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The Incidence of Calculi in Focal Nonshadowing Echogenicity in the Gallbladder

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Sonography is valuable in the accurate diagnosis of gallstones. All but the smallest stones attenuate sound, a phenomenon known as acoustic shadowing. However, when small focal nonshadowing opacities are present, the diagnostic question is whether they represent small calculi. In a four-year review of sonographic studies performed at Henry

Sonography is of great value in assessing gallbladder abnormalities (1-3), and its accuracy for detecting gallstones exceeds 90% (1,4). These features, the ease of performing the procedure, the lack of required patient preparation, and the ability to assess other organs in the upper abdomen, have led to the use of sonography instead of oral cholecystography in most radiology departments in North America.

Focal opacities that demonstrate posterior acoustic shadowing within a fluid-filled gallbladder lumen are almost always gallstones (1,4). However, in a few cases small focal echoes of medium to high intensity are present and do not demonstrate acoustic shadowing. The diagnostic question is whether these echoes represent small stones or other lesions. Since this problem has received little attention in the imaging literature, we undertook a retrospective study of all sonographic examinations of the abdomen performed at Henry Ford Hospital between 1980 and 1984, and we reviewed the medical records of patients who had these findings to determine the incidence of calculi when small focal nonshadowing echoes occurred.

Materials and Methods

We reviewed all reports of sonographic studies of the abdomen performed between January 1980 and October 1984 and found 175 cases of focal opacities without acoustic shadowing present in the gallbladder. Of 175 patients, 15 underwent cholecystectomies. Twelve of these patients formed the basis of this report, since the sonographic studies could not be located for the remaining three patients. The patients ranged in age from 30 to 81 years (average: 52); six were men, and six were women. Nine of the 12 patients underwent surgery within two weeks of the final sonographic study; in the remaining three, the intervals were three weeks, six weeks, and 11 weeks.

We reviewed findings of the sonographic examinations of all patients. Indications for the sonographic study were right

Ford Hospital, 12 patients in whom this sonographic finding was present underwent cholecystectomies, and seven had calculi (58%). If the presence of gallstones is the factor that will determine whether surgery will be performed, we recommend a repeat examination to confirm the presence of the focal opacities and to elicit acoustic shadowing.

upper quadrant, epigastric, or lower abdominal pain. Static and/or real-time images were obtained of the gallbladder in the supine position in sagittal and transverse planes with commercially available equipment. Studies were performed in most patients in the decubitus position. Scans were reviewed for the presence of focal nonshadowing echoes and any other gallbladder pathology.

Results

In all 12 patients (Table) echoes ranging from medium to high intensity could be identified with no acoustic shadowing within a fluid-filled gallbladder. The number of echoes ranged from numerous to a solitary focus.

Five patients (Cases 1-5) had numerous echoes within the gallbladder (Fig 1). Three had many small gallbladder stones; another had small stones in the cystic duct that presumably had passed from the gallbladder in the interval between the sonographic study and surgery. In one patient (Case 5), debris was found presumably due to the patient's gallbladder carcinoma, which was diagnosed sonographically. One patient (Case 6) had two focal 5-mm echoes, and small gallstones were found at surgery.

A solitary echogenic focus that ranged in size from 3 mm to 8 mm was seen within the gallbladders of five patients

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Case Number	Ultrasound Findings
1	Nu 2-5
2	Nu 2 r
3	Nu 3-4
4	Fo 3-4
5	A bla ca
6	Tw ec
7	So
8	Sc
9	Sc
10	Sc
11	Sc n la
12	S h

RUQ = ri
ERCP = e
CBD = cc
HIDA = f

Table
Twelve Cases of Sonography for Gallstones
with Nonshadowing Focal Opacities

