leads to any potential benefits when performed on patients admitted in the ICU.

METHODS

The objective of this study was to compare the benefits of early versus late tracheostomy in terms of VAP, ICU stay and timing of decannulation.

Study design

The study was a prospective study.

Study period

The study period was 1 year from May 2019 to May 2020.

Sample size

We analysed 50 patients in this study who were admitted in the ICU of KLEs Dr. Prabhakar Kore Hospital and Medical Research Centre, Belagavi, Karnataka.

Selection criteria

The patients were divided in two groups. Those patients who underwent tracheostomy within ten days of intubation were in the 'early' group and those who underwent tracheostomy after 10 days of intubation were in the 'late' group.

Ethical approval was obtained by the Institutional Ethics Committee. The various parameters analysed were age, diagnosis on admission to ICU, duration of ICU stay, duration of tracheostomy and timing of occurrence of VAP in both the groups separately.

Analysis was carried out using IBMTM SPSS (statistical package for social sciences) version 24.

RESULTS

A total of 50 patients were studied of which there were 34 patients in the 'early' group and there were 16 patients in the 'late' group.

In the 'early' group, the mean age and male: female ratio was 28.19 years and 3.24 whereas in the 'late' group it was 30.06 years and 3.0 respectively (Table 1).

Table 1: Showing number of patients in both the groups.

Early		Late	
Number	**Percentage (%)**	**Number**	**Percentage (%)**
34	68	16	32
Females=8	23.52	Females=4	25
Males=26	76.41	Males=12	75
Total=34	100	Total=16	100

Most of the patients who underwent tracheostomy in both the groups were admitted with head injury as a result of road traffic accident. In the 'early' group this contributed to 41.18% cases whereas in the 'late' group this contributed to 50% of the cases. Other conditions where the procedure was performed included gullain-barre syndrome, intracranial haemorrhage, diphtheria, hydrocephalus, pneumonia, empyema due to tuberculosis and mitochondrial diseases respectively (Table 2).

Table 2: Showing various conditions where the tracheostomy was performed.

Diagnosis	Early (%)	Late (%)
Guillain barre syndrome	6(17.64)	0
Intracranial haemorrhage	6(17.64)	1 (6.25)
Diphtheria	3(8.82)	0
Hydrocephalus	1(2.9)	0
Pneumonia	3(8.82)	4(25)
Poisoning	1(2.9)	1(6.25)
Road trafiic accident with head injury	14(41.18)	8(50)
Empyema due to tuberculosis	0	1(6.25)
Mitochondrial disease	0	1(6.25)
Total (%)	34(100)	16(100)

The type of tracheostomy significantly influenced on the occurrence of VAP. In the 'early' group VAP was seen on day 6.87 (approximately 1week) as opposed to on day 4 in the 'late' group. The results suggest that those who underwent a late tracheostomy had an earlier chance of getting VAP. The result was statistically significant with a p value of 0.017 (Table 3).

Table 3: Showing relation between the timing of tracheostomy and onset of VAP.

Timing of tracheostomy	Total number	Mean day of onset of VAP	Standard deviation
Early	34	6.87	3.9
Late	16	4	3.7
Total	50 (p value=0.017)		

The mean day of performing the tracheostomy surgery in the 'early' group was on the 6th day whereas in the 'late' group it was on the 14th day respectively.

While comparing the mean ICU stay in both the groups, it was found that in the 'early' group it was 23.1 as opposed to 36.25 in the 'late' group indicating that patients who underwent an early tracheostomy had a shorter duration of ICU stay. The results were statistically significant with a p value of 0.003 (Table 4).

Table 4: Showing relation between the timing of tracheostomy and the duration of ICU stay.

Timing of tracheostomy	Total number	Mean ICU stay (days)	Standard deviation
Early	34	23.1	13.96
Late	16	36.25	13.41
Total	50 (p value=0.003)		

Analysis of the average duration of tracheostomy in both the groups showed that those who underwent 'early' tracheostomy had a mean duration of 25.90 days as compared to 32.667 days in the 'late' group. The p value was 0.103 (Table 5).

Table 5: Showing relation between the timing of tracheostomy and the duration of tracheostomy.

Timing of tracheostomy	Total number	Mean duration of trachea-stomy	Standard deviation
Early	34	25.90	16.626
Late	16	32.667	11.515
Total	50 (p value=0.103)		

Though the results are not statistically significant, it suggests that patients undergoing an early tracheostomy have a lesser duration of being on the tracheostomy tube for ventilation.

In both the groups, 3 patients expired and 1 patient had prolonged tracheostomy. There was no procedure related complication noted in any of the cases in either of the groups and the surgical procedure was performed on the patients by the same operating team.

