

Case Series

Arterial complications after laparoscopic cholecystectomy: single centre experience

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ABSTRACT

Laparoscopic cholecystectomy is one of the most common surgeries done in general surgical practice. Arterial complications after laparoscopic cholecystectomy are not uncommon and usually results due to iatrogenic injury. Mostly patients are managed by interventional radiological procedures, but very rarely we may have to resort to surgical procedures also. Our first patient a 40-year-old female patient presented with haemetemesis and malena. She was diagnosed with a right hepatic artery aneurysm following a laparoscopic cholecystectomy done 2 months back. Due to sudden haemodynamic instability, the patient underwent laparotomy aneurysmal excision and T tube drainage. Later T tube was removed. Another patient, a 41-year-old female patient presented to us with haemetemesis and malena 2 weeks after laparoscopic cholecystectomy. She developed a post-operative biliary leak and was managed with USG-guided pigtail drainage. She was later diagnosed with a GDA aneurysm along with mid-CBD transection. The patient was later managed with hepatico jejunostomy. Our third patient is a 52-year-old gentleman, underwent interval laparoscopic cholecystectomy following acute calculus cholecystitis. Intra operatively following profuse bleeding, RHA artery sectoral branch repair was done. Patient continued to have bleeding and he underwent emergency angioembolisation of right hepatic artery pseudo aneurysm. Arterial complications following laparoscopic cholecystectomy result either from direct arterial or combined Bilio arterial injuries. Interventional radiological procedures are still considered the standard of care in these situations. Surgical interventions hold equally good in ongoing bile leak and in failure of embolization techniques. Management strategy depends on the clinical profile of the patient and the injuries associated with it.

Keywords: Arterial complications, Pseudo aneurysms, Laparoscopic cholecystectomy, Bilio vascular injuries

INTRODUCTION

Laparoscopic cholecystectomy is one of the most common surgeries done in general surgical practice. Arterial complications after laparoscopic cholecystectomy are not uncommon in clinical practice. The incidence of major artery injuries requiring conversion to open procedure is almost 1%.¹ Usually, it results due to iatrogenic injury to the right hepatic artery,

proper hepatic artery, aberrant/replaced hepatic artery, cystic artery stump, and very rarely from gastroduodenal artery also. A post-operative bile leak can also lead to an aneurysm formation later or it can be a direct Bilio-arterial injury. Most of the patients are managed by interventional radiological procedures, but very rarely we may have to resort to surgical procedures also. Treatment strategy depends on the clinical profile and associated injuries which needs to be tackled.

CASE SERIES

Case 1

A lady in her early 40s presented to us with abdominal pain, jaundice, haemetemesis and malena for a week. She underwent laparoscopic cholecystectomy for mild biliary pancreatitis 2 months ago elsewhere and was under their follow-up. During this period, she had multiple episodes of haemetemesis and was managed conservatively in the same hospital. OGD scopy revealed fresh bleeding from the ampulla of Vater (Figure 1). There were clots in the bile duct indicating active extravasation from the aneurysm.



Figure 1: OGD scopy showing active bleeding from ampulla of Vater.

CT abdominal angiogram revealed a saccular aneurysm arising from the right hepatic artery of size 1.9x0.9 cm with active contrast extravasation into the CHD (Figure 2), multiple clots in the CHD, hyper dense linear shadow near the segment 6 surgical clip. Reconstructed images of CT angiogram revealed right hepatic a arising from superior mesenteric artery, left hepatic artery arising from common hepatic artery and accessory left hepatic artery arising from left gastric artery.



Figure 2: CECT abdomen showing right hepatic artery aneurysm with active contrast extravasation to CHD.

The patient developed a significant drop in haemoglobin (from 9.7 to 5.8) and profound malena after the CT angiogram. In view of the sudden hypo tension, haemodynamic instability and significant blood loss, the option of interventional radiological procedure was deferred, and the patient was planned to proceed with emergency laparotomy.

Aneurysmal sac of size 1.5x1.0 cm arising from RHA eroding into the posterolateral wall of CHD (Figure 3). Multiple clots in the CHD. Bile from the CHD appears turbid with sediments. Multiple LT 400 clips near the aneurysmal sac and the hilum. Accessory RHA from SMA, proper hepatic artery divides into RHA, LHA, and Segment 4 artery. Intra operatively-Pringle manoeuvre was done, and the aneurysmal sac was excised. Small feeders were ligated using 5-0 prolene. The main feeder from the right hepatic artery was ligated using 7-0 prolene. A thorough wash of CHD was done using an infant feeding tube, and all sediments and clots were removed. 14F T tube was inserted into the CHD and was fixed with omental reinforcement using 4-0 vicryl. Due to the unhealthy wall of CHD, biliary drainage was reinforced using T tube drainage. The patient was discharged and the T tube was removed after a cholangiogram 4 weeks after the discharge.



