

Commentary

Tracheostomy must be individualized!

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Related to *Research* by Arabi *et al.*, see page 395

Abstract

Tracheostomy is one of the most frequent procedures carried out in critically ill patients with major advantages compared to translaryngeal endotracheal intubation such as reduced laryngeal anatomical alterations, reduced inspiratory load, better patient's tolerance and nursing. Thus, tracheostomy can enhance patient's care in patients who need prolonged mechanical ventilation and/or control of airways. The right timing of tracheostomy remains controversial, however it appears that early tracheostomy in selected severe trauma, burn and neurological patients could be effective to reduce the duration of mechanical ventilation intensive care stay and costs. Percutaneous tracheostomy techniques are becoming the procedure of choice in the majority of the cases, since they are safe, easy and quick, and complications are minor. However, percutaneous tracheostomies should be always performed by experienced physicians to avoid unnecessary additional complications. It is not clear the superiority of one percutaneous technique compared to another, but experience of the operator and clinical individual anatomical, physiopathological characteristics of the patient should be always considered. We believe that the operator should have experience of at least one intrusive and one extrusive percutaneous technique. The general "optimal" tracheostomy technique and timing do not exist, but tracheostomy should be targeted on the patient's individual clinical characteristics.

Keywords neurological injury, open surgical tracheostomy, percutaneous dilational tracheostomy, respiratory failure, tracheostomy, trauma

Tracheostomy is among the most frequently conducted procedures in critically ill patients [1]. It has advantages compared with translaryngeal endotracheal intubation, including reduced laryngeal anatomical alteration, reduced inspiratory load, and better patient tolerance and ease of nursing. Thus, tracheostomy can enhance patient care in the event of prolonged respiratory support and difficulty in weaning.

In the study conducted by Arabi and colleagues [2], those investigators examined the frequency with which tracheostomy was conducted; pathophysiological characteristics of patients undergoing early (first week in the intensive care unit [ICU]) and late tracheostomy (> 7 days in the ICU); and the impact of early tracheostomy on the duration of mechanical ventilation, ICU length of stay and outcomes in a selected population of trauma patients. They

reported that the majority of patients underwent tracheostomy after the first week, and that patients who received tracheostomy within the first week had maxillofacial trauma and more severe neurological injuries. Multivariate analysis showed that early tracheostomy was associated with reduced ICU length of stay. That study presents several issues that require consideration when interpreting the findings. First, the data are from a single population of patients with severe neurological and maxillofacial trauma. Second, both surgical and percutaneous tracheostomy techniques were performed. Finally, the percutaneous techniques used in the study were not reported.

The optimal timing of tracheostomy remains controversial. The results presented suggest that early tracheostomy may reduce ICU length of stay and resource utilization in severe

trauma, which is in accordance with previous data reported in patients with acute respiratory failure [3], but early tracheostomy did not reduce hospital length of stay or mortality. A recent study [4], performed in medical intensive care patients, showed that early percutaneous dilational tracheostomy outweighed the risks of prolonged translaryngeal intubation, leading to reduced mortality, pneumonia, ICU stay and duration of mechanical ventilation

There is general agreement that tracheal intubation should be the first approach, and only thereafter is evaluation for possible tracheostomy necessary. In particular, it has been recommended that translaryngeal intubation be done in those patients whose anticipated need is up to 10 days, and that tracheostomy be done if an artificial airway is likely to be required for longer than 21 days [5]. Tracheostomy is mandatory in severe maxillofacial or neck trauma, burns to the head, neck and airways, and presence of altered swallowing (in which case early tracheostomy is needed). On the other hand, tracheostomy is indicated for prolonged respiratory support and airway maintenance in order to prevent complications of long-term translaryngeal intubation in chronic myopathies or laryngeal cord paralysis (late tracheostomy). Regardless, the decision on the timing of tracheostomy should be made on an individual basis, taking into account the patient's age and prognosis. In the study conducted by Arabi and colleagues [2], 30% of tracheostomies were surgical. Surgical tracheostomy is mandatory, particularly in the presence of anatomical or pathological alterations to the neck.

