

Triangular Tapered Duodenoplasty for the Treatment of Congenital Duodenal Obstruction

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Background/Purpose: To evaluate the safety and efficiency of triangular tapered duodenoplasty, a modified procedure for the treatment of congenital duodenal obstruction was designed.

Methods: Eight children underwent triangular tapered duodenoplasty over a 5-year period with a minimum follow-up of 27-months. Study parameters include morbidity and mortality postsurgical time to feedings, hospital length of stay, and weight gain. In addition, all patients were asked to undergo postoperative gastric emptying scans and upper gastrointestinal series (UGIS).

Results: Eight children underwent triangular tapered duodenoplasty with 0% surgical morbidity and mortality rates. Mean postsurgical time to feedmap was 5.7 days (range, 2 to 12 days), and mean hospital length of stay was 9.6 days

(range, 4 to 15 days). Mean NCHS weight gain was 50% (range, 25% to 75%). Five patients underwent postoperative gastric emptying scans with a mean Tc^{99m} 43 minutes (range, 24 to 70 minutes; normal, 50 minutes). Four patients underwent postoperative UGIS showing no evidence of megaduodenum in any patient.

Conclusions: Triangular tapered duodenoplasty is safe and effective in the treatment of congenital duodenal obstruction. The morbidity and mortality rates and hospital stay resulting from this procedure are the lowest as yet reported in the medical literature.

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INDEX WORDS: Duodenoplasty, congenital duodenal obstruction.

MOST INFANTS DO extremely well after side-to-side duodenoduodenostomy or duodenojejunos-tomy for duodenal atresia. Many, however, have gastro-duodenal dysfunction as a result of megaduodenum and require prolonged total parenteral nutrition (TPN) or surgical revision for persistent abdominal pain and failure to thrive. Previous reports have shown that tapering or contouring the duodenum reduces these problems.^{1,2} We have devised a new method for tapering the duode-num that is simple to perform and appears to produce excellent results.

MATERIALS AND METHODS

Eight children (3 boys and 5 girls) underwent surgical repair of congenital intrinsic duodenal obstruction. At surgery, 6 patients were found to have duodenal atresia, and 2 had a duodenal web located in the second to third portion of the duodenum. All patients had associated megaduodenum. Two of the patients with duodenal atresia had congenital heart defects, and 2 had trisomy 21. One additional patient with a duodenal web had trisomy 21. The median age at surgery was 1.5

days (range, 1 to 3 days) for patients with duodenal atresia. Those with duodenal webs underwent surgery at 6 weeks and 9 months.

Operative Technique

The abdomen is opened by a transverse right upper quadrant incision. The duodenum is mobilized by extensive Kocher maneuver, and the ligament of Treitz is incised as necessary. The obstruction is visualized, and the distal duodenum is sewn to the proximal dilated duodenum in a longitudinal, dependent position using fine interrupted seromuscular sutures. A longitudinal incision is made parallel to the suture line on the proximal and distal sides of the duodenum. A triangular portion of proximal dilated duodenum is excised as illustrated in Fig 1. An anastomosis then is performed using a running full-thickness fine absorbable suture. Holding sutures may be placed on the anterior cut edges of the proximal and distal duodenum to evenly approximate the tissues and prevent the formation of a dog-ear in the corner of the anastomosis. Finally, the anterior border of the anastomosis may be inverted with fine interrupted nonabsorbable seromuscular Lambert sutures. The distal duodenum is placed in a dependent position, and the ligament of Treitz is reconstructed with several fine interrupted sutures. Finally, an 8F or 10F nasogastric tube is placed and positioned properly within the stomach using palpation. A gastrostomy tube is virtually never required with this procedure.

Immediate Postoperative Management

The stomach is emptied continuously by a nasogastric tube that is set to low intermittent suction. The nasogastric tube is removed when the gastric effluent becomes nonbilious or drops below 20 mL/24 hours. Oral feedings then are started using small amounts of Pedialyte, which gradually are increased to 30 mL whereupon the feedings are shifted to one-half-strength formula and advanced to maintenance volume as tolerated. Once maintenance volume is achieved, full-strength feedings are begun, and discharge is planned.

