

Elective Tracheostomy in Mechanically Ventilated Children

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ABSTRACT

Tracheostomy is an important procedure in children requiring prolonged mechanical ventilation. We conducted a retrospective study to assess the frequency, indications, postoperative course and short-term outcome of elective tracheostomy in a Paediatric Intensive Care Unit (PICU) of Pakistan. Twenty-five patients underwent tracheostomy in last 5 years (2.2 % of all PICU admissions). Mean age of patients was 6 years and 60% were male. The most common indication for tracheostomy was prolonged mechanical ventilation secondary to neurological disease (60%), followed by upper airway obstruction (40%). Major complications included accidental decannulation (20%) and tube obstruction (20%). Three patients (12%) developed ventilator-associated pneumonia after tracheostomy change while persistent bacterial colonization of trachea was observed in 8 patients (32%). Decannulation was achieved in 40% (10/25). There was no mortality related to tracheostomy in this series.

Key words: *Tracheostomy. Mechanical ventilation. Children. Neurological disease. Decannulation. Ventilator associated pneumonia. Tube obstruction.*

Tracheostomy is a commonly performed surgical procedure in adult intensive care units.¹ Tracheostomy has evolved more as an elective surgical procedure rather than emergent life-saving procedure. There is a substantial increase in reports of paediatric tracheostomy (PT) during the last decade. Several recent reports have documented the increasing frequency and changing indications for PT in a multidisciplinary as well as a cardiothoracic Paediatric Intensive Care Unit (PICU).²⁻⁵ There are several advantages of performing early elective tracheostomy in patients requiring prolonged endotracheal intubation and mechanical ventilation.² Improvement of patients comfort, reduced work of breathing, better pulmonary toilet, less incidence of ventilator-associated pneumonia, better oral care and more rapid weaning from mechanical ventilation reduce ICU stay and hospital cost.

PT remains an underutilized tool in paediatric intensive care unit of developing countries. There is paucity of data regarding frequency, indications, post-procedure clinical course, complications and outcome from developing countries like Pakistan. The purpose of this study was to evaluate our experience of elective tracheostomy in children who needed prolonged mechanical ventilation in a tertiary-care paediatric intensive care unit of Pakistan.

A retrospective analysis was carried out from the medical records of all children (aged 1 month to 14 years) who

had tracheostomy and were managed postoperatively in the PICU of the Aga Khan University Hospital, Karachi, Pakistan from 2005 to 2009. All tracheostomies were electively performed by consultant paediatric surgeon under general anaesthesia in operation theater in a standard fashion. The appropriate sized tracheostomy tube (Shiley type) was inserted. All patients were cared postoperatively by highly trained staff in modern PICU through a standard protocol which included the following: postoperative chest X-ray for position of tube and look for air leak syndrome, routine humidification, suctioning as well as routine ICU care. On the 7th postoperative day, the tube was changed for the first time by surgeon and then weekly, or as needed by PICU team. Family members especially mothers were educated and actively involved in tracheostomy care by staff nurses. Early complications were defined as incidents that occurred before the first tracheostomy tube was changed (usually first week of PICU). Acute major complications were divided into two groups: Mechanical complication like tube obstruction and accidental dislodgement; and infectious complications like ventilator associated pneumonia and bacterial colonization.

The data that was collected included; basic demographics, indications, complications related to tracheostomy tube and outcome. Descriptive statistics were done by using Statistical Package for Social Sciences (SPSS) version 18. The Ethical Review Committee of the hospital waived the approval for medical chart review.

During the study period, 1124 patients were admitted in PICU. The number of children who required tracheostomy was 25 (2.2% of all admissions). The median age was 4 years with range from 2 months to 16 years. More than 50% tracheostomies were performed in children

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Table I: Patient characteristics.

