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Case and Review

Porta Hepatis Injury during Laparoscopic Cholecystectomy

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Keywords

Conservative treatment · Laparoscopic cholecystectomy · Porta hepatis injury

Abstract

Iatrogenic porta hepatis injury is a rare but devastating surgical complication of laparoscopic cholecystectomy. There are no systematic studies examining the best treatment strategy in patients with this injury. We present a case of a 23-year-old woman with a large abscess in the right hepatic lobe due to an extreme vasculobiliary injury after laparoscopic cholecystectomy. Although rare, the impact of vasculobiliary injuries after cholecystectomy highlights the need for constant alertness and prompt management in order to minimize mortality and morbidity usually associated with the routine operative procedure.

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Introduction

Laparoscopic cholecystectomy is the procedure of choice for symptomatic cholecystolithiasis, and it is one of the most frequent operations in general surgery, which is considered as a safe operation. Unfortunately, it may be associated with an incidence of iatrogenic

extrahepatic bile duct and porta hepatis vessel injuries more than the open procedure [1, 2]. Extreme vasculobiliary injuries which involve major hepatic arteries and portal veins are rare, but have severe consequences, including liver infarction, which is not uncommon, often with rapid onset and frequently necessitating emergency right hepatectomy or urgent liver transplantation [3], in addition to various degrees of hepatic ischemia with subsequent liver necrosis, abscess formation, acute liver failure or secondary biliary cirrhosis [4, 5]. It is worth mentioning that among the structures involved in this type of injury, i.e., extrahepatic bile ducts, the hepatic arteries and portal vein, the latter is most likely to lead to a fatal outcome [6]. Portal vein and hepatic artery injuries are usually identified during surgery, because of the exsanguinating hemorrhage, unlike bile duct injuries, which may appear as occult injuries at time intervals distant from the injury [7].

Case Presentation

A 23-year-old female presented to our institution with abdominal pain, nausea, vomiting, fever, constipation, jaundice, and swelling of the abdomen. Considering her past medical history, the patient's symptoms had started after a complicated laparoscopic cholecystectomy 3 weeks ago, where during surgery, the patient suffered a massive bleeding due to porta hepatis injury, which led to the decision to change to open surgery (open cholecystectomy) and as a result the bleeding could be controlled. Physical examination revealed jaundice, palpitation, paroxysmal nocturnal dyspnea, mild cough with white sputum, polyarthralgia, bruising around the umbilicus, and there was no lymphadenopathy. The patient had an abdominal drainage, and about 200 mL of biliary secretion was coming out through it per day. Abdomen multislice computed tomography showed a cut injury in the right portal vein and right hepatic artery, with an abscess in the right hepatic lobe associated with necrotic areas in liver segments 5-6-7-8 (hepatic infarction), and there were clips in the right branch of porta hepatis (right portal vein and right hepatic artery) (Fig 1, 2). The patient was prepared for endoscopic retrograde cholangiopancreatography to locate the injury and possibly treat it. Endoscopic retrograde cholangiopancreatography showed that the duodenum and papilla were normal, the common bile duct was reflected, and it was interrupted at the level of the gallbladder clip. Intrahepatic bile ducts were not drawn. A sphincterotomy was performed, a catheter was inserted in the papilla, and the common bile duct was tied at the bifurcation. Despite the sphincterotomy, biliary secretions continued to come out through the abdominal drainage. So, based on clinical and radiological findings, we decided to do a laparotomy. Intraoperatively, we found a massive adhesion because of the last operation in addition to necrotic tissue and light local biliary peritonitis. Because of a fragile tissue, our very careful dissection in the porta hepatis in order to identify the right branches of the hepatic artery and the portal vein was unfortunately useless, so we removed the necrotic tissue and put drainage in the space. We decided to finish the procedure at this point to avoid any further injury and to reduce the postoperative morbidity. The patient did not need any intraoperative blood transfusion. Except for a biliary fistula, the postoperative period was uneventful. The patient was followed up for 7 months and she was in good general condition, and the biliary fistula stopped after 2 months.

