Externally removable stents in the treatment of benign recalcitrant strictures and esophageal perforations in pediatric patients with esophageal atresia

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Background: We investigated whether removable stents, such as self-expandable plastic stents (SEPSs) and fully covered self-expandable metal stents (FCSEMSs) could provide an alternative treatment for recalcitrant strictures and esophageal perforations after esophageal atresia (EA) repair.

Objective: The primary aim of our study was to evaluate technical feasibility. Secondary aims were to evaluate safety and procedural success.

Design: Retrospective study.

Setting: Tertiary-care referral center.

Patients: A total of 24 children with EA.

Interventions: Retrospective review of all children with EA who underwent dilation and esophageal stent placement from January 2010 to February 2013 at our institution.

Main Outcome Measurements: Healing of perforation and stricture resolution at 30 and 90 days.

Results: A total of 41 stents (SEPSs 14, FCSEMSs 27) were placed in 24 patients with EA during the study period, including 14 who had developed esophageal leaks. Procedural success of esophageal stent placement in the treatment of refractory strictures was 39% at 30 days and 26% at 90 days. The success rate was 80% for closure of esophageal perforations with stent therapy after dilation and 25% for perforations associated with surgical repair. Adverse events of stent placement included migration (21% of SEPSs and 7% of FCSEMSs), granulation tissue (37% of FCSEMSs), and deep ulcerations (22% of FCSEMSs).

Limitations: Retrospective study with small sample size.

Conclusion: SEPSs and FCSEMSs can be placed successfully in small infants and children with a history of EA repair. The stents appear to be safe and beneficial in closing esophageal perforations, especially post-dilation. However, a high stricture recurrence rate after stent removal may limit their usefulness in treating recalcitrant esophageal anastomotic strictures. (Gastrointest Endosc 2014;80:246-52.)

Abbreviations: EA, esophageal atresia; FCSEMS, fully covered self-expandable metal stent; SEPS, self-expandable plastic stent.

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Esophageal atresia (EA) is the most common reason to have an esophageal anastomosis in children.[1] Recalcitrant strictures after esophageal repair in this population are a rare but difficult problem, and patients can require frequent dilations because of stricture formation.[2] Recalcitrant strictures can be particularly difficult to treat if the gap between both ends of the esophagus was long, because this can lead to a high-tension anastomosis.[1,2]

Traditional stricture treatment in children with EA usually starts with balloon or mechanical dilations.[3] Other endoscopic treatment options have been limited to triamcinolone acetonide or mitomycin C application.[3] More recently, both self-expandable plastic stents (SEPSs) and fully covered self-expandable metal stents (FCSEMSs) have been reported to be an alternative or adjunctive means of preventing stricture formation by providing a continuous means of dilating the esophagus for prolonged periods of time. However, the use of removable stents to definitively treat benign esophageal strictures in adults has yielded mixed results, and pediatric data on the subject of stricture resolution after stent placement has been limited by small sample sizes.[4]

Esophageal perforations or leaks in children with EA are traditionally managed with bowel rest, external drainage, parenteral nutrition, antibiotics, and nasal esophageal tube to suction. If closure does not occur, patients have traditionally required surgical repair. At our institution, we typically initiate treatment by placing a nasal esophageal tube to low-strength wall suction, while the patient is maintained with nothing by mouth and treatment with antibiotics. The patient then undergoes fluoroscopic contrast studies weekly until the leak resolves. Patients with persistent leaks for more than a month are considered candidates for surgical repair. Post-anastomotic surgical leaks in general are drained externally. Post-dilation leaks are generally treated with external drainage if there is evidence of fluid or air collection on radiographs. Several studies of adults with esophageal perforations have suggested that esophageal stent placement may be useful to promote leak closure, especially if the stent is placed early when the leak first develops.[5-8] To date, there has been no pediatric literature on this subject.

The Esophageal Atresia Treatment Program at Boston Children's Hospital is a referral center for children with unrepaired EA, previously repaired EA with recalcitrant strictures, and long-gap EA. Long-gap EA frequently is repaired by using an autologous conduit created from colon, stomach (including a gastric tube), or jejunum.[9-11] An alternative to this is the Foker process, which is a method of placing traction via an open thoracotomy on the proximal and distal esophageal segments in order to induce sufficient esophageal growth to allow for a primary repair.[12-14] Known potential adverse events of the Foker process include high tension anastomoses. We retrospectively looked at our experience as a tertiary-care referral center that provides endoscopic treatment for this pediatric population. Specifically, we sought to evaluate the technical feasibility, efficacy, and safety of removable stents for treating recalcitrant esophageal strictures and esophageal perforation.

Take-home Message

- A high stenosis recurrence rate on stent removal may limit the usefulness of stents in treating recalcitrant anastomotic esophageal strictures in pediatric patients with esophageal atresia. Esophageal stent placement appears to be an especially promising approach to the treatment of post-dilation esophageal leaks in this population.
- Careful monitoring of pediatric patients with indwelling stents may be important to minimize adverse events.

METHODS

We received institutional approval (institutional review board-P00004344) to review the records of all patients who underwent placement of an externally removable stent at our institution's Esophageal Atresia Treatment Program from January 2010 to February 2013. The primary aim of our study was to evaluate technical feasibility of placing stents in our pediatric population. Our secondary aim was to assess safety as well as the efficacy of stent placement in the treatment of recalcitrant strictures and/or esophageal leaks.

All patients in our study had been diagnosed at birth to have EA and had subsequently developed strictures after anastomotic repair. We categorized primary indications for stent placement as refractory stricture, postoperative anastomotic leak (perforation), and post-dilation esophageal leak (perforation). Refractory stricture was defined as an inability to successfully remediate the lumen to a diameter of 10 to 12 mm over 5 sessions at 2-week intervals. All dilations and stents were placed by the same endoscopist (M.M.). Because of patient size, airway stents were placed in most patients. The self-expandable plastic stents used in the study were Polyflex airway stents (Boston Scientific Corporation, Natick, Mass). The FCSEMSs used were AERO fully covered tracheobronchial stents (Merit Medical Systems, South Jordan, Utah) or ALIMAXX-ES fully covered esophageal stents (Merit Medical Systems).

All stents were placed under endoscopic and fluoroscopic guidance over a guidewire. Proper stent placement was confirmed by endoscopy and fluoroscopy. After placement, serial chest radiographs were obtained every 24 to 48 hours to evaluate for stent migration. All children were hospitalized for the duration of stent placement. Stent removal was accomplished by repeat endoscopy by using rat tooth forceps.