

Changing Trends in Tracheostomy in a Critical Care Unit: A Study from a Tertiary Care Centre in Western India

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ABSTRACT

Introduction

Identification of newer trends in indications and timing of tracheostomy and their implication on the outcome of the patients in a critical care unit, based on observations recorded in patients from a tertiary care centre in Western India.

Materials And Methods

100 patients admitted in the critical care unit, who underwent tracheostomy, were studied retrospectively. The patients were analyzed for the epidemiological data, indications, timing, and outcome of the tracheostomy. The outcomes were assessed based on mortality, discharge, decannulation, complications and VAP as parameters. A comparative analysis of the outcome of the tracheostomy depending on the timing of tracheostomy was conducted.

Result

Male: Female ratio was 1.77:1. Majority of the patients belonged to the age group of 21 to 40 years. Anticipation of prolonged airway was commonest indication for tracheostomy (49%). Early tracheostomy was preferred (68%). The mortality rate was 38%. 48% of patients were discharged with a successful decannulation in 72.9% of them. Complications and VAP were observed in 16% and 23% of patients, respectively. The timing of tracheostomy had a significant impact on the outcome.

Conclusion

Anticipating prolonged intubation is the most important indication for tracheostomy in the critical care unit. Early tracheostomy is associated with favourable outcomes in terms of decreased mortality, improved survival rate, lesser complication, low incidence of VAP, and thus, better weaning. As soon as the need for prolonged management of the airway is identified, tracheostomy should be considered.

Keywords

Tracheostomy; Critical Care; Tertiary Care Center

Tracheostomy is an age-old surgical procedure which was at the earliest performed in 3600 BC in ancient Egypt.¹ Tracheostomy is described as the creation of a stoma at the skin surface which leads into the trachea.² The indications for tracheostomy in an intensive care units are³:

- To relieve upper airway obstruction due to tumor, surgery, trauma, foreign body, or infection.
- To prevent upper airway damage due to prolonged translaryngeal intubation.
- To provide stable airway in patients who require prolonged mechanical ventilation or oxygenation support.

- To allow easy and frequent access to the lower airway for suction and secretion removal.

Tracheostomy reduces respiratory resistance and thus decreases the work of breathing. It not only provides stable airway, facilitates pulmonary toilet and ventilator

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Table I: Age distribution of patients

AGE GROUP	PERCENTAGE OF PATIENTS
0-20	26%
21-40	34%
41-60	27%
>60	13%

weaning, it also decreases the direct laryngeal injury of endotracheal intubation, and improves patient comfort and daily living activity such as mobility, speech, and eating.⁴

Despite being considered a safe procedure in ICU, tracheostomy may lead to complications intra and post operatively like hypoxia, cardiac arrest, injury to structures immediately adjacent to the trachea, pneumothorax, hemothorax, incision site bleeding and stoma infection.⁵ Recurrent tube blockage, difficult decannulation, tracheal stenosis, tracheoesophageal fistula, and tracheocutaneous fistula may also be seen as late complications.

Recently, a dramatic change in the trends of the various indications for tracheostomy has been noted. Nowadays, the most common reason for tracheostomy in the intensive care setup is to provide access for prolonged mechanical ventilation.⁶ This contrasts with the previous indication of acute inflammatory upper airway obstruction.

The timing of tracheostomy has also changed over recent years. In older guidelines, tracheostomy was recommended for consideration only if extubation did not occur by 21 days.³ However, more recently it has been suggested that a projected need for 14 days of intubation be used as the criterion for the procedure.³

The outcome of tracheostomy depends highly on the timing of tracheostomy. The purpose of this paper is to identify newer trends in indications and timing of tracheostomy and its implication on the outcome of patients in a critical care set-up.

