

## The significance of the wall echo shadow triad on ultrasonography: a case series

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### Abstract

**Background** The wall echo shadow (WES) triad, also known as the double-arc-shadow sign consists of a well-defined near wall, echos from stones immediately beneath the wall, and posterior shadowing caused by strong echoes from stones in the gallbladder fossa. It has been used for over 20 years as a nonspecific finding suggestive of a gallbladder lumen filled with either multiple stones or one large stone (Miller et al. *J Emerg Med* 30(1):69–74, 2006; Blaivas et al. *Acad Emerg Med* 10(6):1020–1023, 1999; Raptopoulos et al. *AJR Am J Roentgenol* 138(2):275–278, 1982). In the past, the WES triad has been correlated with underlying chronic cholecystitis. However, there are no studies that compare clinical findings to a gold standard such as surgical pathology.

**Case reports** Three cases of the WES triad were reviewed at New York Medical Hospital of Queens over a 16-month period.

**Keywords** WES · Wall-echo-shadow · Emergency ultrasound · Cholelithiasis · Cholecystitis · Gallstones

### Case reports

#### Case 1

A 79-year-old female presented to the Emergency Department (ED) with right upper quadrant (RUQ) abdominal pain radiating to the right flank for 2 weeks. Symptoms were associated with subjective fevers and anorexia. The patient denied nausea or vomiting. Her past medical history was significant for hypertension, hyperlipidemia and hypothyroidism. Vital signs were normal. Laboratory tests including white blood cell count, total bilirubin and liver function tests were all normal. A RUQ ultrasound was remarkable for echogenic shadowing seen from the level of the gallbladder fossa representing a gallbladder filled with stones (Fig. 1). No sonographic Murphy's sign was elicited. There was no gallbladder wall thickening. The patient had resolution of her abdominal pain and was discharged with outpatient surgical follow-up. 19 days later, an elective laparoscopic cholecystectomy was performed. The pathology report was consistent with a diagnosis of acute and chronic cholecystitis.

#### Case 2

A 29-year-old male presented to the Emergency Department with RUQ pain associated with nausea and vomiting. The patient had no significant past medical history. The vital signs were normal. The physical exam was significant only for RUQ tenderness. The patient was discharged from the Emergency Department diagnosed with cholelithiasis after evaluation with normal laboratory results, normal computed tomography (CT) scan of the abdomen and an ultrasound that demonstrated the WES triad. The patient returned to the Emergency Department 1 month later with

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**Fig. 1** Transabdominal right upper quadrant ultrasound of the patient in Case 1 showing the wall echo shadow triad. All three cases had similar ultrasound findings

similar symptoms and was discharged after a similar work-up. The repeat ultrasound revealed the WES triad and was again interpreted as cholelithiasis. The patient returned to the Emergency Department 3 days later with worsening right upper quadrant pain and nausea. Laboratory results were noncontributory. In light of the multiple visits, the patient was admitted to the surgical team. The patient had an uneventful surgery, and pathology results reported a diagnosis of acute and chronic cholecystitis.

### Case 3

A 77-year-old male visited our Emergency Department with 3 days of nausea and vomiting with abdominal fullness. The patient's medical history was significant for hypertension, hypercholesterolemia and hypothyroidism. Initial vital signs were significant for tachycardia of 112 beats/min. The physical examination was noncontributory. Laboratory results were significant for elevated white blood cell count of 20.1 K/ $\mu$ L (normal range, 4.8–10.8 K/ $\mu$ L). Ultrasound showed the WES triad. At admission, CT scan of the abdomen revealed a small bowel obstruction due to a 2.2 cm calcification in the terminal ileum, consistent with a gallstone ileus. The overall CT pattern was suspicious for a gallbladder that formed a fistula into the adjacent bowel, likely the proximal duodenum, thus leading to a gallstone ileus. The patient was admitted to the surgical service. During his operation, it was confirmed that the patient had a cholecystoduodenal fistula.

The surgical pathology of the gallbladder reported chronic cholecystitis.

### Discussion

The WES triad has been recognized as an important ultrasound finding, because it allows one to confidently diagnose cholelithiasis [4–6]. However, the non-visualization of the gallbladder accompanied by posterior acoustic shadowing makes the diagnosis of cholecystitis difficult. The WES sign is diagnostic of cholelithiasis, but it is also suggestive of acute or chronic cholecystitis as confirmed by surgical pathology.

All three cases were managed surgically with the final pathology diagnosis of cholecystitis. The patient in Case 2 had multiple emergency department visits due to recurrent symptoms. The patient in Case 3 developed a cholecystoduodenal fistula, a possible complication of the WES triad if left untreated. To date there are no studies correlating the WES triad on ultrasound to patient outcomes or pathology reports.

We conclude that this rare finding of the WES triad represents cholelithiasis with underlying acute or chronic cholecystitis as described by these case studies. Physicians should be aware of possible complications in patients with the WES triad secondary to subclinical cholecystitis. Further prospective studies are warranted.

**Conflict of interest** None.

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