Outcome of Tracheostomy in COVID-19 Patients

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Abstract

Introduction Since the start of the COVID-19 pandemic 2019, quite a few patients became critical and needed ICU admission with ventilator assistance. Tracheostomy, which was initially performed late during the course of patient on ventilator, has now been considered a procedure that can be performed relatively early as this leads to early weaning of patients and overcomes the shortage of critical beds.

Objective This study aims to focus on the outcomes of tracheotomised COVID-19 patients in terms of survival and any tracheostomy related morbidity.

Methods A prospective study was performed on COVID-19 patients undergoing tracheostomy at this tertiary care teaching hospital, which also was a dedicated centre for treating COVID-19 patients. The duration of this study was from April 2020 to September 2021. Following tracheostomy, all patients were followed up regularly and clinical changes were recorded. Points that were specifically noted were timing of the tracheostomy, change in ventilator settings, tracheostomy related complications, requirement of oxygen, days needed to wean the patient, decannulation, and, if death, the cause of death.

Results A total of 136 surgical open tracheostomies were performed on COVID-19 patients over the study period. The mean duration of intubation (timing of tracheostomy) was 12 days. A total of 73 out of 136 (53.6%) patients survived. 51 patients (37.5%) got decannulated during the course of the hospital stay. 9 patients were decanulated during the follow up visits and 13 patients were lost to follow up. 63 out of 136 (46.3%) patients died due to COVID pneumonia. Most of the patients who died had gone into multi-organ failure. Air leak syndromes (pneumothorax and pneumomediastinum) were common findings. 10 patients already had surgical emphysema before taking up for tracheostomy and 6 developed 2–3 days after tracheostomy. The most common complication was bleeding, which was seen in 28 out of 136 patients. The Median weaning of period of patients who survived was 5 days.

Conclusion Performing tracheostomy early in COVID-19 patients helps in early weaning of the patient from the ventilator and makes nursing care easier and increases the availability of ICU beds. The mortality rate was 46% amongst the 136 tracheostomies done in COVID-19 patients. Local site bleeding was the most common complication and surgical emphysema was also seen more than routine tracheostomies.

Keywords COVID 19 · Tracheostomy · Outcome · Pneumonia
Introduction

As per the reports of The World Health Organisation (WHO), since the start of the COVID-19 pandemic in Dec 2019, a total of 226,844,344 positive cases have been reported up until September 2021. Of these, there have been 4,666,334 coronavirus deaths [1].

Literature and institutional experience show that 10–15% of patients with COVID-19 were critically ill and needed mechanical ventilation [2, 3]. Quite a few of these patients required an extended period of ventilation. Tracheostomy was performed in such critically ill patients for prolonged mechanical ventilation. With the severe paucity of ICU beds, tracheostomy definitely helped in early weaning of patients and shifting them out of the ICU.

Tracheostomy, as an aerosol-generating medical procedure (AGMP), can surely increase the risk of disease transmission. Several COVID-19 guidelines have recommended performing tracheostomy after 10–14 days of intubation to reduce the risk of SARS-CoV-2 transmission [4, 5].

With the probable benefits of tracheostomy for the patients and to overcome the shortage of critical care beds, tracheostomy, which was initially performed late during the course of patient on ventilator, has now been considered a procedure that can be performed relatively early. Over a period of 18 months of treating COVID-19 patients at the ICU of this high volume centre, the understanding of the precautions of how and when to perform tracheostomy has definitely improved. At the start of pandemic tracheostomy was considered a highly aerosol-generating procedure putting the health-care workers at risk of infection during the procedure and subsequent care. However with time it was realised that if done with proper precaution it did lead to early weaning of patients and helped in getting much more ICU beds for critical patients.

Not much data on the detailed outcomes of tracheostomy in COVID-19 patients is presently available, especially from a large volume COVID care setup. This report aims to focus on the outcomes of tracheotomised COVID-19 patients in terms of survival and any tracheostomy related morbidity.

