A bifurcated tracheal tube for the neonates with tracheoesophageal fistula.
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Introduction: The goal for the management of esophageal atresia and tracheoesophageal fistula (EA/TEF) patient’s airway is to maintain adequate ventilation without ventilating the fistula. A classical way to avoid fistula ventilation, proper positioning of the tracheal tube so that the tip is located just proximal to the carina but distal to the fistula, works well if the fistula is located apart from the carina. Another strategy, occlusion of the fistula with a Fogarty embolectomy catheter, can be effective but may not be feasible in every case. Here we present a novel bifurcated tracheal tube to deliver air/oxygen directly to the distal airway without ventilating the fistula, and its application to one patient with a large TEF just above the carina.

Case Report: The patient was a 41-wk gestational age, 2908g male with EA/TEF and a large patent ductus arteriosus, atrial septal defect and mitral and tricuspid valve regurgitation. Because of his cardiac anomalies, radical operation of EA/TEF was postponed and gastrostomy was performed under general anesthesia. Intraoperative bronchoscopy revealed a large TEF (as large as his bilateral main bronchi) just proximal to the carina on the dorsal side of the trachea. After placing the gastrostomy tube, ventilation difficulty due to massive air leak through the gastrostomy tube was noted. Therefore, in preparation for his EA/TEF repair, we invented the bifurcated tube to deliver air/oxygen directly to the distal airway without ventilating the fistula: The tip of a 3.0 mm I.D. tracheal tube was cut off for the bevel to face the right side, then the distal end of the tube, approximately 8 mm, was incised in two to be bifurcated. The cut surface of the tube was smoothed with a fine sand paper and tetrahydrofuran. With the ethical committee approval of our institute and informed parental consent, placement of the bifurcated tube was attempted on the day of his EA/TEF repair. After induction of anesthesia, the tube was passed through the glottis with its bifurcated tip clamped in a mosquito forceps. Then a fiberscope was inserted into the left main bronchus. The tube was then advanced over the fiberscope until the left half of the divided tip was introduced into the left main bronchus, with its counterpart getting into the right main bronchus. The opening of the TEF was blocked with the posterior aspect of the tube (see Figure). The air leak through the gastrostomy tube diminished, and the arterial blood gas proved adequate oxygenation without carbon dioxide retention. On completion of the surgery, the tube was exchanged for an ordinary tracheal tube. He was weaned from the ventilator on the second postoperative day. There were no sequelae related to the use of the bifurcated tube.

Discussion: Compared with former two strategies, our bifurcated tube has several advantages: (1) It is easy to prepare, easy to place on an adequate position under fiberoptic guidance. (2) It does not require rigid bronchoscopy, which has a limitation in the size of the patient’s trachea. Our method can be applied to premature neonates by processing smaller tracheal tubes. (3) It has less risk of accidental displacement, with the bifurcated tip sitting astride the carina. It is also advantageous for those who require mechanical ventilation prior to surgery. (4) It does not require interruption of ventilation during the procedure for proper placement. (5) It may be advantageous for those with tracheomalacia, which is often the case.

Conclusion: Our method of placing the bifurcated tracheal tube is a very useful and apparently benign short-term solution to the management of EA/TEF patients. It can be applied to almost all the EA/TEF patients, including premature cases.