

Surgical Management and Outcomes of Patients Undergoing Modified Surgical Tracheostomy in the Tertiary Intensive Care Unit

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Abstract

Introduction: Tracheostomy, which is one of the surgical procedures since ancient times, can be described as creating a surgical airway in the cervical trachea. Although the need of tracheostomy is reduced compared to the last 50 years, the procedure still remains important in appropriate indications. Tracheostomy can be opened surgically or opened as percutaneous with bronchoscopy or modifications of them.

Material and Method: The aim of this study was to evaluate the cases who underwent modified surgical tracheostomy (mST) at tertiary intensive care unit between February 2017 and February 2019. Twenty six patients who were performed mST in the tertiary intensive care unit were evaluated retrospectively according to age, gender, clinical parameters, indications for admission to the intensive care unit, surgical results and complications.

Results: February 2017 and February 2019, mST procedure was performed in 26 consecutive patients who had a mean age of $64,02 \pm 6,2$ (38 - 88) years. A total of seven patients (27%) were female, and 19 (73%) male. The tracheostomy indications were prolonged intubation (7 days and above) in 20 (71,5%) patients, airway management in 4 (15%) patients and pulmonary toilet, because of recurrent atelectasis due to secretion stasis in 2 (8%) patients. All patients underwent elective tracheostomy. The mean operation time was 16.04 ± 4.61 (20 - 45) minutes. Mean loss of blood was less than 50 ml. No significant difference was found between age and gender of patients compared with demographic, clinical features and surgical outcomes ($p > 0,05$). In 2 (8%) patients developed complication; as bleeding after 24 hours in one (4%) patients, pneumothorax in one (4%) patients.

Conclusions: Tracheostomy is the one of the most frequently used surgical procedure in ICU's. It is known that there are many benefits in the appropriate patient group. mST, which is a modified version of percutaneous technique, can be performed with minimal morbidity with open surgical technique.

Keywords: *Tracheostomy; Modified; Surgery; Thoracic Surgery*

Abbreviations

mST: Modified Surgical Tracheostomy; IV: Intra Venous; X-Ray: Chest Graphy; ICU: Intensive Care Unit; CVD: Cerebro Vascular Disease; COPD: Chronic Obstructive Pulmonary Disease; USD: United States Dollar; ARDS: Acute Respiratory Distress Syndrome

Introduction

Tracheostomy, which is one of the surgical procedures since ancient times, can be described as creating a surgical airway in the cervical trachea. Although the need of tracheostomy is reduced compared to the last 50 years, the procedure still remains important in appropriate indications. The reason for this situation due to increased use of the antibiotics, aspiration-endotracheal intubation techniques, and fiberoptic bronchoscopy. Tracheotomy has become the most common surgical procedure in intensive care units due to improvements in intensive care management and ventilation requirement [1,2]. Tracheostomy can be opened surgically or opened as percutaneous with bronchoscopy [3].

Aim of the Study

The aim of this study was to evaluate the cases who underwent modified surgical tracheostomy (mST) at tertiary intensive care unit between February 2017 and February 2019.

Materials and Methods

Twenty six patients who were performed mST in the tertiary intensive care unit were evaluated retrospectively according to age, gender, clinical parameters, indications for admission to the intensive care unit, surgical results and complications. Patients who underwent tracheostomy with different methods, patients under 18 years of age and patients with missing data were excluded from our study.

The procedure was performed bedside. mST was performed to the endotracheal intubated patient under sedation- local anesthesia with diprivan (0.5 mg/kg IV) and lidocaine 2% (1 mgr/kg subcutaneous). The bleeding parameters were normal and anticoagulant therapy was discontinued at least 48 hours ago in all patients, Portable cautery was made available during the process. The head and neck was classically extended. A 2 cm horizontal skin incision was performed over 1 cm of the jugulum. The pre-tracheal fascia was reached between the thyroid veins and both thyroid lobes with blunt and sharp dissection. Pre-tracheal fascia was opened. The patient was extubated first. Then, a vertical incision was performed over the 3rd to 4th rings of the trachea. 6 f aspiration probes were sent to the trachea through the opening incision as a guide. After the balloon of 7.5 no silicone trachestoma cannula was lowered, it was easily sent to the trachea by guiding the aspiration probe. tracheostomy cannula was connected to the ventilator and the patient was seen to be ventile.

This step was made easier by using the guide to insert the cannula, the most important and difficult step of the tracheostomy procedure. Therefore, the surgical procedure was defined as mST. Immediately after the procedure, fiberoptic bronchoscopy was performed to locate the cannula and aspirate the secretions. Portable chest X-ray was performed after the procedure within hours for possible complications. All patients were routinely followed up during ICU stay and the mean follow up period was $18,4 \pm 2,2$ (range 4 - 55) days.

Data analysis

A statistical analysis was performed using the Statically Package for the Social Science program (SPSS, 20,0) Data were expressed as mean \pm SD. Frequencies and percentages were used for the categorical measures.

Results

February 2017 and February 2019, mST procedure was performed in 26 consecutive patients who had a mean age of $64,02 \pm 6,2$ (38 - 88) years. A total of seven patients (27%) were female, and 19 (73%) male.

