

# Percutaneous Tracheostomy Application to Geriatric Patients in an Intensive Care unit by Anaesthesiologists: An Analysis of 47 Cases

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## BACKGROUND

Percutaneous dilatational tracheostomy (PDT) is indicated when prolonged mechanical ventilation is required. Although tracheostomy has only been applied by surgical techniques in the recent past, it is currently applied using PDT techniques. PDT is performed in a short time; it is a simple technique with a low complication rate and a smaller skin incision, and it can be performed at the patient's bedside. Elderly individuals comprise an increasing proportion of the population and represent a progressively expanding number of patients admitted to the intensive care unit (ICU) who require prolonged mechanical ventilation; thus, the number of tracheotomy procedures is ultimately increasing. In this study, we aimed to present our PDT practices in the elderly in our ICU.

## MATERIAL and METHODS

After obtaining ethics committee approval, we conducted a retrospective chart review of 47 geriatric patients in the ICU who underwent PDT by an anaesthesiologist.

## RESULTS

Eighteen patients died (38%) during hospitalization in the general ICU (of causes unrelated to PDT). Sixteen patients were successfully weaned from mechanical ventilation following PDT. The mean time interval from PDT to weaning from mechanical ventilation was  $9.56 \pm 6.35$  days (range: 1–23 days). Fourteen patients were discharged from the general ICU with tracheostomy cannulae, and five patients were discharged with household ventilators. The mean time interval from PDT to discharge from ICU was  $24.00 \pm 11.86$  days (range 5–45 days).

## CONCLUSION

The Griggs technique for PDT appears to be safe when performed by anesthesiologists or intensive care physicians. It can be performed easily at the patient's bedside; thus, the transport of critically ill patients, especially geriatric patients, to the operating room can be averted.

**Keywords:** Percutaneous tracheostomy, intensive care, geriatric

## INTRODUCTION

Percutaneous dilatational tracheostomy (PDT) is indicated when prolonged mechanical ventilation is required (1–6). The ratio is approximately 10%–24% in intensive care unit (ICU) patients (2).

This procedure is performed to facilitate weaning from mechanical ventilators; reduce infectious complications; promote comfort, oral feeding, and speech in selected patients; reduce complications due to prolonged endotracheal intubation; reduce the volume of dead space; facilitate cleaning of pulmonary secretions; increase compliance; provide more effective alveolar ventilation; and reduce the length of stay in intensive care (1–3, 5–7).

Although PDT has several potential benefits, it can also have many significant complications with high mortalities, such as insertion around the trachea, laceration, tearing of the trachea and esophagus, pneumothorax, and pneumomediastinum (2, 5).

Surgical tracheostomy (SCT) was first described by Jackson in 1909 (4, 5). In 1955, Shelden et al. were the first to describe percutaneous dilatational tracheostomy through the skin as a simple alternative to the surgical technique; however, this method was not welcomed by ICU specialists (4, 5, 8). In 1969, Toy and Weinstein introduced the use of a guide wire for the dilator and cannula (4). In 1985, Ciaglia described the method of percutaneous dilatational tracheostomy, which was widely accepted and increasingly performed at the patient's bedside by Otolaryngologist eye, nose, and throat doctors or other surgeons (5, 9).

Although tracheostomy was only surgically applied in the recent past, it is currently applied using PDT techniques (1, 2, 6). PDT can be performed in a short time; it is a simple technique, the complication rate is low (1, 5, 6), the skin incision is smaller, and it can be performed at the patient's bedside (2, 5, 6). The patient remains on a ventilator for most of the time,

and there is no need to transport the patient to the operating room (6).

Elderly individuals comprise an increasing proportion of the population; mild illness can lead to rapid deterioration of the general condition of these patients, and they represent a progressively expanding number of patients admitted to the ICU who require prolonged mechanical ventilation. Thus, the use of tracheotomy procedures is ultimately increasing (10, 11). Ventilator-associated pneumonia (VAP) is a common problem in patients on long-term mechanical ventilation in the ICU. The risk factors are age greater than 60 years, multiple intubations, and even the tracheotomy itself. VAP incidence decreases when tracheotomies are performed earlier (11). All the components of the respiratory system are affected by aging, although at different rates; however, age in itself is not a risk factor of respiratory failure (12). In this study, we aimed to present our PDT practices in the elderly in our ICU.

