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Case Report

A Case of Right Hepatic Artery Injury

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ABSTRACT
A pure vascular lesion of the right hepatic artery can be asymptomatic, while in some cases may cause infarct, necrosis, and abscess of the right lobe of the liver. We hereby report a case of right hepatic injury which was clipped and cut during laparoscopic cholecystectomy which was mistakenly thought to be the cystic artery. We observed the liver intraoperatively for quite some time and no line of demarcation or necrosis was noticed. We conclude that this is probably due to the extensive collateral circulation between the right and left hepatic arteries. However, this by no means supports the fact that the right hepatic artery is expendable. There have been multiple reports of hepatic atrophy, necrosis, and abscess after right hepatic ligation.
Keywords: Vascular injury; Cholecystectomy; Right hepatic artery injury

INTRODUCTION
A pure vascular lesion of the right hepatic artery can be asymptomatic, while in some cases may cause infarct, necrosis, and abscess of the right lobe of the liver. The management of hepatic vascular lesions seems to be somewhat difficult both from a technical standpoint and to decision-making. The perfect knowledge of anatomy and possible variations of the right hepatic artery and cystic artery is mandatory. A proper surgical technique and consciousness are the key elements of the success and low incidence of complications, which is always achievable [1]. We hereby report a case of right hepatic injury which was clipped and cut during laparoscopic cholecystectomy which was mistakenly thought to be the cystic artery.

CASE PRESENTATION
A 45 years old lady came with complaints of pain in the right upper abdomen since 1 month. This was associated with intermittent vomiting, fever, and jaundice since the last 2 weeks. Her only surgical history was that she had a bilateral tubal ligation 4 years back. There was no other significant history. The patient was icteric and jaundiced. Examination of the abdomen revealed mild tenderness in the right hypochondrium. The gall bladder was palpable. So a diagnosis of obstructive jaundice was made, which was probably due to stone disease.
We requested an ultrasound of the abdomen which revealed normal liver with no dilation of intrahepatic biliary radicals. The gall bladder was distended with multiple stones impacted at the neck region. The wall was thickened. The common bile duct was prominent (8 mm) but had no stones within. The rest of the organs were normal. Impression: Acute calculous Cholecystitis with multiple cholelithiasis.
An MRCP was suggested as there was jaundice and the CBD was dilated. The MRCP showed an enlarged liver with normal parenchyma. The intrahepatic biliary radicals, right and left hepatic ducts were mildly dilated. The CBD was mildly dilated up to 9 mm with a filling defect of size 5 mm. The gall bladder was distended, thick with oedematous wall & had filling defects, the largest being of size 8 mm. The pancreas & main pancreatic duct was normal. Impression: Acute Calculous Cholecystitis with mildly dilated common bile duct with 5mm stone at distal CBD with hepatomegaly.

The patient was then put up for ERCP for management of the common bile duct stones. In the procedure, selective CBD cannulation was done with wire-guided sphincterotomy. This was followed by balloon extraction of the CBD stone. A 10 Fr. 5 cm double pigtail plastic stent was placed in the CBD.
After 2 days of the procedure, the patient was put up for laparoscopic cholecystectomy. Intraoperatively, the liver, stomach & duodenum appeared normal. The gall bladder was tense and thick-walled. The cystic duct was wide and a stone was impacted at CBD - cystic duct junction. The gall bladder was aspirated which revealed thick white pus. Calots triangle showed that the cystic duct, common bile duct & common hepatic duct were adherent to each other.We proceeded slowly and the dissection was done gradually.

The apparent cystic artery was dissected. Because of the dense inflammation, its course could not be delineated fully. It appeared to be going to the gall bladder. It was dissected and clipped and divided.
The cystic duct was wide, oedematous, and adherent to CBD. It was gradually isolated. A stone was impacted at the cystic CBD junction and it could not be milked into the gall bladder. Two Large Hemo-Lock clips were applied at the cystic duct near its junction with CBD. Then cystic duct was opened and three broken pieces of a pigmented stone were removed. Then 400 Ligaclip was applied to the gall bladder end & the cystic duct cut in between.

When the gall bladder was being dissected it was seen that the cystic artery was, in fact, arising from the cut end of the artery clipped and cut before and going to the gall bladder. This made us realize that we had dissected, clipped, and cut the right hepatic artery instead; the cystic artery was pulsating right in front of us. After taking the opinion of senior surgeons, it was suggested that we clip & cut the cystic artery and proceed with the removal of the gall bladder, and then decide about the right hepatic artery later on. The cystic artery was clipped and cut.
The gall bladder dissection was carried out. After quite a while of waiting and watching, we realized that miraculously, the liver vascularity was maintained. There were no signs of demarcation or impending gangrene in the right lobe of the liver. The ports were closed and the surgery terminated.
The total duration of the surgery was around 1 hour and 40 minutes because we waited for quite some time intraoperatively to see any liver changes. This highlights the fact that perhaps the left hepatic artery could take over the challenge and successfully supply the right lobe as well. Or perhaps another vessel could be supplying the right lobe which we could not discern.
The post-op period was uneventful and the patient was discharged after 7 days, to ensure that the patient did not have any complications. The patient was asked to be on regular follow-up. Subsequent CECT scans revealed that the liver was quite normal with no atrophy or evident necrosis.

