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Case Series

Creation of Neo-Bile Duct in Patients with Hepatic Duct Injury or Transection during Laparoscopic/Robotic Cholecystectomy

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Abstract

Introduction: Iatrogenic injury of the bile duct or hepatic ducts during surgery can have severe consequences, sometimes requiring liver transplantation or hepaticojejunostomy. The incidence of Bile Duct Injury (BDI) occurs at 0.3%-0.7%, resulting in a significant impact on quality of life [1]. The incidence of BDI has increased as LC has become the "gold standard" for the treatment of symptomatic cholelithiasis [1]. Surgical repair of BDI is associated with significant morbidity and symptoms typically present as Right Upper Quadrant (RUQ) pain, jaundice, elevated liver function testing, fever, and leukocytosis [2]. Clipping of the bile duct can lead to complete obstruction at varying levels, including L & RHD clipping and transection. BDI rates vary depending on factors mortality, including: anastomotic leak, abdominal abscess, and liver failure [3]. Mortality rates depend on the type of injury, and comorbidity can range from 20-40% [3].

Case Presentation: We present a patient with iatrogenic bile duct and hepatic duct injury who underwent successful neo-bile duct creation eliminating the need for liver transplantation or hepaticojejunostomy. **Conclusion:** Placement of transhepatic internal and external stents using a rendezvous approach helps create a neo-bile duct and can prevent the need for major surgery.

Keywords: Bile Ducts; Biliary Stents; Case Series; Cholecystectomy; Liver Transplant

Introduction

Iatrogenic injury of the bile duct or hepatic ducts during surgery can have severe consequences, sometimes requiring liver transplantation or hepaticojejunostomy. The incidence of Bile Duct Injury (BDI) occurs at 0.3%-0.7%, resulting in a significant impact on quality of life [1]. The incidence of BDI has increased as LC has become the "gold standard" for the treatment of symptomatic cholelithiasis [1]. Surgical repair of BDI is associated with significant morbidity and mortality, including: anastomotic leak, abdominal abscess, and liver failure [3]. Mortality rates depend on the type of injury, and comorbidity can range from 20-40% [3]. Placement of transhepatic internal and external stents using a rendezvous approach helps create a neo-bile duct and can prevent the need for major surgery.

Case Description/Methods

A 46-year old female with a past medical history of hysterectomy and sleeve gastrectomy presented status-post LC with jaundice, bile leak, and elevated liver function tests. An ERCP was performed and revealed inadvertent clipping and transection of the CBD at the level of the CHD and clipping of Lt and Rt HD at the liver hilum. The patient was seen by surgery, it was felt that the patient will require liver transplantation as there was no HD available for hepaticojejunostomy. The patient was accepted for transfer to a liver transplant center. However, there were no beds available at the transplant center, and the patient was placed on a waitlist for transfer. Our group was then contacted, and the patient was accepted to our institution. It was decided to proceed with a rendezvous procedure to bridge the gap between liver and CBD. An ERCP was first performed, a puncture was made near the bile duct clip, and a stone extraction basket was passed through the puncture site into the liver hilum region. An Interventional Radiologist (IR) then punctured and gained access to the Rt HD. A guidewire was passed into the liver hilum region, a drain was passed over the wire and left in the hilum region, and a basket was passed through the drain into the hilar region (Figures 1,2).

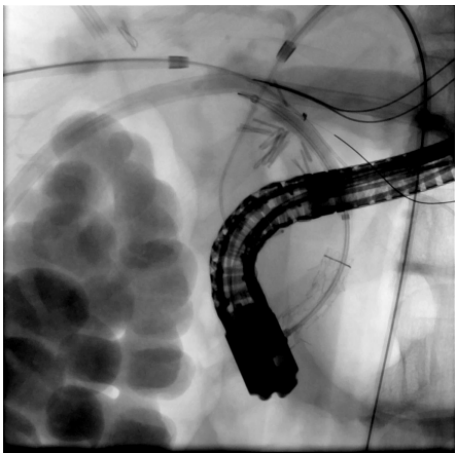

Figure 1: Flower basket and percutaneous drain visualized.

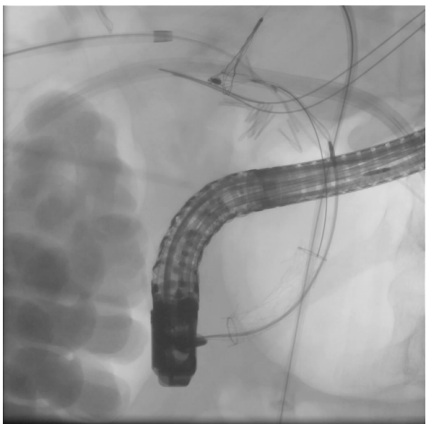

Figure 2: Wire grabbed by flower basket and percutaneous drain.

