ORIGINAL ARTICLE

Tracheostomy in COVID-19 patients and its effect on laboratory parameters: a retrospective case series

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ABSTRACT

Aim To evaluate characteristics of COVID-19 tracheostomy and its effect on laboratory parameters.

Methods Demographic parameters, duration indicators, and laboratory parameters before and after tracheostomy were analysed in a series of 17 patients with COVID-19 patients.

Results Of the 17 patients, four were males and 13 females with a mean age of 59 years. The average length of total hospitalization was 12 days, the length of stay in intensive care was 10 days, the length of endotracheal intubation was 9 days; tracheostomy was mostly performed on the seventh day. There was a significant correlation between comorbidities and outcomes; however, laboratory parameters did not show statistical significance.

Conclusion Open surgical tracheostomy is recommended in all COVID-19 critically ill patients within 1 or 2 weeks after endotracheal intubation; it can be performed in terms of renal laboratory parameters, lactate and D-dimer. These patients had a lower possibility of weaning from mechanical ventilation.

Key words: D-dimer, demographic, endotracheal intubation, lactate, weaning

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INTRODUCTION

The new coronavirus pandemic (COVID-19) can be characterized by rapid respiratory decompensation and subsequent need for endotracheal intubation and mechanical ventilation (1). Up to 40% of COVID-19 critically ill patients require invasive mechanical ventilation with the latest recommendations for early intubation (2). Tracheostomy is an important measure, with the main role in facilitating respiratory weaning, especially in long-term mechanically ventilated patients (3). In addition to this, tracheostomy provides a better toilet of the tracheobronchial system and protects against secondary pulmonary complications (3). Previous studies have shown that about up to 13-15% of critically ill patients undergo tracheostomy (4,5). Many studies of surgical tracheostomy of COVID-19 patients have been described in the literature (6,7). Performing tracheostomies is considered in patients with prolonged endotracheal intubation, longer than 21 days, patients without significant comorbidities in whom a good prognosis is expected (8). Others recommend performing tracheostomies after 10 days for the purpose of weaning, and the Spanish Society of Otorhinolaryngology and Head and Neck Surgery recommends performing tracheostomies in all infected patients with prolonged endotracheal intubation (9,10).

It is still controversial how tracheostomy affects the outcome of COVID-19 (11,12). Influence of tracheostomy as an operative procedure on laboratory parameters and metabolism has not been sufficiently investigated (11,12). Whether tracheostomy worsens aciodosis or causes renal and coagulation impairment is still a topic of discussion and research (11,12).

The aim of this study was to determine clinical characteristics of tracheotomized COVID-19 patients and to determine the impact of tracheostomy in terms of the most important laboratory parameters.

PATIENTS AND METHODS

Patients and study design

A retrospective review of all COVID-19 critically ill patients who were admitted to the Department of Infectious Diseases, Canton hospital of Zenica due to COVID 19 respiratory failure and underwent tracheotomy between 2020 and 2022 was performed.

Methods

All tracheotomized patients were included in the analysis. Collected data included the age, gender, existing comorbidities, duration indicators - day of tracheotomy, length of endotracheal intubation, length of stay in the intensive care unit (ICU), and total length of hospital stay, respirator weaning. The following laboratory parameters were analysed: lactate, urea, creatinine, potassium and D-dimer (collected at two time intervals, before tracheotomy and after tracheotomy).

This study was approved by the Ethics Committee of the Cantonal Hospital of Zenica (No: 00-03-35-745-5/22). Registration of a clinical trial: ClinicalTrials.gov Identifier: NCT05520957.

Statistical analysis

Descriptive statistics (mean, stabdar deviation - SD values) were used to analyse continuous variables, while the nonparametric $\chi 2$ test was used to analyse qualitative data (gender, comorbidities, duration indicators, and weaning). A simple t-test was used to compare laboratory data. Statistical significance was set at $p<0.05$.

RESULTS

Of the 17 patients with COVID-19 who received tracheostomy four were males and 13 females of mean age of 59±11.88 years with higher occurrence among female patients (p=0.029). The length of overall hospitalization was 12.76±4.72 days, length of stay in ICU 10.94±4.08 days, length of endotracheal intubation nine days, tracheotomy was performed on the seventh day (7.18±3.09) (Table 1).

Table 1. Demographic parameters and indicators of duration in 17 COVID-19 critically ill patients

Variable	Values
Gender (No , %)	
Males	4 (30.8)
Females	13 (69.2)
	Mean±SD
Age (years)	59.06±11.88
Length of hospitalization (days)	12.76±4.72
Length in ICU (days)	10.94±4.08
Length of ETI (days)	9.76±3.05
Tracheotomy (days)	7.18±3.09

ICU, intensive care unit; ETI, endotracheal intubation

Of the comorbidities, the largest number of patients had hypertension (p=0.808), diabetes (p=0.225) and coronary heart disease (p=0.467). Chronic obstructive pulmonary disease and renal disease were not presented. Neurological and thyroid diseases were also statistically significant (p<0.05). Weaning was performed in four patients (p<0.05) (Table 2).