Case Number	Ultrasonic Gallbladder Findings	Operative Findings	Indications for Surgery
1	Numerous echoes 2-5 mm	Numerous small stones, chronic cholecystitis	RUQ pain, ERCP showed CBD stones
2	Numerous echoes 2 mm	Acute/chronic cholecystitis, stones in cystic duct	(+) HIDA scan RUQ pain
3	Numerous echoes 3-4 mm	Chronic cholecystitis sludge and small stones	RUQ pain, fever, chills
4	Four focal echoes 3-4 mm	Multiple small stones	Seven months RUQ pain, oral cholecystogram showed stones
5	A 3.2-cm mass in gallbladder, numerous focal echoes 2-3 mm	Gallbladder carcinoma, debris	Sonographic findings of mass
6	Two focal dense 5-mm echoes	Small stones, mild chronic cholecystitis	RUQ pain, abnormal oral cholecystogram
7	Solitary 6-mm echo	Stone in gallbladder, stone in cystic duct, edematous, inflamed gallbladder	Fever, leukocytosis peritoneal signs
8	Solitary 8-mm echo	Adherent stone to gallbladder wall, small stones in cystic duct	(+) HIDA, epigastric pain
9	Solitary 4-mm echo	Impacted stone in gallbladder neck, chronic cholecystitis	RUQ pain, oral cholecystogram, non-visualization
10	Solitary 4-mm echo	Diffuse cholesterosis, no stones	Recurrent colicky pain RUQ, fatty food intolerance
11	Solitary 3-mm echo; not present one week later	Thickened chronically inflamed gallbladder, no stones	Recurrent epigastric pain, oral cholecystogram, non-visualization
12	Sludge with scattered high-intensity echoes	Chronic cholecystitis, no stones	Constant RUQ pain exacerbated with food intake, gastric outlet obstruction

RUQ = right upper quadrant
ERCP = endoscopic retrograde cholangiopancreatography
CBD = common bile duct
HIDA = hepatic amino di acidic nuclear biliary scan

(Cases 7-11) (Fig 2). At surgery, three patients had solitary gallstones, and two had additional stones in the cystic duct. One patient (Case 10) had diffuse cholesterosis at surgery but no definite stones. It is uncertain what the 4-mm dense echo represented; possibilities include localized wall thickening or a small cholesterol polyp. In one patient (Case 11), repeated sonography performed a week later failed to identify the 3-mm dense echoes originally seen. However, since the patient had a history of recurrent colicky abdominal pain and a nonvisualized oral cholecystogram, cholecystectomy was performed. Although severe chronic cholecystitis was found, no stones were present. The 3-mm dense echo probably represented either a small stone that passed or an artifact.

One patient (Case 12) had sludge within the gallbladder. However, unlike the relatively homogeneous appearance of sludge, typically associated with low-level echoes, high-intensity echoes were present (Fig 3). Although chronic cholecystitis was found at surgery, no stones were seen. Exploratory surgery was performed because of gastric outlet obstruction and recurrent right upper quadrant pain.

Discussion

Sonography is extremely accurate in the diagnosis of cholelithiasis. The presence of focal dense echoes with posterior acoustic shadowing is virtually diagnostic of gallstones (1). While the appearance of an echogenic mass in the expected area of the gallbladder fossa without visualization of the gallbladder lumen is also quite suggestive of gallstones (1,5), other entities such as bowel gas, metallic clips from previous surgery, and air in the biliary system can imitate this appearance. Small opacities without acoustic shadowing create a greater dilemma, since they may not be due to calculi.

Several reports have demonstrated that all gallstones greater than 3 mm will cast an acoustic shadow indicating total sound attenuation regardless of the calcium content, shape, surface characteristics, or specific gravity of the stone (6,7). However, this assumes optimal technical factors. The highest possible transducer frequency must be used so that a narrow point of maximum focus will interact with the calculus, and the stones have to be in the focal zone of the transducer. High-gain settings may hide the shadowing, while low-gain settings will accentuate it. If the sound beam of the transducer strikes the calculus at its periphery, no acoustic shadow will be seen (7). This situation can occur in noncomplying patients who are unable to hold their breath, or if a rib obstructs this area. These factors may explain why some focal dense echoes that were calculi in this series were greater than 3 mm, although no acoustic shadowing could be elicited.

While small stones may appear as focal echoes without acoustic shadowing, other less common entities have been described with a similar appearance. These include tumefactive biliary sludge (8), desquamated gallbladder mucosa and fibrinous debris (9), hemobilia (10), and cholesterol polyposis (11). However, tumefactive biliary sludge is masslike, and

an appropriate history of prolonged fasting can usually be obtained. It will also disappear once the patient resumes eating. Desquamated gallbladder mucosa may appear as independent nonshadowing linear echoes (9,12), but it is present in patients who have acute gangrenous cholecystitis; this finding is usually evident by clinical and sonographic evaluation. In patients who have hemobilia, blood clots may be present within the gallbladder, although a cause of bleeding, such as liver biopsy or trauma, should be evident. Polypoid cholesterosis is less common than the diffuse form, and

the cholesterol polyps tend to be multiple (13). However, small cholesterol polyps cannot be distinguished from small adherent calculi or adenomatous polyps.