Discussion

Laparoscopic cholecystectomy is accepted as the gold standard in the surgical management of gallbladder disease. Despite the widespread application of this approach, the rate of common bile duct injury is still reported to be 0–2.7% for laparoscopic cholecystectomy. However, this percentage has decreased due to the increased experience in laparoscopic surgery [8]. Bile duct injuries are treated according to anatomical location and timing of detection, thus there is more than one protocol for repair. Intraoperative identification of a bile duct injury allows the possibility of immediate repair or appropriate nonoperative therapy. If an injury is suspected, intraoperative cholangiography can be beneficial in determining the extent of the problem and can help guide definitive repair [9]. Repair (laparoscopic or open) should be attempted only by surgeons with adequate training in hepatobiliary surgery. In postoperative presentation, subjectively, these patients often report abdominal pain or distension, nausea, fever and malaise. Objectively, they may show evidence of obstructive jaundice, sepsis, or documented bile leakage [8, 10, 11]. For patients with bile peritonitis, it is important to implement endoscopic retrograde cholangiopancreatography, or percutaneous transhepatic cholangiography, or cholangiography via magnetic resonance cholangiopancreatography. Likewise, control of biloma or bile peritonitis is imperative [9]. So, based on the patient's general stability, location of the injury, its scope and local experience, the surgeon must decide whether to proceed with immediate repair or to delay repair of the injury. Morbidity and mortality increase dramatically in vasculobiliary injuries, which means that bile duct and vascular injuries occur simultaneously. In these cases, successful outcome is unlikely when diagnosis of these is delayed. The extent of liver damage and the need for liver resection or transplant significantly influence the progress of patients with such injuries [12], and in other words, the prognosis depends on the severity of the injury. Vasculobiliary injuries may be classified into two types, of which one is common and the other is very uncommon. In the common variety, the right hepatic artery and a bile duct are injured. This variant accounts for about 90% of vasculobiliary injuries. The reason why the right hepatic artery is injured much more commonly than other arteries in association with a biliary injury is simply because it lies in closer proximity to the common hepatic duct. The uncommon type of vasculobiliary injury involves a bile duct(s) and the proper hepatic artery, the common hepatic artery, the main portal vein, the right portal vein, or one of these veins as well as a hepatic artery, possibly including the right hepatic artery. A recent review identified such patients in the literature [13, 15]. Portal vein resistance to injury or underreporting of such cases due to rapid clinical deterioration and death may be some of the reasons [16]. There are some factors that increase the risk of injury. Excess or incorrect traction on the gallbladder while exposing the Calot's triangle can tent the common bile duct superiorly and expose it to injury. Misidentification of the correct anatomy, anatomic variations in bile duct anatomy or short cystic duct also predispose to ductal injury. Therefore, achieving a critical view of safety is useful for avoiding vasculobiliary injury during laparoscopic cholecystectomy [9]. We described the complications of an uncommon vasculobiliary injury in porta hepatis that was caused by laparoscopic cholecystectomy in another hospital; then the patient presented to our hospital, and her complications were managed successfully. Our case is one of the very rare cases in the literature, which was managed only with removing the necrotic tissue without hepatectomy or liver transplantation. We report this case because of its rareness and its importance in clinical

practice, and to highlight the financial, social, and health disaster that may follow these injuries. We have attached [Table 1](#) and [Table 2](#) that summarize the cases that involved vasculobiliary injuries including the portal vein. We have added the result of our research to the reviewed cases in the above-mentioned studies [[13](#), [15](#)], in addition to our case. Table 1 and Table 2 include the location of biliary, arterial and venous injury, the method of management, and the outcome whether the patient survived or died, with some other details.

Because of the reported rareness of these cases on the one hand and its devastating consequences on the other hand, it is important to compile the evidence and experience regarding porta hepatis injuries. Therefore, the present case contributes to the emerging literature about this issue. The most important result to be emphasized is that removing the necrotic hepatic tissue to manage the complications of this injury might be enough without the need for complex and dangerous procedures such as hepatectomy or liver transplantation. Finally, prevention is still the best way to avoid the risk of these injuries.

Statement of Ethics

In accordance with the Declaration of Helsinki, our study has been approved by the ethics committee of the Hospital. Informed consent to participate in our study has been obtained from the participant and her parents.

Disclosure Statement

The authors declare that there are no conflicts of interest regarding the publication of this paper.

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Author Contributions

Fadi Rayya has performed the operation, organized the photos and reviewed the article. Reem Shammout and Raiean Al Habbal analyzed and interpreted the patient data and wrote the manuscript. All authors read and approved the final manuscript.

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The datasets used during the current study are available from the corresponding author on reasonable request



Fig. 1. Multislice computed tomography with intravenous contrast shows cut injury in the right hepatic artery and right portal vein.

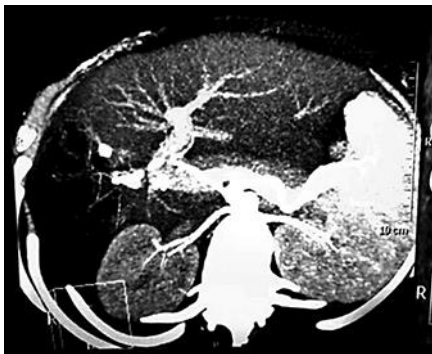


Fig. 2. Multislice computed tomography shows abscess in hepatic segments 5-6-7-8.

