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Endoscopic esophageal substitution for pure esophageal atresia and wide gap esophageal atresia: A report of five cases with minimum follow-up of twelve months

Sujit K. Chowdhary *, Deepak K. Kandpal, Deepak Agarwal, Saroja Balan, Nameet Jerath, Anupam Sibal, Sohan L. Broor

Department of Pediatric Urology & Pediatric Surgery, Indraprastha Apollo Hospital, Sarita Vihar, New Delhi, India

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ABSTRACT

Aim: The aim of the study is to report feasibility and safety of endoscopic esophageal substitution in infants with pure esophageal atresia and wide gap tracheoesophageal fistula with a minimum one year follow-up.
Materials and methods: This prospective study was conducted from January 2012 for twenty four consecutive months at Apollo Hospital, New Delhi. All babies either followed up or referred for esophageal substitution without any history of mediastinitis or associated major congenital anomaly and weighing greater than 6 kg were to be included in the study. The indication, intraoperative details, operative approach, conversion to open, esophageal substitute, postoperative ventilation, ICU and hospital stay, time to solid foods, morbidity and mortality were recorded. Informed consent was obtained from all the parents and ethical clearance was obtained for the study from the hospital ethical committee. Postoperatively babies were followed up monthly for first six months, 3 monthly for next six months and annually thereafter.
Results: Between January 2012 and December 2013, in the two year period six infants were admitted for laparoscopic gastric transposition. In five patients the procedure was completed by the laparoscopic approach and one required conversion to open surgery owing to dense adhesions. The age range at the time of surgery was from 8 months to 12 months with a mean age of 10 months. Four patients had pure esophageal atresia (type A) and two had wide gap esophageal atresia with distal tracheoesophageal atresia (type C). Five had primary esophagostomy and gastrostomy as a newborn, the sixth had postoperative anastomotic leak and required subsequent diversion. The mean operating time was 194 minutes (range 170–210 minutes). The mean stay in ICU was 7 days with a range of 4–12 days. All patients were ventilated in the postoperative period for an average of 5 days with a range of 4–7 days. One patient had prolonged gastric ileus which delayed the oral feeds by 14 days. The mean time to start the oral feeds was 8 days with a range of 6–14 days. The mean hospital stay was 19.6 days (range 16–23 days). Early complications were pneumonia and pleural effusion in one patient. One patient developed anastomotic stricture which was amenable to dilatation. One patient had leak from esophagogastric anastomosis which healed spontaneously. All children are now orally fed, swallow without difficulty, and parents report an excellent cosmetic outcome. The follow-up ranges from 12 to 36 months.
Conclusion: The initial results of endoscopic esophageal substitution are encouraging and easily comparable to the outcome of open surgery with all the attendant benefits of minimally invasive approach.

Esophageal substitution represents one of the most challenging gastrointestinal reconstructions in pediatric surgical practice. The indications for this operation remain the absence of esophagus, failed attempts at esophageal dilatation for caustic strictures and long gap esophageal atresia with tracheoesophageal fistula. The classical open surgical method involves a laparotomy and blunt dissection of the mediastinum with dissection of esophageal remnant with mobilization of stomach through posterior mediastinum into the neck as initially described by Orringer et al. and later by Spitz et al. in pediatric literature [1,2]. Rarely, in case of dense adhesion in the chest secondary to esophageal anastomotic leaks or perforation during attempt at dilatation, additional thoracotomy may be necessary. The other esophageal substitutes are gastric tube, colon, jejunal free graft, all of which used to be more common in pediatric patients in order to reduce the space occupying effect in mediastinum and secondary ventilatory compromise.

The evolution of laparoscopic and thoracoscopic surgery in infants and children has allowed the extension of this surgical approach to this complex procedure [3]. This elegant approach is possible only in babies with easy mediastinal dissection and use of stomach among all

* Corresponding author at: Indraprastha Apollo Hospital, Sarita Vihar, Mathura Road, New Delhi, 110044, India. Tel.: +91 9818448380.
E-mail address: sujitchowdhary@hotmail.com (S.K. Chowdhary).

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other substitutes. We reported our first case in Indian literature [4] and now reporting the follow up in a series of five infants with minimum follow up of one year in each.

1. Materials and methods

A prospective study was set up at the beginning of 2012 for twenty four consecutive months at Indraprastha Apollo hospital, New Delhi to examine the feasibility and safety of endoscopic esophageal substitution. All babies either followed up or referred for esophageal substitution without any history of mediastinitis or associated major congenital anomaly and weighing greater than 6 kg were to be included in the study. The indication, intraoperative details, operative approach, conversion to open, esophageal substitute, postoperative ventilation, ICU and hospital stay, time to solid foods, morbidity and mortality were recorded.