Material and Methods

The study was a retrospective review of 100 randomly selected patients, who underwent tracheostomy from May 2015 to December 2017 in the critical care unit of VS General Hospital, Ahmedabad, India. All the information was retrieved from patient medical records as per standard guidelines and ethical standards. This data was evaluated for the epidemiological data, indications, and time of tracheostomy. Depending on the timing of tracheostomy, all tracheostomies were classified into early and late. Tracheostomies done within 7 days of admission were classified as early. Care of the patient during the hospital stay and follow-up thereafter was observed. The outcomes of the tracheostomies were assessed using the mortality, rate of discharge, successful decannulation, complications, and Ventilator Associated Pneumonia (VAP) as parameters. Furthermore, a comparative analysis was made on the outcome of the tracheostomy depending on the timing of tracheostomy.

Results

A total of 100 tracheostomies were performed during the period of this study. There were 64% males and 36% females with a Male: Female ratio of 1.77:1. The patients included were of age ranging from 11 years to 82 years. The median age was 38 years (Table I).

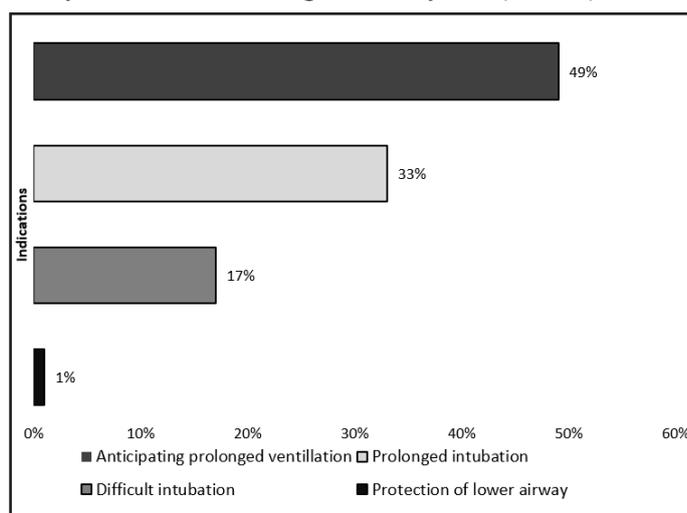


Fig. 1. Indication of tracheostomy

Table II: Primary diagnosis of indication

PRIMARY DIAGNOSIS OF INDICATIONS	PERCENTAGE
Long term coma (Head injury /Stroke/ HIE/ Meningoencephalitis/ Tumors)	49
Respiratory insufficiency (Guillain-Barré Syndrome/ Myasthenia Gravis/ Respiratory failure)	29
Upper airway obstruction (Edema/ Infection/Tumors)	15
Trauma (Facial/ Neck)	7
Total	100

All the tracheostomies were studied to identify the indication for the procedure (Fig. 1). A note on the primary diagnosis of the indication was compiled (Table II). Head injury accounted for 25% of the patients.

68% of the tracheostomies were classified as early. The rest 32% were the cases of late tracheostomies.

The overall mortality in our study was 38%. However, we were able to discharge 48% of patients with a successful decannulation rate of 72.9%. All the tracheostomies were targeted with high accuracy and precision. However, being a surgical procedure, few tracheostomies were associated with complications (Fig. 2). Both early and late complications were observed (Table III). Ventilator associated pneumonia was seen in 23% of patients. 14% of patients took discharge against medical advice and hence outcome could not be studied

Table III: Complications of tracheostomy

COMPLICATIONS	PERCENTAGE
EARLY	
• Lung collapse	2
• Subcutaneous emphysema	2
LATE	
• Recurrent tube blockage	8
• Difficult decannulation	2
• Tracheoesophageal fistula	2
TOTAL	16

in them.

The results were further analyzed to draw a comparison using the above same parameters to understand the effect of timing of tracheostomy on the outcome of tracheostomy (Fig. 3).

