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Colon Interposition in Children after Failed Tracheoesophageal Fistula Repair

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The most common surgical procedure used to manage tracheoesophageal fistula is the primary anastomosis of the esophagus. However, in the case of failed anastomosis, replacing the esophagus with another organ is necessary. We performed two procedures of colon interposition after failure of tracheoesophageal fistula repair. In those cases, stomach replacement was not possible because of a failed Ivor Lewis operation in one case and duodenal atresia in the other.

Key words: 1. Esophageal congenital anomalies
2. Tracheoesophageal fistula
3. Colon

CASE REPORT

1) Case 1

The patient was a 7-year-old boy born with tracheoesophageal fistula (TEF) with esophageal atresia. Fistula division and primary anastomosis of the esophagus was attempted on the third day after birth in another hospital. However, because of long gap atresia, he underwent cervical esophagostomy and feeding gastrostomy. Two years later, he underwent an Ivor Lewis operation, pyloroplasty, and feeding jejunostomy. However, leakage from the anastomosis site occurred and re-anastomosis was attempted on the 7th postoperative day. However, the leakage could not be controlled and the patient became hemodynamically unstable due to septic shock. Therefore, reposition of the gastric conduit in the abdominal cavity and a cervical esophagostomy were performed (Fig. 1A). After a difficult recovery period, he was transferred to our hospital with a body weight of 12 kg at age 2. He was followed up for 5 years with the expectation that he would grow with jejunostomy feeding. However, he suffered from severe growth retardation and his body weight was just 15 kg when he became 7 years old. He was referred to our clinic for corrective surgery. When he visited our clinic, he had not been able to eat food by mouth since his birth.

He underwent esophageal reconstruction with colon interposition via a substernal route. The transverse and descending colon pedicled with a left colic artery was harvested and anastomosis in the isoperistaltic direction was performed. The cervical esophagus was recovered from an esophagostomy and proximal anastomosis with the colon was made. Distal anastomosis was made to the upper body of the remnant stomach. A substernal route was chosen because of the his-

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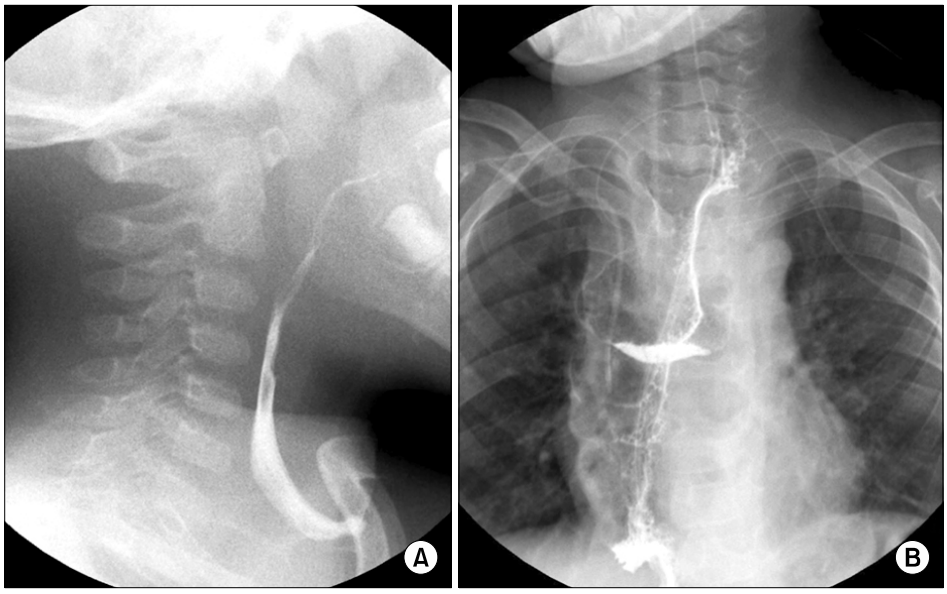

Fig. 1. (A) Preoperative esophagogram demonstrated cervical esophagostomy and disruption of gastrointestinal continuity. (B) Postoperative esophagogram revealed that intact proximal and distal anastomosis with good distal passage.

tory of multiple operations in the posterior mediastinum. On the 7th postoperative day, an esophagogram revealed that the proximal and the distal anastomoses were intact and the distal passage was good (Fig. 1B). Postoperative diet training was difficult because he did not know how to swallow food. However, the amount of oral intake increased gradually, and on the 23rd postoperative day, he was discharged without symptoms of dysphagia. Seven months after the operation, his body weight became 18 kg and he can now tolerate a regular diet.

