**CASE PRESENTATION**

A 58-year-old Chinese woman was admitted for two days for jaundice, right-sided upper abdominal pain, and nausea. Physical examination showed clinical jaundice and mild hepatomegaly. Her initial liver panel showed bilirubin of 161 µM (normal < 30), alanine aminotransferase (ALT) of 1,140 U/L (normal < 70), aspartate aminotransferase (AST) of 387 U/L (normal < 50), and alkaline phosphatase (ALP) of 288 U/L (normal < 130). Acute viral hepatitis A and B markers, anti-HAV IgM and anti-HBc IgM, were negative. Ultrasonography (US) of the upper abdomen was performed the following day (Fig. 1). Endoscopic retrograde cholangiopancreatography (ERCP) was performed five days later (Fig. 2). What is the likely cause of obstructive jaundice and the likely diagnosis? What should the endoscopical and subsequent management be?
**IMAGE INTERPRETATION**

US showed a calculus within the gallbladder (dotted white arrow), and another echogenic calculus within the common bile duct (CBD) (short white arrow) and a dilated biliary tree. Both calculi were accompanied by echogenic shadows (triple white arrows), which were typical of calcified calculi (Fig. 1). Together with the patient’s right hypochondrial pain and jaundice, the initial clinical diagnosis was obstructive jaundice that was most likely due to a CBD calculus. ERCP showed compression of the proximal CBD by an extrinsic lesion (triple black arrows). The common hepatic duct (white arrow) was mildly dilated (Fig. 2). As the compression was extrinsic, a biliary stent was inserted to decompress the proximal biliary system. Subsequent computed tomography (CT) of the abdomen performed during the same admission showed a gallstone at the neck of gallbladder and the position of the biliary stent (Fig. 3). The initial clinical diagnosis was Mirizzi syndrome, i.e. extrinsic compression of the biliary system by a cystic duct stone. However, as a 1.5 cm mass was also noted at the head of the pancreas (Fig. 4), a differential diagnosis of pancreatic carcinoma was also considered.

**DIAGNOSIS**

Extraluminal biliary tree obstruction due to compression by pancreatic head tumour.

**CLINICAL COURSE**

The patient’s jaundice improved two days after biliary stent placement, with the bilirubin and ALT levels dropping to 39 µM and 206 U/L, respectively. CA19-9 level was within the normal range. She was discharged a few days later, and was assessed by a hepatobiliary surgeon. Initial management plan was to consider elective open cholecystectomy after resolution of jaundice. However, while open surgery was being considered, she was re-admitted two months later for recurrent jaundice and fever, presumably due to stent blockage. Repeat ERCP showed a blocked stent, with a 4 cm long stricture at the proximal CBD (Fig. 5). Brushing and biopsy of the stricture were performed, and a new biliary stent was inserted for drainage. Subsequent bile duct brushing cytology showed atypical cells but bile duct biopsy was normal. Repeat CT of the abdomen showed similar findings to the first CT but a 1 cm diameter lymph node was noted at the level of the coeliac axis. Endoscopical US showed a 2 cm diameter mass in the head of the pancreas, and a 3 cm mass at the gallbladder. Clinical diagnosis was carcinoma of the gallbladder with extension to the pancreas.

After extensive preoperative evaluation and family conferences, the patient and family agreed on exploratory laparotomy, which was subsequently performed three months after admission.
weeks after her second admission. Intraoperatively, masses in the gallbladder and head of pancreas, with infiltration to segment IV of the liver, and multiple lymphadenopathy at portocaval and coeliac axis, were found. Frozen section of portocaval lymph nodes showed metastatic adenocarcinoma. In view of the extensive loco-regional involvement of the tumour, resection was not performed. The patient was subsequently admitted three times for recurrent cholangitis, and was managed palliatively with internal biliary metallic stenting. Patient was last reviewed four months since laparotomy, and had stable disease on CT.

DISCUSSION
The differential diagnosis of jaundice can be divided into pre-hepatic, hepatic, and post-hepatic causes. Common pre-hepatic causes include haemolytic anaemia such as thalassaemia, or reduced hepatic uptake such as Gilbert's syndrome. Common hepatic causes include acute viral hepatitis, drug-induced liver injury, or chronic viral hepatitis B or C. Common post-hepatic causes include choledocholithiasis, liver abscesses or hepatocellular carcinoma, or other obstructive lesions at the biliary system. Our patient demonstrated typical features of post-hepatic causes of jaundice, with right upper abdominal colicky pain, elevated bilirubin and dilated biliary system on US. Patients with acute biliary obstruction often complain of acute right hypochondrial pain, and initial liver panel often first shows elevation of ALT and AST. Elevation of ALP often comes later in the course, as shown in our patient.

The follow-up investigation of choice for post-hepatic jaundice is a cholangiogram, either endoscopically by ERCP, or non-invasively by magnetic resonance cholangiopancreatography (MRCP). The upper portion of the common duct is usually less than 4 mm in diameter on US, which may become slightly dilated with age. A common duct with diameter greater than 10 mm on US is certainly considered as being dilated.
As ERCP is invasive and associated with potentially serious complications such as acute pancreatitis, it should be reserved for when therapy is expected. In our patient, the initial clinical diagnosis was choledocholithiasis and hence, ERCP was done with a view to follow with sphincterotomy and stone removal.

On the other hand, in patients with a low pre-test likelihood of endoscopic therapy or high risk for ERCP, MRCP is the appropriate initial modality for cholangiography as it is non-invasive (Fig. 7). ERCP can be planned only when significant findings are found on MRCP.