Discussion

Tracheostomy is one of the most important and standard procedures for emergency airway management, especially in a developing country where patients will not present until they are in an acute and critical condition. Nonetheless, it has its own merits and demerits. The present study observed a male preponderance, most of the patients being young adults belonging to the age

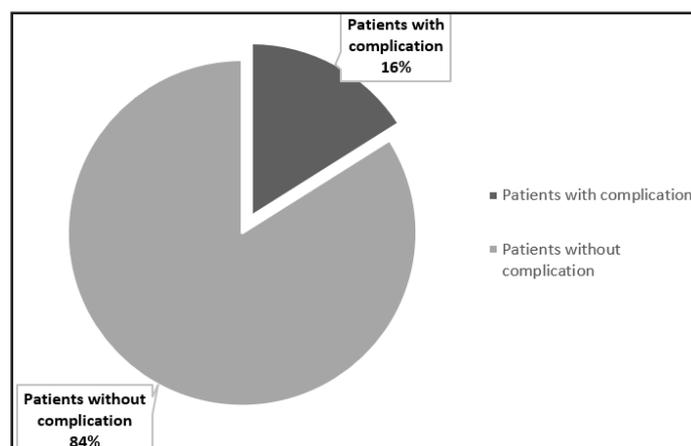


Fig. 2. Complication rate

group of 20 to 40 years. This agreed with the reports from previously published studies done by Chandrashekhar et al⁵ and Mahmud et al.⁷ This may be related to increased incidence of road traffic accidents and trauma among male young adults, being the breadwinners of the family, and thus, more vulnerable.

According to the old published literature, tracheostomy used to be reserved for the severely ill patients with acute respiratory obstruction.⁸ Almost up to the 70's, the main indication was of infectious origin, including epiglottitis and laryngotracheobronchitis.⁹ Eventually, they ceased to be the commonest indication of tracheostomy. This could be attributed to early diagnosis, better investigations, adequate use of antibiotics, and improvement in the capabilities of medical technology.

The results from recent studies show a changing trend. According to Cheung et al⁶ and Flaatten et al,¹⁰ anticipation of the prolonged intubation is the most common indication of tracheostomy. On the other hand, studies by Anwar et al⁴ and Chandrashekhar et al⁵ agrees with prolonged mechanical ventilation being the commonest indication. Adedeji et al¹¹ found airway obstruction due to neoplasm to be the most common indication. Lack of standard operating guidelines for indication of tracheostomy and variation in the primary diagnosis of the patients has contributed to such varied results in different studies. Our study agrees with the anticipation of the prolonged intubation as the commonest indication of tracheostomy in critical care.

An early tracheostomy was performed in the majority of patients in the study. The timing of tracheostomy has also changed over recent years. Tracheostomy in the 1980s was considered "early" if it was performed before 21 days of translaryngeal intubation.¹² However, according to the literature, the performance of tracheostomy to protect the larynx from intubation damage has been recommended within 3 days of intubation as the visually observed mucosal damage to the larynx and vocal cords starts in 3–7 days.¹² If the tube is removed from the larynx within seven days, complete healing of these injuries is the rule.¹³ Therefore, tracheostomy should be performed as soon as the need for prolonged airway support is recognized and a projected need for 14 days of intubation be used as the

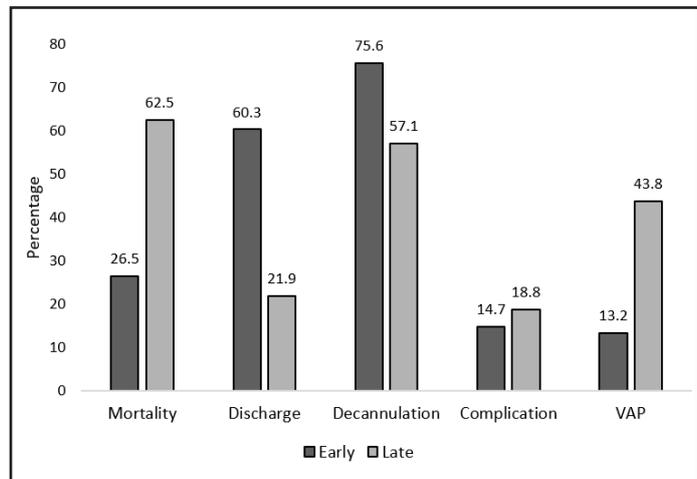


Fig. 3. Comparative analysis of outcome of early and late tracheostomy

criterion for the procedure.³ Nevertheless, the decision to place a tracheostomy should depend upon attending clinician's assessment regarding the severity of illness with its recovery time, risk of continued translaryngeal intubation, and surgical risks of tracheostomy.

