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ORIGINAL ARTICLE

Early versus late percutaneous tracheostomy in critically ill adult mechanically ventilated patients

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KEYWORDS

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Abstract *Introduction:* Critically ill patients frequently require tracheostomy to simplify long term air way management. While tracheostomy indications have remained unchanged, the timing of elective tracheostomy for the ventilated patient has been questioned.

Aim of the work: This study was performed to compare the differences between early and late percutaneous dilatational tracheostomy (PDT) regarding, mechanical ventilation duration (MVD), length of ICU stay, length of hospital stay, incidence of ventilator associated pneumonia and hospital outcome.

Patients and methods: Forty patients who met the inclusion criteria were randomly divided into early PDT who had the tracheostomy within the first 10 days of mechanical ventilation (MV) and the late PDT who had the tracheostomy after 10 days of MV. On admission, demographic data and Acute Physiology and Chronic ill Health II and GCS were collected. The duration of mechanical ventilation, ICU length of stay (LOS) and hospital LOS were all calculated.

Results: Total of 40 patients were randomized to either early PDT ($n = 20$) or late PDT ($n = 20$). There were no significant differences between both groups regarding demographic data or the scores: APACHE II (22.75 ± 7 vs 24.35 ± 8) and GCS (6.10 ± 2 vs 7.10 ± 2.71). An early PDT showed fewer complications vs late procedure, however it was insignificant. There were significant differences between the two groups regarding mean (MVD) which was shorter in early PDT

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than the late PDT group (32.2 ± 10.5) vs (20.6 ± 13 days; $p = 0.004$). Mean ICU stay was shorter in early PDT than late PDT (21 .0 ± 513.4) vs (40.15 ± 12.7 days; $p \leqslant 0.001$). Mean hospital stay was shorter in early PDT than late PDT (34.60 ± 18.37) vs (55.60 ± 25.73 days; $p = 0.005$). Patients with early PDT suffered less sepsis and VAP than late PDT, there was no difference regarding the mortality rate between the two groups.

Conclusion: Early PDT is recommended for patients who require prolonged tracheal intubation in the ICU as outcomes like the duration of mechanical ventilation length of ICU stay and hospital stay were significantly shorter in early tracheostomy.

Introduction

Critically ill patients frequently require tracheostomy to simplify long term airway management [1]. While tracheostomy indications have remained unchanged, the timing of elective tracheostomy for the ventilated patients has been questioned [2,3]. Tracheostomy is among the most frequently performed procedure in critically ill patients, being done in about 24% of patients in ICU [4]. A tracheostomy is commonly performed when clinicians predict a patient will need prolonged mechanical ventilation [5]. The exact ''best'' timing for performing tracheostomy has not been clearly determined, but available data do suggest that ''earlier'' is better than ''later'' [6,7]. The perceived advantages of a tracheostomy over prolonged trans laryngeal endotracheal intubation include improved patient comfort and reduced sedative drug use, faster weaning from mechanical ventilation, a reduced incidence of nosocomial pneumonia, and shorter hospitalization [8,9]. The incidence of ventilator-associated pneumonia is related directly to the duration of mechanical ventilation which is a complication that carries significant morbidity and mortality [10]. So the beneficial effects might be maximized if tracheostomies were performed early in a patient's illness. However, one study reported in 1981 [11] that the incidence of tracheal stenosis after tracheostomy was raised up to 65%. In spite of that, the incidence of tracheal stenosis has decreased substantially with recognition of its etiology and improvements in tracheostomy materials, design and management, particularly with the use of high-volume, low pressure cuffs [12]. Finally, evidence to guide practice has been limited. In 1989, the National Association of Medical Directors of Respiratory Care recommended that trans laryngeal (endotracheal) intubation be used only for patients requiring less than 10 days of artificial ventilation and that a tracheostomy should be placed in patients who still require artificial ventilation 21 days after admission [13]. Although these recommendations are based only on expert opinion, modern practice broadly seems to follow them [14].

Patient and methods

This is a prospective randomized study which was conducted in the King Faisal Hospital of Makkah/K.S.A and the Kasr Alaini Cairo University Hospital /Egypt on forty patients who underwent bedside percutaneous dilatational tracheostomy (PDT) using the Ciaglia's method [15] in the critical care departments (from October 2012 to October 2013). Informed written consents were taken from the next of kin, and the study was approved by the local hospital's ethics committee. Patients included in the study were older than 18 years, mechanically ventilated for respiratory failure > 24 h and has no previous pulmonary infection by chest X-ray. The clinical assessment of the severity of their illness by APACHE II score was equal or more to 15. We excluded patients with a history of anatomical deformity of the neck (including thyroid gland enlargement), cervical tumours history of esophageal, tracheal or pulmonary cancer, and soft tissue infection of the neck, hematological malignancies, terminal malignancy, and terminal liver cell failure but were admitted to the ICU for other reasons.

By protocol, patients who met the inclusion criteria were randomly divided into 2 groups the early group and the late group. The early tracheostomies were placed within 10 days of mechanical ventilation and the late tracheostomies were placed after 10 days of endotracheal tube insertion. All other care was at the discretion of the treating clinicians. During the first 24 h in the critical care unit, clinicians recorded patients' data. Details of the tracheostomy procedure were collected including timing, immediate and late complications. Treatment assignment could not be blinded to the caring team or to the analysis team because it was apparent from the data to which group a patient had been assigned. Patients were randomly assigned in a 1:1 ratio, either to early tracheostomy or to late tracheostomy. From randomization, daily information on respiratory support was recorded .We extracted data on all consecutive patients admitted to the ICU over a one-year period. Data were collected on demographics and admission severity of illness, estimated using the Acute Physiology and Chronic Health Evaluation (APACHE) II [16] and Glasgow Coma Score (GCS). Data included Complete blood picture, Coagulation profile before tracheostomy, BUN, Creatinine, Liver functions, Electrolytes and Cultures of samples from sputum, blood, and urine. The number of days from the initiation of ventilation to tracheostomy, from tracheostomy to weaning (the duration of mechanical ventilation), from tracheostomy to discharge from ICU (length of stay) and hospital length of stay were all calculated. All these durations were calculated as the number of calendar days. ICU and hospital mortality rates were documented.

The data were analyzed using STATA 8.2 and SPSS 17.0; appropriate techniques were applied after checking necessary assumptions. Variables, which were non-normally distributed, were normalized by applying Box–Cox transformation. Mean ± SD is given for normally distributed metric variables, frequencies and percentages are given for non-metric variables. Shapiro–Wilk test was used to test normality. Independent sample t test was applied to observe mean differences among two groups. Fisher's exact test was applied to observe