

Dual Pathology, Single Solution: Interventional Radiology Management of Bile Duct Injury and Hepatic Artery Pseudoaneurysm Post-Laparoscopic Cholecystectomy

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Key clinical message

This case highlights the role of interventional radiology in the diagnosis and successful management of rare complications of laparoscopic cholecystectomy, including bile duct injury and hepatic artery pseudoaneurys. Early diagnosis and prompt intervention, including angioembolization and biliary drainage, were crucial in preventing further complications and achieving a positive outcome.

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Consent

Written informed consent was given by the patient for the publication of this case report.

Introduction

Laparoscopic cholecystectomy (LC), is done for different gallbladder pathologies like acute or chronic cholecystitis, Symptomatic cholelithiasis, biliary dyskinesia- hypofunction or hyperfunction, acalculous cholecystitis, gallstone pancreatitis, and gallbladder masses/polyps. In Pakistan, LC rates are 32%, 80%, and 21.3%, according to reports from Iqbal et al., Abasis et al., and Raza et al, respectively (1). Compared to developed countries, these rates are lower due to the number of skilled surgeons and equipment Some of the complications of LC include common bile duct injuries, surgical wound infection, intra-abdominal collection, incisional hernia, hematoma of the abdominal wall, gall bladder carcinoma and lost gallstones(abscess) (2). Bile duct injury is an unanticipated and catastrophic consequence for a patient having an elective cholecystectomy. It usually necessitates invasive treatment and is linked to severe morbidity and even fatality. There have been reports of fatality rates of 2-4 percent and short-term morbidity of up to 40–50% for significant injuries(3).

Furthermore, LC despite being minimally invasive, has a documented rise in both vascular and biliary injuries. Vascular complications, such as pseudoaneurysms, also occur at an approximate rate of 0.8%(4). Arterial bleeding that starts late can result in the formation of pseudoaneurysms (PSA) in the right hepatic artery or cystic artery. Individuals with postoperative pseudoaneurysms may experience hemobilia or hemoperitoneum. Post-cholecystectomy pseudoaneurysm commonly affects the right hepatic artery in 87.1% of cases, the cystic artery in 7.9% of cases, both the cystic and hepatic arteries in 4.0% of cases and the gastroduodenal artery in 1.0% of cases(5). Interventional radiologic techniques play a significant role in managing these complications as they can provide a preoperative anatomic definition of the extent of injury as well as catheter localization of the intrahepatic duct as well(6). Interventional radiology(IR) also manages pseudoaneurysms by either insertion of an arterial stent or coiling at the neck of the aneurysm(7). This particular case is being reported due to two pathologies occurring in the same patient: bile duct injury and hepatic artery aneurysm post-LC, which were both managed by interventional radiology. It is seldom seen in literature as most of the published cases have one injury only that was treated by IR or other techniques.

Case history and examination

A 31-year-old male with a history of cholelithiasis for which he was managed by laparoscopic cholecystectomy converted to open cholecystectomy presented to the surgery department with the presenting complaints of fever, vomiting, and abdominal pain for a total duration of 8 days. On clinical examination, he appeared pale and jaundiced, and systemic examination revealed a distended abdomen along with tenderness in the epigastric region. He was then admitted to the gastroenterology department.

Investigations and treatment

A preliminary diagnostic workup was carried out that revealed significant findings at the time of admission like raised C-Reactive protein 215mg/L (normal range is 0-10 mg/L), deranged liver function tests, increased INR;1.4 (normal is 0.9-1.2), pus culture obtained from abdominal fluid showed heavy growth of Klebsiella species, etc. A CT abdomen with contrast was done, revealing a tiny focal rounded arterial outpouching measuring 4.5 mm from the hepatic artery, suggesting a pseudoaneurysm at the cystic artery stump site, which was kn turn arising from the superior mesenteric artery (Figures 1-2). Furthermore, CT also revealed a large air-containing collection in the gallbladder fossa extending into the mesentery, gastrohepatic ligament, and subhepatic region. It measured approximately 16.6 x 6.4 x 10.2 cm, along with corresponding inflammatory changes in the gallbladder fossa, lesser sac, mesentery, and pancreas head and body, suggesting acute necrotizing pancreatitis with intra-abdominal fluid collection.

To address these complications, vascular interventional radiology (VIR) procedures were carried out like angioembolization of the pseudoaneurysm. The right femoral artery was punctured, and a 6 Fr sheath was placed using the Seldinger technique. Using a 4 Fr C1 catheter over the compatible glide wire, the celiac axis and superior mesenteric arteries were cannulated, and runs were performed to plan the procedure. A covered stent using a 6 Fr sheath was deployed across the common hepatic artery to restore flow in the hepatic artery, leading to successful exclusion of the aneurysm (Figure 3). A CT-guided drainage catheter was also placed in the gallbladder fossa to manage the intra-abdominal fluid collection (Figure 4). However, the patient developed bile leak from the common bile duct site due to injury, for which an external-internal biliary drain was placed by using a vertebral catheter and glide wire to achieve access into the duodenum (Figure 5). After the wire exchange, an 8 Fr internal-external biliary drain was placed. The patient's symptoms alleviated, after which he was discharged without any complications, and advised to adhere to the follow-ups.