Methods

A prospective study was performed on COVID-19 patients undergoing tracheostomy. The facility was a tertiary care teaching hospital that also was a dedicated centre for treating COVID-19 patients. The duration of this study was from April 2020 to September 2021.

A record of comorbidities and clinical history was kept. During the time of tracheostomy, a sequential organ failure score (SOFA score) was recorded. This score is a simple and objective score that allows for calculation of both the number and the severity of organ dysfunction in six organ systems (respiratory, coagulatory, liver, cardiovascular, renal, and neurologic).

The Indication for Tracheostomy

In this institute, tracheostomy was performed after 10 days of intubation. Tracheostomy was performed in those patients who required prolonged ventilation. The patient’s cardiovascular vitals should show recovery, and some spontaneous effort should have started. There should be a reduction in the need for fractions of inspired oxygen (FiO2), ventilator requirements, and prone positioning as part of their ventilation strategy. The decision for tracheostomy was a combined decision based on the opinions of the critical care specialist and the ENT surgeon on a case to case basis. The safety of the health care staff was also considered in the decision making.

If the patient had a high respiratory SOFA score, tracheostomy was avoided, as these patients would be too sick to benefit from a further interventional procedure that would cause stress to them.

Tracheostomy performed before 10 days was called an early tracheostomy, and one performed later than 10 days was called a late tracheostomy. [6]

Following tracheostomy, all patients were followed up regularly and clinical changes were recorded. Points that were specifically noted were.

1) Timing of tracheostomy.
2) Change in ventilator settings.
3) Any tracheostomy related complication.
4) Requirement of oxygen.
5) Days needed to wean the patient.
6) Decannulation.
7) Death, with the cause of death.

The data were later analysed to understand the efficacy and outcome of tracheostomy in these patients.

Statistical Analysis

Normally distributed variables were presented as a mean, and specific categorical variables were presented as a percentage.

Results

In the given period, a total of 2180 patients were treated in the ICU of this tertiary care hospital. Of these, 890 needed endotracheal intubation. A confirmed case of COVID-19
was defined as those having a positive RTPCR or rapid antigen test.

A total of 136 tracheostomies were performed on COVID-19 patients over the study period [Fig. 1]. 58% (79) of these were male and 42% (57) were female.

The mean duration of intubation (timing of tracheostomy) was 12 days. The earliest tracheostomy was performed at 3 days and the latest was done at 22 days of intubation. All the tracheostomies were performed by an ENT surgeon by the open method with a small incision and assisted by an ICU physician who took care of the ventilator settings and sedating or paralysing the patient. Proper precautions were taken during tracheostomy to minimise the aerosol spread of virus [5].

Post tracheostomy patients were assessed for the readiness of weaning from mechanical ventilation. Once ready for weaning, a spontaneous breathing trial (SBT) with a pressure support mode was given. Post tracheostomy, there was a significant reduction in the need for sedation. The weaning time of the patients who survived ranged from as early as 5 days to as late as 25 days. The median for this data was 6 days.

A total of 73 out of 136 (53.6%) patients survived [Fig. 2]. 51 patients got decannulated during the course of the hospital stay. 22 patients were discharged on tracheostomy. 9 of these 22 patients were decanulated during the follow up visits in ENT OPD, and 13 patients were lost to follow up.

63 out of 136 (46.3%) patients died due to COVID pneumonia.

Most of the patients who died had gone into multi-organ failure. Air leak syndromes (pneumothorax and pneumomediastinum) were common findings.

**Tracheostomy Related Complications**

10 out of 136 patients already had surgical emphysema before taking up for tracheostomy. After tracheostomy, emphysema improved in 6 out of 10 patients.

6 patients developed surgical emphysema within 2–3 days following tracheostomy.

The most common complication was bleeding. This was seen in 28 out of 136 patients (20.6%). Surgical packing improved the bleeding in most of the cases. Two patients required exploration in the operating Room.