## MATERIALS and METHODS

After approval of the ethics committee of the university, we conducted a retrospective chart review of 47 geriatric patients in the ICU who underwent PDT by an anaesthesiologist between September 2015 and March 2015. In our ICU, before we perform PDT, informed consent is obtained from the person responsible for the patient. Demographic data, indications for admission to the general ICU, the timing of PDT, weaning from mechanical ventilation, and discharge from the ICU were collected from these records. There were no exclusion criteria.

After clinical and laboratory evaluation, the patients were positioned on their beds under close monitoring by electrocardiogram, non-invasive blood pressure, pulse oximetry, and capnography.

The procedure was performed with an orotracheal tube in place under sedoanalgesia and muscle relaxation, with administration of 100% oxygen throughout. Under sterile conditions, anatomic markers of the trachea were detected and the tracheostomy was performed with the Griggs guide wire dilating forceps technique using a Portex percutaneous tracheostomy kit.

Then, extubation was performed and mechanical ventilation was continued through the tracheostomy. A plain chest X-ray was routinely performed after PDT. Statistical analyses were performed using THE Statistical Package for the Social Sciences (SPSS) (Statistical Package for the Social Sciences) (SPSS for Windows, Version 16.0; Chicago, IL, USA) 16.00. Descriptive statistics and frequency distributions were calculated for specific variables. Data are presented as mean±standard deviation (SD), number of patients, or median (range) where appropriate.

## RESULTS

We evaluated the data of 47 geriatric patients retrospectively. The demographic characteristics of the patients are presented in Table I.

Ventilation modes during the application of PDT were adaptive support ventilation (ASV) in 92% of patients, synchronized intermittent mandatory ventilation (SIMV) in 4% of patients, and synchronized controlled mechanical ventilation (S-CMV) in 4% of patients.

**TABLE I.** Demographic characteristics of the patients

Age (years), mean (SD)	73.61±9.91
Male (n)/Female (n)	21/26
APACHE II score, mean (SD)	24.68±6.44
Days ventilated prior to PDT, mean (SD), (min-max)	10.95±7.39 days (range 3–31 days)
Time interval from PDT to weaned from mechanical ventilation, mean (SD), (min-max)	9.56±6.35 days (range 1–23 days)
Time interval from PDT to discharge from ICU, mean (SD), (min-max)	24.00±11.86 days (range 5–45 days)
Indication for tracheostomy (n)	Respiratory failure (n=30) Cardiac arrest (n=13) Subarachnoid hemorrhage (n=4)
SD: standart deviation; PDT: percutaneous dilatational tracheostomy; ICU: intensive care unit; min: minimum; max: maximum	

Eighteen patients died (38%) during hospitalization in the general ICU (of causes unrelated to PDT). Sixteen patients were successfully weaned from mechanical ventilation following PDT. Fourteen patients were discharged from the general ICU with tracheostomy cannulae, and five patients were discharged with household ventilators. Ten patients were still being treated by mechanical ventilation in the ICU.

No complications (surgical exploration due to bleeding, subcutaneous emphysema, infection of the stoma site) were seen after PDT. Minor bleeding as an early complication occurred in one patient.

## DISCUSSION

In this study, we aimed to present our PDT practices in the elderly in our ICU. Recently by the advancing at age of population, admissions of geriatric patients to ICU increasing. And long intubation periods is necessary at these group of patients (1, 5). Recently, with the advancing age of the population, geriatric patient admissions to intensive care are increasing; long intubation periods are indicated for many of these patients (1, 5).

The PDT method has recently become a method commonly used in ICUs (1, 9).

To date, different percutaneous tracheostomy methods have been described. (2, 8, 9)

1. Multi dilation method (Ciaglia technique)
2. One-step method of dilation (Ciaglia Blue Rhino)
3. Forceps dilation technique (Griggs)
4. Fantoni translaryngeal method
5. Controlled rotation method (PercuTwist)

Currently, the most commonly used techniques are the methods described by Ciaglia and Griggs (8).

Earlier studies mostly compared surgical tracheostomy methods with percutaneous tracheostomy. However, there are few studies comparing PDT techniques.

Despite the increasing rate of tracheostomy in the ICU, selection of the technique is still controversial. The surgical tracheostomy method is preferred in France, whereas in England, bedside tracheostomy is implemented by anesthesiologists in 90% of patients (9). Other important issues are who should perform this procedure (4) and when to perform this procedure (8, 11).