DISCUSSION

Vascular injury is a common surgical complication of cholecystectomies, the most frequent of which is the disruption of the right branch of the hepatic artery [2]. Unlike biliary injuries, it does not usually lead to significant complications and therefore probably remains asymptomatic in most patients as was in our case [3]. Its incidence after cholecystectomy has been estimated to be 7% in an autopsy series of cadavers who had undergone an open procedure [4]. The most commonly interrupted vessel was the right hepatic artery, misidentified as the cystic artery; however, no liver infarctions were observed. It was speculated that unrecognized hepatic artery injury might occur even more frequently during the laparoscopic procedure due to limited surgical exposure.
Although there was no bile duct injury in our case, the incidence seems to be increased in patients with a bile duct injury, ranging between 12% and 39% [5]. As angiographic studies are usually not routinely performed, the exact figure is however unknown (Figure 1-4).

Figure 2: Intraoperative view showing apparent cystic artery.

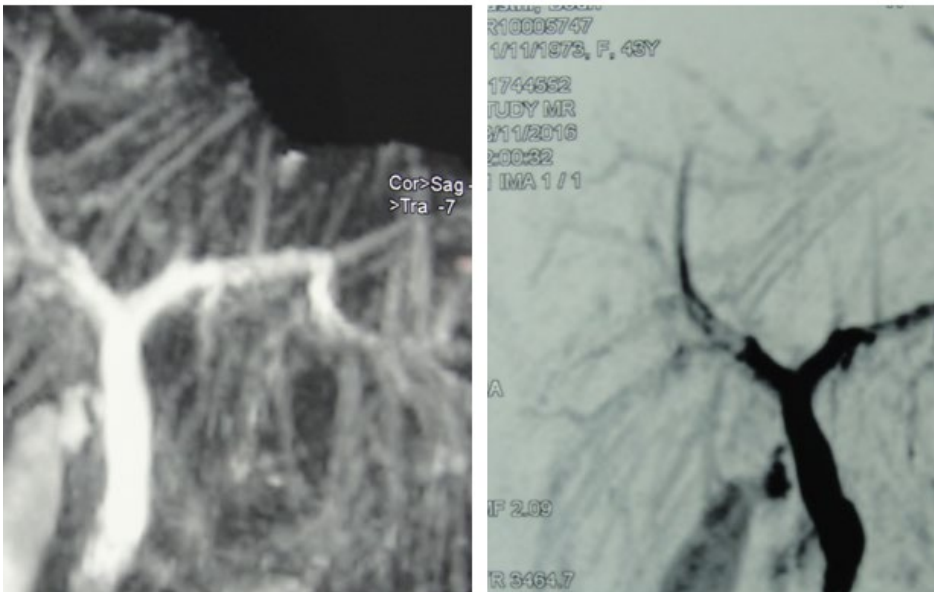

Figure 1: MRCP showing distal CBD obstruction and dilated CBD and IHBR.

