

Original Article

Timing to perform bed-side surgical tracheostomy in COVID-19 patients in intensive care unit

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Abstract

Background: Tracheostomy is an important surgical procedure in the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) disease (COVID-19) pandemic, particularly those patients undergoing prolonged tracheal intubation. The timing and indications for tracheostomy in COVID-19 patients with ventilators are still controversial.

Methods: We prospectively studied the best timing for performing surgical tracheostomy in COVID-19 patients (n = 22) from April 2020 to May 2021 in the COVID-19 ICU attached to our COVID-19 hospital. The tracheotomised patients were followed up and the number and timing of the death were documented.

Results: There were 14 males (male:female = 1.75:1). The mean duration of endotracheal intubation to tracheostomy was 14.4 days (range 10-22 days). The mean time for tracheostomy was 18.45 min (range 12–25 min). Five patients (22.7%) died after tracheostomy. The median time between tracheostomy and death was 4 days.

Conclusions: Surgical tracheostomy has to be performed in a proper time with safe manner for benefit of the patients with COVID-19 and the health care professionals managing the patient.

Keywords: COVID-19 pandemic, mechanical ventilation, SARS-CoV-2, timing of tracheostomy

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Submitted: 01-Jul-2021 **Revised:** 01-Oct-2021 **Accepted:** 02-Oct-2021 **Published:** 14-Apr-2022

INTRODUCTION

The by severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2) disease (COVID-19) is a highly contagious disease.^[1] The clinical manifestations of COVID-19 patients vary from throat pain, fever, myalgia to severe respiratory problems such as acute respiratory distress syndrome (ARDS) and even respiratory failure.^[2]

Severe COVID-19 patients may require tracheal intubation and mechanical ventilation to support their potential recovery and in approximately 4%–5% of such patients, invasive mechanical ventilation is needed.^[3] Tracheostomy is a common surgical procedure performed in the intensive care unit (ICU) and helpful for weaning from ventilator support, facilitate pulmonary toilet, improve

Access this article online	
Quick Response Code:	Website: www.jcsr.co.in
	DOI: 10.4103/jcsr.jcsr_41_21

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How to cite this article: Swain SK, Behera IC, Jena PP. Timing to perform bed-side surgical tracheostomy in COVID-19 patients in intensive care unit. J Clin Sci Res 2022;11:83-7.

patient comfort and daily living activity, decrease laryngeal injury by endotracheal intubation and prevent long-term complications such as subglottic or tracheal stenosis.^[4] However, the surgical indications of the tracheostomy are greatly affected by the general health condition of the patient, comorbidity, prognosis, staff experience and hospital resources.^[5] The optimal timing for performing tracheostomy is also controversial. The timing and indications for tracheostomy in COVID-19 patients are a matter of debate. The optimal timing of the tracheostomy in critical patients is controversial.^[6] There are no defined data to guide the optimum timing for tracheostomy on COVID-19 patients at the ICU with tracheal intubation. The timing to perform tracheostomy in COVID-19 patients with ventilators in ICU ranged from 14 to 25 days for reducing sufficient viral load.^[7] Because of the unstable condition of the COVID-19 patients, early tracheostomy (within 10 days) should be avoided.^[6] However, there are not many studies for the optimum time to perform a tracheostomy on COVID-19 patients in ICU. Here, this study aims to evaluate the optimum timing for performing tracheostomy on the COVID-19 patients at the ICU.

MATERIAL AND METHODS

This prospective study was done at a COVID-19 hospital ICU. We evaluated the clinical data from 22 patients with COVID-19 admitted to the ICU and underwent surgical tracheostomy during the period April 2020 to May 2021. This study was approved by the Institutional Ethical Committee (IEC); written informed consent was waived by the IEC. The clinical data such as age sex, medical comorbidities, intubation history, operative data, complications and outcome. All patients diagnosed with COVID-19 were confirmed using reverse transcriptase-polymerase chain reaction (RT-PCR) of the nasopharyngeal swab specimen were included. Patients with age <18 years and patients transferred from other hospitals to our ICU with tracheostomy were excluded from this study. The detailed profile of patients such as date of intubation, date of tracheostomy, date of weaning from mechanical ventilation and date of decannulation was documented. Tracheostomy was defined as early when performed within 10 days after endotracheal intubation, as late otherwise. In this study, patients were assessed daily and the surgical tracheostomy was performed when the intensivist verified that they could not be weaned from mechanical ventilation and the clinical conditions of these patients were stable, albeit the severity. In our centre, surgical tracheostomies were performed by otolaryngologists which were the most used technique. Surgical tracheostomy was

done by an experienced tracheostomy team to reduce the risk of virus infection in health care professionals. We performed all bedside tracheostomies in the ICU with negative pressure rooms for avoiding unnecessary transport of patients. Post-operative chest X-ray was done in all cases for seeing any improvement of lungs status. The staff who performed tracheostomy were two surgeons, one intensive care specialist, a nurse of intensive care and two scrub nurses. All the health care professionals who were in the team for tracheostomy worn personal protective equipment (PPE) with surgical gowns (preferable double gown), N95 mask, head cap, face shield, surgical cap, double surgical gloves and goggles. One scrub nurse did not enter to room and helped the health care personnel with donning and doffing of the PPE and in the preparation of the surgical instruments.