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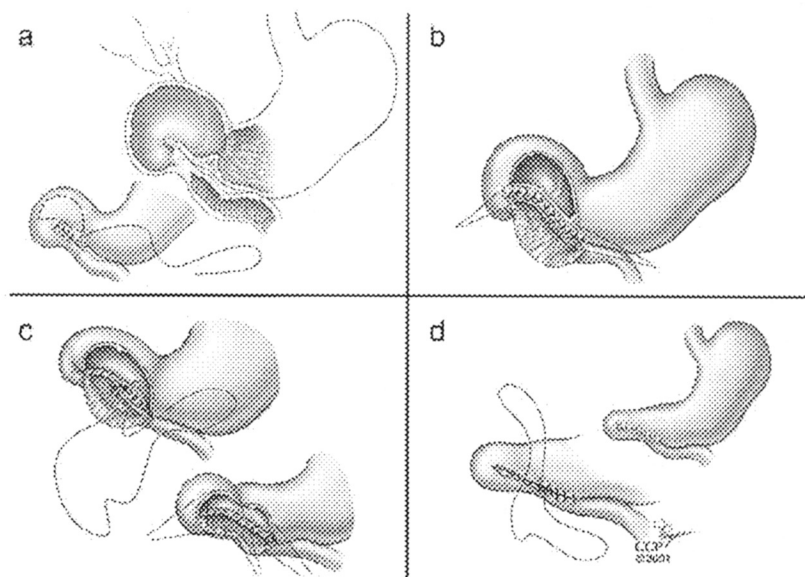


Fig 1. (a) Placement of back wall seromuscular suture line. (b) Excision of triangular portion anterior duodenal wall and back wall anastomosis begun. (c) Front wall anastomosis completed with optional holding sutures. (d) Front wall seromuscular inversion suture line.

Follow-Up

All patients were recalled 27 months to 5 years after surgery, and all were requested to undergo gastric emptying scans and upper gastrointestinal series.

RESULTS

All patients survived, and there were no duodenal leaks or other complications. Postoperative feedings were begun at a mean of 5.7 days (range, 2 to 12 days). Length of stay was a mean of 9.6 days (range, 4 to 15 days). Gastric emptying scans were performed in 5 patients showing a mean $Tc_{1/2}$ of 43 minutes (range, 24 to 70; normal, 50 minutes). Upper gastrointestinal series were performed in 4 patients, which showed no evidence of a megaduodenum (Fig 2). One patient reported symptoms of gastroesophageal reflux that was confirmed by gastric emptying scan and found to be grade 2 by upper gastrointestinal series. All other patients were asymptomatic. No patient in this study had any sign of blind loop syndrome such as abdominal pain, diarrhea, steatorrhea, or anemia. Mean weight using NCHS standards was 50% (range, 25% to 75%) with a mean follow-up of 35.6 months (range, 27 to 60 months).

DISCUSSION

For many years, side-to-side duodenoduodenostomy (SDD) or duodenojejunostomy (SDJ) were standard treatment for duodenal atresia and continue to be used by many surgeons today.³ These operations are safe and generally yield satisfactory results. However, sometimes they are attended by serious problems.

For example, gastroduodenal stasis develops in many infants after these operations resulting from megaduode-

num, poor coaptation of the duodenal wall, and ineffective peristalsis. In the short term, gastroduodenal stasis may lead to prolonged times to feedings after surgery. This is illustrated by a report from Spigland and Yazbeck⁴ who found megaduodenum in 22% of 33 patients after standard SDD and SDJ for congenital intrinsic duodenal obstruction. In this report, patients required a mean time from surgery to feedings of 13 days with a range of 6 to 45 days. In the long term, gastroduodenal

