



EDITORIAL

Tracheostomy in children: an ancient procedure still under debate

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Tracheostomy is one of the oldest surgical procedures reported in ancient medicine books. It became widely used in the 19th century during the diphtheria epidemics in Europe, and then in the 20th century following a series of devastating poliomyelitis epidemics in the 1950s [1–3]. Around the turn of the 20th century, JACKSON [4] standardised the indications for tracheostomy, the technique itself and the instruments used; he developed anatomically correct tracheostomy tubes and paved the way for further improvement of the technique.

The role of tracheostomy in the ventilatory management of the critically ill adult has been endorsed by the American College of Chest Physicians to improve patients' comfort, to reduce the incidence of pneumonia and to facilitate respiratory weaning [5]. Adults that are clinically stable and necessitate prolonged mechanical ventilation have an indication for tracheostomy [5]; patients with acute respiratory failure, acute exacerbations of chronic pulmonary disease, coma and neuromuscular disorders may also require it [6, 7].

While tracheostomy in adults is accepted, in children it is perceived as an aggressive procedure, but over time the indication in paediatrics has changed from an emergency procedure during diphtheria and poliomyelitis epidemics into aid for children dependent on assisted ventilation. In children the most frequent indications are upper airway obstruction (craniofacial malformations, craniofacial and laryngeal tumours, and obstructive sleep apnoea), laryngotracheal abnormalities (bilateral vocal cord paralysis, laryngeal obstruction, severe tracheomalacia and subglottic stenosis due to intubation in premature infants), need for long term ventilation (irreversible neuromuscular conditions and central nervous system conditions), chronic respiratory disease (bronchopulmonary dysplasia in children aged 1 yr or younger) and failure of extubation [8–13].

Data on the incidence of tracheostomy in ventilated children are lacking: in a Canadian survey tracheostomy is referred in less than 1.5% of ventilated children [14], and LEWIS *et al.* [15], in a data analysis of 2,521 hospitals in the USA, refer a rate of 6.6 children per 100,000 child-years. In ventilated adults, incidence of tracheostomy varies from 10 to 24% depending on the case series [6, 7].

Optimal timing for tracheostomy in children is controversial, outweighing the risk of the procedure and the expected benefits, which include the reduction on duration of mechanical ventilation, stay in the intensive care unit (ICU) and hospital, and the decrease in morbidity and mortality [7]. Surveys in ventilated adult indicate that tracheostomy should be performed medially at 9–13 days of mechanical ventilation [16]. In ventilated children, the option of tracheostomy is suggested later on, after 21–28 days of mechanical ventilation. An explanation for this delay can be the more rapid resolution of acute respiratory distress syndrome in children compared to adults [6, 17].

In the 2-yr longitudinal multicentre study involving 22 Spanish hospitals by PÉREZ-RUIZ *et al.* [13] in this issue of the *European Respiratory Journal*, indications, duration and complications are reported in 249 tracheostomised children, aged between 1 day and 18 yrs at the beginning of the study. To our knowledge this is the largest case series published in the English literature on this topic. In these patients, the main reason for tracheostomy was prolonged ventilation, required as a result different underlying conditions; the median age of children undergoing the procedure was 6 months, with a wide range of age (from 1 day to 17 years). 92 children (36.9%) required mechanical ventilation during the study period, either in the ICU or at home, demonstrating the necessity for prolonged nursing to tracheostomy. In a survey in the UK, 933 children aged under 17 yrs received long term ventilation and 22% of them were tracheostomised [8]. Only 9% of all patients were treated in hospital units, while 91% were cared at home; these data emphasise the importance of the nursing support and educational aid at home in the management of tracheostomy in these patients. Also, in the Spanish survey educational support was provided in 79% of cases both in hospital and at home [13].

The duration of tracheostomy in mechanical ventilated children can depend on different factors, in particular underlying conditions, such as neuromuscular diseases or neurological conditions, cranial malformations, bronchopulmonary dysplasia, and the age of the patients. In the Spanish paper the duration of tracheostomy ranged from 1 day to 19 yrs, with a median duration of 34 months in children persistently tracheostomised during the 2-yr study period [13]. In 130 children (45.4%) the intervention of tracheostomy was performed under 6 months of age, as a result of a condition predisposing to extubation failure and to tracheostomy [12]. In adults the duration of mechanical ventilation is lower than that observed in children, depending on different underlying diseases and on the use of early *versus* delayed intervention for tracheostomy. RUMBAK *et al.* [18]

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performed a study on 120 adults comparing those with an early tracheostomy (within 48 h) to those with a delayed intervention (14–16 days), and they demonstrated that early tracheostomy appears correlated to a reduction in time of mechanical ventilation. The same results were obtained by FLAATTEN *et al.* [19] and by MÖLLER *et al.* [20].

With regard to tracheostomy-related complications in children, in older studies [21–23] data showed a complication rate of 20–40%, 2–3 times higher than in adults [24], although in a recent study a decrease has been reported [25]. Complications are related to a prolonged cannulation period and persisting underlying conditions [8, 26]. The Spanish study showed complications in 46.9% of children: severe obstruction of tracheostomic cannula, infection related to tracheostomy and accidental decannulation were those most commonly observed [13]. To reduce the risk of local and general complications, different techniques to perform tracheostomy are used in adults, like percutaneous dilatational tracheostomy, still little used in children [27–29].

The mortality rate in tracheostomised children in the Spanish study is reported to be 12.5%, only slightly lower than that reported by KOLLEF *et al.* [30] in adults with early tracheostomy; mortality rate is higher in severely ill patients. In recent years the improvement of technology in small children has reduced the risk of tracheostomy-related mortality, even in very low birth weight infants [10].

In conclusion, tracheostomy is widely performed in children, despite the advances of noninvasive mechanical ventilation. However, multicentre studies with large patients cohorts are lacking and some aspects of tracheostomy still under debate need to be clarified, for example whether, when and how to perform tracheostomy, and when to stop it.

PÉREZ-RUIZ *et al.* [13] contribute to keeping alive the interest on this ancient procedure still under debate.

STATEMENT OF INTEREST

None declared.

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