Total (n) = 25	
Mean age - 6 years (2 months - 16 years)	
Male/ Female - 15/10	
Indications:	
CNS - 16	
Traumatic brain injury	(n=4)
Guillain Barre Syndrome	(n=3)
Encephalitis	(n=3)
Neurodegenerative disorders	(n=2)
Complicated meningitis	(n=2)
Others	(n=2)
Upper airway obstruction - 9	
Subglottic stenosis	(n=3)
Laryngomalacia	(n=2)
Bronchomalacia	(n=2)
Others	(n=2)
Major acute complications:	
• Accidental decannulation - 5 (20%)	
• Tube blockage - 5 (20%)	
• Ventilator associated pneumonia - 3 (12%)	
Decannulation rate - 40% (10/25)	
Mortality - 0%	

less than 5 years of age. There was male predominance i.e. 60% of total. The median pre-tracheostomy length of stay in PICU was 15 days and post-tracheostomy length of stay was 5 days. The main indication for tracheostomy in children was prolonged mechanical ventilation (60%) secondary to neurological or neuromuscular illness as compared to upper airway obstruction (40%). Patients' indications for tracheostomy are summarized in Table I.

There were no intraoperative adverse events. Fifty two percent children had complications before the first tracheostomy change. Tube blockage due to thickened secretions (20%) and accidental decannulation (20%) were the early major complications. We reintubated with endotracheal tube orally and tracheostomy was reinserted by paediatric surgeon under controlled condition. Three patients (12%) had ventilator associated pneumonia after tracheostomy change according to CDC definitions.⁵ Persistent bacterial colonization of trachea was observed in 8 patients (32%). There were no acute haemorrhagic complications. There was no cardiac arrest or death related to tracheostomy. All patients were discharged home without oxygen and home ventilation. The overall decannulation rate was 40% (10/25) during the study period.

This study solely focused on the postoperative course in paediatric intensive care unit of children who underwent tracheostomy. The morbidity and mortality associated with tracheostomy in children is higher than adults due

to narrow inner radius of airway and pliable trachea. Death from complications of tracheostomy itself is rare. The reduction in cannula-related morbidity and mortality is attributed directly to vigilant postoperative care in PICU, which allowed better handling of complications. The complication rates related to post-tracheostomy varied widely in literature ranging from 33 to 90%.¹⁻⁴ The mechanical complication rate was 52% (13/25). All of these complications occurred in the first week after tracheostomy and were managed without permanent sequelae. Most of the tracheostomy reports did not consider lower respiratory tract infection as a complication. The persistent bacterial colonization of trachea was the most common observation (33%) in this series most likely due to easier access for microorganisms and less forceful coughing action. Despite regular suction and advanced nursing care, ventilator associated pneumonia occurred in 3 patients (12%). There was no mortality related to tracheostomy despite the occurrences of severe complications like tube occlusion and accidental decannulation. The other remarkable finding of this study was that all patients were liberated from mechanical ventilation, thus reducing the post-procedure length of stay in PICU.

It also confirms recent trends in paediatric tracheostomy over the last decade. The most common indication for tracheostomy performed was prolonged ventilation with a substantial decrease in those done for airway obstruction.⁴

The main limitations of this study were its retrospective nature, small sample size and lack of data regarding decannulation after discharge from PICU. The appropriate timing of tracheostomy is also not well defined, especially in prolonged mechanical ventilation. This may be due to physician's decision, parental anxiety and elective nature of the procedure.

REFERENCES

1. Kluge S, Baumann HJ, Maier C, Klose H, Meyer A, Nierhaus A, *et al.* Tracheostomy in the intensive care unit: a nationwide survey. *Anesth Analg* 2008; **107**:1639-43.
2. Principi T, Morrison GC, Matsui DM, Speechley KN, Seabrook JA, Singh RN, *et al.* Elective tracheostomy in mechanically ventilated children in Canada. *Intensive Care Med* 2008; **34**: 1498-502.
3. Alladi A, Rao S, Das K, Charles AR, D'Cruz AJ. Paediatric tracheostomy: a 13-year experience. *Pediatr Surg Int* 2004; **20**: 695-8.
4. Carron JD, Derkay GL, Strobe G, Nosonchuk J, Darrow D. Paediatric tracheostomies: changing indications and outcomes. *Laryngoscope* 2000; **110**:1099-104.
5. CDC. NNIS criteria for determining nosocomial pneumonia. Atlanta (GA): *U.S. Department of Health and Human Services*; 2003.

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