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**A COMPARATIVE STUDY ON THE COMPLICATIONS OF PERCUTANEOUS AND SURGICAL TRACHEOSTOMY AMONG ICU PATIENTS: A STUDY CONDUCTED ON GOLESTAN AND IMAM HOSPITALS, AHVAZ, IRAN**

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**Abstract:**

**Objective:** In this study the complications of two tracheostomy methods of percutaneous dilatational tracheostomy (PDT) and classic surgery were compared among patients hospitalized in intensive care units (ICUs).

**Method:** This was a clinical trial conducted on 228 patients who were divided into two groups: group one (n=57) underwent PDT and the group two (n=171) underwent classic tracheostomy surgery called classic surgery. The efficacy and complications of two methods were compared.

**Results:** Premature bleeding after the operation was observed in 12 cases, of them one case (1.8%) was from PDT group 11 cases (6.4%) from the classic surgery group, and the difference was significant. No case in the PDT showed wound infection during the first 10-day period after operation, whereas two cases in the classic surgery group showed infection (1.2%) and the difference was significant. No case showed emphysema in the PDT group, whereas one case in the classic surgery showed the complication which finally resulted in death. The average of the operation time in the PDT and classic surgery was 8.4 min and 15.5 min, respectively.

**Conclusion:** The PDT approach is better than the classic surgery method in terms of the hospitalization's time duration and expectation for classic surgery, imposed cost to the patient and treatment system and also in terms of the appearance and beauty for doing the tracheostomy and also time duration of doing the tracheostomy. According to obtained results from this study it can be said that PDT tracheostomy according to less complications and doing in the patient's bed in ICU can be the safe and affordable alternative method for classic surgery tracheostomy.

**Keywords:** Tracheostomy, percutaneous dilatational tracheostomy, Infection, Emphysema, Complications

## **Introduction**

Long-term hospitalization of patients in intensive care units (ICUs) can bear significant additional costs to healthcare system. Moreover, due to the long hospitalization and occupation of ICUs' beds, the appropriate medical care would be withdrawn of other patients who are under urgent needs for hospitalization. Therefore, for effective planning in order to optimal use from ICU's beds it is better to complications after operation be identified and then suitable solutions to be presented for prevention of that (1).

Isolating from ventilator has an important role in survivorship of patients who are hospitalized in ICU and suffer from acute respiratory failure. So evaluating effective factors in isolating of patients from mechanical ventilation and finding correct ways to shortening the hospitalization time and mechanical ventilation of patient in this unit can greatly help to reduction of hygienic-medicinal costs and correct planning in order to optimal use of existing resources (2).

It is evident that on time, fast, without complication and successful isolation leads to reduction of ventilation complications (reduction of cardiac output and infections from artificial ventilation), hyper and hyperventilation, atelectasis, oxygen poisoning, barotrauma and mental dependence of patient on the ventilator by shortening the period of artificial ventilation (3-5).

Use cases have been increased from intubation into the trachea in order to keep open and protecting the airways, using ventilator, doing various classics and emergency controlling of airways in recent years that along with increasing from day to day of doing intubation into the trachea, complications of this method have been appeared more (6, 7).

Dependence of patients on ventilator has become more in recent years, which this issue has been caused to prolongation use from tube into the trachea and complications related to that (6, 8). Patients who are placed under the prolonged mechanical ventilation, the amount of short-term and long-term mortality and morbidity is high in them and also much health care is used for them pro rata resources (9). In patients under the mechanical ventilation the tracheostomy can be used instead of using the endotracheal tube. Tracheostomy is usually done in patients who have accustomed to mechanical ventilation or in order to simplification the long-term ventilation in patients with respiratory failure (10) and regularly it is done in more than 10% of hospitalized patients in ICU who need mechanical ventilation more than three days (11, 12). Tracheostomy has many advantages compared with intubation into the trachea including the resistance reduction of the lower airways in the case of right choose, creating the less dead space, reduction of residence in ICU,

less movement of endotracheal tube, more comfort of patient, proper discharge of secretions, possibility of receiving food from the mouth and possibly talking of the patient by special tube (13).

