

Imaging Findings in Mucin-producing Carcinoma of the Gallbladder

Chiu-Ping Huang, Yi-You Chiou,* Yi-Hong Chou, Jen-Huey Chiang, Cheng-Yen Chang

Mucin-producing carcinoma of the gallbladder is rare, and its imaging features have not been well documented. Its symptoms and signs are nonspecific and the prognosis of the disease is poor. We present a 73-year-old male with mucin-producing carcinoma of the gallbladder, emphasizing its imaging features on ultrasound, computed tomography and magnetic resonance imaging. The tumor usually presents as a cauliflower-like soft tissue mass with small calcified spots in the gallbladder wall and some laminated high viscosity fluid inside the gallbladder cavity. Recognition of these features can provide clues to the diagnosis of mucin-producing carcinoma of the gallbladder. [*J Formos Med Assoc* 2006;105(5):427–430]

Key Words: computed tomography, gallbladder, mucin-producing carcinoma, magnetic resonance imaging, ultrasound

Carcinoma of the gallbladder is the most common biliary tract malignancy, accounting for 1–3% of all cancers,¹ but mucin-producing carcinoma of the gallbladder is a rare disease and its imaging findings have not been well described in the literature. We report a case of primary mucin-producing carcinoma of the gallbladder with emphasis on its imaging findings on ultrasound (US), computed tomography (CT) and magnetic resonance imaging (MRI).

Case Report

A 73-year-old man presented to our hospital with right abdominal pain on and off for 2 weeks. On admission, physical examination showed mild tenderness over the right upper abdomen with stable vital signs. Laboratory data were unremarkable except for slightly elevated alkaline phosphatase (143 U/L; normal range, 10–100 U/L).

Serum tumor markers including CA-125 and CA-199 were all within normal limits, except for slightly elevated carcinoembryonic antigen (7.33 ng/mL; normal range, < 6 ng/mL). Abdominal US revealed a small cauliflower-like mass in the fundus of the gallbladder with retraction of the gallbladder wall (Figure 1). Some laminated echo-



Figure 1. Ultrasound showed a cauliflower-like soft tissue mass in the fundus of the gallbladder (arrow) with echogenic streaks inside (arrowheads).

©2006 Elsevier & Formosan Medical Association

Department of Radiology, Taipei Veterans General Hospital, and School of Medicine, National Yang-Ming University, Taipei, Taiwan.

Received: April 29, 2005

Revised: May 30, 2005

Accepted: August 2, 2005

*Correspondence to: Dr. Yi-You Chiou, Department of Radiology, Taipei Veterans General Hospital, 201, Shih-Pai Road, Section 2, Taipei, Taiwan.
E-mail: yychiou@vghtpe.gov.tw

genic streaks were noted inside the gallbladder with dilatation of the cystic duct, common bile duct (CBD), and bilateral intrahepatic bile ducts (IHDs). Color Doppler US showed increasing color flow, indicating high vascularity of the mass. CT study disclosed a 2.5-cm soft tissue mass with tiny calcification spots in the fundus of the gallbladder (Figure 2). Mild enhancement of the mass after intravenous contrast medium injection was also seen. No definite adjacent organ involvement or enlarged lymphadenopathy was found. MRI and magnetic resonance cholangiopancreatography (MRCP) showed a stellate soft tissue mass in the fundus of the gallbladder with laminated streaks of fluid inside the gallbladder cavity. Dilatation of the CBD, cystic duct and bilateral IHDs were also noted. No definite dilatation of the main pancreatic duct was found (Figure 3). From the above imaging findings, a mucin-producing tumor of the gallbladder was suspected.