Subsequently, a 10 x 70 mm covered biliary wall stent was placed in the CBD with its tip in the duodenum (Fig. 6).

Conclusion

In conclusion, this case underscores the rare occurrence of concurrent bile duct injury and hepatic artery pseudoaneurysm following laparoscopic cholecystectomy. Both complications were successfully managed using interventional radiology, demonstrating its crucial role in treating such complex cases. The combined use of angioembolization and biliary drainage procedures highlights a minimally invasive, effective approach to avoid the need for further surgical intervention. This case report contributes valuable insights into the management of dual complications post-LC, which are seldom seen in medical literature.

Discussion

LC has become the preferred treatment for gallbladder pathologies worldwide nowadays. Its popularity over classical cholecystectomy is due to its minimally invasive nature, enhanced safety, fewer postoperative complications, quicker recovery, and significantly shorter hospital stays(8). Biliary complications of this procedure include injuries to the right hepatic duct, common bile duct, or gallbladder perforation with calculi spilled. Additionally, there are non-biliary complications such as iatrogenic pneumothorax, and intestinal, diaphragmatic, and vascular injuries.

Concurrent bile duct and hepatic artery damage have been reported as consequences of LC in the case study by Mistry J and fellows(9), but this case report, although having the same scenario of two injuries occurring in the same patient, highlights the rare management of both of the pathologies by interventional radiology. In our case, LC was identified as the cause of hepatic artery pseudoaneurysm (HAP), despite the prevalence of pseudoaneurysms in the context of bile duct injury (BDI) during LC being only 2.6–4.5%(7) that accounts for the rarity of the case. Hepatic artery pseudoaneurysm patients often present with jaundice, changes in the liver function test (LFT) profile, gastrointestinal bleeding (hemobilia) in the form of haematemesis or melena, and abdominal pain or discomfort. Numerous of the above-mentioned conditions were also reported in our patient as well. The most effective imaging test for identifying hepatic artery damage after LC is

a multiphase contrast CT scan. In our instance, a contrast-enhanced CT scan verified the existence of a hepatic artery pseudoaneurysm (HAP), as documented similarly by Gandhi RJ and associates(10).

In addition to HAP, BDI is also a serious LC complication that significantly lowers the patient's quality of life(11), and 80–85% of bile duct injuries are caused by laparoscopic cholecystectomy, which has complicated and difficult management(12). The type and extent of the injury will determine the most appropriate step, which may involve surgery, percutaneous, or endoscopic procedures. Interventional radiology plays a great role in identifying and treating bile leaks. It is possible to perform percutaneous transhepatic cholangiography (PTC) with or without decompression, involving the implantation of an external drainage catheter for initial diversion. This procedure allows time for the patient's clinical status to improve and for postoperative swelling and inflammation to subside while also providing anatomic delineation for future therapeutic planning. If desired, the external drain can be changed to an internal/external drain after about two to four days(13). While the precise frequency of combined microvascular injury is uncertain, it seems to occur more frequently than anticipated. Taking care of these injuries after LC can be challenging. However, interventional radiology has made the treatment of combined microvascular injuries feasible by offering a non-surgical, less complex management approach for our patients.

Images



Figure 1: Contrast-enhanced CT abdomen in the arterial phase shows a tiny focal rounded arterial out-pouching arising from the right hepatic artery, representing a pseudoaneurysm at the cystic artery stump site (arrow). No active contrast extravasation is noted to suggest arterial bleeding.



Figure 2: 3D reconstruction from a contrast-enhanced CT abdomen in the arterial phase shows the right hepatic artery arising from the superior mesenteric artery (arrow). A tiny focal rounded arterial outpouching is seen arising from the right hepatic artery, representing a pseudoaneurysm at the cystic artery stump site (encircled).