Many studies that compared PDT with surgical tracheostomy reported that PDT is safe and advantageous in terms of cost (9). Düger et al. (3) reported that PDT, in terms of postoperative complications and bleeding, gives better results than surgical tracheostomy (SCT) and can be used widely as a routine method for elective tracheostomy in ICUs. Hasanloei et al. (5) showed a statistically significant difference between the PDT and SCT methods in terms of the duration of the tracheostomy procedure, the duration of mechanical ventilation, and the expense of the procedure. Also, Yeniaras et al. (9) reported that the cost decreases by approximately 39% when tracheostomy is performed by PDT techniques at the patient's bedside compared to surgical tracheostomy.

In an organized meta-analysis of PDT and SCT by Delaney et al. (13), PDT was reported to be associated with less wound infection, bleeding, and mortality compared to SCT. Satio et al. (14) found that PDT patients had obviously less scar malformation and less wound and stoma infection; also, the duration of the procedure was shorter. Türkmen et al. (15) investigated the complications of PDT and SCT by control MRI 1 month after closure of the tracheostomy in 30 critical patients. They concluded that PDT appears to be safer and more effective than SCT.

We perform percutaneous tracheostomy on all elderly patients in our ICU. We plan to use surgical tracheostomy in patients with anatomic abnormalities; however, we have not encountered such anatomic abnormalities. All tracheostomies were applied using the Griggs technique at the patient's bedside by anesthesiologists in our ICU. The Griggs technique is preferred because of its short application time (5.5 min); also, we have more experience with the Griggs method than with other methods.

In some studies, only surgeons performed PT, whereas in other studies, it was performed by anesthesiologists and intensive care physicians. The advantage of having anesthesiologists or intensive care physicians perform tracheostomies is that the procedure can be performed without delay (4). Klein et al. (4) reported that the Griggs technique for PDT appears to be a safe and effective modality in the hands of intensive care physicians. In addition, when intensive care physicians perform PDT, delays relating to surgeons or operating rooms are no longer a problem.

Akinci et al. (16) compared the Ciaglia and Griggs methods for PDT in their study. They reported that the Griggs method requires less manipulation, has a more comfortable application, and has a significantly shorter processing time.

The debate on when to apply tracheostomy in the ICU is still ongoing. Early tracheostomy is the time when tracheostomy is applied between the second and tenth days that the patient is ventilated with mechanical ventilation after being admitted to the ICU (7).

Early tracheostomy application improves patient comfort, improves communication with the patient, and increases the patient's oral intake (8). Griffiths et al. (17) reported that early tracheostomy application in ICU patients reduces the rate of hospitalization. Schneider et al. (11) suggested that elderly patients benefit from an earlier tracheostomy, resulting in a decreased incidence of VAP and a shorter admission time.

In our ICU, if we plan to perform a tracheostomy, we seek to apply it within the first 10 days that the patient is on mechanical ventilation. We prefer early PDT to prevent VAP; facilitate weaning from the mechanical ventilator; promote the patient's comfort, oral feeding, and speech; and in selected patients, reduce the length of stay in intensive care.

Although PDT has advantages, it is an invasive procedure that has early and late complications (1). The early complication rate of PDT applied by the Griggs method ranges from 9.7% to 15% (6). Elective tracheostomy performed by experienced practitioners has a lower complication rate (3). We observed minimal bleeding in one case during our PDT applications.

The importance of the size of the tube was highlighted in 1971 by Andrews and Pearson. They observed a significant relationship between the diameter of the tracheostomy tube and the incidence of stricture. The percutaneous technique offers the smallest possible tube (and stoma) consistent with adequate air flow and suctioning ability (6). We use tracheostomy cannula number 8 in men and number 7 in women.

The potential limitations of this study are that ultrasound or bronchoscopy was not performed before the tracheal puncture. We use a landmark technique in which most anaesthesiologists have significantly more experience than ultrasound.

## CONCLUSION

The Griggs technique for PDT appears to be safe when performed by anesthesiologists or intensive care physicians. It can be performed easily at the patient's bedside; thus, the transport of critically ill patients, especially geriatric patients, to the operating room can be averted.

**Ethics Committee Approval:** Ethics committee approval was received for this study from the ethics committee of Katip Çelebi University Atatürk Training and Research Hospital, İzmir, Turkey.

**Informed Consent:** Informed consent was not received due to the retrospective nature of the study.

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