A STUDY OF ROLE OF IMMEDIATE TRACHEOSTOMY IN CRITICALLY ILL ADULT PATIENTS IN AN ICU OF TERTIARY HOSPITAL OF ANDHRA PRADESH

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ABSTRACT

BACKGROUND

Tracheostomy is done in patients with compromised airway to simplify its long term effects on the outcome of the underlying disease. Indications of tracheostomy have not changed but its timing has been shown to have definite effect on the outcome of the underlying disease. In most of the ICU setups, immediate intubation tides over the crisis of airway obstruction and tracheostomy is done electively when the underlying disease seems to be far from recovery.

To compare the differences between immediate and elective tracheostomy irrespective of the underlying disease in terms of Ventilator Support Duration (VSD), ICU stay (ICUS), Total Hospital stay (THS), incidence of pulmonary complications (PC) and Final Hospital outcome (FHO).

MATERIALS AND METHODS

Patients are divided in to two groups. In group "A", 42 patients were performed immediate tracheostomy as soon as the airway obstruction is noticed. In group "B", 46 patients underwent tracheostomy electively 10 days after endotracheal intubation. Demographic data, acute pathophysiology, Glasgow Coma Scale (GCS) were noted. The VSD, ICUS, PC, FHO were calculated.

RESULTS

Patients of both groups were randomised to either immediate or elective tracheostomy. The demographic data was similar in both the groups. There was no significant difference between the two groups in regards with initial clinical and laboratory data to account statistically. The GCS was 5.2±1.86 Vs. 5.8±2.3, APACHE II score was 20.82±1.5 Vs. 22.38±2.1. Statistical significance between the two groups in relation to VSD, ICUS and PC was observed with a p value of 0.041 (p significant at 0.05).

CONCLUSIONS

The study supports immediate tracheostomy irrespective of the initial assessment of underlying disease and airway compromise as the parameters like Ventilator Support Duration, ICU Stay, Pulmonary Complications, Total Hospital Stay are shorter and statistically significant unlike the elective tracheostomy which is done after 10 or more than 10 days of endotracheal intubation.

KEYWORDS

ICU, Immediate Tracheostomy, Elective Tracheostomy, Air Way, Critically Ill, Ventilator, Criteria.

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BACKGROUND

Tracheostomy is required in critically ill patients to manage airway on a long term basis.[1] Indications of tracheostomy have not changed, but its timing has been questioned though shown to have definite effect on the outcome of the underlying disease.[2,3] Among the surgical procedures performed in critically ill patients in ICU setup tracheostomy accounts to 24%.[4] This is performed when the attending physician feels that the underlying illness needs a prolonged ventilator support.[5] In spite of this situation the timing of tracheostomy has not been clearly determined, though the available data suggest an early tracheostomy gives better results.[6,7]

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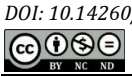

The advantages of tracheostomy over prolonged endotracheal intubation include improved patient comfort and reduced sedative drug use, faster weaning from mechanical ventilation, a reduced incidence of nosocomial pneumonia, and shorter hospitalisation.[8,9] The incidence pneumonia is directly related to the duration of mechanical ventilation that carries significant morbidity and mortality.[10] In the weight of advantages of tracheostomy performed earlier over ET intubation, a study showed in 1981 that the incidence of tracheal stenosis after tracheostomy was raised up to 65%.[11] With the recognition of causes and improved availability of tracheostomy tubes material, design, use of high-volume, low pressure cuffs, this is brought down.[12] According to the recommendations of National Association of Medical Directors of Respiratory Care (NAMDR), ET intubation is to be used for patients requiring less than 10 days of mechanical respiratory support and that a tracheostomy to be done in patients still requiring ventilator support after 21 days after admission.[13] These are only recommendations on expert opinion but in modern practice many broadly seem to follow them.[14] The present study contemplates to observe the role of immediate tracheostomy over the recommendations of NAMDR.

MATERIALS AND METHODS

The present study is a prospective randomised study undertaken at NRI Medical College Hospital between Jan 2010 and Dec 2016 on 88 patients. The patients were randomised and grouped into A and B. In group A, 42 patients underwent immediate conventional tracheostomy in the ICU. In group B, 46 patients underwent elective conventional tracheostomy after a stay of 10 to 21 days in the ICU. Ethical committee clearance was taken prior to commencement of the study. Due consent was taken from the attendants of the patient prior to tracheostomy.

Inclusion Criteria

1. Patients aged above 18 years admitted to ICU with respiratory distress requiring ventilator support.
2. Patients with APACHE score equal to or more than 15.
3. Patients with head injury, traumatic brain injuries and cerebrovascular accidents and other chronic medical diseases.