2) Case 2

The patient was a 13-month-old girl born with tracheoesophageal fistula with esophageal atresia, type C. An attempt at primary anastomosis in other hospital failed due to long gap atresia. She also underwent fistula division, cervical esophagostomy and feeding gastrostomy on the third day after birth.

After the first operation, duodenal atresia was found and an additional gastrojejunostomy was performed. She visited our clinic for esophageal reconstruction with a weight of 7.4 kg, which was below the 3rd percentile of the growth curve. Nutritional support had been maintained by gastrostomy tube only when she visited our clinic. Preoperative CT scans showed malrotation of the bowel with whirling of mesenteric vessels, the small bowel aggregated in the right side of the abdomen, and the large bowel aggregated in left side. However, an angiogram of the superior mesenteric artery and inferior mesenteric artery demonstrated normal arcades to the marginal arteries.

She underwent esophageal reconstruction with the colon via a substernal route at 13 months of age. The left colon, pedicled with a left colic artery, was used in the isoperistaltic direction. On the 9th postoperative day, an esophagogram demonstrated no leakage at the proximal or distal anastomoses. Diet training was also difficult because she initially refused oral feeding. On the 25th postoperative day, she was discharged without dysphagia. Eight months after the operation, stenosis at the proximal anastomosis site occurred and endoscopic balloon dilatation was attempted twice. At 22 months after the colon interposition, surgical widening of the proximal anastomosis site was performed. She is now on a regular oral diet.

DISCUSSION

The two patients presented in this paper were born with esophageal atresia and suffered from failed primary anastomosis because of long gap atresia. The stomach could not be considered a substitute because of duodenal atresia in one patient and a failed previous attempt at an Ivor Lewis operation in the other patient. They had suffered from long-term tube

feeding after failed TEF repair, and colon interposition successfully restored oral feeding.

Long gap esophageal atresia is technically challenging in TEF repair. In most cases, elongation of the proximal esophageal pouch or delayed attempts at primary esophageal anastomosis can establish esophageal continuity [1]. However, if this attempt at delayed primary esophageal reconstruction fails, esophageal reconstruction with other substitutes is necessary after temporary cervical esophagostomy [2].

Esophageal reconstruction in childhood should be performed with the anticipation of satisfactory function for a full lifetime [3]. From the perspective of the long-term results of colon interposition, several long-term complications have been reported. Coopman and colleagues reported that long-term complications were observed in 27 of 32 patients (84%) after colon interposition. Frequent late complications were stricture, bezoars, graft redundancy, and anemia [4]. However, Burgos and colleagues reported good functional outcomes and health perceptions in the long-term follow-up [5]. Although long-term complications of colon interposition have been reported, considering life-long function in the choice of a substitute for the esophagus, the colon can be the first choice in children.

Colon interposition in children is technically challenging, because the pedicle vessels are too small and the mesentery is too weak. Most early mortalities are associated with poor graft vascularity leading ischemic necrosis [6]. However, most studies showed low mortality rates of 0% to 13%.

In these patients, colon harvesting was technically challenging because of multiple abdominal surgery in the first patient and abnormal congenital anomaly of the bowel and excessively small size in the second patient. A meticulous surgical technique was necessary to prevent surgical morbidity. To prevent early and late complications, Henderson recommended several principles: careful preservation of the vascular pedicle, selecting a conduit of ample length, decompressing with a nasal sump drain for several days, avoiding redundancy, and performing anastomoses with two layers [7]. A study reported that safe surgery with low morbidity resulted from a combination of meticulous surgical techniques and careful follow-up [6].

Colon interposition in children is not a frequently performed procedure and is technically challenging due to the small size of grafts and vessels. We report cases of colon interposition after failed TEF repair in which bowel continuity and oral feeding were successfully restored.

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