Gallbladder sludge, which is thick or inspissated bile present when the gallbladder is not emptying, occurs in patients who have extrahepatic biliary dilatation, intrinsic gallbladder disorders, or have experienced prolonged fasting (8). It appears as a relatively homogeneous layer of low-level echoes (11). Purulent bile or cholesterol crystals may have

Fig 1
Transverse scan of gallbladder (arrows) showing numerous small high-intensity opacities without acoustic shadowing. Reverberation artifact is present anteriorly.

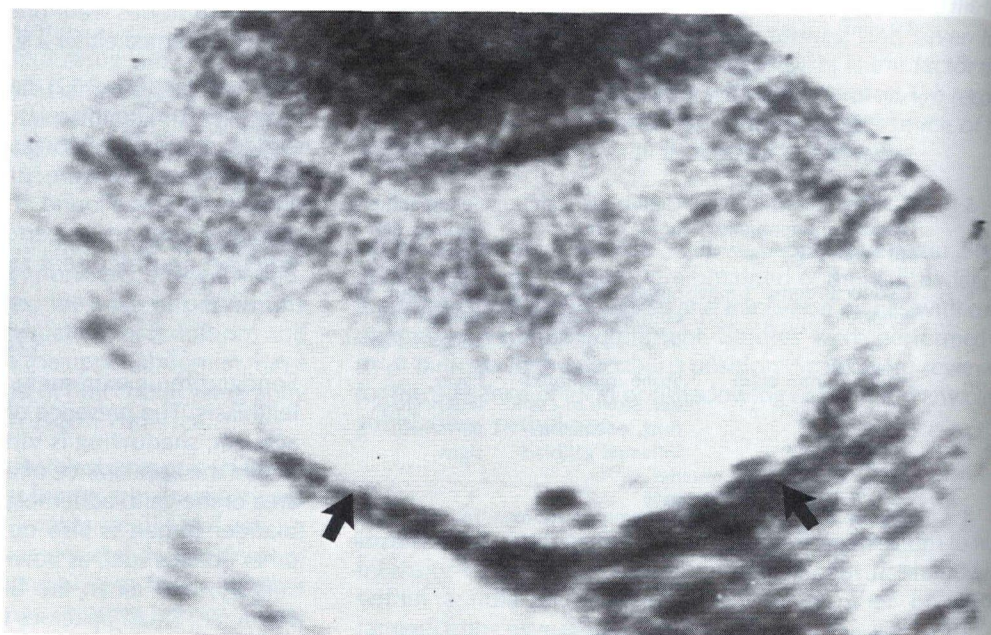


Fig 2
Longitudinal scan of gallbladder (arrows) showing solitary non-shadowing echogenic focus.



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3. Raghavend... AJ, Hilton... Radiologic-
4. Cooperberg... high resolu... 1979;131:7
5. Simeone JF... nificance of... diology 19

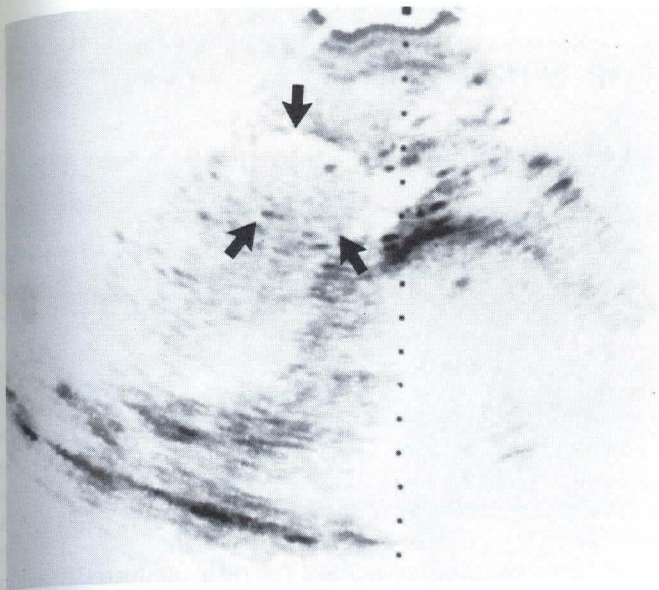


Fig 3

Transverse scan of gallbladder (arrows) showing numerous low-level echoes representing sludge with several high-intensity echoes.

a similar appearance (11). In one patient (Case 12), high-intensity echoes present within the sludge suggested the possibility of calculi. Repeat sonography performed after eating has resumed should determine whether the high-intensity echoes represent small stones since sludge will be absent with gallbladder emptying.