Exclusion Criteria

1. Patients with previous respiratory illness as diagnosed by chest x-ray. 2. Patients with neck deformities, thyroid enlargements, obesity and tumours of the neck. 3. Patients with thyroid, oesophageal, bronchial carcinomas. 4. Patients with haematological malignancies, terminal malignancies, liver failure and renal failure. A protocol was developed in the ICU to allot the patients to two groups based on exclusion and inclusion criteria and at a random ratio of 1:1. Except to the tracheostomy care all other care and treatment was at the discretion of the treating neurosurgeons or clinicians. Immediately after the admission, the duty doctors of ICU recorded patient's demographic data, GCS score, Acute Physiology and Chronic Health Evaluation (APACHE) score, details of bedside tracheostomy. During the stay of the patient in the ICU, immediate and late complications of tracheostomy were recorded by the ENT surgeon who performed the surgery. As it was apparent from the data available in the case sheet, treatment assignment could not be blinded to the caring team. The extracted data on patients of both the groups included complete blood picture, Electrolytes, Creatinine, Coagulation profile before tracheostomy, BUN, Liver functions, and Cultures of samples from sputum, blood, and urine. Number of calendar days spent in the ICU from tracheostomy, total number of days on ventilator, time taken for weaning of tracheostomy, the number of days remained in ICU, total stay in the hospital and the final outcome of the patient were recorded and statistically analysed. ICU and hospital mortality rates were documented. Mean±SD is given for normally distributed metric variables, frequencies and percentages are given for non-metric variables. Chi square calculator was used to know the significance of the study by calculating p value (p significant at <0.05). Fisher's exact test was applied to demographic data and data of diagnosis in ICU to know the p value. A p-value of <0.05 was considered statistically significant.

OBSERVATIONS AND RESULTS

In group A, among the 42 patients, males were 32 and females were 10 with a male to female ratio of 3.2:1. Patients belonged to the age groups of 18 to 58 with a mean age of 43.2±2.2. The youngest patient was aged 18 and the oldest aged 56 years (Table 1). In group B, among the 46 patients, males were 38 and females were 8 with a male to female ratio of 5.75:1. Patients belonged to the age groups of 18 to 58 with a mean age of 45.2±1.2. The youngest patient was aged 18 and the oldest was aged 58 years (Table 1).

Groups	Immediate Tracheostomy-Group A	Elective Tracheostomy-Group B	P value
Age	43.2±13.2	45.2±1.2.	0.06
Sex	32/10	38/08	0.09

Table 1: Showing the Age and Sex Incidence of the Group A & B patients (n=42 & 46)

Even though the majority of the patients were males, there was no statistical significance between the two groups in regards with age and gender. At the time of admission in group A, the number of patients with traumatic brain injury (TBI) was 18 and with other causes of respiratory failure were 24. In group B, the figures were 20 and 26 respectively (Table 2). However, no statistical significance was observed between the diagnosis and timing of the tracheostomy.

Diagnosis in ICU	Early Tracheostomy		Elective Tracheostomy		Test Significance
	N	%	N	%	Easy Fisher Exact Test Calculator-P= <0.05
Traumatic Brain Injury (CI, SAH, SDH, EDH)	18	42.85	20	43.47	1
Cerebrovascular Accident CVA	09	21.42	09	19.56	1
Renal Failure (Acute+ Chronic)	10	23.80	09	19.56	0.49
Respiratory Failure (Type II, COAD)	O5	11.90	08	17.39	0.49
Tetanus	00	00	00	00	00

Table 2: Showing the Diagnosis made in ICU of Groups A & B (n=42 & 46)

(CI: Concussion Injury, SAH: Subarachnoid Haemorrhage, SDH: Subdural Haemorrhage, EDH: Extradural Haemorrhage, CVA: Cerebrovascular Accident, COAD: Chronic Obstructive Airway Disease).

In group A, the APACHE score was 20.82±1.5 and in group B it was 22.38±2.1 (p=1). In group B, the GCS score was 5.2±1.86 and in group B it was 5.8±2.3. There was no statistically significant difference between both groups regarding the mean GCS (p=1). There was no significant statistical difference in the laboratory data collected like CBC, PT, INR, chemistry, blood, in both groups. But the APTT was higher in group B when compared to group A (37.13±4.41 Vs. 28.27±3.46; p=0.020), but both readings were within normal limits. Tracheostomy related intraoperative and post–operative complications showed no difference among the two groups and were also not statistically significant. But the percentage of complications observed post-operatively in group B was more than in group A (Table 3). Though the incidence of pneumonia in group B was more in percentage, the values were not significant on calculation with chi square

test calculator giving a p value of 0.804 (p significant at <0.05), (Table 4). Patients of both the groups showed no difference in the mortality outcome and were not statistically significant (Table 5). Group A patients required a significantly shorter duration of ventilator support when compared to group B patients (Group A 11.20±1.58 Vs. group B 23.23±2.66; p= 0.020), shorter ICU stay (group A 13.60±1.0 Vs. group B 28.50±2.60; 0.020), shorter hospital stay (Group A 16.12±2.20 Vs. group B 35.40±1.60; p=0.020).

