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Case Report

Bile duct injury in an anatomical variant of the posterior right hepatic duct draining in the cystic duct: case report

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ABSTRACT

During laparoscopic cholecystectomy, several factors increase the likelihood of bile duct injury (BDI). The most common cause of BDI during laparoscopic cholecystectomy is an inappropriate identification of the critical view of safety associated with acute and chronic inflammation, obesity, haemorrhage, and anatomical variants. Of all anatomic variants of the biliary tree, Blumgart type F has been reported as the least common, but allegedly it carries the biggest risk of BDI. We present the case of a 45-year-old woman with acute cholecystitis subjected to laparoscopic cholecystectomy with Strasberg type C injury in association with a Blumgart F variation confirmed by magnetic resonance cholangiopancreatography. The anatomical variant was identified during the surgical procedure but the BDI was diagnosed postoperatively. Intraoperative identification and treatment of the injury confers a better prognosis to the patient. Management of a BDI on a Blumgart F variant can be challenging and must be targeted to the individual case. Safety measures to prevent such injuries must be promoted by institutions.

Keywords: Strasberg classification, MRCP imaging, Surgical case reports, Biliary tree variants, Post cholecystectomy BDI

INTRODUCTION

Incidence of bile duct injury (BDI) during cholecystectomy is unknown.[1] Some data suggests that BDI during open cholecystectomy ranges between 0.10 to 0.20%, and from 0.10 to 0.85% for laparoscopic cholecystectomy.[1,2] However, during laparoscopic cholecystectomy, several factors increase the likelihood of BDI, such as limited vision, difficult orientation and estimation of depth in a bi-dimensional image, reduced haptic feedback, and varying degrees of laparoscopic skill among surgeons.[2]

The most common cause of BDI during laparoscopic cholecystectomy is an inappropriate surgical technique without identification of the critical view of safety associated with acute and chronic inflammation, obesity, haemorrhage, and anatomical variants.[1]

Anatomical variants of the biliary tree must be considered when performing a laparoscopic cholecystectomy. There are several classifications for biliary tree anatomic variations, but the Blumgart classification is probably the most extensive.[3] Of all variants, Blumgart type F has been reported as the least common ranging from 0.58% to 5% of cases, but it carries the biggest risk of BDI.[4-6]

Identifying BDI as soon as possible is important because early treatment provides better outcomes.[1,7] However, only 25% of BDI are recognized during surgery.[1] Here

we present a case of Strasberg type C injury in association with a Blumgart F variation confirmed by magnetic resonance cholangiopancreatography (MRCP), followed by a review of the literature.

CASE REPORT

A 45-year-old woman was admitted to the emergency department at a secondary level hospital in Mexico City, with a two-day history of progressive abdominal pain in the right upper quadrant. Family history was clear. Comorbidities included grade I obesity. Previous surgeries included three caesarean sections 16, 22 and 23 years prior.

The pain was described as colicky, with irradiation to the epigastric region, and was associated with the ingestion of fat-rich food. Additionally, she also referred having nausea, bilious vomiting, and anorexia.

On initial examination, she was hemodynamically stable, and not febrile. She had abdominal tenderness in the right upper quadrant, Murphy's sign was positive, and she had no jaundice. Laboratory tests showed an elevated white blood cell count of 14.800/mm^3 and normal bilirubin levels. Serum amylase, lipase, alanine transaminase, aspartate transaminase and alkaline phosphatase were all within reference levels. Upper abdominal ultrasound showed a gallbladder with a thickened wall of 6.8 mm and peri vesicular laminar fluid, with many small stones in which the largest one was about 7.3 mm, located at the fundus.

The patient was diagnosed with grade I (mild) acute cholecystitis, according to the Tokyo 2018 guidelines.[8] Emergency laparoscopic cholecystectomy was performed. Findings included lax hepatoepiploic adhesions, a distended gallbladder with approximate dimensions of 10×5×4 cm, with a thickened wall of up to 5 mm, with multiple small stones inside, one up to 2 cm in diameter. Cystic duct and cystic artery were estimated to be 3 and 2 mm in diameter, respectively. An anomalous implantation of the right hepatic duct into the cystic duct observed, but intraoperative cholangiography was not available to confirm the anatomical variant.