Informed consent was obtained from all the parents and ethical clearance was obtained for the study from the hospital ethical committee.

The same team of surgeons (DK/SKC) operated all cases and same team of intensivists (SB/NJ) managed all babies through the postoperative period. The same team of pediatric gastroenterologist managed nutrition and anastomotic strictures (SLB/AS). All morbidity, mortality, and long term respiratory complications including growth failure were recorded. Postoperatively babies were followed up monthly for first six months, 3 monthly for next six months and annually thereafter.

1.1. Surgical technique

After general anaesthesia and endotracheal intubation, the patient was placed at the foot end of the table in supine position with right side elevated by 30 degrees by placing saline bags below the right shoulder. The video screen was arranged at the head end of the table with operating surgeon at the foot end of table and camera control being managed from the left foot end (Fig. 1). The right side of table was used for thoracoscopic approach. Painting and draping was done in such a way that the whole abdomen, right side of chest and neck was exposed for laparoscopic, thoracoscopic access and neck anastomosis.

A 10 mm umbilical port was placed by open technique and pneumoperitoneum of 10 cm of water was created. Two 5 mm ports were placed in the right and the left iliac fossa at the level of the

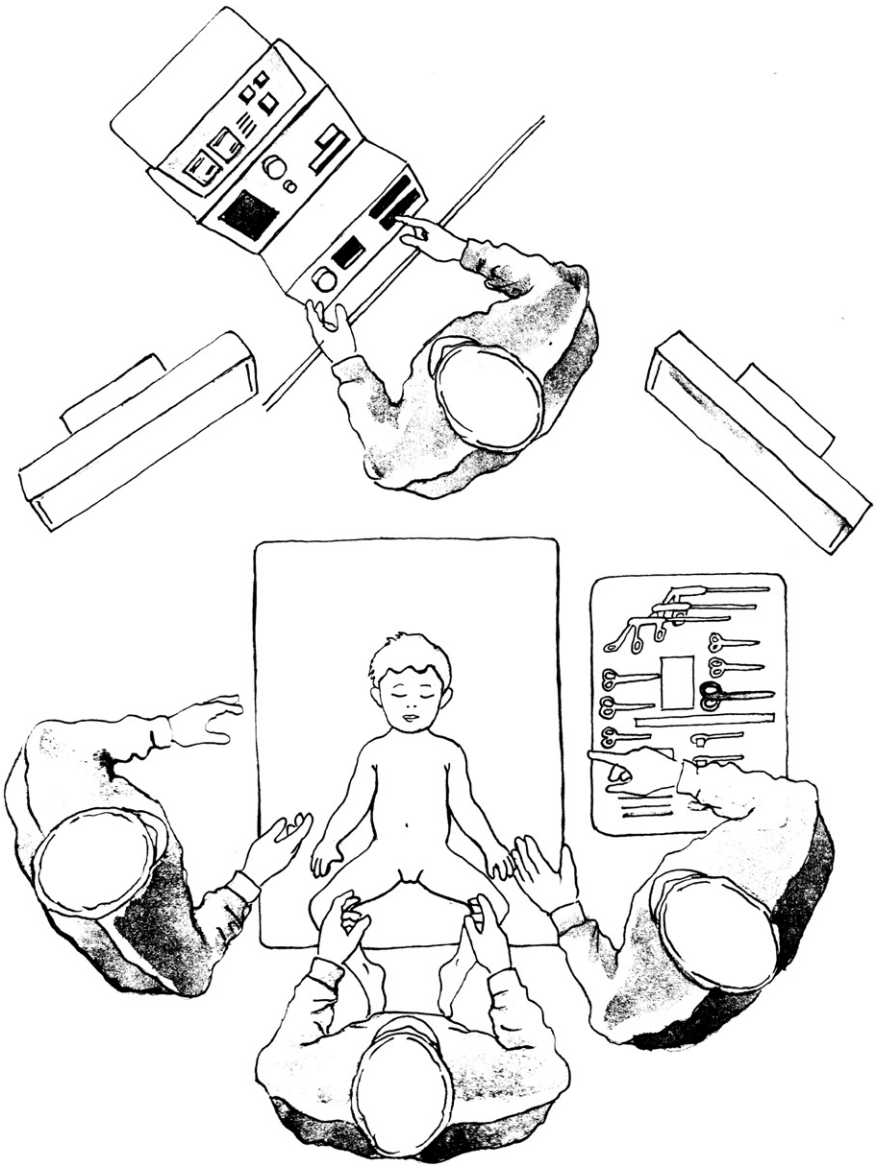

Fig. 1. Patient positioning, port placement and arrangement of monitors for endoscopic esophageal substitution.