Obstruction of biliary system can further be divided into intraluminal lesions such as calculus or rarely, parasites such as *Clonorchis sinensis*; luminal lesions such as stricture; and extraluminal lesions such as lymphadenopathy, stone at the neck of the gallbladder, acute pancreas, carcinoma of the pancreas or carcinoma of the gallbladder. The origin of obstruction can usually be demonstrated by cholangiography. Intraluminal lesions are seen as a filling defect inside the biliary tree (Fig. 8). In the absence of any filling defect within a dilated biliary tree, biliary stricture or extraluminal lesions should be considered, with differentiation between these two being difficult in some cases.

Luminal lesions, such as strictures, usually manifest as an irregular narrowing on cholangiogram, although smooth strictures can also be seen in some patients. The imaging features of another patient with post-liver transplant ischaemic biliary stricture, due to acute hepatic artery thrombosis, are shown in Fig. 9. Extraluminal lesions can manifest as a smooth narrowing with its borders showing the perimeter of the external lesion (Fig. 10), and should be further evaluated with CT.
MR imaging, or endoscopical US (EUS). Patients with intraluminal calculus should be undergone ERCP with sphincterectomy and stone removal. Patients with biliary stricture or extraluminal obstruction should be further evaluated with either CT, MR imaging of the abdomen, or EUS. A proposed management workflow for patients with suspected malignant biliary tree obstruction is shown in Fig. 11. Yield of tissue sampling at time of ERCP can be increased by performing both brushings and biopsy of the stricture, as done in our patient. (6)

Gallbladder carcinoma is an aggressive disease with poor prognosis, with less than 10% five-year survival rates in most series. (5) Its poor prognosis is due to its vague and non-specific presenting symptoms, and a high proportion of cases being diagnosed at an advanced stage. As seen in our patient, who initially presented with obstructive jaundice and subsequently with cholangitis, she was deemed inoperable at laparotomy. Risk factors for development of gallbladder carcinoma include gallstones, calcified gallbladder, gallbladder polyp larger than 1 cm, anomalous pancreaticobiliary duct junction, and exposure to carcinogens such as nitrosamines. Although surgical resection is the only curative option, only 10%–30% of patients at presentation are considered to be surgical candidates. Results from external beam radiation therapy and systemic chemotherapy are also disappointing. The mainstay of management is palliative, which includes relief of biliary (and occasionally gastric outlet) obstruction by either stent placement or surgical bypass.

**ABSTRACT**

A 58-year-old Chinese woman presented initially with obstructive jaundice. Initial ultrasonography showed gallstones, calculus in common bile duct, and obstructed biliary system. Endoscopic retrograde cholangiopancreatography showed an extrinsic compression at common bile duct, and subsequent computed tomography scan showed a mass in the head of the pancreas. Endoscopy ultrasound revealed masses in the gallbladder and pancreas. An exploratory laparotomy confirmed gallbladder cancer with spread to pancreas, segment IV of the liver, and regional lymph nodes. The patient was treated palliatively with metallic biliary stent for biliary drainage.

**Keywords:** cholangiography, endoscopic retrograde cholangiopancreatography, gallbladder cancer, jaundice, magnetic resonance imaging, obstructive jaundice

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REFERENCES


**Multiple Choice Questions (Code SMJ 200704A)**

### Question 1.
Regarding causes of jaundice in adults:

(a) Gilbert’s syndrome is a common cause.  
(b) History of intake of any medications including herbs should always be sought.  
(c) Acute hepatitis E is a common cause among Singaporean patients.  
(d) Choledocholithiasis typically presents with painless jaundice.

### Question 2.
Regarding obstructive jaundice:

(a) CT of the abdomen is the initial imaging of choice.  
(b) It can be safely ruled out by liver panel if both ALT and AST levels are elevated.  
(c) Unless endoscopic therapy such as sphincterectomy is expected, cholangiogram should be performed non-invasively by magnetic resonance imaging.  
(d) Common complications of endoscopic retrograde cholangiogram include acute pancreatitis and post-sphincterectomy bleeding.

### Question 3.
Regarding biliary obstruction:

(a) Parasites such as *Clonorchis sinensis* are commonly seen among local patients.  
(b) Strictures always present as a smooth narrowing on cholangiogram.  
(c) Yield of positive diagnosis in patients with suspected malignant obstruction from biliary tree brushing is the same whether it is done with or without stricture biopsy.  
(d) Cholecystectomy should be performed after bile duct stone removal in fit patients to prevent a second episode of choledocholithiasis.

### Question 4.
Regarding malignant biliary obstruction:

(a) Common causes include cholangiocarcinoma and carcinoma of head of pancreas.  
(b) Endoscopic retrograde cholangiogram should be done in all patients prior to surgical exploration.  
(c) Percutaneous transhepatic cholangiogram (PTC) is a better choice than endoscopic retrograde cholangiogram as PTC is not associated with acute pancreatitis.  
(d) Jaundice should always be relieved by stent insertion prior to surgical exploration.

### Question 5.
The following statements are correct regarding gallbladder carcinoma:

(a) Most are diagnosed at a resectable stage.  
(b) Weight loss and painless jaundice are common presentations.  
(c) Chronic alcohol consumption is a recognised risk factor for its development.  
(d) Combined external beam radiation therapy with systemic chemotherapy is the standard of care for most patients with advanced disease.

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