Clips were applied to the cystic duct distal to the implantation of the aberrant right hepatic branch, and on the right hepatic branch itself before sectioning and laparoscopic cholecystectomy was completed as routinely. Placement of a Penrose drainage with the proximal end underneath the cystic plate was performed.

The post-operative period went favorably, with less than 30 cc of serohematic fluid measured the next day. After removing the Penrose drainage without incidents, the patient was discharged on the second post-operative day.

Three weeks postoperatively an MRCP was performed. Findings included a slight dilation of the right intrahepatic duct associated with an anatomical variation in which the posterior right hepatic branch drained into the cystic duct, described as a Blumgart F variation (Figure 1). Also, an amputation of the posterior right hepatic branch in its medial third was observed in association with a liquid collection of approximately 73 cc (Figure 2). The latter described as a Strasberg C BDI.

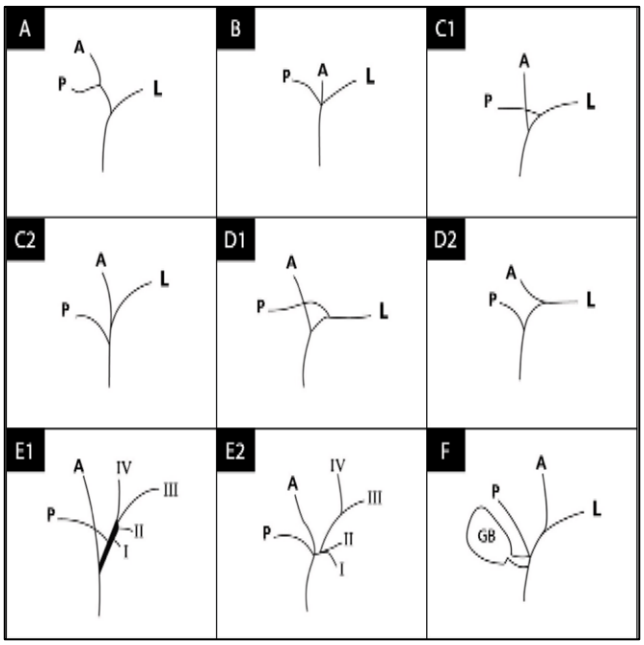

Figure 1: Blumgart classification of anatomical variants of the biliary tree.
A: Anterior branch of the right hepatic duct; P: Posterior branch of the right hepatic duct; L: Left hepatic duct; I, II, III and IV segments of the liver; GB: Gallbladder.

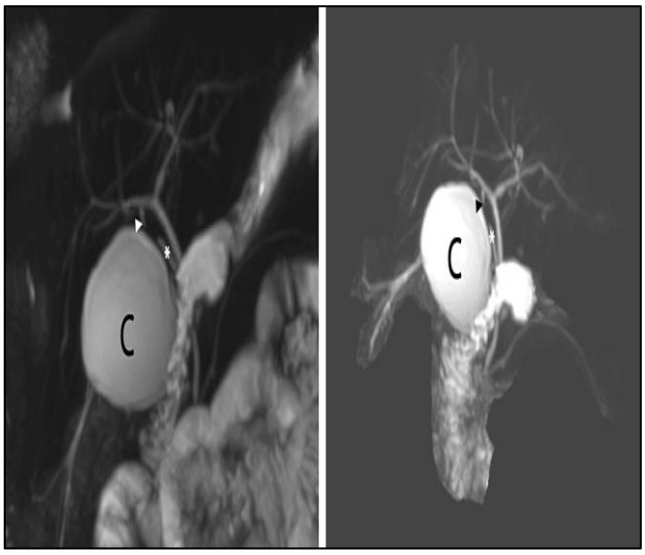

Figure 2: MRCP of patient 3 weeks after surgery.
Arrowhead: Amputation of the posterior branch of right hepatic duct; Asterisk: Transected cystic duct; C: Fluid collection.