A Chiba needle was used to puncture the skin and enter the two baskets using 3-D fluoroscopy. Through the needle, a guidewire was passed and grasped by the ERCP basket and pulled into the duodenum. The second basket was used to pull a wire out through the Rt HD. The track was dilated using a balloon, and a 10F percutaneous drain was placed into the duodenum bridging the defect between the liver and CBD. The process was then repeated through the Lt HD leaving the patient with 2 percutaneous drains

in the Lt and Rt HD. The patient tolerated the procedure with no adverse events. An ERCP was performed six weeks later, and the drains were exchanged for Rt & Lt HD stents (Figure 3). The stents were exchanged repeatedly every 2-3 months for one year. All stents were removed in one year. A cholangiogram was completed and showed a successful creation of a neo Lt & Rt HD and CHD (Figure 4). The two other patients were transferred to our hospital with similar complications and have done well with the same rendezvous approach. One of the three patients still has stents in-situ which will be removed in the near future.

Figure 3: Left & right hepatic duct stents in place six weeks after initial procedure.

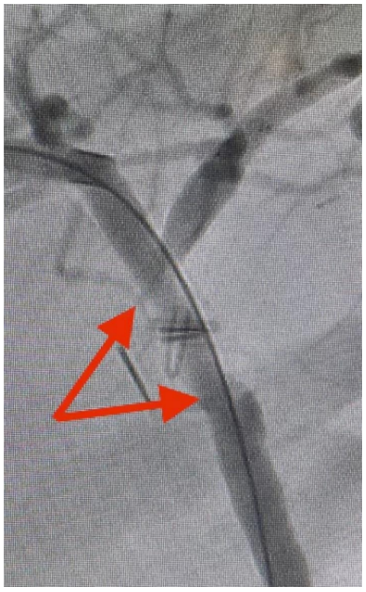

Figure 4: Neo-common hepatic duct and right & left hepatic duct.

Discussion

Bile duct injuries are a serious complication of LC. Many of these injuries can cause bile leakage, intra-abdominal collections, fistula formations, and peritonitis. Patients with these symptoms typically present as Right Upper Quadrant (RUQ) pain, jaundice, elevated liver function testing, fever, and leukocytosis [2]. Clipping of the bile duct can lead to complete obstruction at varying levels, including L & RHD clipping and transection. BDI rates vary depending on factors such as surgeon experience, patient characteristics, and anatomical variations. Reported incidence rates range from 0.3% to 0.7%, while prevalence rates have been estimated at 0.1 to 0.3% [1,3]. BDIs are categorized based on the Strasberg classification, ranging from minor injuries to complete transections. Type A injuries involve minor bile duct leakage, while Type E injuries refer to complete bile duct transections [3]. The Strasberg classification aids in predicting the complexity and challenges associated with each injury type. A current therapeutic approach requires prompt recognition and early management, which is crucial in improving patient outcomes. The creation of a neo-bile duct, an emerging therapeutic technique, involves the combined interventions of an advanced endoscopist and an IR. This approach allows direct visualization of the biliary anatomy and creation of a neo-bile duct as a result of granulation tissue formation around the stent or biliary drain. This creation of a neo-bile duct is a new therapeutic approach, with few case reports highlighting the effectiveness of this procedure in successfully managing challenging BDIs [4,5]. Righetti et. al, highlighted the creation of a neo-bile duct of a Strasburg Type C CBD injury after LC for a poor surgical candidate due to pre-existing comorbidities, who was successfully treated with a rendezvous procedure [4]. Shin et. al, showed the creation of a neo-bile duct of a 55-year-old female with malignant pheochromocytoma with metastasis to the liver presenting with complete CBD transection after right hepatectomy, who successfully underwent a rendezvous procedure with biliary stenting allowing for further biliary continuity [5].

Sharma et. al, displayed a 52-year-old female status-post LC due to symptomatic gallstone disease who was able to successfully undergo a rendezvous procedure with biliary stenting after complete transection of the CBD allowing for improvement in biliary drainage [6]. Iatrogenic injury of the bile duct or hepatic ducts during surgery can have severe consequences, and the creation of a neo-bile duct rendezvous procedure has emerged as a valuable technique to address complex BDIs, offering improved outcomes and reduced morbidity and mortality.In summary, we present a case series with severe BDI after LC. In two cases, the patients would have required liver transplantation, which was avoided. In one case, hepaticojejunostomy was prevented with the

creation of a neo-bile duct. A team approach by IR and an advanced endoscopist using the rendezvous technique can help create a neo-bile duct and save these patients from major surgery [7].

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