

Presentation of Gallbladder Chloroma in B-Mode Imaging and Contrast-Enhanced Ultrasound (CEUS) in a Patient with Acute Myelomonocytic Leukemia (AML M5)

Introduction

Chloromas (myeloid sarcoma) are solid tumors consisting of primitive myeloid precursors and have been described in acute myeloid leukemia (AML) and myeloproliferative disorders (Aznab, Mozaffar; Kamalian, Naser; Beiki, Omid et al., *Int J Hematol Oncol Stem Cell Res* 2015; 9 (1), S. 50–54). In AML, they are observed in 3–8% of all cases, while the frequency varies (J. C.; Edenfield, W. J.; Shields, D. J. et al., *Extramedullary myeloid cell tumors in acute nonlymphocytic leukemia: a clinical review. In: J Clin Oncol* 1995, 13 (7), S. 1800–1816). Chloromas can be observed at diagnosis, precede the diagnosis, occur during the course of the disease or manifest as a relapse of the AML (Aznab, Mozaffar; Kamalian, Naser; Beiki, Omid et al., *Int J Hematol Oncol Stem Cell Res* 2015; 9 (1), S. 50–54). They can affect every organ system, with infiltration of bone, skin, soft tissues and lymph nodes being observed most frequently (Aznab, Mozaffar; Kamalian, Naser; Beiki, Omid et al., *Int J Hematol Oncol Stem Cell Res* 2015; 9 (1), S. 50–54), J. C.; Edenfield, W. J.; Shields, D. J. et al., *Extramedullary myeloid cell tumors in acute nonlymphocytic leukemia: a clinical review. In: J Clin Oncol* 1995, 13 (7), S. 1800–1816). Single case reports describe chloromas of the gallbladder and the bile ducts (Azin, Arash; Racz, Jennifer M.; Carolina Jimenez, M. et al. *Int J Surg Case Rep* 2014; 5 (6), S. 302–305). In summary, we present the first description of contrast-enhanced ultrasound (CEUS) patterns of a histologically confirmed gallbladder chloroma.

History and Clinical Findings

A 64-year-old patient with acute myelomonocytic leukemia (AML M5) was hospitalized for consolidation therapy. The patient achieved complete remission after standard induction therapy. No excess of blasts was detected in histological examinations of the bone marrow and the patient showed no clinical signs of extramedullary AML. From day 20 after therapy initiation,

laboratory testing indicated an acute infection with concomitant increasing serum bilirubin levels and a cholestatic liver enzyme pattern (max. GOT: 105 U/l, max. GPT: 172 U/l, max. alkaline phosphatase 428 U/l). Platelet counts ranged between 20 and 60 G/l and the leukocytes remained less than 1 G/l. The patient received transfusion of erythrocyte concentrates without signs of bleeding (hemoglobin levels ranged from 7 to 10 G/l),

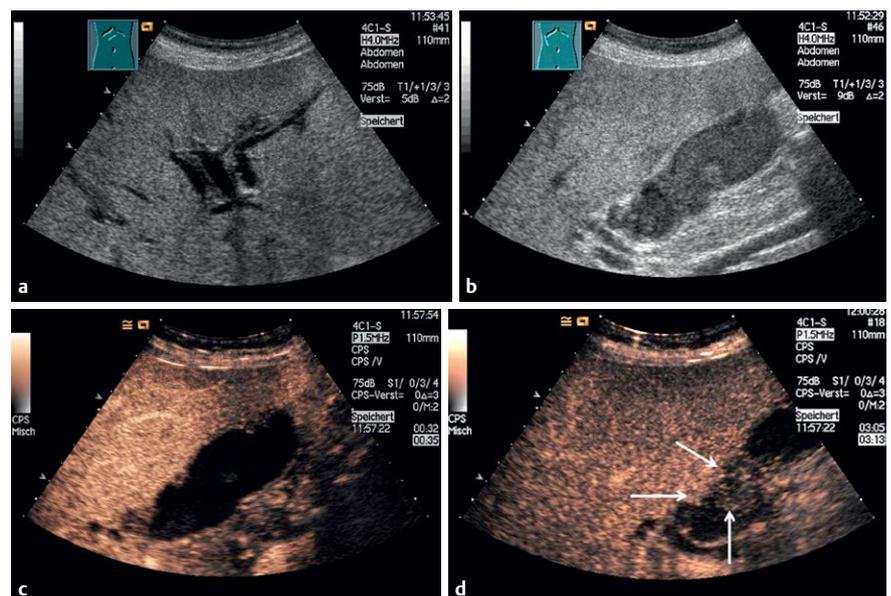
Examination

The abdominal ultrasound showed an intra- and extrahepatic cholestasis (► Fig. 1a). B-mode imaging revealed an enlarged, wall-accented gallbladder with intraluminal echogenic sludge and small nodules in the wall. For further differentiation contrast-enhanced ultrasound (CEUS) was performed. Therefore, 2.4 ml of the contrast media SonoVue were applied and rinsed with 10 ml of NaCl. CEUS of the nodules (► Fig. 1b–d) and the intraluminal sludge showed enhancement, indicating vital tissue, and

was therefore suspicious for malignancy (► Fig. 1b–d).