At six months, the patient remained asymptomatic with no signs of infection or jaundice. A Roux-en-Y

hepaticojejunostomy offered as treatment of the BDI, but she did not consent surgical intervention at moment.

DISCUSSION

Although laparoscopic cholecystectomy was introduced more than 35 years ago, BDI incidence continues to increase with time.[1,2,4] Efforts to improve techniques and perform a secure laparoscopic cholecystectomy have been developed, such as the Strasberg's critical view of safety.[8] Some institutions have spread the use of intraoperative cholangiography to identify anatomical variations and BDI.[5,8] Despite guidelines recommending this procedure, there is no general consensus and some surgeons still oppose the critical view of safety.[1]

According to the Blumgart classification, anatomical variants can be divided into A, B, C1, C2, D1, D2, E1, E2 and F.[3,9] Our patient presented with a variant F, which is the least common type of variant reported in the literature. In this variation, the right hepatic duct drains into the cystic duct or even the junction between CBD and cystic duct.[9] The anatomical variant was identified during the surgical procedure, and laparoscopic cholecystectomy was performed applying clips to the cystic duct distal to the implantation of the aberrant right hepatic branch and on the aberrant branch itself, causing a BDI inadvertently. Some authors have described type F variant as the one with the highest risk of BDI given that the junction of the abnormal right hepatic branch lies inside the hepatic hilum, often being mistaken as the cystic duct.[4,5]

BDI is a serious complication, that if not treated properly can lead to great morbidity and mortality.[1,2,7] According to the Strasberg classification, the patient sustained a type C injury, with transection without ligation of aberrant right hepatic duct.[1] This was identified on MRCP three weeks later, accompanied with a small fluid collection. This could be explained by the clip on the right hepatic branch falling off postoperatively. It has been described that in type C injuries, ducts <3 mm in diameter or that drain an isolated hepatic segment can be ligated securely, whereas ducts >4 mm in diameter or that drain multiple segments need a more radical treatment.[1] Treatment of choice for BDI is a Roux-en-Y hepaticojejunostomy.[1,2,5] However, Mutignani et al have reported a primary endoscopic cannulation of Strasberg type C bile leaks.[10]

Intraoperative identification and treatment of BDI confers a better prognosis to the patient, with less complications such as cholangitis, portal hypertension and cirrhosis when treatment is delayed.[1,2] When a BDI is identified postoperatively, MRCP or ERCP are required.[4] MRCP in our patient was performed to demonstrate the anatomical variant but revealed the type C injury with a small fluid collection given the right hepatic duct was not communicating with the common bile duct, although, the patient remained asymptomatic. When BDI are identified postoperatively, treatment must be multidisciplinary and individualized to each patient.[1,5,6] Some authors prefer a delayed reconstruction of the biliary tree, however, a study by Stewart and Way, showed that timing was not a predictor of success.[7] A successful biliary repair surgery was associated with eradication of intra-abdominal infection, having a preoperative cholangiography, correct surgical technique, and having a hepatobiliary surgeon perform the operation.[2,7]

CONCLUSION

In conclusion, anatomical variations of the biliary tree are an important cause of BDI, and surgeons must be familiar with such variants when performing a cholecystectomy. Patients with a BDI that receive intraoperative treatment of the bile leak have a better quality of life than those diagnosed postoperatively. However, postoperative BDI workup must be extensive and a multidisciplinary treatment could provide better outcomes for patients. Safety measures to prevent BDI such as the critical view of safety and the use of intraoperative cholangiography must be promoted by institutions to decrease the incidence of BDI. Finally, management of an injury on a Blumgart F variant can be challenging and must be targeted to individual case, considering patient's opinion.

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