Modified Rendezvous Biliary Procedure Involving the Hepatobiliary Surgeon, Endoscopist, and Interventional Radiologist: A Novel Solution for Complex Bile Duct Injuries

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Bile duct injury is a well-known complication of laparoscopic cholecystectomy. It can be a dreadful complication resulting in biliary peritonitis, cholangitis, and sepsis. Early diagnosis, bile leak control, and repair of the injury are crucial in preventing further complications; injuries are often missed, however, leading to a delayed presentation. Successful repair of complex bile duct injuries requires transfer to a tertiary care center equipped with a hepatobiliary surgeon for definitive surgery. In certain cases with extensive injury to the biliary ductal system, a primary biliary enteric or end-to-end bile duct anastomosis may not be feasible and may be deferred until the inflammation resolves. In these situations, external biliary drainage is performed. However, this does not provide a physiologic conduit for bile flow. We describe an alternative procedure in which physiologic bile flow can be attained while the inflammatory process subsides to allow for a subsequent bilioenteric anastomosis. To our knowledge, there is no evidence of this procedure reported in the literature and we discuss 2 patients with extensive (Bismuth type E4) biliary ductal injuries with different clinical scenarios who underwent successful modified rendezvous procedures.

METHODS
A retrospective review of prospectively collected data was performed on 2 patients with complex bile duct injuries from 2011 to 2012 at a tertiary care hospital equipped with a hepatobiliary surgeon, interventional radiologist, and an endoscopist.

RESULTS
Patient 1
A 27-year-old woman with no significant past medical history underwent a laparoscopic cholecystectomy for biliary colic at a local community hospital. Her postoperative course was complicated with a bile leak suspected to be from the cystic duct stump. She was transferred to our institution for definitive management of biliary peritonitis. An MRI scan demonstrated a bile leak from the common hepatic duct free into the peritoneal cavity. On postoperative day 2 from the laparoscopic cholecystectomy, she underwent a laparotomy, and a bile leak was noted from the hepatoduodenal ligament. The extent of the thermal coagulation injury involved missing segments of the common bile duct (CBD) and the common hepatic duct, exposing the right and left branches of the hepatic ducts in the porta hepatis proximally and a shriveled CBD stump distally (Fig. 1). Given the extensive thermal biliary ductal injury and separation of the right and left hepatic ducts, a primary reconstruction was deemed not ideal. At this point, the modified rendezvous

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Figure 1. Intraoperative picture demonstrating the extent of injury with a distinct loss of common bile duct (CBD) length.
procedure was performed to control bile leak and provide forward flow of bile into the intestinal tract. The biliary probes were inserted retrograde into the right and left hepatic ducts from the porta hepatis through the liver parenchyma. A biliary catheter (Cook Medical, 10.2 Fr) was inserted transcutaneously over the biliary probe and was drawn into the porta hepatis. These catheters were then advanced into the duodenal lumen via the distal CBD stump, confirmed by upper endoscopy (Fig. 2). The catheter was secured distally to the CBD with a silk tie, but not proximally because the hepatic ducts were friable. A completion cholangiogram was performed demonstrating antegrade flow of contrast without any evidence of leak.

Four weeks postoperatively, a cholangiogram was performed demonstrating a pseudo wall formation around the catheters without any biliary extravasations. Eight weeks later, she underwent a definitive Roux-en-Y hepaticojejunostomy reconstruction to the right and left hepatic ducts. Her immediate postoperative course was insignificant and she was discharged home. Two years after her Roux-en-Y hepaticojejunostomy, she presented with cholangitis secondary to a stricture at the right hepaticojejunostomy requiring a balloon dilatation by the interventional radiologist.

**Patient 2**

A 52-year-old man with a history of diabetes mellitus was admitted to our hospital with acute cholecystitis. He underwent a laparoscopic converted to open cholecystectomy secondary to bleeding from an un-named arterial branch. His postoperative course was complicated by jaundice and a bile leak from the common hepatic duct diagnosed by magnetic resonance cholangiopancreatography. He underwent endoscopic retrograde cholangiography (ERC) to stent the suspected leak but this was technically unsuccessful. His biliary leak progressed to peritonitis. On postoperative day 10, he underwent a laparotomy, and 4,500 mL of cloudy biliary fluid was evacuated. After adhesiolysis, an active bile leak was noted from the porta hepatis. A damage control procedure had to be performed given his septic shock. Multiple drains were placed in the right upper quadrant to control biliary spillage, and the abdomen was closed temporarily with a vacuum-assisted dressing; the patient was then transferred to the ICU. At this point, the extent of biliary injury could not be defined given extensive scarring from the inflammatory process. The interventional radiologist placed a fluoroscopic-guided, percutaneous transhepatic cholangiogram (PTC) catheter with its tip in the hepatic duct confluence to control further bile leak.