Table 1. Vasculobiliary injuries involving the portal vein

Authors	Portal vein injury	Arterial injury	Biliary injury	Type of hepatic ischemia	Type of liver resection	Timing of resection or transplantation after laparoscopic cholecystectomy	Outcome
Felekouras et al. [14]	Main portal vein	RHA	CBD	Rapid	R. hepatectomy	1 day	Died on day 16 of sepsis
Frilling et al. [17]	Main portal vein and superior mesenteric vein	RHA	CHD	Rapid	R. hepatectomy	16 days	Died on day 28 of sepsis and multisystem organ failure
Madariaga et al. [18]	Main portal vein	RHA	CHD	Rapid	R. hemihepatectomy	5 days	Survived
Madariaga et al. [18]	Right posterior portal vein branch	RHA	CHD	Rapid	R. hemihepatectomy	21 days	Survived
Laurent et al. [19] (pt 2)	RPV	RHA		Rapid	R. hepatectomy	7 days	Survived
Strasberg [20]	RPV	RHA		Rapid	R. hepatectomy	1 day	Survived
Ragozzino et al. [21] (pt 1)	RPV	RHA	CBD	Rapid	R. hepatectomy	1 day	Died day 15
Ragozzino et al. [21] (pt 2)	RPV	RHA		Rapid	R. hepatectomy	1 day	Survived
Nishio et al. [22]	Right anterior portal vein	RHA	CBD	Slow with abscess formation	R. hepatectomy	4 months	Survived
Robertson et al. [23]	Left portal vein	PHA		Slow with abscess formation	Porto-enterostomy, orthotopic liver transplant	5 months 1 year	Survived
de Santibañes et al. [24]	RPV (immediate repair)	RHA		Atrophy	Orthotopic liver transplant	2 years	Survived
Laurent et al. [19] (pt 7)	RPV	None		None	R. hepatectomy	8 years	Survived
Laurent et al. [19] (pt 8)	RPV	None		None	R. hepatectomy	2.5 years	Survived
Thomson et al. [25] (pt 3)	RPV	None		Not stated	R. hepatectomy	Not stated	Survived
Thomson et al. [25] (pt 12)	RPV	RHA		Not stated	Awaiting liver transplant		Died at 10.5 years
Thomson et al. [25] (pt 13)	Left portal vein	Common hepatic artery		Not stated	Orthotopic liver transplant	4 months	Died
Alves et al. [26] (3 pts)	Portal vein	RHA		–	R. hemihepatectomy	361 days	Survived
Alves et al. [26] (1 pts)	Portal vein	None		–	R. hemihepatectomy	361 days	Survived
Heinrich et al. [27]	RPV	RHA	RHD	–	R. hemihepatectomy	2 weeks	Survived

All patients had an accompanying major biliary injury. CBD, common bile duct; CHD, common hepatic bile duct; LHA, left hepatic artery; MPV, main portal vein; PHA, proper hepatic artery; pt, patient; R, right; RHA, right hepatic artery; RHD, right hepatic duct; RPV, right portal vein.

Table 2. Vasculobiliary injuries involving the portal vein (continued)

Authors	Portal vein injury	Arterial injury	Biliary injury	Type of hepatic ischemia	Type of liver resection	Timing of resection or transplantation after laparoscopic cholecystectomy	Outcome
Felekouras et al. [14]	RPV	RHA	CBD	–	R. hepatectomy	20 h	Died
Fonseca-Neto et al. [12]	RPV	RHA	CHD	Rapid	R. hepatectomy	–	Survived
Zaydfudim et al. [28]	Transection of all three portal structures			Rapid	Hepatectomy	20 h	Survived
Strasberg et al. [3] (7 pts)	RPV	RHA	CBD transection LHD laceration		Sutured portal vein. Primary repair of CBD and LHD		Survived
	RPV	RHA	CBD and CHD at bifurcation		Hepaticojejunostomy after initial R. hepatectomy	140 days	Survived
	RPV	RHA	CHD		Right hepatectomy Hepatico-jejunostomy	76 days	Died
	RPV	RHA	Necrosis of the intrahepatic biliary tree		Liver transplant	39 days	Died
	RPV	RHA	Above confluence		Right colectomy with ileostomy		Survived
	MPV	RHA	CHD		Emergency reconstruction of portal vein, PHA and bile duct	20 h	Died
	MPV	PHA	Above confluence		R. hepatectomy	90 days	Died
Jadrijevic et al. [16]	Portal vein thrombosis and occlusion	RHA	CBD		R. hepatectomy	4 weeks	Survived
Our case	RPV	RHA	CBD at bifurcation	Slow with abscess formation	None (only removing the abscess and the necrotic tissue)	–	Survived

All patients had an accompanying major biliary injury. CBD, common bile duct; CHD, common hepatic bile duct; LHA, left hepatic artery; MPV, main portal vein; PHA, proper hepatic artery; pt, patient; R, right; RHA, right hepatic artery; RHD, right hepatic duct; RPV, right portal vein.