

A Case of Tubular Adenoma of Gallbladder Diagnosed Using Contrast-Enhanced Ultrasonography

Lo-Yi Lin¹, Hong-Jen Chiou^{2,3,4*}, Yi-Hong Chou^{2,3}, Hsin-Kai Wang², Yi-Chen Lai², Yun-Hui Lin²

¹Department of Radiology, Taipei Veterans General Hospital, Taipei, Taiwan, ²Division of Ultrasound and Breast Imaging, Department of Radiology, Taipei Veterans General Hospital, Taipei, Taiwan, ³School of Medicine, National Yang Ming University, Taipei, Taiwan, ⁴National Defense Medical Center, Taipei, Taiwan

Abstract

Contrast-enhanced ultrasound (CEUS) has been used to diagnose gallbladder (GB) diseases for recent years because it is sensitive to visualize vascularity. Herein, we report a case who had a 1.7 cm × 1.2 cm polypoid lesion located in the gallbladder fundus with a feeding artery located in the stalk. On CEUS, the lesion showed early arterial phase enhancement (time to peak enhancement 18 s), persisting throughout the venous and delay phases. This enhancing pattern suggested that the lesion was a GB adenoma rather than a GB carcinoma. Cholecystectomy was performed, and pathology of the tissue revealed tubular adenoma of the GB.

Keywords: Adenoma, adenocarcinoma, contrast-enhanced ultrasound, gallbladder, polypoid

INTRODUCTION

Gallbladder (GB) polyps are classified into neoplastic polyps (e.g. adenomas and adenocarcinomas) or nonneoplastic polyps (e.g., cholesterol polyps and adenomyomatosis).^[1] In addition, motionless GB sludge can sometimes mimic polypoid lesion. Precisely, distinguishing benign polypoid GB lesions from malignant ones can help delineate better operative options and avoid unnecessary liver resection.^[2,3] Contrast-enhanced ultrasound (CEUS) has been used to diagnose GB polypoid lesions for recent years because it can detect smaller (>40 μm) blood vessels better than color Doppler (>100 μm).^[4,5] In this case report, we demonstrate how we used CEUS to distinguish GB adenoma from GB carcinoma in an older female patient.

CASE REPORT

A 75-year-old female was admitted to our hospital presenting fever with chills that had started 2 days prior. Physician examination found deep tenderness of the right upper quadrant of abdomen, for which abdominal sonography was arranged to rule out cholecystitis. While there was no evidence of acute cholecystitis on abdominal sonography, we found a polypoid lesion (1.7 cm × 1.2 cm) in the gallbladder fundus. The lesion

had a cauliflower-like surface and was hyperechoic compared to the adjacent liver parenchyma. Color Doppler revealed a feeding artery in the stalk of the lesion, peak systolic velocity 15.2 cm/s, and resistive index 0.47 [Figure 1]. Our first impression was tumor growth. However, because grayscale and Doppler ultrasound cannot sufficiently differentiate benign lesions from malignant ones, we arranged for the patient to receive dynamic computed tomography (CT) study and CEUS. The dynamic CT study showed arterial enhancement and delayed phase washout of the GB lesion. This CT characteristic favors GB adenocarcinoma. On the contrary, on CEUS, the lesion showed early arterial phase enhancement (time to peak enhancement 18 s), with enhancement persisting throughout the venous and delay phases [Figure 2], which suggested that the lesion was more consistent with GB adenoma than adenocarcinoma. Cholecystectomy was performed, and the pathology of the tissue revealed tubular adenoma and chronic cholecystitis. The cause of the patient's fever was probably

Address for correspondence: Dr. Hong-Jen Chiou, Division of Ultrasound and Breast Imaging, Department of Radiology, Taipei Veterans General Hospital, No. 201, Section 2, Shipai Road, Beitou District, Taipei City 112, Taiwan.
E-mail: hjchiou@vghtpe.gov.tw

Received: 01-04-2018 Accepted: 07-06-2018 Available Online: 24-08-2018

Access this article online

Quick Response Code:



Website:
www.jmuonline.org

DOI:
10.4103/JMU.JMU_47_18

This is an open access journal, and articles are distributed under the terms of the Creative Commons Attribution-NonCommercial-ShareAlike 4.0 License, which allows others to remix, tweak, and build upon the work non-commercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.

For reprints contact: reprints@medknow.com

How to cite this article: Lin LY, Chiou HJ, Chou YH, Wang HK, Lai YC, Lin YH. A case of tubular adenoma of gallbladder diagnosed using contrast-enhanced ultrasonography. J Med Ultrasound 2018;26:218-21.