On resolution of sepsis (4 weeks after laparoscopic cholecystectomy), a planned re-exploration of the abdomen and the hepatoduodenal ligament was performed. The extent of injury was apparent: the bile duct was transected with the proximal opening just below the hepatic duct bifurcation and the distal CBD stump was scarred down and was unable to be visualized. The patient was also found to have a concomitant replaced right hepatic arterial injury originating from the superior mesenteric artery. At this point, the modified rendezvous procedure was performed because primary biliary reconstruction would not be feasible for multiple reasons: severe scarring and inflammation in the hepatoduodenal ligament, a large anatomic gap

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**Abbreviations and Acronyms**

- CBD = common bile duct
- ERC = endoscopic retrograde cholangiography
- PTC = percutaneous transhepatic cholangiography
between the injured ends of the bile duct, and concomitant right hepatic artery injury. The endoscopist performed an ERC to introduce a guidewire transduodenally into the major papilla then to the distal CBD stump opening. The distal CBD opening was identified by the guidewire in the subhepatic space protruding from the distal CBD stump. The PTC catheter placed antegrade (preoperatively by interventional radiology) with its tip residing in the hilum, was exchanged to a Cook Medical 10.2-Fr biliary catheter, and then advanced in to the distal CBD stump over the ERC-placed guidewire into the duodenum. The intraluminal position of this catheter was confirmed endoscopically. The utility of the interventional radiologist in this case was limited to preoperative PTC catheter placement. The catheter was secured distally to the CBD with a silk tie but not proximally because the hepatic ducts were friable. A completion cholangiogram demonstrated antegrade flow of contrast into the duodenum without any evidence of leak (Figs. 2 and 3).

Four weeks later, a cholangiogram was performed demonstrating continuity of bile flow from the liver to the duodenum via a pseudo wall formation around the catheters (Fig. 4). Given the severe inflammatory process from his biliary peritonitis and complex abdominal wound from the multiple laparotomies, the patient returned a year later for the definitive Roux-en-Y hepaticojejunostomy reconstruction. His postoperative course was uncomplicated and he was discharged home.

DISCUSSION
The incidence of bile leak with or without a bile duct injury after a laparoscopic cholecystectomy remains to be less than 1%.1 Bile leaks are a known complication resulting in increased morbidity, longer hospitalization, infections, and reoperations.2 Even though many biliary leaks can be successfully managed by ERC, some of them require a classic rendezvous procedure involving an endoscopist and an interventional radiologist. The endoscopist performs an ERC and advances the tip of the guidewire to reside freely in the hepatoduodenal ligament. This guidewire is snared by the interventional radiologist via fluoroscopically guided
PTC and over which a long catheter is introduced to serve as biliary conduit. This procedure, however, can be unsuccessful in select scenarios. The larger the anatomic gap between the proximal and distal bile ducts, the greater the challenge to maintain the continuity of bile flow in the classic rendezvous procedure.

Previous reports of classic rendezvous have been described, mostly to manage bile leaks after hepatectomy and post-transplant biliary strictures. \(^2\)\(^3\) Fiocca and colleagues' and Saleem and associates' described the combined endoscopic and radiologic approach in patients with complete CBD transection. Complex bile duct injuries, failed endoscopic drainage, and ongoing bile leaks are some of the indications for surgical procedures. Select patients would benefit from our unique modified rendezvous operation, requiring not only an endoscopist and interventional radiologist, but also a hepatobiliary surgeon. To our knowledge, this unique procedure has not been described in the literature and we report 2 cases that were successfully managed with the modified rendezvous procedure as a bridge to a definitive hepaticojejunostomy. The traditional rendezvous procedure would not have been feasible in either of our patients in the setting of extensive thermal injury to the bile duct, resulting in a large biliary anatomic gap exposing the right and left hepatic ducts in our first patient and biliary peritonitis with sepsis and a large anatomic gap with missing segment of the CBD in our second patient.

**CONCLUSIONS**

Our modified rendezvous procedure can be useful as a bridge to a definitive hepaticojejunostomy, by allowing pseudo wall formation and conferring adequate time to control biliary sepsis and to regenerate collateral blood supply in patients with concomitant hepatic arterial injury. The modified rendezvous procedure can be performed in patients with extensive bile duct injury and concomitant hepatic arterial injury with a preoperatively placed PTC (Patient 2) and in patients with extensive bile duct injury (especially thermal) with a significant loss in CBD length (Patients 1 and 2).

This report is the first to describe a safe and effective procedure to manage patients with extensive bile duct injuries in which a classic rendezvous procedure is not feasible as a bridge to a definitive hepaticojejunostomy.

**Author Contributions**

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**REFERENCES**