The patient received cholecystectomy 10 days after admission. A 2.5-cm indurated cauliflower-like tumor was found in the fundus of the gallbladder, and some mucous fluid with tumor-like debris was noted inside the gallbladder cavity. Poorly differentiated adenocarcinoma with mucin pools was pathologically confirmed. The patient was discharged in a good condition. He received adjuvant chemotherapy and regular follow-up at our hospital. Unfortunately, 17 months after the

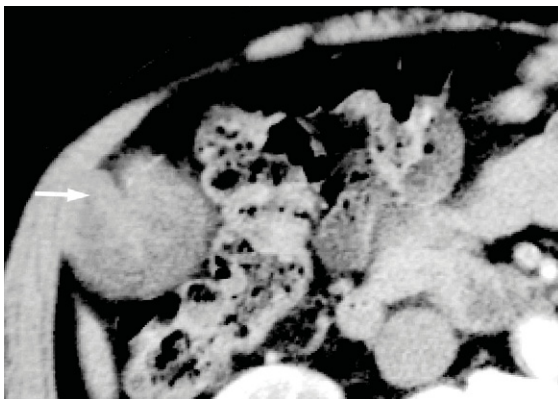


Figure 2. Non-contrast enhanced computed tomography showed a cauliflower-like soft tissue mass with some calcified spots in the fundus of the gallbladder with gallbladder wall retraction (arrow).

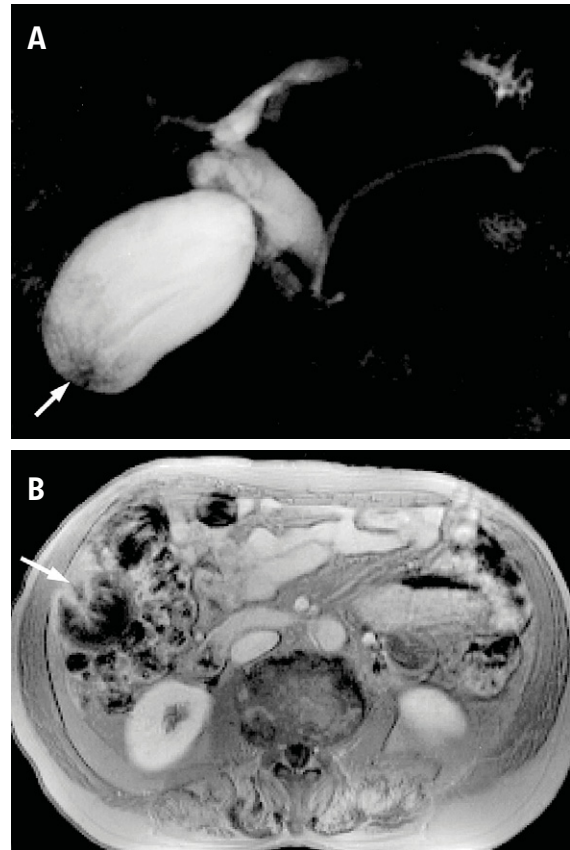


Figure 3. (A) Magnetic resonance cholangiopancreatography showed a stellate soft tissue mass in the fundus of the gallbladder (arrow) with laminated streaks inside the cavity. Dilatation of the cystic duct, common hepatic duct, common bile duct, and intrahepatic bile ducts were also found. (B) Post-gadolinium enhanced T1WI image showed mild enhancement of the mass with wall retraction (arrow).

operation, abdominal CT showed omental cake with peritoneal seeding. Disease progression was noted in spite of continuing chemotherapy, and the patient died 24 months after the operation.

Discussion

Gallbladder carcinoma is the most common biliary tract malignancy in the West.^{1,2} There is tremendous regional variability in its incidence. In the United States, there are 6500 new cases of gallbladder carcinoma each year, and the vast majority is adenocarcinoma. Primary mucin-producing carcinoma of the gallbladder is a rare disease, and fewer than 30 cases have been reported in the literature.^{1,3-8} The definition, dis-

ease incidence, clinical presentation, and imaging features have not been well established. Gallbladder carcinoma is difficult to detect due to no prominent signs and symptoms in the early stage. When symptoms are present, they are usually nonspecific, including upper abdominal pain, fever, jaundice, nausea and vomiting. It is often too late for complete surgical removal of the tumor when diagnosed, so the prognosis of the disease is poor. Mucin-producing carcinoma is thought to be more aggressive and to spread more easily than adenocarcinoma.³ However, due to its rarity, prognosis and optimal treatment cannot be concluded with confidence at this time until more cases are reported.

