Endorectal pull-through of transplanted colon as part of intestinal transplantation

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Abstract

Background—Two children with life-threatening disorders underwent intestinal transplantation; one multivisceral transplantation excluding the liver, and the second transplantation of the liver, small bowel, and colon.

Methods—Involvement of the native rectum necessitated resection and replacement with the transplanted allograft. To prevent a permanent colostomy, a pull-through of the allograft colon was performed.

Results—Both patients had a stormy early postoperative course, mainly because of the complexities of intestinal transplantation, but with eventual recovery, including improvement of rectal function.

Conclusions—These are the first two known cases in which a transplanted large intestine was used for a pull-through procedure.

Transplantation of the intestine is recommended when parenteral nutrition is not possible or when the patient's life is threatened by complications. [1,2] Addition of the large intestine to the graft may help control loss of water and electrolytes from the gastrointestinal tract.[1] When the rectum is involved by the underlying pathologic condition, prevention of a permanent colostomy is only possible by its replacement. We report two cases in which a pull-through procedure was performed.

CASE REPORTS

Case 1

The recipient, a girl who was 21 months old at the time of transplantation, was brought for treatment at the age of 5 months with rectal bleeding and passage of excessive amounts of mucus per rectum. Physical, endoscopic, and radiologic examinations showed multiple juvenile polyps extending from the stomach to the rectum. She was kept alive with total parenteral nutrition (TPN), biweekly blood transfusions, and daily albumin infusions. Liver function remained normal, although the patient was found to have anti-hepatitis C virus antibodies at the age of 12 months, presumably from an infected blood transfusion.

Case 2

A 16-month-old girl with Hirschsprung's disease extending from the jejunum to the rectum underwent a subtotal colectomy, an ileal resection, and a terminal ileostomy 8 days after birth. End-stage liver disease developed after TPN. She was referred to our center for a liver and intestinal transplantation at the age of 10 months.

DONORS

The donors were heart-beating, hemodynamically stable cadavers of the same blood type and approximately the same size as the recipients. Serologic analysis of the donors was negative for hepatitis B and C, human immunodeficiency virus, and cytomegalovirus. Cytotoxic crossmatch was strongly positive in case 1 and negative in case 2. The crossmatch was done in retrospect. No changes of the immunosuppression were made because of the positivity in case 1.

The donor operation has been described elsewhere in detail. [3] In brief, the intraabdominal organs of the donors (liver, stomach, small and large intestines, pancreas, and spleen) were removed en bloc and transported to the recipient hospital. Belzer solution was used for preservation. After surgical exploration of the recipients was completed, extraneous organs were removed on the back table.

The stomach, pancreaticoduodenal complex, small intestine, and ascending, transverse, and descending colon were transplanted in case 1. A Heineke-Mikulicz pyloroplasty was performed. The liver, small intestine, and ascending, transverse and, descending colon were transplanted in case 2. Cold ischemia times were 10 hours 20 minutes in the first case and 9 hours 50 minutes in the second.

RECIPIENT PROCEDURES

The recipient procedures were started shortly after the donor organs were visualized by the donor team and were found to be satisfactory. Surgical approach was with a cruciated abdominal incision in both cases.

Case 1

The native liver appeared grossly normal and was preserved, although frozen section showed evidence of mild chronic hepatitis and moderate steatosis. The native stomach, pancreaticoduodenal complex, and small and large intestines were resected. The rectum was resected submucosally. The arterial blood supply to the native liver was from a single hepatic artery arising from the celiac axis and was carefully preserved. The native gallbladder was resected, and the common bile duct was transected below the cystic duct confluence. Left gastric, splenic, and gastroduodenal arteries were ligated and transected. The portal vein was transected at the confluence of splenic and superior mesenteric veins. Superior and inferior mesenteric arteries were transected near their takeoff from the aorta.

Arterialization of the graft was from the infrarenal aorta. The outflow was with an end-to-end anastomosis between donor and recipient portal veins.

An esophago (native) gastrostomy (donor) was performed to the fundus of the stomach and was reinforced with a fundoplication. The donor distal colon was pulled through the seromuscular rectal cuff. A rubber catheter was introduced into the descending colon through the exteriorized stump of the donor colon. Biliary outflow was with a choledochus jejunostomy into a Roux-en-Y loop constructed with donor jejunum.

Case 2

The native stomach and pancreaticoduodenal complex were preserved with intact arterial blood supply. The native portal vein was anastomosed end to side to the native infrahepatic vena cava. The recipient liver was stripped from the inferior vena cava, and the remaining small and large intestines were removed, except the rectum. The spleen, which was enlarged, was removed.

The graft was arterialized through the infrarenal aorta. The outflow was at the confluence of the native suprahepatic veins. The patient's coagulation quickly improved after revascularization, and the rectal mucosa was resected. Donor bile duct and native duodenum were drained into the first loop of the donor jejunum. A pull-through of the descending colon allograft was performed. Decompression of the intestinal graft was with a Bishop-Koop ileostomy.

A short piece (2 cm) of donor thoracic aorta was used for the arterial reconstruction in both cases. It was interposed between the native infrarenal aorta and a Carrel patch containing the donor celiac axis and superior mesenteric artery.

