Case Report

Milk of Calcium Gallbladder - Limy Bile Syndrome: An Unusual Cause for Acute Cholecystitis

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ABSTRACT

A rare disorder in which accumulation of calcium salts in the gallbladder leads to the formation of a whitish substance known as the milk of calcium gallbladder or limy bile syndrome. We report such a case which presented as acute cholecystitis. The diagnosis was done by plain X-ray and ultrasonography (USG) of the abdomen and laparoscopic cholecystectomy was performed. The pathogenesis for such a case is also discussed.

KEY WORDS: bile pigment, laparoscopic cholecystectomy, milky bile

INTRODUCTION

Milk of calcium gallbladder or limy bile syndrome is a rare disorder in which there is accumulation of calcium carbonate (commonest) or oxalate in the gallbladder[1]. The lumen of the gallbladder is filled with a radiopaque material whose consistency varies from fluid to paste-like or even firm to solid. Its color ranges from white, grey, yellow to brown and sometimes black depending on the amount of the bile pigments in the gallbladder[1,2]. The etiology is unknown, although gallbladder stasis is believed to be the main factor[3].

CASE REPORT

A 36-year-old Filipino female was admitted to Mubarak Al-Kabeer Hospital in August 2009 with a persistent right sided upper abdominal pain of two days duration. It was dull aching in nature with no history of fever or jaundice. This was her second attack within one year. On examination, she had a temperature of 36.8 °C with abdominal tenderness over the right upper quadrant (positive Murphy's sign) and there was no hepatomegaly. Blood tests showed a total leucocytic count of 11.1 x 10^9/L and the liver function tests were normal (total bilirubin 5 μmol/L; direct bilirubin 1 μmol/L; alkaline phosphatase 54 IU/L; albumin 44 g/L). Plain X-ray (Fig. 1) and ultrasound (Fig. 2) of the abdomen performed at the time of admission confirmed the diagnosis as a case of acute cholecystitis induced by limy bile. The abdominal ultrasound also revealed that the intrahepatic biliary radicals and the common bile duct were normal. The patient was started on intravenous fluids and antibiotics. Emergency laparoscopic cholecystectomy was performed on the next day and showed a thickened wall gallbladder containing a whitish, semisolid, paste-like substance and wide cystic duct (Fig. 3A, B, C & D). No stones were found. After an uneventful recovery she was discharged on the next day of surgery. On follow-up of the case, the histopathological examination of the gallbladder revealed acute on top of chronic cholecystitis while the biochemical analysis of the substance (bile) showed calcium oxalate with a pH of 8.5 (reference range: 6.5 - 9, mean: 7.25). The serum calcium level was normal 2.33 mmol/l and the corrected calcium was 2.25 mmol/l (reference range: 2.2 - 2.6 mmol/l). The parathormone level was also normal (5.23 pmol/l reference range: 1.3 - 9.3 pmol/l). On her normal diet the urinary calcium excretion was 2.2 mmol/l in 24 hours (reference range: 1.2 - 10 mmol/l in 24 hours) with a urine-creatinine clearance of 106.1 ml/m (reference range: 80 - 120ml/m).

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DISCUSSION
In 1911, Churchman first described the findings of a white substance in the gallbladder as white "milky" bile[1]. A substance also called "limy bile" was reported by Knutsson in 1933 and only 300 cases had been reported until 1988[2,3]. It is a rare disease predominantly of the adults with male : female ratio is 1:3 with almost the same age and sex distribution as those for gallstones alone[4]. Limy bile syndrome accounts for 0.1 - 1.7% of patients operated on for gall stones in western countries[5,6]. Its presentation ranges from abdominal discomfort or pain (biliary colic) to acute or chronic cholecystitis[6]. It can lead to obstructive jaundice or pancreatitis with the passage...
of the limy bile into the common bile duct\cite{16} but it also can pass spontaneously without any symptoms or signs depending on the consistency of the bile\cite{17}. The diagnosis of such case can be made depending on the plain X-ray of the abdomen where it appears as a radiopaque shadow below the liver margin\cite{18}. The different types of gallstones (e.g., cholesterol, mixed and pigmented) are principally formed due to abnormal bile constituents (e.g., cholesterol, phospholipids and bile salts)\cite{19}. There are several factors that favor gallstone formation which can occur due to obesity, hormones (e.g., estrogen, progesterone, use of oral contraceptive pills) marked weight loss, hemolytic anemia, liver cirrhosis and ileal disease\cite{20,21}. Also pronucleating factors (including infections, calcium and bacterial biofilms) and gallbladder stasis (which can occur from total parenteral nutrition, octreotide use, pancreatic insufficiency and spinal cord injury) can promote gallstone formation\cite{22}. The pathogenesis of the limy bile formation or the precipitation of calcium salts in the gallbladder has not been clearly defined. Various factors have been suggested to play a role in its formation is due to abnormal calcium metabolism\cite{23,24}, a variable pH of the gallbladder\cite{25-27} or gallbladder stasis which is believed to be the main cause\cite{28}. In our case, the presentation was in the form of acute cholecystitis. There was no evidence of abnormal calcium metabolism or malfunction of the liver. The pH was in the higher normal range but some studies revealed that calcium salt formation in the gallbladder occurs when the pH is above 6.6\cite{29-31} as in our case. Also the intra-operative finding of a wide cystic duct could be explained by prolonged or partial cystic duct obstruction which can lead to stasis of the bile with the formation of the limy bile. A close differential diagnosis of milk of calcium gallbladder is the porcelain gallbladder which is characterized histologically by flakes of dystrophic calcium within chronically inflamed and fibrotic wall of gallbladder. On plain radiography it shows calcifications in segment of the wall or the entire wall. Also it is differentiated from limy bile by its inability to contract on gallbladder contractility test with cholecystokinin or in response to a fatty meal. The strategy for managing patients with limy bile is individualized based on symptoms, the clinical conditions and the location of the limy bile. Also any associated biliary stones or lesions causing biliary obstruction can be included. Most of surgeons prefer surgical intervention for early acute cholecystitis to minimize the rate of complications (e.g., infection and obstruction), the rate of conversion to open surgery (due to subsequent adhesions formation) and enable significantly shorter total hospital stay\cite{32-34}. In our case we preferred early intervention with laparoscopic cholecystectomy to avoid any further complications.

**CONCLUSION**

Milk of calcium gallbladder is a rare disorder that can be diagnosed with plain X-ray of the abdomen and needs early intervention with cholecystectomy to avoid any complication.

**REFERENCES**