Figure 3: Excised aneurysmal sac.

Case 2

A 41-year-old lady presented underwent laparoscopic cholecystectomy 2 weeks back. She developed jaundice and abdomen distension in her early post-operative course which was managed conservatively. Later on, due to progressive jaundice and deteriorating general condition patient underwent Ultrasound-guided pigtail drainage. The patient continued to have bile leak and was further evaluated with ERCP which revealed a complete mid-CBD transection (Figure 4).

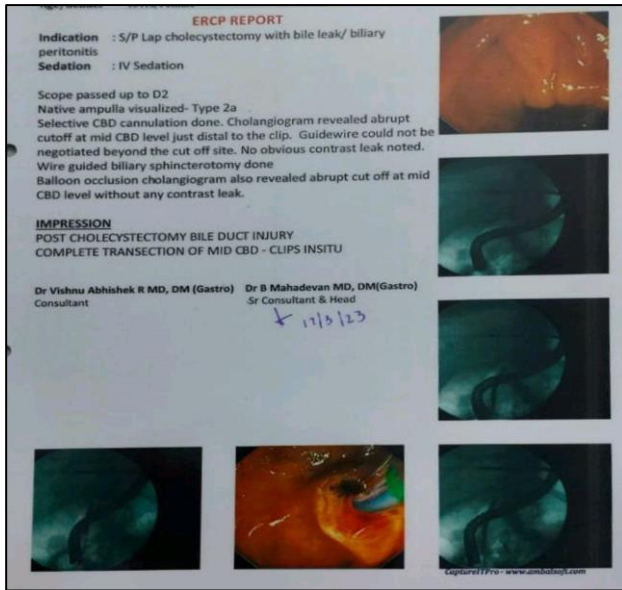


Figure 4: ERCP showing transection at mid CBD level.

The patient was planned for Bilio enteric drainage but in view of dense adhesion and fibrosis, only laparotomy and lavage were done in an outside hospital and was referred to us for further management.

At the time of admission, the patient was having jaundice, multiple episodes of haemetemesis and malena. She was evaluated with a CT abdominal angiogram which revealed a tiny contrast-filled out pouching of size 1 x 0.5 mm of GDA, multiple loculated collections were present in the peritoneal cavity (Figure 5). The patient was later evaluated with MRI with MRCP which showed a loculated collection in the gastrohepatic ligament abutting the lesser curvature of the stomach and left lobe of the liver, collection extends to perisplenic space (Figure 6 and 7). Common hepatic duct and proximal portion of CBD not visualized for a length of 2 cm with Bilo bar IHBRD. The patient was planned for definitive procedure.

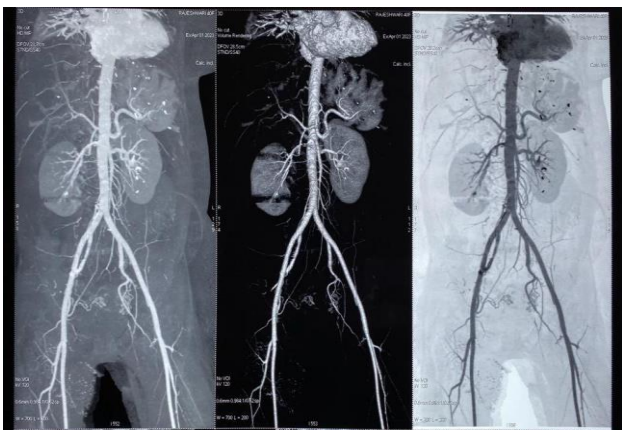


Figure 5: CT angiogram showing suspicious out pouching from GDA.

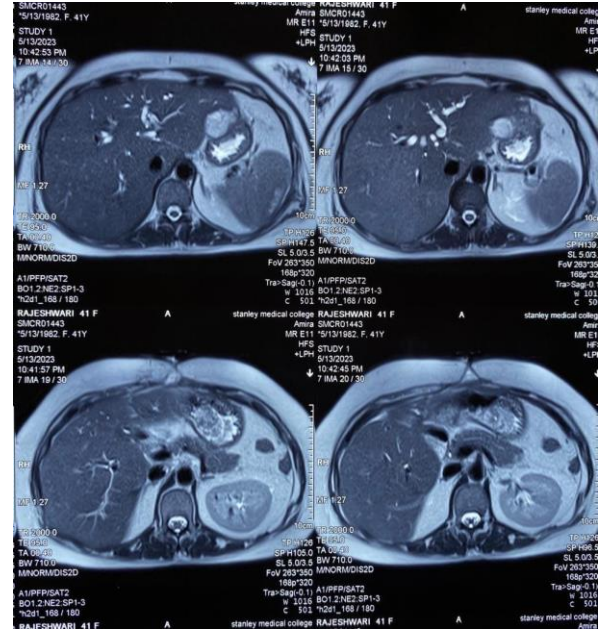


Figure 6: MRI revealed loculated collection in the gastrohepatic ligament abutting the lesser curvature of the stomach and left lobe of the liver, collection extends to perisplenic space.