Tracheostomy tube into false passage was seen in 2 patients. Both patients had pre-tracheostomy surgical emphysema. This was identified, and the tube was reinserted in the tract.

One patient had developed trachea-oesophageal fistula, and one patient developed tracheal stenosis.

125 out of 136 patients underwent early tracheostomy, and 11 underwent late tracheostomy. A comparison was not done due to the non-comparability of the number of patients in each group.

**Discussion**

The novel coronavirus infection that started in Wuhan, China in December 2019 did spread rapidly all across the world and took the form of a pandemic. During the peak of the pandemic, the majority of the ICUs all over the world were full with patients with respiratory failure that required endotracheal intubation and mechanical ventilation. Those patients needing long-term ventilation were considered for tracheostomy. Tracheostomy, especially in COVID pneumonia, has its pros and cons. A total of 136 tracheostomies were performed at this tertiary care dedicated COVID treating centre.

In the present prospective observational study, all COVID-19 positive patients admitted to the ICU and that needed tracheostomy were studied and followed up to understand the outcome.

Various studies have given different recommendations for the timing of the tracheostomy. Recommendations by AAOHNS and a study by Miles et al. have suggested that
tracheostomy should be performed after 14 days to allow for the reduction of the viral load [7, 8]. However, studies by Schultz et al. and Mishra et al. have suggested that tracheostomy should be performed earlier to help wean the patient off ventilation, thus making ICU beds available earlier for more patients [5, 9]. At our institute, tracheostomy was generally done at 10–12 days of intubation.

Not many studies, to date, have published the outcome following tracheostomy. A scientific letter by Taboada et al. on the same subject reported a mortality rate of 41%, where 12 of the 29 tracheotomised patients died due to COVID related complications. The number in their case was much less than in the present study; however, the results are comparable [10].

Another study by Tang et al. had 80 COVID tracheostomies, of which 43 (53.8%) died [11].

In the present study, 73 out of 136 patients (54%) that underwent tracheostomy survived. The mortality rate in the present study was 46%, with most of deaths due to COVID pneumonia or multi-organ failure.

136 of the 890 patients that were intubated underwent tracheostomy (15%). In the study by Taboada et al., 29.6% of the intubated patients underwent tracheostomy.

As a protocol, all tracheostomies were performed by ENT surgeons and supported by an ICU physician for the ventilator and anaesthesia support. Because of the increased chance of aerosol generation in per cutaneous tracheostomy, which involves early opening of the ventilator circuit and serial dilatation, in the present institute, all cases were done by the open method.

The most common complication was bleeding, which occurred in 20.6% of the patients, most of which were mild. In various other studies, bleeding was also the most common complication, ranging from 5 to 30% [10, 12]. The most common reason for this could be that all these patients were on blood thinners, which was ideally stopped 24 h before the procedure, though at the present centre, we do stop anticoagulation as per standard protocols. LMWH was stopped 12 h prior and UFH 6 h prior to the procedure.

In the present study, the subcutaneous emphysema rate is 4% (6/136). The reason for the higher rates of subcutaneous emphysema in COVID patients compared to tracheostomies in non-COVID patients is due to the increased frailty of the lungs in this disease.

The limitation of these studies is that long-term follow up of these patients has not been performed, which might affect the mortality rates; however, the strong point is that the sample size is higher than in most of the other published studies, so the results are more valid.

**Conclusion**

The mortality rate amongst the 136 tracheostomies performed in COVID-19 patients was 46%, however there was no death directly due to tracheostomy. Local site bleeding and surgical emphysema are the two common complications in these patients.

Performing tracheostomy early helps in early weaning of the patient from the ventilator and makes nursing care easier and increases the availability of ICU beds.

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**Data Availability** Yes available on request.

**Code Availability** NA.

**Declarations**

**Conflict of interest** None.

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