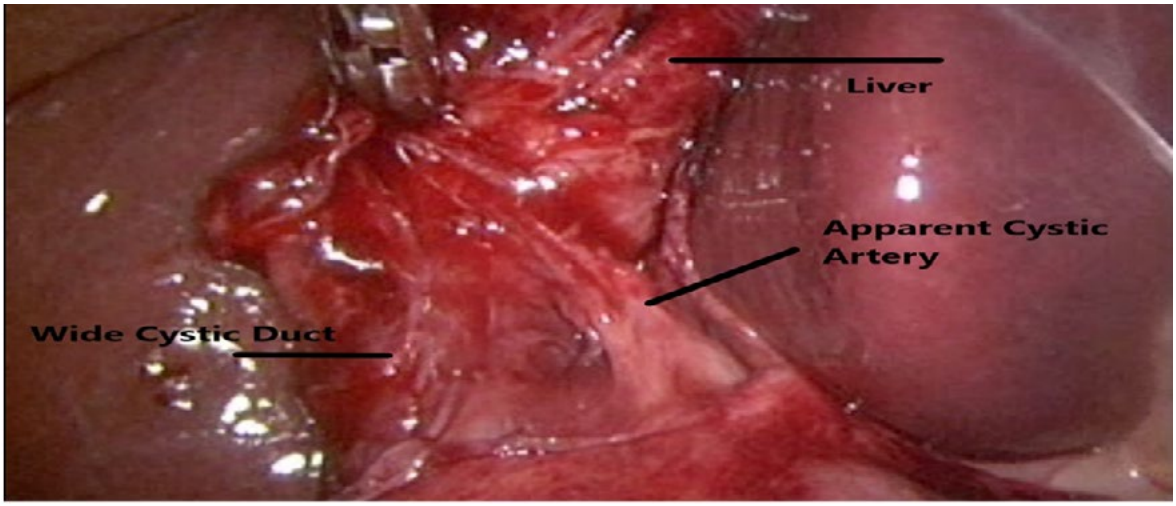

Figure 2: Intraoperative view showing apparent cystic artery.

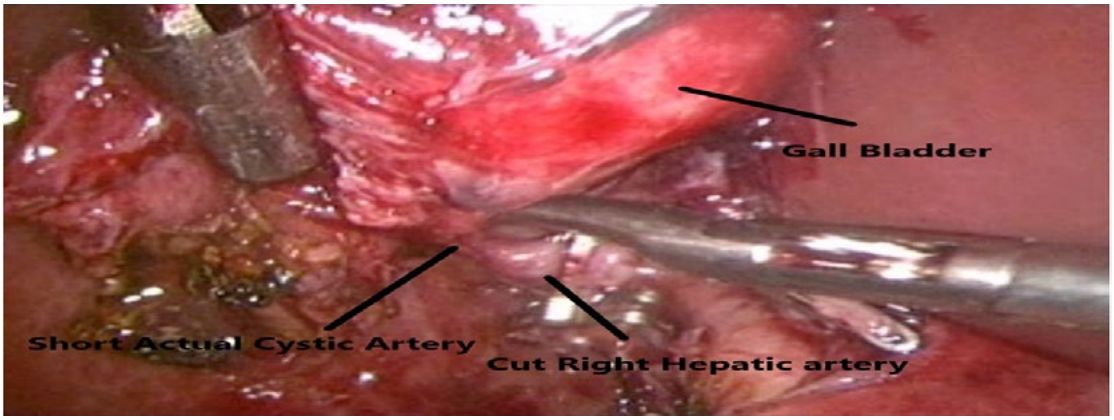

Figure 3: Intraoperative view showing actual cystic artery.

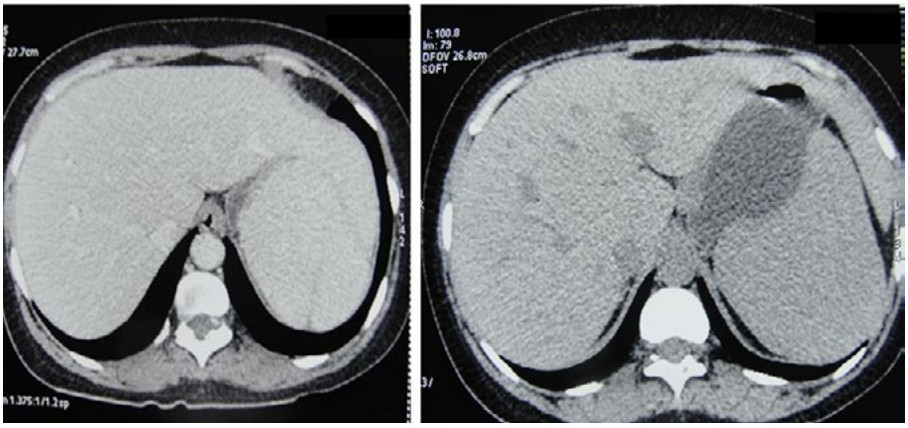

Figure 4: Postoperative CECT scans showing normal liver.

While the consequence of these arterial injuries in patients with bile duct injuries has not been assessed, uncontrolled reports suggest that they may induce liver necrosis or abscess increase the risk of bleeding at the time of the biliary repair and favor recurrent stenosis [6,7].

This lack of influence of the arterial injury in our patient was because of disruption was unilateral, in contrast to what happens after arterial thrombosis of the liver graft. This allowed free communication between the left and right hepatic arteries via the hilar plate arterial plexus [8]. This communication that develops very rapidly is very effective [3].

However, this does not mean that the right hepatic artery is expendable. Indeed, hepatic infarction has occasionally followed hepatic artery injury during conventional open cholecystectomy [9]. The apparent lack of ischemic sequelae in most cases of arterial interruption relates to the observation that complete dearterialization of native (non-transplanted) livers is very difficult to achieve, due to extensive arterial collateralization that rapidly develops following hepatic artery ligation, usually from phrenic, intercostal, or gastric arteries [10].

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