The percutaneous dilatation technique was proposed by Ciaglia and coworkers [6] in 1985, and since then other methods have been proposed so that percutaneous tracheostomy may be performed at the bedside, rather than surgical tracheostomy in the operating theatre [7–10]. Various complications have been reported for percutaneous techniques, including tracheal ring fracture or dislocation, tracheal stenosis and obliteration above the tracheostoma, emphysema or pneumothorax due to posterior tracheal wall laceration, tracheo-oesophageal fistula, and acute fatal haemorrhage [11]. Several studies have compared safety and outcome with percutaneous tracheostomy versus those with surgical tracheostomy, but lack of rigorous design renders useful comparisons quite impossible. The majority of prospective randomized trials reported that potential advantages of percutaneous technique relative to surgical tracheostomy include ease of performance, and lower incidence of peristomal bleeding and postoperative infection, which are associated with lower costs [12–14]. Among the percutaneous techniques, the most popular are the modified original Ciaglia technique ('single step' Blue Rhino) [7], the guidewire dilator forceps technique proposed by Griggs and coworkers [8], the Percu-twist technique proposed by Frova and Quintel [9], and the translaryngeal technique proposed by Fantoni and Ripamonti [10].

The Blue Rhino, the Griggs and the Percu-twist techniques are characterized by dilation of the tissues using forces applied from outside to inside the tracheal wall (intrusive techniques). The main potential complications with these techniques are rupture or dislocation of tracheal rings and bleeding. The main advantages are that ventilation is relatively easy during the manoeuvre and the neck does not need to be overdistended.

The translaryngeal technique is different from the others because the cannula is stripped from inside to outside (extrusive technique). This should reduce injury to the anterior–posterior tracheal wall and bleeding. Thus, the translaryngeal technique is indicated in patients with active spontaneous bleeding or in patients at high risk for bleeding, such as those receiving heparin therapy or with coagulation factor deficits. Moreover, this technique is first choice in paediatric patients, in whom other techniques are contraindicated. The main problem with this technique is its complexity because of the need for two intubations. Thus, the technique is contraindicated in patients with expected difficult intubation and in those in whom extension of the neck must be avoided. Regardless of technique, it has been suggested that bronchoscopy should be used when performing percutaneous tracheostomy, with simple or video-assisted endoscopy, to facilitate and reduce possible complications [15]. Few studies in small groups of patients have been performed, and so there are few data with which to compare different percutaneous techniques [16–18]. In general, it does not appear that any one percutaneous technique is better than any other, but the patient's choice and the experience of the operator are determining factors.

It is important to emphasize that the introduction of different percutaneous techniques has reduced the number of supposed contraindications to tracheostomy in selected patients. In cardiothoracic patients, with mediastinal wounds, the percutaneous techniques should be considered first choice because of the marked reduction in tracheostomy-associated risk for mediastinitis. Tracheostomy in these patients has also been reported to be effective in reducing the duration of mechanical ventilation and in expediting weaning [19]. In head trauma and neurological patients, who are at high risk for nosocomial infection, the percutaneous tracheostomy was found to be associated with a marked reduction in late infections of the stoma. In severe head injury patients, however, careful monitoring of the physiology of the brain should be done, adequate sedation given, and timing carefully considered. Tracheostomy should be performed as soon as a stable physiological condition in the brain is achieved and prolonged ventilation is expected [20]. However, in spine injured patients we believe that Blue Rhino, Griggs and Percu-twist techniques are preferable because of the reduced need to extend the neck to optimize the manoeuvre. In patients with coagulation problems, percutaneous techniques, and in particular the translaryngeal

technique, are indicated [21]. In patients with severe respiratory failure percutaneous techniques have been found to be safe, but it is wise to perform tracheostomy only when respiratory insufficiency is stabilized [22]. Development of the Griggs technique has broadened the indications for tracheostomy to include emergency settings [23], whereas the translaryngeal technique is contraindicated.

It is also important to emphasize that, after the procedure has been completed, careful clinical monitoring of the patient is mandatory, as well as bronchoscopy to clear airway secretions and blood, and to confirm correct positioning of the tracheostomic tube and so avoid bronchial intubation.

In conclusion, tracheostomy can offer several advantages in the management of critically ill patients who need mechanical ventilation and/or airway control. The optimal timing of tracheostomy remains controversial, but it appears that early tracheostomy in selected patients, such as those with severe trauma, burns and neurological injuries, may be effective in reducing the duration of mechanical ventilation, ICU stay and costs. Percutaneous tracheostomy techniques are becoming the procedures of choice in the majority of cases because they are safe, easy and quick, and complications are minor. However, percutaneous tracheostomies should always be performed by experienced physicians so that unnecessary additional complications may be avoided. It is not clear whether any one percutaneous technique is superior to any other, but experience of the operator and the anatomical and physiopathological characteristics of the patient should always be considered. The operator should have experience of at least one intrusive and one extrusive percutaneous technique. In general, the 'optimal' tracheostomy does not exist; we must use the right technique in the right patient and at the right time.

Competing interests

The authors declare that they have no competing interests.

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