Complications	Early Tracheostomy-42		Elective Tracheostomy-46	
	N	%	N	%
Pneumothorax	01	2.38	03	6.52
Sepsis	03	7.14	02	4.34
Ventilation Associated Pneumonia	05	11.90	20	43.47

Table 3. Showing Intraoperative and Postoperative Complications of both the Groups, (n=42 & 46)

Timing of Tracheostomy	Immediate Tracheostomy-Group A (5)		Elective Tracheostomy-Group B (20)	
	N	%	N	%
0-4 Days	0		03	6.52
5-10 Days	01	2.38	03	6.52
11-15 Days	01	2.38	04	8.69
16-20 Days	02	4.76	04	8.69
> 21 Days	01	2.38	06	13.04

Table 4. Showing the Incidence of Pneumonia in both the Groups (n=42 & 46). P Value 0.804

Mortality	Early Tracheostomy		Elective Tracheostomy	
	N	%	N	%
Expired	5	11.90	5	10.86

Table 5: Showing the Mortality Rate in both Groups, (n=42 & 46)

DISCUSSION

Review of literature shows many randomised studies observing reduction in ventilator support, incidence of pneumonia and reduced mortality among the patients undergoing early tracheostomy when compared to late tracheostomy.[15,16] There is considerable variation in timing the tracheostomy when various centres are compared.[17,18] Even the recommendations of NAMDR do not specify the timing but leaves a margin of 11 days between 10th and 21st day to decide the timing of tracheostomy when a prolonged ventilator support is required. In such a scenario, the main aim of this study is to observe the advantages of immediate tracheostomy over elective tracheostomy in terms of duration of ventilator support, ICU stay, hospital stay, incidence of pneumonia (VAP) and hospital outcome. In the present study, the demographic data like age, sex, clinical diagnosis on admission (APACHE II score, GCS score), underlying diseases and comorbidities were almost similar between both the groups. There was no statistical significance also.

Head Injuries resulting in traumatic brain Injury and followed by cerebrovascular accident (CVA) were the commonest causes of ICU admissions that required tracheostomy. This may be due to alarmingly increasing road traffic accidents. Milo Engoren 2004[19] in his retrospective chart review with prospective evaluation of functional status noted similar increase in TBI patients. Also in a prospective study by Raees Ahmed et al (2010), in medical-surgical ICU in Emirates out of 117 tracheostomies, around 50% of the patients were of road traffic accidents resulting in traumatic brain injury. The total percentage of intraoperative and postoperative complications in both the groups in the present study was 73.4% during their ICU stay. The incidence of pneumonia in both the groups was 60.37%. The other complications included pneumothorax, sepsis, accounted for 20.25%.

The percentage of complications was observed to be more in elective tracheostomy. However, this was not statistically significant. Observing the total incidence pneumonia in both groups was more in elective tracheostomy group than immediate group. In similar studies by Wise (2002), Fikkers (2004), and Yw Li (2009) the incidence of pneumonia was more in late tracheostomies.[20-22] Studies in support of early tracheostomy especially in medical ICU patients was noted by Rumbark[23] et al (2004) where physicians require a prolonged ventilator support at high risk of pneumonia, sepsis and death. The outcome of the present study mainly focuses upon the significantly shorter duration of ventilator support in immediate tracheostomy group versus elective group, (11.20±9.8 Vs. 23.40±8.4; p=0.04). This observation is similarly found in the study of Gatti et al Zagli et al.[24,25] But opposed by Terragni[26] et al, though these studies are conducted between early and late tracheostomies they are also significant in the present study. The present study also emphasises on the results showing shorter ICU stay (Group A 13.60± Vs. group B 28.50±6.60; p=0.045) and shorter total hospital stay (group A 16.12±3.20 Vs. group B 35.40±1.60; p= 0.040) and final hospital outcome, which were shorter in the immediate tracheostomy group when compared to elective tracheostomy group. This is confirmed by the results of Lee[27] (2005). The present study is also in conformity with a similar study by Zheng et al (2012) who found that early tracheostomy resulted in more ventilator free, sedation free, and in the patient's ICU free days, higher successful weaning, and ICU discharge rate, and lower ICU incidence of VAP. There were no statistically significant values among the mortality cases in the present study when both the groups are compared. But we state that there was no mortality attributed to the immediate tracheostomy and complications due to immediate tracheostomy.

Limitations of the Present Study

The present study population was small because of securing immediate consent for immediate tracheostomy had to be inculcated in the ICU staff as it was not practised in these parts of Andhra Pradesh. Further studies are required in this angle for the study to be more conclusive. The study was not blinded so there was a chance for performance bias which could have influenced the results. The decision of final weaning of tracheostomy was left with the ENT surgeon rather than the attending physician.

CONCLUSIONS

The role of immediate tracheostomy in critically ill patients though not convincing in changing the final outcome of the of the hospitalisation and mortality but is influential in reducing the secondary outcomes like duration of ventilator support, length of ICU stay and total hospital stay. These results are statistically significant with a p value at 0.041 ($p < 0.05$ being significant).

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