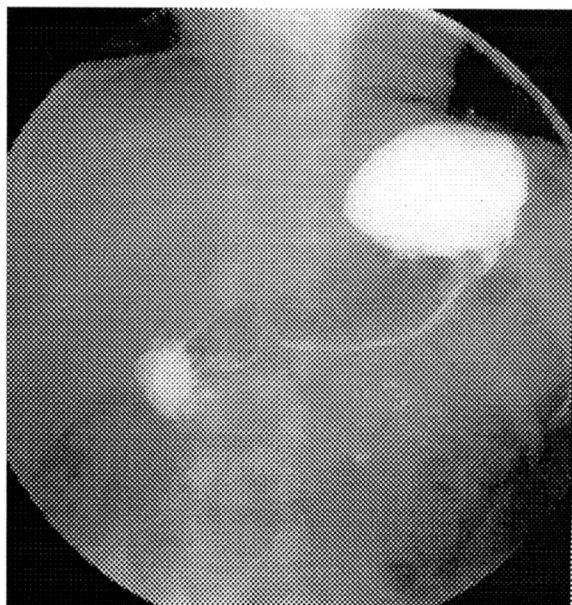


Fig 2. Upper gastrointestinal series shows duodenal contour after triangular tapered duodenoplasty.

stasis may cause a variety of chronic abdominal symptoms. Kokkonen et al⁵ found megaduodenum by upper gastrointestinal series in 22% of 41 patients who underwent SDD or SDJ. Thirty-one percent of these patients were symptomatic, and 95% had an abnormal upper gastrointestinal series with either megaduodenum, duodenogastric reflux, gastroesophageal reflux, gastritis, diverticula, delayed gastric emptying, or bezoar. Spigland and Yazbeck⁴ reported chronic abdominal symptoms in 77% of their patients who underwent SDD or SDJ for congenital intrinsic duodenal obstruction related to megaduodenum with blind loop syndrome, gastroesophageal reflux, cholestatic jaundice, and delayed transit. In the same study, 18% of patients required secondary surgical procedures. In another report, Ein and Shandling⁶ described 3 patients who required surgical revision after SDD.

Several reports indicate that tapering or contouring the duodenum may ameliorate these problems. Sherman and Schulten⁷ used longitudinal resection and imbrication of the duodenum in 2 cases of high jejunal atresia. Weisgerber and Boureau⁸ showed that tapering duodenoplasty allows earlier feeding compared with conventional duodenoplasty in 25 patients with duodenal atresia. Adzick et al¹ used a GIA stapler to taper the duodenum in conjunction with duodenoduodenostomy in 6 patients with duodenal atresia. Although length of stay was not reported, feedings were initiated in 7 days or less in all of these cases.

Perhaps the most significant recent advance in the treatment of congenital duodenal obstruction has been the diamond-shaped duodenoplasty reported by Kimura

et al in 1990.² In this contouring procedure, a transverse incision in the proximal duodenum is anastomosed to a longitudinal incision in the distal duodenum. In his series of 44 patients, oral feedings were started at a mean of 3.66 days (range, 2 to 6 days), and intravenous fluids were discontinued in 7.54 days (range, 3 to 20 days). No length of stay was reported, and overall mortality rate was 32% (although none apparently related to the surgical procedures). Follow-up from 6 months to 15 years in 20 patients showed normal weight gain and normal upper gastrointestinal series in 19 of 20 patients. This procedure was evaluated subsequently by Weber et al⁹ who reported a mean time to feedings of 4.1 days, and a mean of length of stay 16.2 days after diamond-shaped duodenoplasty compared with 9.6 days and 28.0 days, respectively, after SDD. In this study, survival rate was 100%, and complications occurred in only 1 patient in each group.

Using the method of tapered duodenoduodenostomy described in this report, survival rate was 100%, and there were no complications. Mean time to feedings after surgery was 5.75 days (range, 2 to 12 days), and hospital length of stay was 9.6 days (range, 4 to 15 days). All patients were growing well at follow-up, and only one patient was symptomatic with gastroesophageal reflux. Gastric emptying scans showed normal gastric emptying, and no patients were found to have megaduodenum by UGIS. This procedure appears to be an acceptable alternative to diamond-shaped duodenoplasty and provides superior results compared with standard side-to-side duodenoplasty.

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