Most cases of mucin-producing carcinoma of the gallbladder were reported from Japan.³⁻⁷ It was first reported by Ishibashi et al in 1986.³ In 2003, Tian et al reported four cases of mucin-producing carcinoma of the gallbladder:⁴ two males and two females with ages ranging from 66 to 76 years old. The clinical symptoms were pain at the right hypochondrium, nausea, vomiting and anorexia. US was performed in all four cases, and all showed a soft-tissue nodule in the body or fundus of the gallbladder with hyperechoic debris inside the gallbladder lumen. Associated wall thickening and calcification were depicted in two cases, and one of them showed intrahepatic and extrahepatic bile duct dilatation. All of the patients received cholecystectomy and pathologic examination revealed well-differentiated papillary adenocarcinoma in three cases and mucinous adenocarcinoma in one. In their conclusion, mucin-producing carcinoma occurs mostly in older women, and its primary clinical symptoms include right upper abdominal pain and jaundice. Our case had similar clinical presentations and imaging findings. The pathologic diagnosis of our case was poorly differentiated adenocarcinoma, which indicates a poor prognosis for the patient.

Although primary mucin-producing carcinoma of the gallbladder is a rare disease, the imaging studies gave us some good clues to diagnosis. US is good in demonstrating the echogenic streaks that are suggestive of the high viscosity fluid con-

tent inside the gallbladder. CT scan is superior in detecting calcification and in evaluating the extent of the disease, but it offers little diagnostic information in detecting the high viscosity fluid content inside the gallbladder. Nobusawa et al claimed that if there are mucin pools inside the tumor, it will produce near-water density of the tumor and make it difficult to differentiate from water on CT scan.⁵ MRI and MRCP study can provide multiplanar images showing the extent of the tumor and the correlative changes of the cystic duct, CBD, IHDs and pancreatic duct. The high viscosity character of the fluid content is also well demonstrated on this imaging modality. To the best of our knowledge, the MRCP features have not been reported before.

The differential diagnosis of mucin-producing carcinoma of the gallbladder included complicated or chronic cholecystitis, gallbladder empyema, gallbladder adenomyomatosis, and gallbladder adenocarcinoma. Cholecystitis or gallbladder empyema usually present with diffuse wall thickening, pericholecystic fluid accumulation, adjacent dirty fat plan, or gallstones, and are always associated with fever and leukocytosis. Gallbladder adenomyomatosis or adenocarcinoma seldom presents with high viscosity fluid inside the gallbladder lumen or biliary tracts. These features can be used to differentiate them from mucin-producing carcinoma of the gallbladder.

In conclusion, the typical appearance of mucin-producing carcinoma of the gallbladder is a cauliflower-like soft tissue mass with small calcified spots. Laminated high viscosity fluid inside the gallbladder cavity is usually present and dilatation of the cystic duct, CBD and IHDs is sometimes seen. Although mucin-producing carcinoma is a rare gallbladder tumor, recognition of these imaging features may help to preoperatively suggest the diagnosis in some cases.

References

1. Levy AD, Murkata LA, Rohrmann CA. Gallbladder carcinoma: radiologic-pathologic correlation. *Radiographics*

- 2001;21:295–314.
2. Piehler JM, Crichow RW. Primary carcinoma of the gallbladder. *Surg Gynecol Obstet* 1978;147:929–42.
3. Ishibashi H, Minesuga K, Yamaguchi A, et al. A case of mucin-producing carcinoma of the gallbladder. *Tan to Sui* 1986;7:1173–8. [In Japanese]
4. Tian H, Matsumoto S, Takaki H, et al. Mucin-producing carcinoma of the gallbladder: imaging demonstration in four cases. *J Comput Assist Tomogr* 2003;27:150–4.
5. Nobusawa H, Hashimoto T, Munechika H, et al. US and CT findings of mucinous carcinomas of the gallbladder. *Nippon Act Radiol* 1994;54:1359–67. [In Japanese]
6. Araidai T, Kogure M, Takasaki K. Mucin-producing gallbladder. *Ryoikibetsu Shokogun Shirizu* 1996;9:352–5. [In Japanese]
7. Matsuda M, Watanabe G, Hashimoto M, et al. Mucin-producing early carcinoma of the gallbladder: report of two cases. *J Jpn Biliary Assoc* 2002;16:113–8. [In Japanese]
8. Hughes ODM, Haray PN, Williams IM, et al. Carcinoma of the gallbladder producing mucous obstruction of the common bile duct: a cautionary note. *J R Coll Surg Edinb* 1997;42:280–2.