Simeone et al (5) reviewed 55 patients who had 3-mm to 5-mm focal opacities without acoustic shadowing in the gall-

bladder (6). Of these, 21 patients underwent surgery, and gallstones were found in 17 (81%). In three of four patients who did not have gallstones, there was no apparent explanation for the densities. Crade et al (1) reviewed 18 patients who had nonshadowing opacities but did not distinguish between focal lesions and sludge, as was done in our series and by Simeone et al (5). Eleven patients (61%) in Crade's series had gallstones at surgery. In our series, seven of 12 (58%) patients had cholelithiasis; however, if the case of sludge that resulted in high-intensity level focal echoes is eliminated, the figure rises to 64%.

Our work, like that of Simeone et al (5) and Crade et al (1), indicates that most patients who have small focal nonshadowing echoes within the gallbladder lumen will have gallstones. Although the remaining five patients in our series had indications for surgery regardless of the sonographic findings, this may not always be the case. If the presence of gallstones is the factor for determining whether surgery will be performed, we recommend that patients who have focal nonshadowing opacities undergo a repeat examination to confirm the presence of these opacities and that another attempt be made to elicit acoustic shadowing. Although sludge has been described as having low-level echoes (11), occasionally high-level echoes may be seen and not be significant. Therefore, if assessment for calculi is necessary, repeat examination is essential after the patient begins eating.

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References

1. Crade M, Taylor KJW, Rosenfield AT, de Graaff CS, Minihan P. Surgical and pathologic correlation of cholecystosonography and cholecystography. *AJR* 1978;131:227-9.
2. Weiner SN, Koenigsberg M, Morehouse H, Hoffman J. Sonography and computed tomography in the diagnosis of carcinoma of the gallbladder. *AJR* 1984;142:735-9.
3. Raghavendra RN, Subramanyam BR, Balthazar EJ, Horli AJ, Megibow AJ, Hilton S. Sonography of adenomyomatosis of the gallbladder: Radiologic-pathologic correlation. *Radiology* 1983;146:747-52.
4. Cooperberg PL, Pon MS, Wong P, Stoller JL, Burhenne HJ. Real-time high resolution ultrasound in the detection of biliary calculi. *Radiology* 1979;131:789-90.
5. Simeone JF, Mueller PR, Ferrucci JT Jr, Horbin WP, Wittenberg J. Significance of nonshadowing focal opacities at cholecystosonography. *Radiology* 1980;137:181-5.
6. Carroll BA. Gallstones: In vitro comparison of physical, radiographic, and ultrasonic characteristics. *AJR* 1978;131:223-6.
7. Filly RA, Moss AA, Way LW. In vitro investigation of gallstones shadowing with ultrasound tomography. *J Clin Ultrasound* 1979;7:255-62.
8. Fakhry J. Sonography of tumefactive biliary sludge. *AJR* 1982;139:717-9.
9. Wales LR. Desquamated gallbladder mucosa: Unusual sign of cholecystitis. *AJR* 1982;139:810-1.
10. Grant EG, Smirniotopoulos JG. Intraluminal gallbladder hematoma: Sonographic evidence of hemobilia. *J Clin Ultrasound* 1983;11:507-9.
11. Conrad MR, Janes JO, Dietchy J. Significance of low level echoes within the gallbladder. *AJR* 1979;132:967-72.
12. Jeffrey RB, Laing FC, Wong W, Callen PW. Gangrenous cholecystitis: Diagnosis by ultrasound. *Radiology* 1983;148:219-21.
13. Price RJ, Stewart ET, Foley WD, Dodds WJ. Sonography of polypoid cholesterosis. *AJR* 1982;139:1197-8.