Combined Surgical and Transhepatic Rendezvous Procedure for Relieving Anastomotic Biliary Obstruction in Children with Liver Transplants

John Crowley, MB, Kyle Soltys, MD, Rakesh Sindhi, MD, Kevin Baskin, MD, Sabri Yilmaz, MD, Orrie Close, MD, and Avinash Medsinge, MD

ABSTRACT

Four children (3 boys and 1 girl, age 1.4–9.4 y) presented 2–70 months after liver transplantation (mean 26 months) with high-grade narrowing at the surgical anastomosis that could not be crossed at percutaneous transhepatic cholangiography. Each patient was treated with a combined surgical and interventional radiology "rendezvous" procedure. Biliary drainage catheters were left in place for an average of 6 months after the procedure. At a mean 7.5 months after biliary drainage catheter removal, all children were catheter-free without clinical or biochemical evidence of biliary stricture recurrence.

Biliary stricture is the most common complication of pediatric liver transplantation and has been reported to occur in 10%–45% of patients (1). If anastomotic stricture is suspected, the usual approach is to perform percutaneous transhepatic cholangiography and, if stricture is confirmed, to guide a catheter and wire across the anastomosis and treat with serial dilation and catheter upsizing (1,2). This approach presumes the stricture can be crossed at cholangiography. If it cannot, the usual treatment is endoscopic access or surgical revision (3). Transjejunal biliary access is a well-described technique for treating biliary strictures (4–8). Most series involve percutaneous access to a Roux limb, which is fixed to the anterior peritoneum (6,7). In this series, the Roux loop was posteriorly located (retrocolic) and inaccessible to percutaneous access. Hence a combined surgical and interventional radiology (IR) approach was used.

From the Departments of Radiology (J.C., S.Y., A.M.) and Transplant Surgery (K.S., R.S.), Children's Hospital of Pittsburgh, 4401 Penn Ave., Pittsburgh, PA 15224; Medical Radiologists, Inc (K.B.), Dayton, Ohio; and Department of Radiology (O.C.), University of Pittsburgh Medical Center, Pittsburgh, Pennsylvania. Received February 26, 2016; final revision received and accepted June 16, 2016. **Address correspondence to** J.C.; E-mail: crowleyjj@upmc.edu

None of the authors have identified a conflict of interest.

J Vasc Interv Radiol 2017; 28:1189–1193

http://dx.doi.org/10.1016/j.jvir.2016.06.021

MATERIALS AND METHODS

This retrospective observational study was approved by the institutional review board. The study comprised patients who presented to a pediatric liver transplant center over a 1-year period (October 2014 to October 2015) 2–70 months (mean 26 months) after liver transplantation with intractable biliary-enteric anastomotic stricture. Intractable stricture in this study was defined as either severe stenosis or occlusion at the biliary-enteric anastomosis that could not be crossed with a wire and catheter on at least 2 occasions during percutaneous transhepatic cholangiography. The study included 3 boys and 1 girl with a mean age of 4.1 years (range, 1.4–9.4 years). Patient characteristics are summarized in **Table 1**. Each of these patients was being considered for retransplantation because of intractable stricture, as endoscopic access and surgical revision were judged to be unfeasible.

Each patient underwent laparotomy and enterotomy in the Roux limb in the operating room. Patients 1 and 3 were transferred to the IR suite after laparotomy. In patients 2 and 4, the entire procedure was performed in the operating room. The first patient was a girl age 4 years 5 months who had undergone whole-liver transplantation with choledochojejunostomy for hepatoblastoma 22 months previously. Three prolonged attempts at crossing the surgical anastomosis from the biliary side had been unsuccessful. A 4-F directional catheter (Kumpe; AngioDynamics, Inc, Latham, New York) and an angled 0.035-inch hydrophilic guide wire (Terumo Medical Corporation, Somerset, New Jersey) were

guided through the enterostomy and adjacent bowel across the strictured choledochojejunostomy anastomosis into the left bile ducts (Fig 1a–e). In each case, there was an obvious "nipple" at the point where the Roux loop was attached to the biliary tree. This "nipple" was firmly probed with the catheter and wire, as has been previously described (7). There was an external biliary drainage catheter in place, and the Kumpe catheter and wire were guided along this external biliary drainage catheter and exteriorized. Another 4-F French catheter and hydrophilic wire were then guided into the "nipple" and directed toward the right bile ducts. It was possible

Table 1. Patient Characteristics

	Patient 1	Patient 2	Patient 3	Patient 4
Age	**4 y 5 mo**	**1 y 2 mo**	**9 y 5 mo**	**1 y 5 mo**
Reason for transplantation	Hepatoblastoma	Urea cycle defect (carbamylphosphatase synthetase 1 deficiency)	Hepatoblastoma	Hepatoblastoma
Type of transplant	Whole liver	Left lateral segment, deceased donor	Whole liver	Whole liver
Type of surgical anastomosis	Choledochojejunostomy	Hepaticojejunostomy	Hepaticojejunostomy	Choledochojejunostomy
Time from transplantation to procedure	22 mo	9 mo	70 mo	2 mo