Therapy/diagnosis

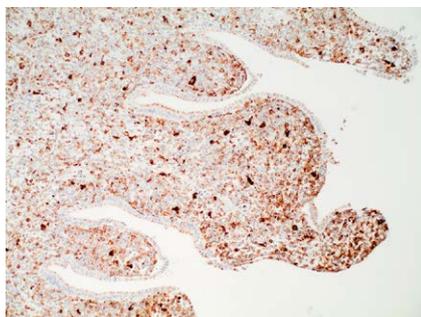
An endoscopic retrograde cholangiopancreatography (ERCP) revealed massive resistance in the common bile duct as a cause for the biliary obstruction. Endoscopic maneuvers failed to restore biliary flow and an emergency laparotomy was performed. The interoperative situs showed a callous and thickened gallbladder as well as multiple palpable masses alongside the bile ducts from the ampulla of vater to the transverse fissure of the liver. The patient underwent cholecystectomy followed by a percutaneous biliary drainage procedure. It was suggested that the cholestasis was partially caused by the tumorous gallbladder resembling Mirizzi syndrome. Postoperative radiological control of the percutaneous biliary drainage showed a stenosis in the area of the bifurcation of the bile duct which presented the intraductal obstruction as the cause of the cholestasis. The contrast media and the bile flowed off via



► Fig. 1 a Intrahepatic cholestasis. b Thickening of the gallbladder wall with parietal noduli and intraluminal enhancement in a patient with acute myelomonocytic leucemia. c Enhancement of the parietal noduli in the gallbladder wall in the arterial phase of CEUS. d Enhancement of the parietal noduli in the gallbladder wall and the intraluminal material in CEUS.



► **Fig. 2** Postoperative radiological control of the percutaneous biliary drainage with evidence of a stenosis in the area of the bifurcation of the bile duct.



► **Fig. 3** Gallbladder wall with infiltration of AML, immunohistochemistry CD 68 (marker FAB M5).

the inserted drainage tube (► **Fig. 2**). Histopathological examination showed a tumorous infiltration of the gallbladder wall and the cystic duct with AML M5 blasts (► **Fig. 3**).

Discussion

The main differential diagnoses of marked echogenic material of the gallbladder wall and gallbladder lumen in B-mode imaging are gallbladder carcinoma, gallstones, gallbladder polyps, sludge, and special forms of chronic cholecystitis. In 2011, the EF-SUMB first recommended the application of contrast-enhanced ultrasound (CEUS) outside the liver (Piscaglia, F.; Nolsoe, C.; Dietrich, C. F. et al., *Ultraschall in Med* 2012, 33 (1), S. 33–59). CEUS may be helpful in the diagnosis of pathologic processes of the gallbladder especially in the discrimination

of vascular from avascular tissue (Piscaglia, F.; Nolsoe, C.; Dietrich, C. F. et al., *Ultraschall in Med* 2012, 33 (1), S. 33–59). Gallstones or sludge as non-vascularized waste products can be differentiated from vascularized processes that indicate growth of a vital tumor (Piscaglia, F.; Nolsoe, C.; Dietrich, C. F. et al., *Ultraschall in Med* 2012, 33 (1), S. 33–59). XU et al. observed that the application of CEUS is helpful to assess gallbladder wall thickening of unclear malignancy (Xu, Jun-Mei; Guo, Le-Hang; Xu, Hui-Xiong et al. *Ultrasound Med Biol* 2014, 40 (12), S. 2794–2804). Malignant gallbladder wall thickening was associated with intralumenal vessels, inhomogeneous enhancement of the gallbladder wall, rapid flushing of the contrast media and discontinuous wall stratification (Xu, Jun-Mei; Guo, Le-Hang; Xu, Hui-Xiong et al. *Ultrasound Med Biol* 2014, 40 (12), S. 2794–2804). Of course in cases of pathologic enhancement of the gallbladder wall or lumen, histologic confirmation is warranted. In our case, B-mode imaging showed gallbladder wall thickening with parietal noduli and intraluminal masses, morphologically resembling sludge. Both findings indicate several malignant and non-malignant differential diagnoses. Inhomogeneous enhancement on CEUS strongly indicated a malignant process which was later histologically confirmed as a chloroma. Chloromas, extramedullary tumorous hematopoiesis and hematoma of the gallbladder or of bile ducts are a possible differential diagnosis in patients with acute or chronic myeloproliferative diseases and unexplained cholestasis or inflammatory processes of the biliary tract. CEUS can be a valuable tool for the diagnostic workup.

Conflict of Interest

The authors have no conflict of interest to disclose.

Authors

Corinna Trenker¹, Marius Dohse², Stephan K. Metzelder¹, Anette Ramaswamy³, Walter Hundt³, Christian Görg⁴

Affiliations

- 1 University hospital Gießen and Marburg, Department of Haematology, Oncology and Immunology, Philipps University Marburg, Marburg, Germany
- 2 Universitätsklinikum Gießen und Marburg, Standort Marburg, Department of Pathology, Philipps-University Marburg, Marburg, Germany
- 3 Universitätsklinikum Giessen und Marburg – Standort Marburg, Diagnostische Und Interventionelle Radiologie, Marburg, Germany
- 4 University hospital Gießen and Marburg, Interdisciplinary ultrasound center

Correspondence

Dr. Corinna Trenker UKGM
Klinik für Innere Medizin, Schwerpunkt
Hämatologie
Onkologie und Immunologie
Universitätsklinikum Giessen und Marburg,
Standort Marburg
Baldingerstraße
35043, Marburg
Germany
+49/6421/5862 599
trenker@med.uni-marburg.de

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