The criteria used to study the outcome of tracheostomy have varied in different studies. An effort was made in the present study to consolidate different parameters like mortality, discharge, decannulation, complications, and VAP rates to study the outcome.

The 38% of mortality noted in our study was higher than values reported by Flaatten et al (11%),¹⁰ Adedeji et al (5.8%),¹¹ and Chandrashekhar et al (0%).⁵ The percentage of the patients discharged in the present study (48%) was lesser than 89% reported by Flaatten et al.¹⁰ On the contrary, the rate of successful decannulation was higher in the present study (72.9%) as compared to Flaatten et al (11%).¹⁰ As the study was done on the patients admitted in the critical care unit, their pre-existing life-threatening conditions would influence the mortality and discharge rates.

Complication rates quoted in the literature range between 6 and 66 percent for surgical tracheostomy.¹⁴ In the present study, the complication rate was found to be 16%. Other studies done by Chandrashekhar et al,⁵ Mahmud et al⁷ and Adedeji et al¹¹ noted a complication rate of 14%, 10%, and 21.1% respectively, which is comparable to our study. On the other hand, Anwar et al⁴

Table IV: Studies assessing the timing of tracheostomy and VAP rates

YEAR	STUDY	TIME OF TRACHEOSTOMY		DEVELOPMENT OF VAP		INFERENCE
		EARLY	LATE	EARLY	LATE	
2014	Diaz-Prieto et al ¹⁸	<8th day	>14th day	13%	9%	VAP in early > late
2014	Mohamed et al ¹⁹	≤10th day	>10th day	20%	40%	VAP in late > early
2012	Zheng et al ²⁰	3rd day	>15th day	29.30%	49.20%	VAP in late > early
2011	Trouillet et al ²¹	≤5th day	>15th day	46%	64.40%	VAP in late > early
2008	Blot et al ²²	≤4th day	>14th day	49.20%	50%	No significance difference
Present Study		≤7 days	>7 days	13.2%	43.8%	VAP in late > early

There is a lack of uniform criteria to define early or late tracheostomy and duration of mechanical ventilation (through endotracheal intubation or tracheostomy)

reported a relatively higher complication rate of 52.8%.

The incidence of VAP in our study was seen in 23% of the patients. The VAP incidence is indicated to be between 6%-26% in patients with tracheostomy.¹⁵ However, the role of tracheostomy in VAP is debatable. While tracheostomy makes bronchial cleaning easier, facilitates patient mobilization, and decreases bronchial epithelial damage, it is also argued that it may increase the VAP risk due to the direct damage caused to airways and possible microbial entry during the procedure.¹⁶

Despite there being a limited number of publications in the literature on the relationship between the time of tracheostomy and the outcome, the present study noted that the timing of the tracheostomy hugely impacts the outcome. There is a lower mortality rate and a favorable survival rate in early tracheostomy when compared to late tracheostomy, which was consistent with the findings of Flaatten et al¹⁰ and Rumbak et al.¹⁷ More patients being discharged and a higher decannulation rate in early tracheostomy also indicate a positive outcome in our study.

The complication rate was found marginally higher in late tracheostomy. As the complications noted in the study were either procedure or tracheostomy care

related, a significant impact of timing of tracheostomy on the complication rate was not observed. On the other hand, the incidence of VAP was much higher with late tracheostomy than early tracheostomy. Other recent studies concerning tracheostomy and VAP development have shown disparate results (Table IV), but most of the studies agreed to the results of the present study.

Thus, it could be inferred that early tracheostomy is associated with a superior outcome as compared to late tracheostomy. However, there is a need for further studies with stricter and more uniform criteria, and broader participation.

Conclusion

A change in trend in the indications and timing of tracheostomy has been observed. Anticipation of prolonged ventilation is the most common indication of tracheostomy in a critical care unit. Early tracheostomy is being used more commonly and is associated with favorable outcomes in terms of reduced mortality, increased survival, low complication rates, less VAP incidence, and better chances of weaning. As soon as the need for prolonged management of the airway is

identified, tracheostomy should be considered.

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