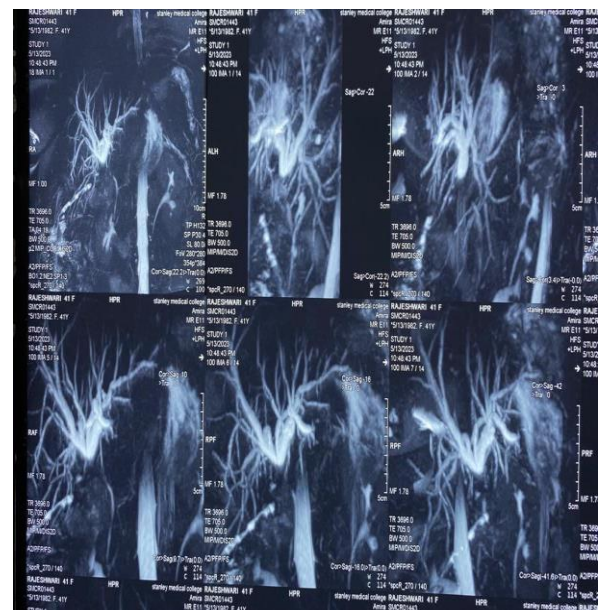


Figure 7: MRCP showing non visualization of common hepatic duct and proximal portion of CBD for a length of 2 cm with Bilobar IHBRD.

Cholestatic enlarged liver, dense adhesion in supra colic compartment between left lobe of the liver, transverse colon, stomach, duodenum plastered each other and to peritoneum. Abscess of size 5x5 cm in sub hepatic space between left lobe of liver and stomach. Roux en Y Hepatico jejunostomy was done using 3-0 vicryl after thorough evacuation of the abscess cavity (Figure 8). The patient recovered well and was discharged after 2 weeks and is on regular follow up.



Figure 8: Hepatico jejunostomy.

Case report 3

A 52 year old gentleman, underwent interval laparoscopic cholecystectomy following acute calculus cholecystitis. Intra operatively laparoscopy was converted to open following profuse bleeding, RHA artery sectoral branch repair was done. Patient continued to have bleeding on POD1 with haemodynamic instability with hypovolemic shock then, and was referred to our hospital for further care. He was in hypovolemic shock on multiple inotropic supports. Emergency CT angiogram was done which revealed focal out pouching measuring 5.4x4.7mm with neck measuring 2 mm noted in the proximal part of the right hepatic artery around 6 mm from its origin without active contrast leak (Figure 9). Blind ending focal out pouching noted in the distal part of the right hepatic artery with approximate size of 4-5 mm noted without active contrast leak -possibly ligated vessel stump. Emergency embolisation was planned due to ongoing blood loss. Selective catheterization of right hepatic artery using micro catheter done and embolization of the pseudo-aneurysm of right hepatic artery done. Post procedure days were uneventful.

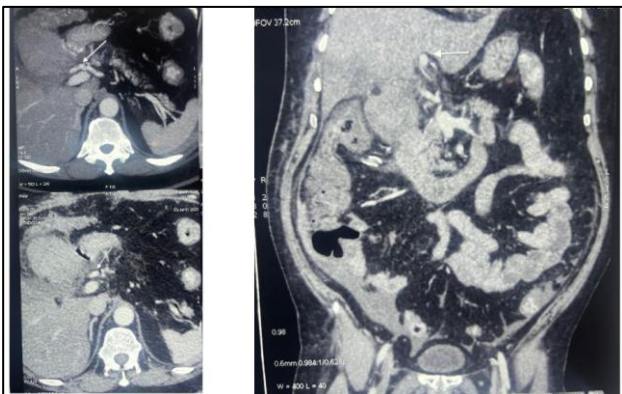


Figure 9: CT angiogram showing right hepatic artery aneurysm.

DISCUSSION

Arterial complications after laparoscopic cholecystectomy are not uncommon in clinical practice. The incidence of major arterial injuries requiring conversion to open procedure is almost 1%.¹ Usually, it results due to iatrogenic injury to the right hepatic artery, proper hepatic artery, aberrant/replaced hepatic artery, cystic artery stump, and very rarely from gastroduodenal artery also. A post-operative bile leak can also lead to an aneurysm formation later or it can be a direct Bilio-arterial injury. Most of the patients are managed by interventional radiological procedures, but very rarely we may have to resort to surgical procedures also. Treatment strategy depends on the clinical profile and associated injuries which needs to be tackled.

