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Outcome of Early versus Late Tracheostomy in Neurosurgical critical Patient

The Study was conducted to evaluate the effectiveness of early tracheostomy and of late tracheostomy in neurosurgical critical patients. A retrospective chart review of Neurosurgical critical patients who underwent Tracheostomy from September 2017 to March 2019. Patients were divided into two groups: early tracheostomy occurring within 7 days and late tracheostomy after 7 days of mechanical ventilation. Two groups were compared in terms of days under ventilation, Complication and outcome. There were 30 patients over 18 month period .Age range from 18years to 86 years with means of 52.93 ± 16.59 years. Male: Female ratio was 3:1. 12 (40%) had Early tracheostomy (ET) and 18 (60%) had Late tracheostomy (LT). Day on ventilation on ET group was 14.8 ± 10.25 while on LT group was 20 ± 8.4 . Procedure related complication were more common in Late tracheostomy group with 11.11% and 16.66% tracheostomy site hematoma and pneumonia respectively, and subcutaneous emphysema were 8.33% of LT versus a 5.55% of ET, Stomal site infection were 11.11% in late tracheostomy versus 8.33% in ET. Early tracheostomy compare to late tracheostomy reduces the days on Mechanical ventilation, the ICU length of stay, hospital stay and procedural related complication, but it does not affect the mortality rate.

Key words: tracheostomy, neurosurgery, ventilation, infection

The maintenance of airway is essential for management of the neurosurgical patients. Patient often required prolonged intubation or tracheostomy.⁸ Early versus late tracheostomy is always a debate between neurosurgeons for neurologic recovery.⁵ An early tracheostomy raises the concern of performing an unnecessary procedure on a patient with the potential for rapid neurologic recovery. In most cases, the decision is

clear and easily made, but there are clinical situations where the decision of when to perform a tracheostomy is less well defined and, unfortunately, the scientific evidence is lacking.¹⁸ Early tracheostomy, when performed in selected neurosurgical patients with poor GCS scores, enables rapid weaning from ventilator support.^{10,17-18} Additionally, early tracheostomy may have a beneficial role in decreasing the incidence of nosocomial pneumonia and may reduce the

days of ventilation and financial burden.^{2,12} Aim of study is to evaluate the effectiveness and safety of early (≤ 7 days or during neurosurgical period) versus late (>7 days after tracheal intubation) tracheostomy in neurosurgical critical patient whose admission GCS is low or predicted to be on prolonged mechanical ventilation.

Methods:

A retrospective chart review was performed on all Neurosurgical critical patients who underwent Tracheostomy for having low GCS or anticipated prolonged mechanical ventilation as a result of cerebral insult in our tertiary referral center, Lumbini Medical College and Teaching Hospital, from September 2017 to March 2019.

	Early Tracheostomy(≤ 7 days)	Late(>7 days)		P value
Age	(n1)	(n2)		
<20	2	0	2 (6.66%)	
21-30	0	1	1 (3.33%)	
31-40	1	2	3 (10%)	
41-50	4	4	8 (26.66%)	
51-60	3	4	7 (23.33%)	
61-70	1	3	4 (13.33%)	
71-80	1	3	4 (13.33%)	
>80	0	1	1 (3.33%)	
Sex				
Male	9	14	23 (76.66%)	1.00
Female	3	4	7 (23.33%)	1.00
Admission GCS				
≤ 8	8	3	11(36.66%)	0.008
9-12	3	10	13(43.33%)	0.14
≥ 13	1	5	6(20%)	0.35
Tracheostomy GCS				
≤ 8	8	3	11(36.66%)	0.008
9-12	3	14	17(56.66%)	0.008
≥ 13	1	1	2(6.66%)	1.000
Diagnosis				
Diffuse Axonal injury	0	1	1 (3.33%)	1.00
Subdural hematoma	6	2	8(26.66%)	0.03
Brain contusion/burst lobe	1	2	3(10%)	1.00
Basal ganglia/thalamic hemorrhage	2	8	10(33.33%)	0.23
Cerebellar hemorrhage	2	1	3(10%)	0.54
Cerebral/cerebellar Infraction	1	2	3(10%)	1.00
Intracranial infection/abscess	0	2	2(6.66%)	0.50
Indication				
Low GCS	9	1	10(33.33%)	0.0001
Prolonged intubation	3	17	20(66.66%)	0.0001

Days on Ventilation				
<7 days	2	0	2(6.66%)	0.15
8-14 days	5	5	10(33.33%)	0.46
15-30 days	3	10	13(43.33%)	0.14
>30 days	2	3	5(16.66%)	1.00
Days on Tracheostomy Tube				
<7 days	1	0	3 (10%)	0.40
8-14 days	6	3	10(33.33%)	0.10
15-30 days	3	10	12(40%)	0.14
>30 days	2	5	5(16.66%)	0.66
Complication				
No complication	10	10	20 (66.66%)	0.23
False tract	0	0	0 (0%)	1.00
Hemorrhage	0	2	2(6.66%)	0.50
Subcutaneous emphysema	1	1	2(6.66%)	0.76
Stomal infection	1	2	3 (10%)	0.80
Pneumonia	0	3	3 (10%)	0.25
Disability				
Good recovery	3	2	5(16.66%)	0.31
Moderate disability	3	2	5(16.66%)	0.31
Severe disability	4	8	11(40%)	0.54
vegetative	0	3	3(10%)	0.25
Death	2	3	5(16.66%)	1.00

Table 1. Showing the clinical characteristics of the different study group.

