



Evidence-Based Medicine Journal Club

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Journal club critique

Early percutaneous dilatational tracheostomy leads to improved outcomes in critically ill medical patients as compared to delayed tracheostomy

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Expanded Abstract

Citation

Rumbak MJ, Newton M, Truncale T, Schwartz SW, Adams JW, Hazard PB: A prospective, randomized, study comparing early percutaneous dilational tracheostomy to prolonged translaryngeal intubation (delayed tracheostomy) in critically ill medical patients. *Crit Care Med* 2004, 32:1689-1694 [1].

Hypothesis

In the critically ill medical patients who are projected to require ventilation for ≥ 14 days, early percutaneous tracheostomy within 48 hours of intubation offers significant survival advantage as well as decreased morbidity when compared with prolonged translaryngeal intubation (delayed tracheostomy) 14-16 days after intubation.

Methods

Design: Prospective, randomized trial.

Setting: Closed medical intensive care units of three academic medical centers in Memphis, Tennessee and Tampa, Florida.

Subjects: All patients in the three medical ICUs who were intubated and mechanically ventilated for acute respiratory failure were screened and included if they were: >18 years old, projected to need mechanical ventilation >14 days, and had an initial APACHE II score >25 . Specific exclusion criteria were established to ensure the safe performance of percutaneous tracheostomy (anatomical factors, evidence of potential prolonged bleeding, and PEEP >12 cm H₂O).

Intervention: One hundred and twenty patients projected to need ventilation >14 days were prospectively randomized to either early percutaneous tracheostomy within 48 hrs of

intubation (early group, $n=60$) or delayed tracheostomy at days 14-16 (late group, $n=60$). All tracheostomies were performed by the study authors under bronchoscopic surveillance. Clinical circumstances determined whether patients who were randomized to receive a delayed tracheostomy actually received one.

Outcomes: Time in the intensive care unit and on mechanical ventilation and the cumulative frequency of pneumonia, mortality, and accidental extubation were documented. The airway was assessed for oral, labial, laryngeal, and tracheal damage at tracheostomy and 10 weeks post-intubation using a combination of physical examination, fiberoptic bronchoscopy, and linear radiographic tomography.

Results

The early group showed significantly less hospital mortality (31.7% vs. 61.7%, $p<0.005$), pneumonia (5% vs. 25%, $p<0.005$), and accidental extubation (0% vs. 10%, $p=0.03$) compared with the late group. The early group spent less time in the intensive care unit (4.8 vs. 16.2 days, $p<0.001$) and on mechanical ventilation (7.6 vs. 17.4 days, $p<0.0001$). There was significantly less damage to the mouth and larynx, but not the trachea, in the early group.

Conclusion

This study demonstrates that the benefits of early tracheostomy outweigh the risks of prolonged translaryngeal intubation. It gives credence to the practice of subjecting this group of critically ill medical patients to early tracheostomy rather than delayed tracheostomy.

Commentary

Mechanical ventilation through the cannulation of the trachea is one of the fundamental therapies of intensive care, with translaryngeal endotracheal intubation and

tracheostomy the most common methods in practice today. Tracheostomy has several potential advantages over translaryngeal endotracheal intubation, including reduced laryngeal irritation, better patient tolerance, enhanced ability to communicate, and easier nursing care [2]. It is, however, not without risk and there continues to be considerable debate regarding the optimal timing of tracheostomy. In an attempt to balance the risks and benefits of tracheostomy, it is common practice today to delay the procedure until patients have required at least 10 days of mechanical ventilation. With the advent of the percutaneous approach to tracheostomy and the apparent safety of this technique, the optimal timing of this procedure warrants reevaluation. Recent studies favor the use of early tracheostomy in terms of improved clinical outcomes, yet high quality randomized trials comparing the risk and benefits of early versus delayed percutaneous tracheostomy in general medical intensive care unit (ICU) populations are lacking.

The study by Dr. Rumbak and colleagues [1] provides additional evidence in support of early tracheostomy, defined as percutaneous tracheostomy within 48 hours of intubation. In their study of 120 medical ICU patients randomized to early versus delayed percutaneous tracheostomy, early tracheostomy was associated with significantly reduced hospital mortality, pneumonia, ICU length of stay, and duration of mechanical ventilation. Furthermore, there was significantly less damage to the mouth and larynx in the early group. Strengths of the study include the use of standardized care protocols, such as ventilation with low tidal volumes in patients with acute lung injury, daily sedation interruption, and spontaneous breathing trials. Special attention was paid to the prevention, diagnosis, and treatment of ventilator-associated pneumonia. All of the percutaneous tracheostomies were performed by non-surgical intensivists (the authors) using well-described methods; the relative ease and safety of the procedure in experienced hands is apparent from the paucity of major complications.

A few limitations of this study deserve consideration. First and foremost, is how patients who were "projected to need ventilation support for >14 days" were identified. Duration of mechanical ventilation is notoriously difficult to predict. The fact that ten of the sixty patients randomized to the late group did not require tracheostomy points out the inherent difficulty in making this prediction. In this study, this determination was made by clinicians and lacked specific objective criteria, making it difficult to determine precisely which patients should be selected for early tracheostomy based on these results. The second limitation is the use of an APACHE II score >25 as an inclusion criteria, limiting the generalizability to patients with an expected mortality rate of 50% or greater. It is therefore plausible that the survival benefits seen in this study may not be applicable to ICU patients who are less severely ill. Finally, there were high incidences of pre-existing community acquired and aspiration pneumonia in both groups of patients at the time of admission. In the face of the high rate of pneumonia at admission, the diagnosis of ventilator-associated pneumonia may be misleading. Therefore, the finding of

reduced ventilator-associated pneumonia, though statistically significant, may not truly reflect an advantage of early tracheostomy.

Despite these limitations, the findings of reduced mortality, ICU length of stay, and duration of mechanical ventilation are quite striking, which raises the question, *why?* By reducing work of breathing [3] and improving lung mechanics [4], early tracheostomy may have facilitated weaning from mechanical ventilation, thereby reducing time at risk for the development of ventilator-associated pneumonia and other complications of intensive care. Additionally, early tracheostomy may have resulted in greater patient comfort and, therefore, avoided excess sedative and analgesic use, which has been associated with prolonged duration of mechanical ventilation and ICU length of stay [5,6].

Recommendation

Dr. Rumbak and colleagues have provided powerful and convincing evidence in support of early tracheostomy, particularly for medical ICU patients who are expected to require prolonged mechanical ventilation and at high risk of death. Additionally, the authors have demonstrated that in the hands of experienced, non-surgical intensivists, percutaneous dilatational tracheostomy is safe and associated with low complications rates. Further studies are needed to define predictors of prolonged mechanical ventilation and to determine whether the survival and other reported advantages are applicable to patients who are less severely ill and to different ICU patient populations.

Competing interests

The authors declare that they have no competing interests.

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