Arterial injury

The most commonly encountered arterial injuries are the right hepatic artery, cystic artery stump, and rarely from the gastroduodenal artery. RHA injury is frequently seen associated with bile duct injury, even if the true incidence of RHA injury without concomitant bile duct injury is not clearly defined.¹ In a cadaveric study, Halasz reported that the incidence of injury to the RHA or its branches was only 7%.² RHA injuries always occur in two ways: a fundus-first approach for laparoscopic cholecystectomy is performed in the presence of severe inflammation; the second is in the presence of vascular anomalies, as in the case of caterpillar hump of the RHA, where the hepatic artery may be wrongly mistaken for the cystic artery.³⁻⁵ Haemobilia may be the presentation very rarely due to variations from conventional vascular anatomy especially of cystic or hepatic artery.^{6,7}

The most important complication of RHA injury is massive bleeding during dissection, which always leads to conversion to open surgery in inexperienced hands. Ligation of the hepatic artery is even advocated but rarely may develop ischemia-related hepatitis in some patients. The exact cause of the aneurysm is unclear.

Thermal injury-induced damage and bile leak-associated development of aneurysms are commonly proposed reasons. CT abdominal angiogram remains the investigation of choice in locating the aneurysm. It helps to find out the accurate site of the aneurysm and the feeders in relation to it. It also gives us a clear-cut idea of the biliary ductal status and extravasation of the aneurysm into the bile duct. Conventional angiography is a better choice if we are planning for an interventional radiological procedure like coiling/embolization. Even though coiling/embolization are the preferred modalities of treatment available for aneurysms, exceptions like profound blood loss, haemodynamically unstable patients and failure of interventional radiological procedures will justify controlling these bleeders surgically. In this case, the vascular anatomy was not conventional, and the presence of variations might have created fuss during the

primary laparoscopic cholecystectomy. The presence of multiple large clips near the aneurysm and hilum indirectly throws light on the intra operative bleeding that might have happened during the primary surgery. The cause of the aneurysm may be an inadvertent injury to the right hepatic artery or a sub clinical bile leak, that could have initiated a pathological process resulting in an aneurysm. Bile has been shown to cause damage to the vascular wall and therefore delay the healing of injured arteries leading to pseudo aneurysm formation. Failure to deal with bile leak and secondary infection may result in pseudo aneurysms.⁸ CT abdominal angiogram was excellent in identifying the aneurysm as well as depicting all the variations in hepatic artery anatomy as classified by Michel. Conventional angiographic examination is useful for identifying and treating the bleeding artery and needs to perform aggressively.⁹ Haemodynamically stable patients can be managed with supportive care and planned for angioembolisation. Our patient had severe haemodynamic instability requiring emergency laparotomy along with biliary obstruction due to clots in the extra hepatic biliary system requiring T-tube drainage.

Combined Bilio arterial injuries

Injury of RHA is found in approximately 12% to 61% of iatrogenic bile duct injuries, leading to high morbidity and mortality associated with altered quality of life.¹⁰⁻¹² It is of utmost importance to rule out a biliary lesion because the poor vascularization of the common bile duct may result in anastomotic strictures after surgical biliary tract repair, recurrent cholangitis and secondary biliary cirrhosis.¹¹ In fact, it is better to refer the patient to a higher centre with HPB exposure and experience. There are no clear-cut consensus guidelines regarding the timing of surgery.^{13,14} Most favourable outcomes were more frequently observed in the immediate (within the first 72 h) and (after 6 wk.) reconstruction of biliary injury.¹³ E4 injury was found to be an independent factor of worse outcomes.¹⁴ In general, if a major bile duct transection occurs (types E1-E2 according to the Strasberg classification), the integrity of the hepatic artery, especially the RHA, should always be examined meticulously to plan early vascular reconstruction if technically possible. In our case, there was a complete transection of CBD, but was associated with a GDA aneurysm which was embolised and the patient was managed surgically with a hepatico jejunostomy.

CONCLUSION

Laparoscopic cholecystectomy, one of the most done surgeries has been associated with aneurysms of the right hepatic artery and cystic artery stump. Many times, variations in vascular structures, difficult cholecystectomies and poor understanding of the anatomy may end up in inadvertent injuries of the vessels and can present symptomatically. Even though angiographic embolization/coiling remains the standard

of care in aneurysmal bleeding, patients with severe haemodynamic instability, ongoing bleeding has no other option than emergency surgery to salvage the situation. In cases with combined Bilio vascular injuries, stepwise management should be followed. Control of sepsis, patency of extra hepatic biliary tree, level of injury, and associated major vascular injury are major factors that contribute to better outcomes in these patients. The timing of Bilio enteric drainage is still a matter of debate among experienced surgeons. But in case of an intra operative Bilio vascular injury it is better to attempt repair on table itself with experienced HPB surgeons. Our centre follows early repair in the absence of bile leak with minimal or no inflammation if patient presents within 72 hours.

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