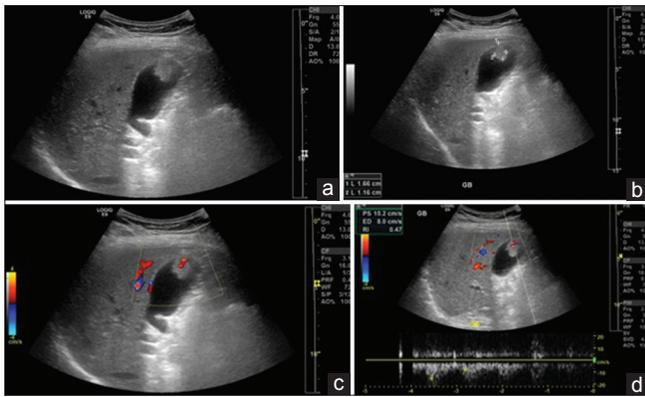


Figure 1: (a and b) A 1.7 cm × 1.2 cm polypoid lesion in gallbladder fundus. The lesion has cauliflower-like surface and is hyperechoic compared with adjacent liver parenchyma. (c and d) Color Doppler revealed a feeding artery in the stalk of the lesion with peak systolic velocity 15.2 cm/s and resistive index 0.47

due to urinary tract infection. The urine analysis revealed pyuria, but urine culture only revealed yeast-like organism, and there was no growth of organism in both two sets of blood culture. The patient was discharged after complete empirical intravenous antibiotic treatment for 2 weeks and 6 days postsurgery.

DISCUSSION

On grayscale ultrasound, GB adenomas, which are richly vascularized tumors, appear as sessile polypoid lesions and are isoechoic or hyperechoic compared with the liver.^[5,6] On CEUS, GB adenomas appear with arterial enhancement and synchronous washout contrast enhancement pattern and homogeneity at peak-time enhancement.^[7] It is challenging to differentiate GB adenomas from adenocarcinomas because early-stage adenocarcinoma may also present as a polypoid lesion with arterial enhancement.^[6] Two studies have compared GB adenocarcinomas and with other benign GB lesions.^[4,8] GB adenocarcinomas have been found more in older patients and males and larger in size and have a lower echogenicity on ultrasound (compared with liver), have wider stalks, longer time to peak enhancement (on CEUS), branch or liner intralesional vascularity (on CEUS), a heterogeneous enhancement pattern, and evidence of wall destruction.^[4,8] Of these characteristics, destruction of GB wall integrity is the best diagnostic indicator of malignancy.^[7,9] When using CEUS to study a polypoid GB lesion, if time to peak enhancement is >20 s, it is highly possible that it is GB adenocarcinoma (89% sensitivity and 84% specificity); however, if time to peak enhancement of the lesion is <20 s, it is more likely a GB adenoma or cholesterol polyp.^[8] Malignant lesions have been found to have a shorter washout time than benign lesions.^[10] According to one study,^[11] lesions with washout time longer than 35 s are presumed benign and those with washout times <35 s malignant. One retrospective study found an irregular shape, branched intralesional vessels, and hypoenhancement in the late phase to indicate malignancy in lesions.^[9] CEUS is generally a reliable, noninvasive, and

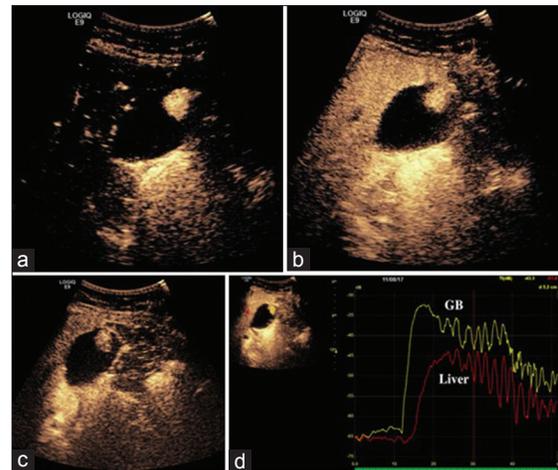


Figure 2: Contrast-enhanced ultrasound of the polypoid lesion: (a) 18 s, arterial phase; (b) 45 s, venous phase; and (c) 200 s, delay phase. (d) Enhancement intensity of gallbladder lesion and liver parenchyma over time. Notice the early arterial enhancement and persisting throughout the venous and delay phases. The time-to-peak enhancement was about 18 s

nonradiative imaging modality with high sensitivity and specificity for detection of GB carcinomas,^[12] which appear as “slowly” arterial enhancement and early washout. Knowledge of these characteristics is important because our ability to distinguish GB adenomas and adenocarcinomas allows to arrange for the most suitable surgical strategy and helps us avoid unnecessary resection of liver.