Statistical analysis

Data were entered in a structured proforma. Continuous variables are reported as mean, standard deviation, median, range. Categorical variables are reported as percentages. The Statistical Package for the Social Science (SPSS) Statistics for Windows, version 20, was used for statistical analyses (IBM-SPSS Inc., Chicago, IL, USA).

RESULTS

There were 214 patients with confirmed SARS-CoV-2 infection who received endotracheal intubation at the ICU attached to the 500-bedded COVID hospital, among whom surgical tracheostomy was performed in 22 patients (10.3%); there were 14 males (male:female = 1.75:1). Their mean age was 46.4 years (range 18–65 years). The mean duration of endotracheal intubation to tracheostomy was 14.4 days (range 10–22 days). The mean consultation time for surgical tracheostomy from the ICU COVID-19 intensivist to the otolaryngologists was 7.6 days (range 6–10 days). Of 22 patients, 18 had associated comorbidities. These included 10 (45.5%) patients with diabetes mellitus, 7 with hypertension, 3 with bronchial asthma and 2 with both diabetes mellitus and hypertension (Table 1). All those COVID-19 patients who underwent tracheostomy received antibiotics treatment before the procedure as ventilator-associated pneumonia (VAP) or possible VAP related to the tracheal intubation. The average time for tracheostomy was 18.45 min (range, 12–25 min) (Table 1). There was no loss of a large amount of blood. Post-operative chest X-ray showed no clinical progression of the respiratory condition. Two patients showed post-operative bleeding from the surgical wound which was easily controlled by an absorbable suture and no additional treatment was needed. Five patients (22.7%) died after

Table 1: Patient profile of the COVID-19 patients those underwent tracheostomy

Case No.	Age (years)	Gender	Co-morbidity	Duration from symptom to tracheal intubation (days)	Duration from tracheal intubation to tracheostomy (days)	Operating time (min)	Complications	Outcome
1	18	Male	Bronchial asthma	12	15	14	None	Alive
2	22	Female	Nil	14	11	17	None	Dead
3	26	Male	Nil	5	16	20	None	Alive
4	28	Female	Diabetes mellitus	5	10	12	None	Alive
5	32	Female	Bronchial asthma	7	14	14	Bleeding	Alive
6	34	Male	Diabetes mellitus	13	13	21	None	Alive
7	35	Female	Hypertension	9	19	22	None	Alive
8	36	Male	Nil	3	18	16	None	Alive
9	37	Male	Nil	11	15	21	None	Alive
10	39	Female	Diabetes mellitus	15	14	23	None	Dead
11	42	Male	Hypertension	12	11	24	None	Alive
12	44	Male	DM	4	12	24	Bleeding	Alive
13	45	Female	DM	7	14	21	None	Alive
14	45	Male	HTN	10	10	14	None	Dead
15	47	Male	Bronchial asthma	12	17	15	None	Alive
16	48	Female	Diabetes mellitus	8	20	16	None	Alive
17	50	Male	Diabetes mellitus	15	22	15	None	Alive
18	54	Male	Hypertension	14	12	22	None	Alive
19	56	Male	Diabetes mellitus and hypertension	7	14	19	None	Dead
20	59	Female	Hypertension	6	16	25	None	Alive
21	64	Male	Diabetes mellitus	9	12	15	None	Alive
22	65	Male	Diabetes mellitus and hypertension	16	11	16	None	Dead

tracheostomy; decannulation was accomplished in 17 patients. Of the 17 patients, who were decannulated, 11 were decannulated before discharge and rest were decannulated after 1 month of discharge. The median time between tracheostomy and death was 4 days. The mean duration of hospital stay of COVID-19 patients with tracheostomy was 28.1 days (range 5-9 days). None of the members who participated in performing tracheostomy procedure developed symptoms of COVID-19 infections.

DISCUSSION

COVID-19 infection is a fatal contagious disease and is considered a global public health emergency.^[5,8] Hospitals in several parts of the world are being overwhelmed with a high number of COVID-19 patients requiring urgent care or invasive ventilation. Respiratory decompensation with a requirement of mechanical ventilation is the hallmark for severe COVID-19 infection. In severe cases, COVID-19 patients develop ARDS with a resultant requirement of mechanical ventilation. The rise of the COVID-19 patients in the current pandemic will expect more requirements of tracheal intubation and prolonged ventilation. For avoiding complications of prolonged intubation, a tracheostomy can be considered by health care professionals. Tracheostomy is one of the important surgical procedures performed among critically ill patients for prolonged ventilation.^[9] The critically ill patients have been defined by the occurrence of respiratory failure with a requirement of mechanical ventilation and treatment at the ICU.^[10] Data from Europe showed that for most critically

ill patients, the duration of invasive ventilation can be up to 21 days.^[11] The guidelines for performing a tracheostomy are to reduce the duration of mechanical ventilation and duration of stay at ICU but its benefits towards the recovery of a patient from COVID-19 infection is not known.^[12] Study shows that the requirement of tracheostomy for ICU patients ranges from 2%–11%.^[13] In this study, there were 214 patients with confirmed SARS-CoV-2 infection among whom surgical tracheostomy was performed in 22 patients (10.3%).