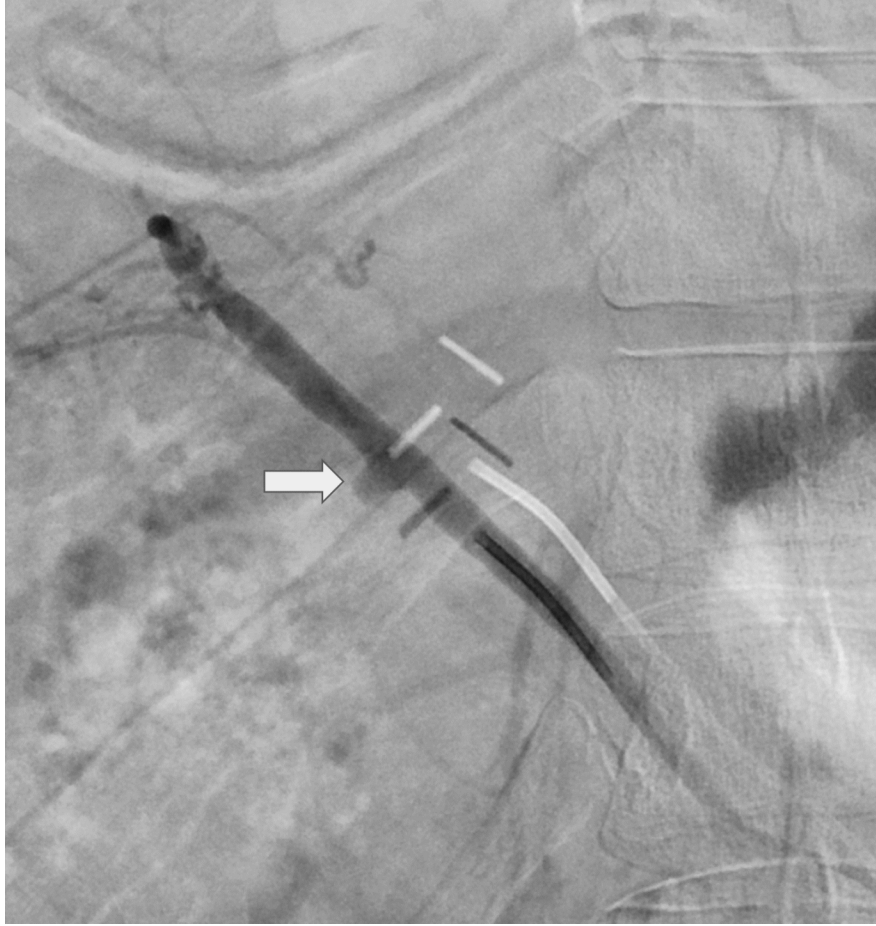




Figure 3: Left: Selective cannulation of the right hepatic artery angiogram showed a small pseudo-aneurysm (white arrow) arising from mid right hepatic artery adjacent to the site of cholecystectomy clips. Right: Subsequently, a covered stent was deployed across the common hepatic artery to restore flow in the hepatic artery. Post embolization run showed no contrast opacification of the pseudoaneurysm (black arrow).

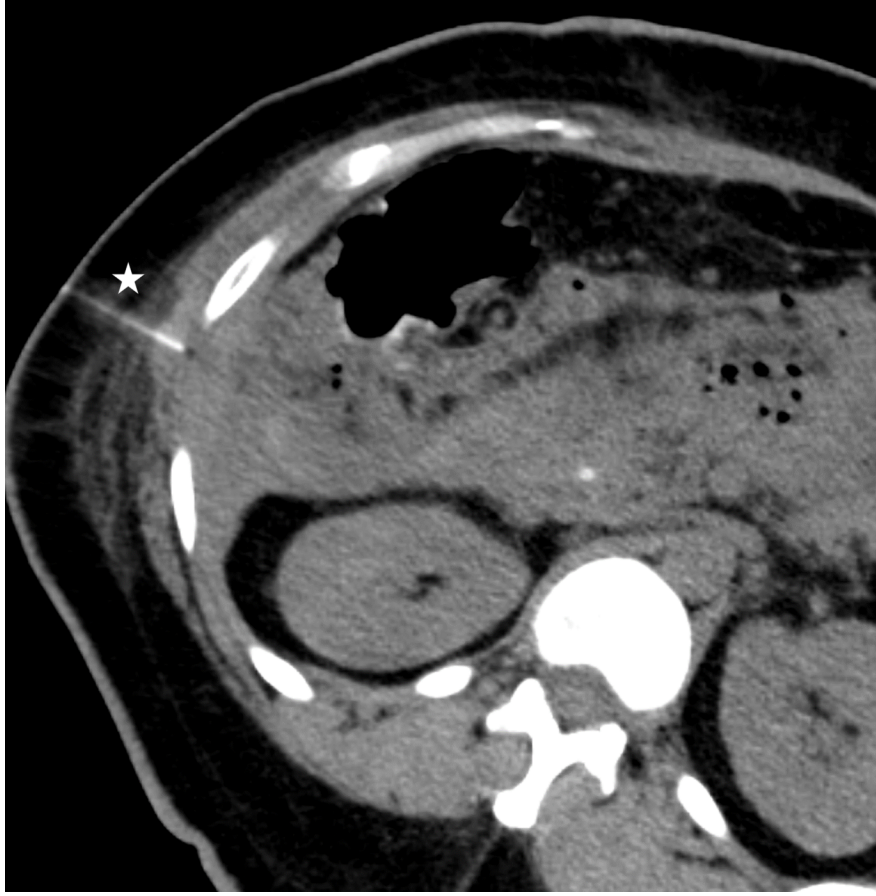






Figure 4a-c: A CT-guided drainage catheter was inserted into the gallbladder fossa to address the intra-abdominal fluid collection (arrows). (Asterisk: needle)







Figure 5a-c: Bile leakage from the common bile duct due to injury led to the placement of an internal-external biliary drain. A vertebral catheter and glide wire were used for access, followed by an 8 Fr drain placement.





Figure 6. a-b: Biliary stent in the CBD with its tip in the duodenum (arrow). b. Followup cholangiogram showing patent stent (arrow) flowing freely into the duodenum (arrowhead).

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