In addition, some of researchers believe that doing the tracheostomy can cause to reducing the needs of patients to invasive mechanical ventilation (14, 15). However, other researchers believe that tracheostomy does not reduce the period of patients' isolation from mechanical ventilation (16). In addition to the aforementioned advantages for tracheostomy, this method has some disadvantages including tracheal stenosis or necrosis, increasing the proliferation and colonization of bacteria, bleeding and pneumothorax and aspiration (17-20). Old doing method of tracheostomy that was used in patients with acute respiratory status needs to transition from ICU to the operating room, a where that classic team does the tracheostomy in the classic method. This method needs to an incision in the trachea in order to placing the tracheostomy tube with direct view (21). Another method that is used more in the last two decades in order to tracheostomy in IC is percutaneous tracheostomy. Perhaps one of the most important advantage of this method than tracheostomy in classic method is doing of that beside the patient's bed and the surgery room will not be needed which have its own certain complications. Therefore, the possibility of appearing the problems during the transmission into the surgery room will not exist like separation of vascular catheters or pulling and egressing the tracheal tube; from another side causes to reduction of costs. Also since the ICU is always crowded or often the visit time is given late to ill patients or the turn is given to them at the end of operations so doing the tracheostomy will be always done with delay in ill patients with surgery method that will be lead to increasing the possibility of appearing complications (22-24). On the other hand, percutaneous tracheostomy approach needs several dilators with internal diameter in gradual increase. Using several dilators along with the tracheal manipulation increases the risk of complications necessitating high level of training to perform percutaneous tracheostomy.

In addition to the operational skills, necessary equipments and having expert assistants familiar with the operation are needed for the surgery (25, 26).

Both methods have their own advantages and disadvantages. To our knowledge, there has not been a study on comparing the efficacy of these two methods in reducing complications in hospitalized patients in ICU in Ahvaz city, Iran. Therefore, this study aims to compare the efficacy and complications of two tracheostomy methods of percutaneous dilatational tracheostomy (PDT) and classic surgery among patients hospitalized in ICUs.

## Materials and Methods

The population consisted of the hospitalized patients in ICU who needed tracheotomy due to specific reasons. Patients with anatomical disorders, history of previous tracheostomy in the neck, bleeding disorders, goiter, bulky neck, unstable general conditions, and trauma in the neck, were removed from study.

Patients of the both groups were placed under the mechanical breathing in terms of breathing status. Mood of device in them was SIMV and received less than 40% oxygen. In addition, the patients received 8 to 10 cc/kg flow rate of oxygen and pressure of end expiratory was equal to 2 to 5 cm. In the Grease method the forceps is used to direct the guide wire. Two teams performed the PDT. One team has the task of bronchoscopy and changing the status of tracheal tube and another team has the task of preparation of tracheostomy tube.

Vital signals of the patient are permanently monitored. The necessary drug for sedation and relaxation of patient was administered before the PDT operation and then the patient was ventilated sufficiently through tracheal tube by mechanical ventilation.

For suitable position that is in the form of neck extension, an appropriate circular shaped holder is placed under the shoulder of the patient. In order to local anesthetic of the neck, a combination of 2% lidocaine with epinephrine was subcutaneously injected. Standard method of tracheostomy surgery was performed in the department of neurosurgery. In surgery room and by anesthesia by incision the skin and subcutaneous tissue and achieve to tracheal and then cutting off the tracheal ring and passing the tracheostomy tube into the trachea under direct vision will be done.

The evaluating parameters included bleeding (15 cc and higher was considered as bleeding during the operation), subcutaneous emphysema, wound infection during the hospitalization period and within one month after release). Sample volume in PDT group was considered 57 and sample volume in classic tracheostomy was considered 171 people. The data were analyzed with statistical package of SPSS (version 20) using Chi-Square test and independent t test. The significant level of  $P=0.05$  was set for all of the analyses.

## Results

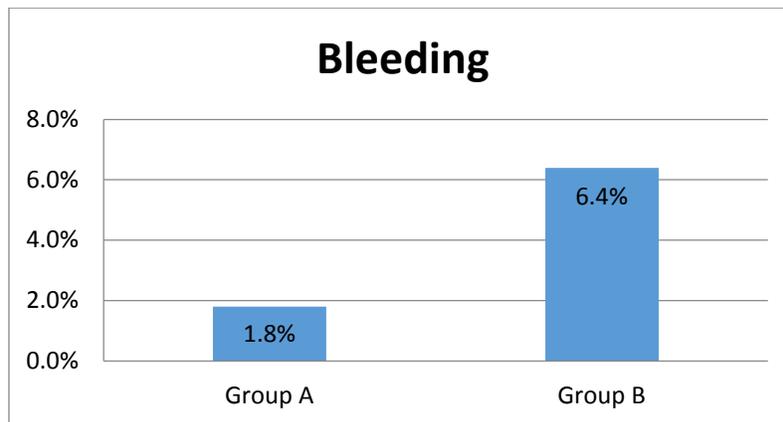
This study was conducted on 228 hospitalized patients in ICU who were candidate of tracheostomy surgery. The patients were divided into two groups: PDT (Group A, n=57) and classic tracheostomy (Group B, n=171) methods.