Tracheostomy in COVID-19 patients with respiratory failure is often a challenging surgical procedure because of its severity, duration and risk of infections. The study showed, COVID-19 patients with respiratory failure require ventilator support for more than 4 weeks, which results in prolonged rehabilitation as well as severe critical illness and neuropathy.^[14] Performing tracheostomy on COVID-19 patients in ICU impose challenges on health care professionals including the operating surgeon. Before performing surgical tracheostomy, this can be reviewed by a multidisciplinary team, and the risk versus benefits of this surgical procedure and also associated health care team should be assessed.^[15] Tracheostomy is a safe and effective surgical procedure performed for patients with prolonged tracheal intubation as in acute respiratory failure. The decision for performing tracheostomy in COVID-19 patients is often based on standard weaning procedures.^[16] However, the decision for performing tracheostomy should consider both benefits of the patient and occupational infection of SARS-CoV-2

in health care professionals during the COVID-19 pandemic. We performed bedside surgical tracheostomy in all enrolled patients. Bedside tracheostomy avoids unnecessary transport of the patients to the operating room and frequent connections and disconnection of the ventilator during the transfer of the patients.^[9] The bedside tracheostomy should be well planned with optimum time from tracheal intubation with a limited transfer of the surgical instruments with proper positioning of the patient.

As tracheostomy is an aerosol-generating procedure, it increases the chances of exposure of COVID-19 infections to health care workers, but the duration of viral load and correlation with infection transmission rate is not yet exactly known.^[17] Currently, there are few challenges associated with tracheostomy in COVID-19 patients such as indications of tracheostomy, the best timing for performing tracheostomy, and correlation between the viral load and security of health care professionals.^[18] The peak infectivity of SARS-CoV-2 is around 9–10 days following symptom onset. Hence, tracheostomy at that period may be a risk to those performing the procedure.^[9] The risk of infectivity of the virus decreases after 9–10 days.^[9] The patients with severe manifestations of COVID-19 patients have higher viral loads. The infectivity of the tracheal secretion is likely to be minimal after a mean of 22 days from the day of symptoms.^[19]

Some authors avoid tracheostomy before 21 days of endotracheal intubation to stop the spreading of infections.^[20] Some patients may need early tracheostomy for reasons such as pulmonary toilet or requirement for sedation weaning.^[9] Some recommend tracheostomy no sooner than 2–3 weeks after endotracheal intubation, although long-term laryngotracheal problems may occur in longer periods of intubation.^[21] In this study, the duration of endotracheal intubation to tracheostomy ranged from 10 days to 22 days (average 14.36 days). The timing to perform tracheostomy is yet to be defined in critically ill patients with tracheal intubation, but our results and recommendations worldwide suggest doing a tracheostomy after at least 14 days of endotracheal intubation in patients those are unable to weaned by ventilator but have sufficient chances for survival. One study showed that the average time for performing tracheostomy is approximately 27 min.^[22] In this study, the average time for tracheostomy was 18.45 min (range, 12–25 min).

Currently, the intensive care protocols are helping to decrease the incidence of tracheal stenosis following prolonged intubation and this value is not much higher

than the 2%–3% airway stenosis associated with a tracheostomy.^[23] The mortality benefit of tracheostomy in severely ill patients in ICU has not been demonstrated.^[24] To reduce aerosolisation during the surgical tracheostomy, the role of timing to perform the procedure play an important role. The optimum timing to perform a tracheostomy on COVID-19 patients in ICU is an important criterion for the safety of the health care professionals and other patients.

The timing for performing tracheostomy in a COVID-19 patient with tracheal intubation at ICU is a matter of debate. Performing surgical tracheostomy on COVID-19 patients is a high-risk aerosol-generating procedure for health care professionals. Adequate PPE is required by health care professionals for smooth and safe execution of the tracheostomy. Timing of tracheostomy is an important relationship with the safety of the patients and health care professionals. In this study, the mean duration from endotracheal intubation to tracheostomy is approximately 2 weeks for avoiding the active phase of infection in patients and stop the spread of infections to health care professionals and other patients.

This is a single-centre study with a limited sample size. There is no assessment of the follow-up effect of COVID-19 infection on discharged patients. The greater propensity in our centre to perform surgical tracheostomies and was not possible to carry out an analysis and comparison with percutaneous tracheostomies.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

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Swain, *et al.*: Timing to perform tracheostomy in COVID-19 patients

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