**Case Report**

**Tumefactive Sludge Mimicking Gallbladder Neoplasm: A Case Report and Review of the Literature**

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**Abstract**

Biliary sludge (or very thick bile) is mainly comprised of calcium bilirubinate granules and lesser amounts of cholesterol crystals, and it can produce a layer of low amplitude of echoes in the most dependent part of the gallbladder (GB). In tumefactive biliary sludge, low-amplitude echoes do not form a fluid–fluid level but instead tend to give the appearance of a polypoid mass that is bounded by a smooth margin, round, and lobulated. Differential diagnoses for an echogenic mass in the GB lumen include GB carcinoma, tumefactive sludge, and gangrenous cholecystitis. In this case report, we describe a rare case in which biliary sludge did not form a fluid–fluid level but tended to accumulate and appear as a polypoid mass within the lumen of the GB. The lesion was finally identified as being tumefactive sludge mimicking neoplasm of the GB.

**Keywords:** Gallbladder neoplasm, sludge, tumefactive

**INTRODUCTION**

Ultrasonography is the method of choice for screening gallbladder (GB) disease, with a reported accuracy exceeding 90%. Bile is rendered echogenic by the presence of calcium bilirubinate and cholesterol crystals.[1] GB sludge is most often seen in patients with prolonged fasting, extrahepatic bile duct obstruction, various intrinsic disorders of the GB, and those with sickle cell disease or other causes of hemolysis.[2] Sludge can be quite viscid, and movement under gravity may be very slow or absent. If no movement is demonstrated, then the picture may mimic a sessile GB tumor.[1] Fakhry called this mass “tumefactive biliary sludge.”[2]

**CASE REPORT**

A 75-year-old female suffered from epigastric pain and fever for 2 days. She came to our emergency department for help, and abnormal liver function tests were noted SGOT 713 IU/L (normal range 5–40 IU/L), SGPT 429 IU/L (3–35 IU/L), alkaline phosphatase 192 IU/L (35–104 IU/L), and total bilirubin 2.8 mg/dl (0.2–1.2 mg/dl). She was then admitted for further evaluation and management under the impression of acute cholangitis.

After admission, abdominal sonogram findings revealed a mild fatty liver and GB sludge [Figure 1]. Computed tomography (CT) of the abdomen showed distended GB with sludge formation. Endoscopic retrograde cholangiopancreatography was performed due to cholangitis which showed a periampullary diverticulum and no obvious filling defect within the common bile duct. An endoscopic retrograde biliary drainage stent was then inserted smoothly, her fever resolved and symptoms improved after antibiotic treatment and stent insertion, and her liver function tests also improved (SGOT 27 U/L, SGPT 73 U/L, alkaline phosphatase 192 IU/L (35–104 IU/L), and total bilirubin 2.8 mg/dl (0.2–1.2 mg/dl). She was then admitted for further evaluation and management under the impression of acute cholangitis.

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102 U/L, and total bilirubin 1.2 mg/dl). The symptom gradually improved, and she was discharged 5 days later. Then, she was followed regularly at our outpatient department (OPD). Right upper quadrant abdominal tenderness occurred again 9 months later, and she visited our OPD. An abdominal sonogram showed a mass-like lesion about 2.96 cm in size within the GB [Figure 2]. Abdominal CT was then performed, which showed a mildly high-density polypoid mass lesion about 1.8 cm × 5.2 cm × 2.9 cm in size in the GB [Figure 3]. She decided to receive surgical intervention and then admitted to our general surgery section ward.

She denied a history of systemic disease or major surgery, and she did not smoke or drink alcohol. No family history of malignancy was noted. After admission, she appeared ill looking, but she was lucid and cooperative. Her vital signs were as follows: blood pressure – 128/76 mmHg, pulse rate – 88/min, respiratory rate – 18/min, and temperature – 36.2°C. Her sclera was not icteric, and conjunctiva was not pale. A chest examination showed clear breathing sounds over both lung fields, and she had a regular heartbeat without murmur. Distension of the abdomen was present, and mild abdominal tenderness over the epigastric area was noted.

Surgery with laparoscopic cholecystectomy was performed smoothly. The pathology report showed chronic cholecystitis of the GB and a large amount of brown and black sludge within the lumen [Figure 4]. The postoperative course was uneventful, and she was discharged 4 days after the operation. Her condition remained stable after 12 months of follow-up.