Patients' demographic information has been shown in Table 1.

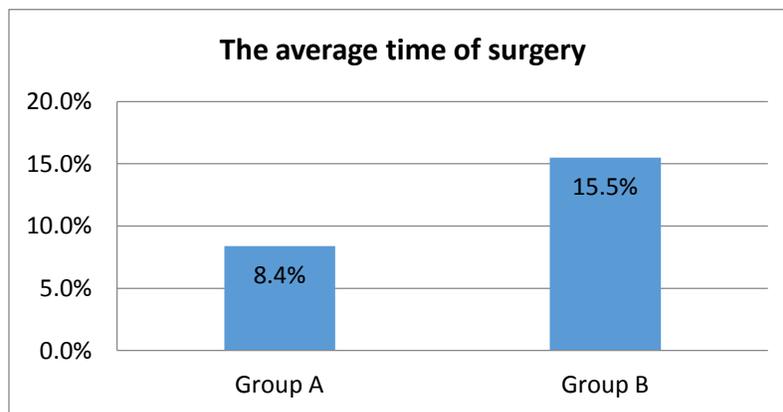
**Table 1. Patients' demographic information.**

Variables	Group A	Group B
Number	57	171
male	55	153
Female	2	18
The mean age (years)	54.42	49.81

The patients of both groups were compared with each other in terms of premature bleeding. In group A, one patient (1.8%) and in group B, 11 patients (6.4%) were bleeding (figure 1).

**Figure1. Comparing the frequency of patients with premature bleeding in two groups of A and B.**

The average amount of time duration of doing the surgery was compared between two groups that this amount was 8.4 minutes in group A and it was 15.5 minutes in group B (Figure 2).

**Figure 2. Comparing the average amount of time duration of doing the surgery between two groups of A and B.**

The patients of the both group were compared with each other in terms of infection. No case was observed in group A, but two cases of infection were reported in group B. Also the patients of the both group were evaluated in terms of Emphysema. In PDT group no case was observed and 1 case was reported in the second group that finally had led to

death. Hospitalization's time duration in the segment depends on many factors, but because all works were done by the physician and ICU's cadre and finally we didn't have any dawdling and in terms of hospitalization's time in the segment because of no need to coordinate with the surgeon and operating room and doing the track operation by physician in ICU, at least 24 hours of reduction of hospitalization's time were observed in the first group. In terms of cost because of doing tracheostomy in ICU and no need to transferring the patient to operating room and costs of operating room and anesthesia and surgery team, the patients of first group paid less cost. In terms of appearance and beauty and remained traces of surgical site, the much better appearance was observed after bring out the track in the first group.

## **Discussion and Conclusion**

Tracheostomy is the most common and vital operation in ICUs of hospitals that is done in two ways include PDT and classic surgery approach. In this study, the complications of tracheostomy in two ways include PDT and surgical in 228 patients were hospitalized in the intensive care unit is investigated and compared. In the present study, the incidence of hemorrhage during tracheostomy, in PDT group was 8.1% and in the surgery group was 4.6% which was statistically significant ( $P < 0.05$ ). The results were consistent of other studies such as Khalili et al. (2002) and Holdgaard et al. (1998) (24, 34). In term of the incidence of wound infection, the PDT group showed no case of infection, while the surgery group showed 2 cases of infection. In a similar study that Park et al. (2013) had done, rate of infection in surgical site in PDT group was 3.4% and in the surgery group was 7% that it had shown significant differences ( $P = 0.04$ ).

The results of other similar studies also had reported that the incidence of infectious complications in PDT group was less than surgical group (27-29). The subcutaneous emphysema was not seen in PDT group, but 1 case was reported in surgical group that eventually was lead to death. Among the advantages of PDT is perform this function at the bedside of patients and not to transfer the patients to the operating room (28, 29, 30-32). The mean duration of surgery was compared between the two groups that this value in PDT group was less than surgical group. These results were similar to study of Fernandez et al. (2010) and Freeman et al. (2001). According to the results of this study and other similar studies, we can conclude that complications such as bleeding, infection and subcutaneous emphysema has less complications in PDT method compared with surgical. In addition, the PDT approach is more efficient than the classic surgery in terms of operation duration. Furthermore, tracheostomy surgery with PDT method can be performed in an ICU and does not need to transfer the patient to the operating room. Therefore, the cost of the operating room,

anesthesia, and surgical team is more affordable (28, 30, 31). In conclusion, the PDT technique for patients hospitalized in ICUs is an effective, safe, and cost-effective method.

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