In the case presented here, on CEUS, the lesion showed early arterial enhancement with a time to peak enhancement of 18 s, which was <20 s, and enhancement persisting throughout the venous and delay phases. This enhancement pattern indicates that the patient’s lesion was a GB adenoma, not GB cancer. CEUS can also help differentiate other polypoid-like GB lesions such as cholesterol polyps and motionless sludge or GB wall thickening such as that found in adenomyomatosis. Cholesterol polyps are usually found in multiples, between 2 and 5 mm in size, and in contact with the GB wall.^[5,6] On CEUS, arterial enhancement is noted in up to 93% of the lesions, and in late phase, hypoenhancement or iso-enhancement can be seen.^[2,5,6,13] Differentiating GB adenomas from cholesterol polyps could be difficult. While GB polyps are more heterogeneous at peak-time enhancement than adenomas,^[1,7] some researchers have found no significant difference in enhancement pattern between the two; instead, cholesterol polyps tend to have lower enhancement intensity and narrower stalks.^[3] Adenomyomatosis may present as focal, segmental, or diffuse.^[14] On grayscale ultrasound, it presents as focal or diffuse GB wall thickening with small anechoic cystic spaces, intramural echogenic spots, or “comet tail” artifacts, depending on the content filling the Rokitansky–Aschoff sinuses (RAS).^[5,6,14,15] Without the typical presentations above, it would be difficult to distinguish a thickening wall associated with adenomyomatosis from GB carcinoma. On CEUS, adenomyomatosis is seen as a “moth-eaten” enhancement pattern in the arterial phase; a pattern results

Table 1: Summary of polypoid gallbladder lesions

	Grayscale	Doppler	CEUS
Adenomas	Solitary, usually 5-20 mm Isoechoic or hyperechoic No GB wall destruction	Intra-lesional vascularity	Arterial enhancement (shorter time-to-peak enhancement) Homogenous enhancement Enhance persistent to venous and delay phases
Adenocarcinoma	Solitary, usually > 1cm Hypoechoic GB wall destruction Wider stalks	Intra-lesional vascularity	Arterial enhancement (longer time-to-peak enhancement) Heterogeneous enhancement Washout in venous and delay phases
Cholesterol polyp	Multiples, usually 2-5mm Narrower stalks	Intra-lesional vascularity	Arterial enhancement Variable echogenicity in later phases
Focal adenomyomatosis	Usually in fundus, usually 10-20mm "Comet tail" artifacts ± Small anechoic cystic spaces ± Intra-mural echogenic spots	No significant vascularity "Twinkling" artifacts	"Moth-eaten" pattern in arterial phase
Motionless sludge balls	Variable echogenicity, ± punctate hyperechoic foci No posterior acoustic shadowing	No significant vascularity "Twinkling" artifacts	No enhancement

from nonenhancement of the RAS zone contrasted by normally enhanced healthy wall.^[5,6,8,13,14] The use of CEUS can improve visualization of RAS and intact GB wall.^[13] Dense motionless sludge balls can mimic neoplastic lesions. Color Doppler shows no blood flow on sludge. However, a Doppler signal might be detected in sludge due to motion artifact, and its signal might not be seen in neoplastic lesions due to slow perfusion.^[5] CEUS has higher sensitivity than color Doppler for detecting blood flow, which makes it more useful for differentiating a nonenhancing sludge ball from enhancing neoplasm. On CEUS, no enhancement is observed at any time during visualization because there is no vascularization in sludge.^[2] Therefore, CEUS has a sensitivity of almost 100% when differentiating motionless sludge from GB carcinomas.^[6] The summary of polypoid GB lesions is shown in Table 1.

Limitations of current studies of the use of CEUS in detecting GB carcinoma are a small number of patients with GB cancer, and there is a shortage of enhancement intensity data. More studies with a larger population are needed for evaluating the rule of CEUS in differential GB polypoid lesions.

In recent guideline,^[16] management of GB polyp is based on its size for GB polyp >1 cm having increased risk of malignancy and cholecystectomy should be considered. GB polyps can be categorized into cholesterol polyps, adenomas, and adenocarcinomas. Cholesterol polyps are usually <1 cm and only needs regular follow-up. For GB polyps >1 cm, CEUS can be used to differentiate GB adenomas from adenocarcinomas. While GB adenomas are recognized by early enhancement at arterial phase persisting throughout the venous and delay phases, adenocarcinomas are recognized by early enhancement in the arterial phase and early washout in the venous phase. Although CEUS has not been recommended by European Federation of Societies for Ultrasound in Medicine and Biology guidelines

for the routine differentiation of benign from malignant GB polyps,^[17] we believe that it can play an important role in precisely differentiating GB polypoid lesions. We have found that CEUS helps us diagnose polypoid GB lesions with more confidence, decide on suitable operative strategies for the patients.