**DISCUSSION**

Biliary sludge is a suspension of cholesterol monohydrate crystals and calcium bilirubinate granules in a matrix of mucous gel and bile. It is essentially diagnosed by ultrasonography, and it may play a pathogenic role in the etiology of biliary colic pain and acute pancreatitis. Characteristically, biliary sludge produces nonshadowing low-amplitude echoes that tend to layer in the most dependent part of the GB because of its high specific gravity and forms a fluid–fluid level that moves very slowly when the patient changes positions. Artifactual side lobe echoes from

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**Figure 1:** Abdominal ultrasonogram showing sludge within the gallbladder

**Figure 2:** Abdominal ultrasonogram showing a sessile mass-like lesion within the gallbladder

**Figure 3:** Computed tomography showing a mildly high-density polypoid mass lesion within the gallbladder

**Figure 4:** The specimen of surgery showing full of sludge within the gallbladder
adjacent structures are often noted in the GB lumen where they can be mistaken for sludge or calculi. Layering of the more dependent parts of the biliary tree occurs because of its higher specific gravity, and this produces a horizontal sludge-bile interface. The sludge also moves very slowly when changing position, and this is not always detected on real-time imaging. The first ultrasonographic examination of the present case showed the typical pictures of sludge as described above.

Biliary sludge has a variable appearance. Occasionally, biliary sludge in the GB accumulates with a mass-like configuration, and its pseudotumor appearance was termed tumefactive biliary sludge by Fakhry. It is a homogenous echogenic mass rather than horizontal layering, the echoes being heaped up or clumped together causing a tumor-like appearance. The second ultrasonographic examination of the present case showed a tumor-like appearance which was quite different to the previous typical image of sludge.

Identification of an echogenic, nonmovable mass in the GB suggests specific differential diagnoses such as GB neoplasm, tumefactive biliary sludge, and sloughed mucosa from gangrenous cholecystitis, or GB hematomas. Ultrasonography plays a significant role in the diagnosis of both malignant and benign primary tumors of the GB. In general, a polypoid fungating mass protruding into the lumen of the GB is a common appearance. Such masses are less echogenic than gallstones and do not cast an acoustic shadow behind them. However, GB cancer can be easily missed by ultrasonography for several reasons. GB carcinoma is usually associated with gallstones and often extends into adjacent tissues, and clinicians may forget to look beyond the initial findings. The mass may be echo-poor and appear fluid-like unless gain is increased and the echoes may be interpreted as sludge. Further, it does not gravitate with changes in the patient’s position because it is a mucosal lesion. When low-amplitude echoes of sludge do not form a fluid–fluid level but instead tend to accumulate, they appear as a smooth, round, and lobulated polypoid mass within the lumen of the GB. The ultrasonography findings of the present case are compatible with the above descriptions. With other differential diagnoses of GB tumors such as empyema or gangrenous cholecystitis, intraluminal echogenic materials do not show acoustic shadows or gravity dependence. Acute infection seemed to be unlikely in the present case because she did not have a fever, there were no toxic signs, and no significant laboratory abnormalities were noted during the second admission.

The mass effect of tumefactive sludge is due to temporary clumping of highly viscous material stasis in the GB. Colloidal particles such as cholesterol and calcium bilirubinate have a tendency to separate in bile and precipitate to the bottom of the GB, and these precipitates are seen as sludge, often accompanied by a fluid–fluid level. When these particles are held together by the rather weak van der Waals force or exist in a gel having an unstable supportive structure, they often take the form of a mass. The gel turns into a solution when the GB is strongly tapped and returns to the gel form when the solution is left at rest.

A soft echogenic pattern and lack of acoustic shadowing are features common to tumefactive biliary sludge and primary fungating neoplasms of the GB. In clinical practice, tumefactive sludge is difficult to differentiate from mass-forming GB cancer on a cross-sectional conventional ultrasonography examination. Some suggested the magnetic resonance imaging features of a well-defined mass-like lesion, hyperintensity on a T1-weighted image, and the absence of both enhancement and diffusion restriction are highly suggestive of tumefactive sludge. Gravity dependence should be a distinguishing feature however it is not always possible to demonstrate motion. A repeat examination after a short interval (1 day to 2 weeks), especially for patients on prolonged fasting who resume normal eating habits, can prove to be very helpful. The disappearance of a sizable intraluminal GB mass without any symptoms referring to the biliary tract or the right upper quadrant establishes almost unequivocally the diagnosis of disintegrated sludge expelled through the cystic duct. The altered appearance of biliary sludge is almost certainly due to a different physical-chemical state of the bile in the GB at the time of the second examination. In the present case, the patient did not receive repeat examinations during the second admission because she decided to receive a surgical intervention.

Although prevalence of tumefactive sludge at ultrasonography was rare, a considerable proportion of patients had a malignancy. Some advocated that careful follow-up is essential, especially for older patients, women, and those with an absence of hyperechoic spots at ultrasonography. This is consistent with the present case.

**Conclusion**

We report a case with the initial presentation of acute cholangitis due to biliary sludge. When a tumor-like lesion is noted within the GB, tumefactive biliary sludge should always be considered. When such lesions are discovered, the examination must be repeated, as this will generally allow for the diagnosis to be made.

**Declaration of patient consent**

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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Conflicts of interest
There are no conflicts of interest.

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