Table 2. Comorbidities and weaning of 17 COVID-19 critically ill patients

Variable	No (%) of patients with comorbidity	No (%) of patients without comorbidity	p
Comorbidities			
HTA	9 (52.9)	8 (47.1)	0.808
DM type 2	6 (35.3)	11 (64.7)	0.225
Coronary disease	7 (41.2)	10 (58.8)	0.467
COPD	0	17 (100)	NA
Neurologic disease	2 (6.3)	15 (93.7)	<0.05
Renal disease	0	17 (100)	NA
Thyroid disease	1 (5.9)	16 (94.1)	<0.05
Weaning	4 (23.5)	13 (76.5)	<0.05

NA, not applicable; HTA, hypertension arterial; DM type 2, diabetes mellitus type 2; COPD, chronic obstructive pulmonary disease

There was no statistical significance among any of the analysed laboratory parameters (Table 3).

Table 3. Laboratory parameters of 17 COVID-19 critically ill patients before and after tracheostomy

Variable	Mean±SD		p
	T1	T2	
Lactate (mmol/L)	2.72±0.68	2.71±0.73	0.973
Urea (mmol/L)	11.44±8.01	23.41±23.03	0.051
Creatinine (mmol/L)	100.23±68.40	147.18±114.05	0.155
Potassium (mmol/L)	4.26±0.58	4.53±1.02	0.340
D Dimer (μg/mL)	6.42±8.45	7.91±8.66	0.615

T1, laboratory analysis before tracheostomy; T2, laboratory analysis after tracheostomy

DISCUSSION

We presented a case series of seventeen COVID-19 surgical tracheotomized patients in the ICU. Our results showed that most patients were female patients, with an average age of 59 years. The average length of stay in the ICU was 12 days, and the time of tracheotomy was on the seventh day. There was no difference in laboratory parameters before and after the procedure.

Although the effects of performing tracheotomy in these patients are still not clear enough, high mortality is also present in tracheotomized patients (13). There is a great controversy over the first line tracheostomy technique in COVID-19 patients (8). Open surgical tracheostomy takes preference over percutaneous dilatation tracheostomy for the minimization of aerosol (8). On the other hand, percutaneous tracheostomy has an advantage over surgical tracheostomy because it is associated with fewer respirator days, earlier weaning and a shorter stay in the ICU (14). Older age and obesity strongly increase the risk of prolonged intubation in mechanically ventilated COVID-19 (15) patients. Prevalence and duration of mechanical ventilation in our patients were associated with gender. In relation to our results, male patients admitted to the ICU have a higher severity of the disease, which mainly refers to vasopressor therapy and longer duration of intubation (16). The average length of stay in intensive care is 12.4 days, with a total stay in hospitals from 4 to 21 days (17,18). No significant difference between the duration of indicators of ventilation was found in our study, probably because of a small number of patients with tracheostomy.

The predominant comorbidities (hypertension, diabetes mellitus and heart disease) of our patients coincide with results according to a study by Kwak et al. (19). In a study by Reis et al., the most common comorbidities in patients undergoing tracheostomy were heart disease, diabetes, and obesity with a significant correlation between comorbidities and outcomes (20). Our results showed a small percentage of patients weaned from the mechanical ventilation. This was probably because of the necessity for higher values of fraction of inspired oxygen during the first five days of mechanical ventilation. This is one of the reasons why early patient weaning is a more demanding process (21).

Several authors have analysed laboratory parameters in COVID-19 critically ill patients in order to assess the prognosis in these patients (22,23). Lactate values in these patients are generally high, and in mechanically ventilated patients according to our results they cannot be an indicator of the severity of the condition as for early identification from admission (24). Laboratory parameters that are the first indicator of the need for renal replacement therapy are urea, creatinine and potassium (25). Nadeema et al. study did not show significance in tracheotomized/non-tracheotomized patients when it comes to laboratory analyses, but concluded that most tracheotomized patients required renal replacement therapy (26). Urea and creatinine values did not differ in early and late tracheotomy according to the results of Tang et al. (27).

Given that our study is retrospective, it has a limitation, because of the small number of patients.

In conclusion, tracheostomy should be considered in all critically ill patients with the need for prolonged ventilation without impact on laboratory parameters but further studies should confirm these results.

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TRANSPARENCY DECLARATION

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