Each patient's case note was reviewed for the following information: Age, sex, admission diagnosis, Glasgow Coma Scale (GCS) score on admission, Indication of tracheostomy, Timing of tracheostomy, GCS at tracheostomy, Days under ventilation, Continuation of tracheostomy tube, Complication of tracheostomy, Disability at discharge. For the purpose of the study, only open tracheostomies performed by neurosurgical team were studied. This was to allow relative standardization of the operative technique and hence, a more uniform evaluation of any complication. Patients were divided into two groups: early tracheostomy occurring within 7 days of mechanical ventilation or during other neurosurgical procedure and late tracheostomy after 7 days of mechanical ventilation. Two groups were compared in terms of days under ventilation, Continuation of tracheostomy tube, Complication of tracheostomy, Disability at discharge.

Statistical analyses for continuous variable were performed with Student's t test, and for discrete variables

with Chi-square or Fisher's exact test, with a *P* value <0.05 considered statistically significant.

Result:

There were 30 patients over 18 month period comprising 23 males and 7 females. 50% of patients were at age group 40-60 years age range from 18 years to 86 years with means of 52.93±16.59 years. Male: Female ratio was 3:1. Mean GCS was 9.6±2.5 on admission (range 4 to 15) while GCS at the time of tracheostomy was 9±2.3. There were 10(33.33%) basal ganglia/thalamic hemorrhage, 8(26.66%) Acute Subdural hematoma, 3(10%) Brain contusion/burst lobe, 3(10%) Cerebellar hemorrhage, 3(10%) Cerebral/cerebellar Infarction 2(6.66%) Intracranial infection/abscess and 1 (3.33%) Diffuse Axonal injury.

12 (40%) had Early tracheostomy(ET) and 18 (60%) had Late tracheostomy (LT) were compared and analyzed.

There was slight difference in age (47 ± 16.5 versus 56 ± 15.8 years) between these two groups. ET patients had poorer GCS score on admission (8.33 ± 2.7) and at time of tracheostomy (7.8 ± 2.6) compare to LT patients (on admission GCS (10.56 ± 2) and GCS at time of tracheostomy (9.7 ± 1.8)).

Procedure related complications were minimal. There was no complication on 83.33% ($10/12$) of ET patients and 55.55% ($10/18$) of LT patients. 11.11% ($2/18$) of LT patient had tracheostomy site hematoma, and 8.33% ($1/12$) and 5.55% ($1/18$) on ET and LT patients group respectively developed subcutaneous emphysema, Stomal site infection were 8.33% ($1/12$) in early tracheostomy and 11.11% ($2/18$) in late tracheostomy and 16.66% ($3/18$) of LT patients developed pneumonia.

Day on ventilation on ET group was 14.8 ± 10.25 while on LT group was 20 ± 8.4 . Tracheostomy tube were successfully removed in 76.66% ($23/30$) of patient on which 83% ($10/12$) in case of early tracheostomy with mean duration of 19.33 ± 9.99 days and 72.22% ($13/18$) on Late tracheostomy with mean duration of 25 ± 9.04 days while 16.66% ($2/12$ on ET and $3/18$ on LT) eventually died with the tube in situ and remaining 5.55% ($1/18$) was discharge from hospital or transferred to a rehabilitation facility with the tracheostomy tube.

Discussion

Tracheostomy remains one of the most commonly performed procedures in neurosurgical critical patients⁶. The timing of tracheostomy, however remains a matter of controversy and the recommendations are still based on the experience of neurosurgeon rather than on scientific evidence.¹⁴ In recent years, some study have attempted to define the appropriate timing of tracheostomy more accurately. one group of authors evaluated 120 patients, those were divided into two groups: early tracheostomy (within 2 days) and late tracheostomy (within 14-16 days). they conclude early tracheostomy had better outcome: the duration of mechanical ventilation was shorter (7.6 vs. 17.4 days; $p < 0.0001$); the occurrence of ventilation acquired pneumonia was lower (5% vs. 25% ; $p < 0.005$) and the most importantly the mortality rate was lower (32% vs. 62% ; $p < 0.005$).¹⁶

In the present study, early tracheostomy was associated with reduced ventilator support duration, a short ICU length of stay and procedural related complication. However, outcome of patient was associated with disease condition instead of time of tracheostomy. In neurosurgical patients, most previous studies reported a significant correlation of early tracheostomy with a shorter ICU or hospital stay whereas no difference in ICU or hospital stay

between patients with early tracheostomy and those with late tracheostomy was also reported.^{1,7,3,4,13,15,19}

In present study, late tracheostomy significantly increases the incident of procedural related complication (pneumonia, tracheostomy site hematoma, subcutaneous emphysema and stromal infection) in compare to early tracheostomy. Other studies have shown that early tracheostomy did not result in a reduced incidence of ventilation associated pneumonia in critically ill patients, compared with late tracheostomy. Although, mortality and morbidity were not related to procedure but morbidity was more common to late tracheostomy then early tracheostomy however, mortality was similar.

Our study had several limitations. It was retrospective study of single center involved a small number of patient. In this retrospective study time of tracheostomy depend on neurosurgeon and were inhomogeneous regarding severity score, the GCS scores and the neurological diagnosis resulting in selection bias. The principal consequence of the small size sample was to limit the capacity to demonstrate statistical significance in the difference found. As a result, this present study only raises the issue of the possible benefits of early tracheostomy in these patients, without confirming such benefits.

Conclusion: early tracheostomy is beneficial to late tracheostomy in term of the days on mechanical ventilation, the hospital and ICU length of stay and procedural related complication however does not affect the mortality rate.

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