The indication of ICU admission was CVD (Cerebro Vascular Disease) for 14 (54%) patients, COPD (Chronic Obstructive Pulmonary Disease) with acute exacerbation for 8 (31%) patients, multi trauma for 2 (8%) patients, malignancy for 2 (8%) patients (Table 1).

Indication of ICU admission, n (%)	26 (100)
CVD	14 (54)
COPD with acute exacerbation	8 (31)
Multi trauma	2 (8)
Malignancy	2 (8)

Table 1: Indication of ICU admission for 26 cases.

CVD: Cerebro Vascular Disease; COPD: Chronic Obstructive Pulmonary Disease.

The tracheostomy indications were prolonged intubation (7 days and above) in 20 (71,5%) patients, airway management in 4 (15%) patients and pulmonary toilet, because of recurrent atelectasis due to secretion stasis in 2 (8%) patients.

All patients underwent elective tracheostomy. The mean operation time was 16.04 ± 4.61 (20 - 45) minutes. The other demographic and clinical data, surgical outcomes are summarized in table 2. Mean loss of blood was less than 50 ml. The mean a patient's cost for the health care system for this procedure was calculated as $32,42 \pm 3,7$ USD.

Sex, n (%)	26 (100)
Male	19 (73)
Female	7 (27)
Age, mean \pm SD (range, years)	$64,02 \pm 6,2$ (38 - 88)
Mean operation time, mean \pm SD (range, min)	16.04 ± 4.61 (20 - 45) minutes
Operation Indications, n (%)	26 (100)
Prolonged intubation	20 (77)
Airway management	4 (15)
Pulmonary toilet	2 (8)
Complications, n (%)	2 (8)
Hemorrhage	1 (4)
Pneumothorax	1 (4)

Table 2: Demographic and clinical characteristics and surgical outcomes of 26 cases.

No significant difference was found between age and gender of patients compared with demographic, clinical features and surgical outcomes ($p > 0,05$). We found macroscopic thyroid nodules in 10 patients (38%), but this did not interfere with the process. There were no conversion of mST to open classic tracheotomy and no intraoperative complications.

In 2 (8%) patients developed complication; as bleeding after 24 hours in one (4%) patients, pneumothorax in one (4%) patients. The bleeding was resolved by re-exploration and cauterization. Tube thoracostomy was performed for pneumothorax.

The mean follow up period was $18,4 \pm 2,2$ (range 4 - 55) days. No pathological findings related to tracheostomy were reported in this period. Intraoperative or postoperative mortality was not observed depending on the processing of mST.

Discussion

Tracheostomy is one of the most frequently performed surgical procedures in intensive care unit (ICU) patients. In addition to surgical techniques, it is frequently used for minimally invasive percutaneous techniques for tracheostomy. Several study have reported that shorter procedure times and lower complication rates with percutaneous techniques compared to open surgical techniques [4,5]. In the study, open surgical technique was used in the modified version of percutaneous technique and it was determined that it facilitated the process time with low morbidity and complication.

Tracheostomies can be performed through with an open or percutaneous technique. Each methods have various modification and specific advantages and disadvantages. The most common indication for tracheostomy is prolonged mechanical ventilation in ICU. Among other indications trauma patients with acute respiratory failure, septic shock, COPD and ARDS can be counted [6]. In the study, the most common indication for hospitalization of ICU was CVD-induced respiratory failure (54%) and the most common indication for tracheostomy was prolonged intubation (73%).

The tracheostomy contraindicated in patients with coagulopathy, thrombocytopenia, other risk factors for bleeding, patients with narrow, short thick neck anatomical structure, inability to tolerate hypoxemia or hypercarbia, morbid obesity [5-7]. For the patients in the study group the bleeding parameters were normal and anticoagulant treatment was stopped. There were no patients with different anatomical structures and obese.

Molardi, *et al.* [7] similarly, described the technique in which they applied modified tracheostomy in their study. Their purposes is reduce surgical trauma and postoperative complications without any specialized tools. They used the technique they developed in 67 patients and reported that it was successful as a classical technique and that it was similar to percutaneous technique. They only find that in-hospital mortality was significantly higher in classic surgery group. mST was preferred in the study because of its minimally invasive nature and accelerating and facilitating the procedure.

The most common complication following tracheostomy is reported as bleeding. Other major complications include pneumothorax, recurrent nerve palsy, esophageal rupture, and innominate artery fistula [4]. Two complications were seen in 26 patients, as bleeding after 24 hours and pneumothorax.

Another benefits of tracheostomy are faster weaning, shorter stay of ICU, fewer lung infections, increased patient safety and improved comfort of patients. Expected intubation for more than 14 days should be considered as a tracheostomy [8]. Techniques for tracheostomy are evolving and improving. The technique used in the study is thought to be used successfully.

Conclusion

Tracheostomy is the one of the most frequently used surgical procedure in ICU's. It is known that there are many benefits in the appropriate patient group in the ICU. mST, which is a modified version of percutaneous technique, can be performed with minimal morbidity with open surgical technique. It is recommended that the procedure be performed by thoracic surgeons who are more familiar with tracheal surgery and can manage the possible complications better.

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