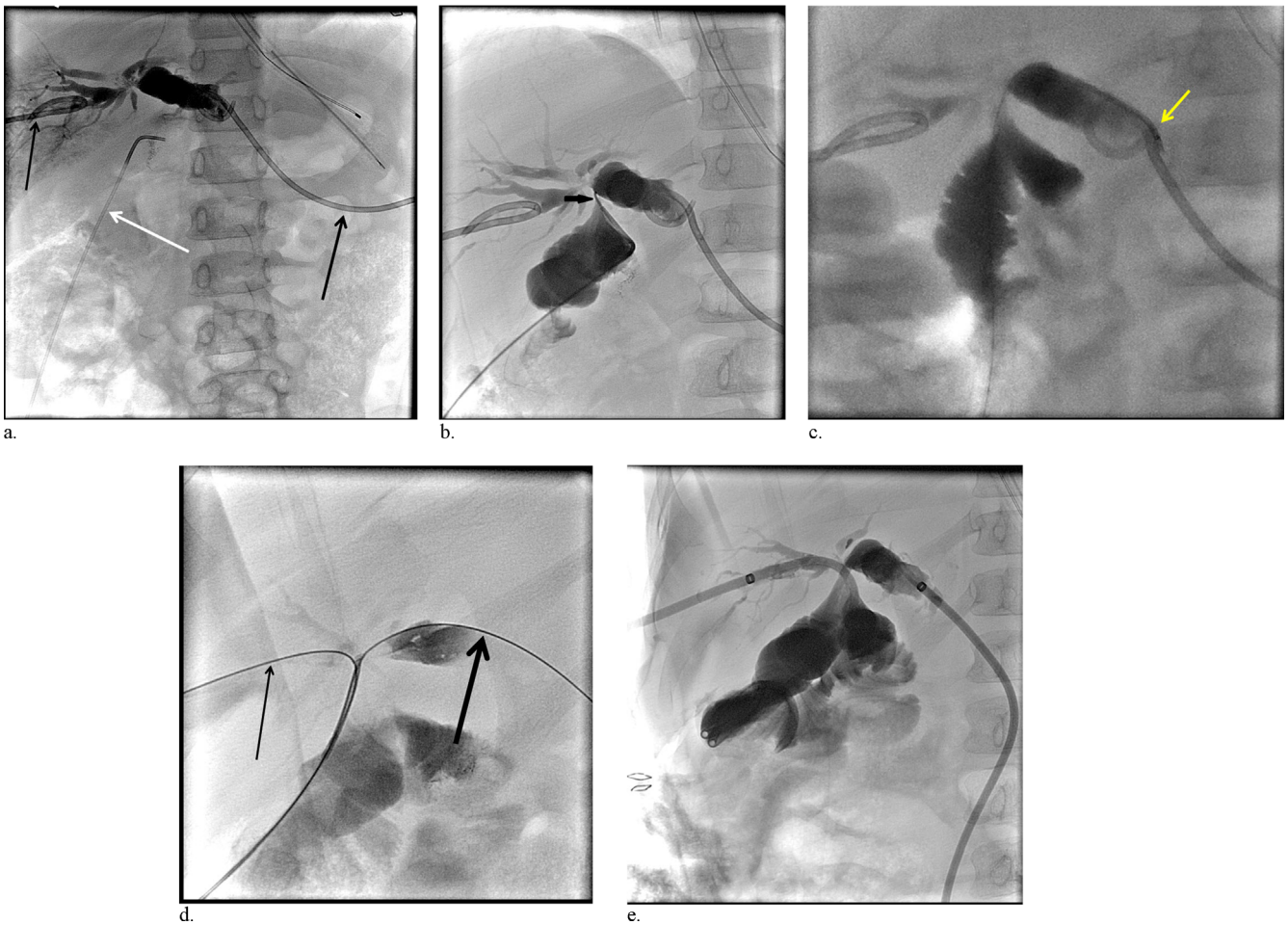

Figure 1. **(a)** A 4-F diagnostic catheter has been introduced into the Roux loop (white arrow). There are drainage catheters in the right (thin black arrow) and left (thick black arrow) ducts. **(b)** The anastomosis is being probed with a directional catheter and a hydrophilic wire (arrow). Note obvious "nipple" at the anastomotic site. **(c)** A directional catheter has been guided across the anastomosis into the left ducts (arrow). **(d)** Wires have been guided from the Roux loop through the right (thin arrow) and left (thick arrow) ducts. **(e)** Internal/external biliary drainage catheters have been guided from each side into the bowel.