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Cuffed endotracheal tube for occlusion of a tracheo-oesophageal fistula in an extremely low birth-weight infant

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Sir: Large distal tracheo-oesophageal fistulas (TEF) in type C oesophageal atresia may compromise respiratory support in premature infants suffering from severe respiratory distress syndrome (RDS), due to an air shunt through the fistula leading to abdominal distension, subsequent intestinal rupture, and peritonitis. We report on the successful temporary TEF occlusion by using a newly designed cuffed endotracheal tube avoiding emergency surgical TEF ligation in an extremely low birth-weight infant. Traditional teaching prohibits the use of cuffed endotracheal tubes (ETT) in children below 8 years of age. Our report challenges this dictum in critical situations even for very premature infants.

A male infant (birth weight 770 g) was delivered by caesarian section after abruptio placentae at 27 weeks of gestation. Following immediate intubation with an uncuffed ETT [Portex; 2.5 mm internal diameter (ID)] due to severe respiratory distress, an unsuccessful attempt was made to pass a nasogastric tube into the stomach. X-rays showed signs consistent with significant RDS and a nasogastric tube coiled in the proximal oesophageal pouch; air-filled stomach and bowel loops supported the diagnosis of oesophageal atresia with distal TEF. Despite surfactant application and a trial of high frequency oscillatory ventilation, assisted ventilation became progressively difficult due to increasing abdominal distension. Respiratory function was further impaired by the presence of a patent ductus arteriosus (PDA). Decompressive gastrostomy on day 3 failed to improve pulmonary gas exchange because persistent air shunt resulted in increasing pneumoperitoneum and further clinical deterioration. On day 5, non-invasive TEF occlusion was therefore attempted by re-intubating the infant with an ETT featuring a micro-thin high-volume-low-pressure polyurethane cuff located very close to the tip (Microcuff; ID 3.0 mm). Correct placement was confirmed by flexible bronchoscopy: the TEF was visualized 5–10 mm above the carina and the ETT advanced until complete covering of the fistula was achieved. Cuff inflation to less than 15 cmH_2O successfully occluded the air shunt, while single deflation led to immediate recurrence of air leakage into the peritoneal cavity. Secondary TEF repair, anastomosis of both oesophageal pouches, and PDA ligation were performed on day 10. Following surgery, the infant was re-intubated with an uncuffed (ID 2.5 mm) ETT. Rigid bronchoscopy after surgical repair and a subsequent flexible bronchoscopy prior to successful extubation on day 27 of life did not reveal any signs of tracheal mucosal damage.

Various modes of temporary TEF occlusion (besides emergency fistula repair) have been advocated in infants suffering from respiratory instability due to "low-resistance" TEF, namely transtracheal or transabdominal TEF occlusion using an embolectomy Fogarty catheter, ligation of the lower esophageal pouch or, most recently, TEF occlusion using a cuffed ETT in a term infant [1, 2, 3]. Our case highlights that even in the smallest premature infants, cuffed ETT can be safely used for at least several days to occlude TEF after fiberendoscopic visualization [4] and facilitate respiratory support prior to definite surgical repair. However, the appropriate ETT size for the intended airway is crucial in order to minimize the risk of tracheal injury. It seems noteworthy that the Microcuff ID 3.0 mm ETT's outer diameter (OD) of 4.1 mm exceeds the uncuffed Portex ID 2.5 mm ETT's OD of 3.7 mm and even the smallest manufactured cuffed ETT (Ruesch; ID 2.5 mm/OD 4.0 mm) by just 0.4 and 0.1 mm, respectively. The new high-volume-low-pressure cuffs allow tracheal sealing at fairly low cuff pressures [5]. Cuff pressures should be meticulously monitored to remain at "just seal" or, at least, below the capillary perfusion pressure (<20 cmH_2O). Despite concerns regarding cuffed ETT in premature infants, tracheal damage was ruled out in our patient by serial bronchoscopies and the long-term absence of clinical signs of airway obstruction after extubation.

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