Early Versus Late Percutaneous Tracheostomy In Adult Critically Ill Mechanically Ventilated Patients

Thesis

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Investigator

Adel Mohamed Saleem Mustafa
MBBCh

Supervisors

KamelAbdElaziz Mohamed, MD
Asst. Prof. of Critical Care,
Critical care department,
Cairo University

Ahmed YehiaZakaria, MD
Lecturer of Critical Care Medicine
Critical care department
Cairo University

Ahmed Samir Elsawy MD
Lecturer of Critical Care Medicine,
Critical care department,
Cairo University

Cairo University
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Abstract

Percutaneous dilatational tracheostomy (PDT) has largely replaced surgical tracheostomy in the intensive care unit settings.

Many authors have shown that PDT can be performed in the ICU, more rapidly, at a lower cost, and with less morbidity than open tracheostomy.

Currently, longer term data are becoming available and authors are reporting few complications including lower rates of tracheal stenosis, when compared to open tracheostomy.

This study was conducted to evaluate and compare the patients who had a bedside percutaneous tracheostomy before 10 days from those who had it after 10 days from connection to mechanical ventilation regarding mean ICU stay, hospital stay and complications.

This study, which is prospectively randomized was conducted between Cairo university hospital and king Faisal Hospital of Makkah-K. S.A. on forty patients who underwent bedside percutaneous tracheostomy using ciaglia's method in the critical care departments.

Key Words:

Historical Aspect of Percutaneous Tracheostomy in Critically ill Patients, Anatomy and Physiology of Tracheostomy, Bedside Percutaneous Dilatational Tracheostomy (PDT) In Critically Ill Patients, Timing of Tracheostomy in Critically Ill Patients.

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Dr. Adel Saleem

Contents

List of Abbreviations

ABG	**:**	*Arterial Blood Gas Analysis*
COPD	**:**	*Chronic Obstructive Pulmonary Disease*
ET	**:**	*Early Tracheostomy*
ETT	**:**	*Endotracheal Tube*
HRQoL	**:**	*Health rate quality of life*
ICU	**:**	*Intensive Care Unit*
LOS	**:**	*Length of stay*
LT	**:**	*Late Tracheostomy*
MV	**:**	*Mechanical Ventilator*
NIS	**:**	*Nosocomial Infections*
OST	**:**	*Open Surgical Tracheostomy*
OT	**:**	*Open Tracheostomy*
RCTs	**:**	*Randomized controlled trials*
PDT	**:**	*Percutaneous Dilatational Tracheostomy*
ST	**:**	*Surgical Tracheostomy*
VAP	**:**	*Ventilator Associated Pneumonia*
VS	**:**	*Versus*
WKs	**:**	*Weeks*

APACHE II Score: Acute Physiology &Chronic Health Evaluation II :is a severity of disease classification system. It is applied within 24 hours of admission of a patient to an intensive care unit. The point score is calculated from 12 routine physiological measurements:

1 .Age

2. Tempreature

3. Mean arterial pressure

4. Heart rate

5. pH arterial

6. Respiratory rate

7. Sodium (serum)

8. Potasium(serum)

9. Creatinine

10. Hematocrit

11. White blood cell count

12. Glassgow Coma Scale

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Introduction

Tracheostomy is a 4000 year old procedure that has become increasing common during the 20th century. As our ability to sustain patients through multisystem organ dysfunction improves, tracheostomy likely will be even more increasingly utilized[1]. Critically ill patients frequently require tracheostomy to simplify long term airway management. This is accomplished by decreasing airway resistance which facilitates weaning thereby providing more secure airway and easier access for pulmonary toilet, increasing patient comfort and providing the ability to speak[2].

For most of this century, an open surgical tracheostomy was standard of practice for long term airway access. However, over the last 40 years, an increasing number of alternative percutaneous dilatational tracheostomy (PDT) techniques have been proposed. The alternatives (PDT) are faster, cheaper, having fewer bleeding and infectious complications and better cosmetic results than open surgery. They also avoid the need for, and complications associated with the transport of unstable critical ill patients from the intensive care unit (ICU), therefore in many centers percutaneous dilatational tracheostomy largely replaced open surgical tracheostomy for critical ill patients during the 1980s-1990s[3].

Percutaneous tracheostomy has been safe in terms of immediate and late complications and has gained widespread popularity over the past decade. The percutaneous tracheostomy can be done by the ciaglia, Griggs

or Rapitrch method. Numerous studies have looked at these techniques. The ciaglia technique has been associated with the fewest complications and is used more widely[4].