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.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

REFERENCES

1. Park CH, Chung MJ, Oh TG, Park JY, Bang S, Park SW, *et al.* Differential diagnosis between gallbladder adenomas and cholesterol polyps on contrast-enhanced harmonic endoscopic ultrasonography. *Surg Endosc* 2013;27:1414-21.
2. Gerstenmaier JF, Hoang KN, Gibson RN. Contrast-enhanced ultrasound in gallbladder disease: A pictorial review. *Abdom Radiol (NY)* 2016;41:1640-52.
3. Fei X, Lu WP, Luo YK, Xu JH, Li YM, Shi HY, *et al.* Contrast-enhanced ultrasound may distinguish gallbladder adenoma from cholesterol polyps: A prospective case-control study. *Abdom Imaging* 2015;40:2355-63.
4. Zheng SG, Xu HX, Liu LN, Lu MD, Xie XY, Wang WP, *et al.* Contrast-enhanced ultrasound versus conventional ultrasound in the diagnosis of polypoid lesion of gallbladder: A multi-center study of dynamic microvascularization. *Clin Hemorheol Microcirc* 2013;55:359-74.
5. Cokinos DD, Antypa EG, Tsolaki S, Skylakaki M, Skoura A, Mellou V,

- et al.* Contrast-enhanced ultrasound examination of the gallbladder and bile ducts: A pictorial essay. *J Clin Ultrasound* 2018;46:48-61.
6. Sparchez Z, Radu P. Role of CEUS in the diagnosis of gallbladder disease. *Med Ultrason* 2012;14:326-30.
 7. Yuan HX, Cao JY, Kong WT, Xia HS, Wang X, Wang WP, *et al.* Contrast-enhanced ultrasound in diagnosis of gallbladder adenoma. *Hepatobiliary Pancreat Dis Int* 2015;14:201-7.
 8. Sun LP, Guo LH, Xu HX, Liu LN, Xu JM, Zhang YF, *et al.* Value of contrast-enhanced ultrasound in the differential diagnosis between gallbladder adenoma and gallbladder adenoma canceration. *Int J Clin Exp Med* 2015;8:1115-21.
 9. Zhuang B, Li W, Wang W, Lin M, Xu M, Xie X, *et al.* Contrast-enhanced ultrasonography improves the diagnostic specificity for gallbladder-confined focal tumors. *Abdom Radiol (NY)* 2018;43:1134-42.
 10. Liu LN, Xu HX, Lu MD, Xie XY, Wang WP, Hu B, *et al.* Contrast-enhanced ultrasound in the diagnosis of gallbladder diseases: A multi-center experience. *PLoS One* 2012;7:e48371.
 11. Xie XH, Xu HX, Xie XY, Lu MD, Kuang M, Xu ZF, *et al.* Differential diagnosis between benign and malignant gallbladder diseases with real-time contrast-enhanced ultrasound. *Eur Radiol* 2010;20:239-48.
 12. Wang W, Fei Y, Wang F. Meta-analysis of contrast-enhanced ultrasonography for the detection of gallbladder carcinoma. *Med Ultrason* 2016;18:281-28.
 13. Tang S, Huang L, Wang Y, Wang Y. Contrast-enhanced ultrasonography diagnosis of fundal localized type of gallbladder adenomyomatosis. *BMC Gastroenterol* 2015;15:99.
 14. Bonatti M, Vezzali N, Lombardo F, Ferro F, Zamboni G, Tauber M, *et al.* Gallbladder adenomyomatosis: Imaging findings, tricks and pitfalls. *Insights Imaging* 2017;8:243-53.
 15. Meacock LM, Sellars ME, Sidhu PS. Evaluation of gallbladder and biliary duct disease using microbubble contrast-enhanced ultrasound. *Br J Radiol* 2010;83:615-27.
 16. Piscaglia F, Nolsøe C, Dietrich CF, Cosgrove DO, Gilja OH, BachmannNielsen M, *et al.* The EFSUMB guidelines and recommendations on the clinical practice of contrast enhanced ultrasound (CEUS): Update 2011 on non-hepatic applications. *Ultraschall Med* 2012;33:33-59.
 17. Wiles R, Thoeni RF, Barbu ST, Vashist YK, Rafaelsen SR, Dewhurst C, *et al.* Management and follow-up of gallbladder polyps: Joint guidelines between the European Society of Gastrointestinal and Abdominal Radiology (ESGAR), European Association for Endoscopic Surgery and other Interventional Techniques (EAES), International Society of Digestive Surgery-European Federation (EFISDS) and European Society of Gastrointestinal Endoscopy (ESGE). *Eur Radiol* 2017;27:3856-66.