DISCUSSION

Our analysis was performed on two groups of patients who underwent 'early' tracheostomy within 10 days of ICU admission and 'late' tracheostomy on those who underwent the procedure after 10 days. The male: female ratio in the two groups was comparable. Most of our patients who underwent tracheostomy were admitted to the ICU with head injury secondary to road traffic accidents. This is because our institution is a tertiary care referral centre and also due to its close proximity with the national highway.

The mean day was 6th and 14th day respectively in the 'early' and 'late' groups. Various studies have defined different timings for 'early' and 'late' groups. This is due to the differences in the timing of referral of the patients to the otolaryngologist for the procedure by the treating doctor. According to a Cochrane review of early versus late tracheostomy, those who underwent tracheostomy before 10 days were considered early and those after 10 days were condsidered 'late'. There were difficulties in comparing the various studies due to heterogeneity in the data.[7]

It is seen in the group that underwent 'early' tracheostomy, the duration of ICU stay was less (mean- 23.1 days) compared to the 'late' tracheostomy group (mean- 36.25 days). According to a study done by Rumbak, the mean duration of ICU stay was 4.8 days and 16.2 days in the early and late groups respectively.[8] A similar study done by Trouillet, showed a mean duration of 23.9 days in the early group and 25.5 days in the late group.[7] 2 other studies have been done comparing the discharge from the ICU on day 28. A study by Terragni, showed 101 out of 209 patients could be discharged from the ICU in the early group as opposed to only 82 out of 210 patients in the late group.[9] Another study by Zheng, showed 39 out of 58 patients who could be discharged in the early group as compared to 29 out of 61 in the late group.[10] Since most of our patients were from the neuro-ICU, most of them did not get admitted due to chronic lung disease or severe lung injury. Usually, these patients undergo tracheostomy due to their low glassgow coma scale and higher risk of aspiration. According to Brook et al early tracheostomy in medical ICU patients reduced the hospital stay and also proved to be more economical by reducing costs to the patient.[11] According to Hsu CL et al, late tracheostomy predisposes to inability to wean off the ventilatory support and in turn contributes to ICU mortality when the period of intubation exceeds 21 days. Also, they concluded in their study that the duration of endotracheal intubation prior to performing tracheostomy correlated with the length of ICU stay. A prolonged intubation might also be an etiology for a defective local barrier and endobronchial hygiene which accelerates the probability of bacterial infection. The risk of VAP was seen higher in the failure to wean group.[12]

The mean day of occurrence of VAP in our study was on the 4th day in the 'late' group. This was significant as opposed to the 'early' group where VAP was seen on an average on day 6.87. Georges et al in their study of 135 patients observed that the reasons for nosocomial pneumonia was that the tracheostomy was performed relatively late (at 18±3 days). One more possible reason could be a prior diagnosis of pneumonia on admission to the ICU itself.[13] Rodriguez et al in their study reported that VAP was seen in 96% of the cases who underwent late tracheostomy as opposed to 78% of the cases who underwent early tracheostomy.[14] In a bench to bedside review of early tracheostomy done by Shirawi N et al, it was seen that VAP is more likely to occur in greater probability in those who underwent late tracheostomy.[15]

According to the review done by Shirawi et al on 6 studies, 2 were prospective randomized control trials and 4 were retrospective observational studies, it has been observed that early tracheostomy reduced the duration of mechanical ventilation.[15] Also, studies done by Rumbak et al, Rodriguez et al, Bouderka et al, and Saffle et al collectively showed that early tracheostomy had reduced the duration of days of mechanical ventilation as opposed to late tracheostomy.[8,14,16,17]

In our study, since we had most of the cases from the neuro-ICU, it was observed that in those patients in whom prolonged assistance with respect to ventilation is required, an early elective tracheostomy is better in reducing overall ICU stay, better chances at decannulation and also in reducing the duration of mechanical ventilation. This also translates into reduced ICU costs which would prove beneficial to patients in a country like India wherein most of the patients fall outside the coverage of health insurance

Limitations of this study were larger sample size and a multicentric study done across a developing country would give better conclusions.

CONCLUSION

Due to large clinical heterogeneity amongst cases admitted to the ICU, the timing of tracheostomy is different in different centres. Hence, guidelines need to be formulated in order to perform tracheostomy in critically ill patients in order to prevent the demerits associated with late tracheostomy such as prolonged ICU stay, early occurrence of VAP and late decannulation. In addition to this, economic advantages also need to be considered as most of the population in developing countries do not have universal health insurance.

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