The evidence whether the incidence of most common pneumonia, ventilated associated pneumonia (VAP) is affected by tracheostomy and the timing of tracheostomy is controversial. In a retrospective study of surgical ICU patients, patients were subjected to early tracheostomy (less than 7 days) had a significant lower rate of pneumonia as compared to patients with late tracheostomy[5].

Zlung et al.*(2012)* for early versus late percutaneous tracheostomy in critically ill patients concluded that PDT resulted in more ventilation free, sedation free days, higher successful weaning and ICU discharge rate, and lower incidence of ventilator associated pneumonia, but did not change the cumulative 60-day incidence of death in the patient's anticipated requiring mechanical ventilation[6].

Bruno do Vallepinheiro et al*. (2010)* studied early tracheostomy (ET) versus late tracheostomy (LT) in patients with acute severe brain injury and they found that there were no significant differences regarding demographic data, severity (APACHE II and SOFA scores), coma severity (GCS score) and neurological diagnosis. Moreover, they found that the 28 day mortality rate was lower in the early tracheostomy group (Group A) than late tracheostomy group (Group B). There was a tendency towards faster

weaning among (Group A) patients and none of them developed VAP during the first 7 days of mechanical ventilation[7].

Denis B et al. (2013) found from their results that bedside percutaneous dilatational tracheostomy is safe across a broad critically ill patient population. The safety of this technique, even in the obese population, is demonstrated by its low complication rate. Routine bronchoscopic guidance is not necessary. Specially trained procedure nurse and process improvement programs contribute to the safety and efficacy of this procedure[8].

Aim of the Work

To compare the effects of early versus late bedside percutaneous dilatational tracheostomy (PDT) done for critically ill adult patients mechanically ventilated regarding their length of ICU stay, hospital stay, mechanical ventilation duration, development of ventilator associated pneumonia (VAP) and hospital outcome.

Chapter I

Historical Aspect of Percutaneous Tracheostomy in Critically ill Patients

Tracheotomy is one of the oldest known surgical procedures. Prior to 16th century tracheostomy was first referred on Egyptian artifacts in 3600 BC. However the first reference to this procedure is in the ancient book of medicine, the Rig-Veda written in 1500 BC[4].

The evolution of tracheostomy can be divided into five stages. The first and longest period (covering roughly 3,000 years from 1500 BC to 1500 AD) begins with references to incisions into the "wind pipe" in the Ebers Papyrus and the Rig Veda. However, Alexander the Great, Asclepiades, Aretaeus and Galen are all recorded as having used this operation. Between 1546 with the writings of Brassarolo until 1883, the procedure was considered futile and irresponsible and few surgeons had the courage to perform it. The third period starts with Trousseau's report of 200 cases in the therapy of diphtheria in 1833. Tracheostomy became a highly dramatized operation for asphyxia and acute respiratory obstruction. In 1932 Wilson suggested its prophylactic and therapeutic use in poliomyelitis. Tracheostomy was then recommended for a large variety of assorted maladies. This started a tremendous period of enthusiasm. Finally, the present era starting in 1965 comes as a period of rationalization. Complications, indications and interrelation with endotracheal intubation are clearly outlined. Tracheostomy has found its place[9].

The modern era of tracheostomies began with Chevalier Jackson's description of the standard surgical technique in 1909. Jackson standardized the procedure and recommended suctioning and post procedural care. The mortality rate dropped from 25% to less than 5%[1].

In 1943, Thomas Galloway advocated the use of tracheostomies to aspirate lower airway secretions in polio patients. In 1958, the first tracheostomy for positive pressure ventilation was performed. The Seldinger technique of percutaneous tracheostomy was described by Sheldon and colleagues in 1957 and by Toye and Weinestein in 1969. In 1965 Toye et al reported a tracheostomy technique based on a single tapered dilation with a recessed cutting blade. This dilation was advanced into the airway over a guiding catheter, and the recessed blade was designed to cut tissues under tension and the dilator was forced into the trachea. The 1970s witnessed the explosive growth of ICUs throughout the United States[1].

Ciaglia I and associates1985 described the percutaneous dilatational Technique using curved dilators[10].

This technique involves the use of seven dilators of progressively larger size. The next widely used technique was developed in 1989 by Bill Griggs an Australian intensive care specialist. This technique involves the use of a specially modified pair of forceps with a central hole enabling them to pass over a guide wire, enabling the performance of the main dilatation in a single step[1].