The classic Soavé technique was used for the pull-through. No coloanal anatomosis per se was performed. The donor descending colon was secured in place with one layer of interrupted absorbable sutures to the native mucocutaneous junction of the anal canal. Additional support was provided with interrupted nonabsorbable sutures placed in the pelvic floor between the seromuscular cuff and the pulled-through colon.

A closed (Jackson-Pratt) drain was placed just above the seromuscular cuff in both cases.

Both patients received feeding jejunostomies. The ileostomy was closed at 4 months in the first patient and at 1 year after transplantation in the second.

IMMUNOSUPPRESSION, MONITORING, AND TREATMENT OF REJECTION

FK 506 was administered first intravenously (0.15 mg/kg/day) and then orally (0.3 mg/kg/day). An intravenous bolus of hydrocortisone (1 gm) was given after reperfusion of the graft followed by prednisolone 100 mg/day tapered to 20 mg/day maintenance dose within 5 days.

Stomal endoscopies and biopsy specimens were obtained frequently. Neither patient had a major episode of rejection. The first patient was treated for mild acute cellular rejection of the small bowel on postoperative days 18, 24, and 29 by steroid boluses and augmentation on the FK 506 serum levels. Desired plasma FK 506 levels were 1.5 to 2 ng/dl.

The second patient also received a steroid bolus on postoperative days 22 and 50 for small bowel rejection and on postoperative day 128 for rejection of the large bowel. All rejections were documented with biopsy findings.

OTHER COMPLICATIONS

Case 1

The immediate postoperative course was complicated by a retroperitoneal abscess, which was drained on postoperative day 9. The abscess (3 × 5 cm) was located just above the rectal cuff and was suspected to be due to contamination during the procedure. A subtle ischemia of the distal colon could not be excluded, and a protective loop ileostomy was performed. A low-grade rectal stricture was diagnosed on postoperative day 42 and treated successfully with rectal bougienage. Hegar's dilators were used transrectally for daily dilatation for 1

month. Eight-French dilators were used initially, and eventually 24F dilators could be easily advanced.

Ten months after operation the first patient had posttransplantation lymphoproliferative disease. The second patient had enlargement of the liver (native) and tonsils, as well as intestinal ulcerations, all of which were positive for Epstein-Barr virus by in situ hybridization. Treatment was with reduction of the immunosuppression, intravenous acyclovir, and *α*-interferon and is maintained to date, although there are no remaining pathologic findings.

Case 2

Because of the small size of the peritoneal cavity, the abdomen could only be closed at the end of the procedure with the aid of a Gore-Tex sheet (W. L. Gore & Associates Inc., Newark, Del.). The wound healed under secondary intention. The child's recovery was also delayed by respiratory failure, which necessitated a tracheostomy.

NUTRITION

Parenteral nutrition was administered to both patients after operation. It was gradually weaned and then stopped when the patients' enteral intake met their caloric requirements (postoperative day 43 in case 1 and postoperative day 52 in case 2). Intravenous fluid supplementation was required in case 1 until the ileostomy was closed. The development of the Epstein-Barr virus infection necessitated periodic supplementation with TPN during the active stage of the infection.

CURRENT STATUS

Both patients are at home maintaining normal activities. They receive their nutrition and medications enterally, with the exception of acyclovir, which is being administered intravenously in case 1.

Both patients are too young for bowel training, and manometric assessment has not been performed. Both patients have good anal tone and have 3 to 6 pasty bowel movements daily.

DISCUSSION

The current state and indications for intestinal transplantation were discussed in the closing session of the Third International Symposium on Intestinal Transplantation in Paris, November 3-6, 1993. Because of the risk of the procedure and lack of long-term follow-up, intestinal transplantation is not indicated for patients who are doing well on parenteral nutrition at this time. It is performed only if it is lifesaving, as in the patients in this report. Several technical and immunologic considerations were raised in the treatment of these two patients.

The liver did not need replacement in case 1 because the native liver was thought to be in satisfactory condition. It was removed from the graft with the flexible "cluster" principle[4] and uneventfully transplanted into another patient. Hepatopetal portal flow was maintained by porto (donor) portal (recipient) anastomosis. In the second case, drainage of the native portal vein into the systemic circulation was chosen versus portal (donor) drainage for technical reasons. The rectal mucosectomy in the second case was only possible after adequate liver function was secured from the transplanted liver. The colonic mesentery was of sufficient length. Nevertheless, the additional measure of exteriorizing the distal pulled-through colon was taken to provide maximum safety from retraction.

The prognostic significance of a positive cytotoxic crossmatch in clinical intestinal transplantation is not known. We have performed six such intestinal transplantations (four combined with the liver, two without). Three patients (two combined, one without the liver) are currently alive, including the patient in the current report.

Endorectal pull-through with sphincter preservation and rectal mucosectomy was initially proposed by Ravitch and Sabiston[5] in 1947 for benign colorectal disease and by Soave[6] in 1964 for Hirschsprung's disease. In the two patients reported on here, rectal involvement by the pathologic process necessitated the use of this procedure, otherwise, the patients would have had a permanent colostomy. The rectal mucosectomy was not particularly difficult.

The short follow-up period and current age of these two patients preclude a thorough evaluation of their rectal function, which is expected to be satisfactory, as indicated by a normal anal tone. Nevertheless, these two cases show the feasibility of the pull-through procedure with transplanted bowel.

Acknowledgments

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