

AMSER Case of the Month

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8-year-old female with fatigue, abdominal pain, and jaundice

Saahil Sanon, M4

Gregory Vorona MD, Eman Sabah Mahdi MD, Chakradhar Mishra MBBS
MD, Kathryn Starkweather Jones MD, and Jacqueline Urbine MD

The Children's Hospital of Richmond

Virginia Commonwealth University School of Medicine

Pediatric Radiology



Patient Presentation

- **HPI:** 8-year-old female presenting to the pediatric ED with 1 week history of increasing fatigue and intermittent abdominal pain and 2 days of jaundice. Denies nausea/vomiting, recent illness or travel.
- **Past Medical/Surgical History:** Prior tympanostomy tubes, otherwise none.
- **Developmental History:** Normal development.
- **Health Maintenance:** Up to date on routine vaccinations.
- **Physical Exam:** Afebrile, tired appearance, icteric sclera, normal S1/S2, lungs clear to auscultation bilaterally, abdomen soft and nontender without palpable HSM, no peripheral edema, dark urine.

Pertinent Labs

- **Hepatic Panel**

- AST - 2410 (H)
- ALT - 2294 (H)
- Alk Phos - 290
- Total Bili - 7.9 (H)
- Direct Bili - 4.5 (H)

- **Coagulation Studies**

- Prothrombin Time - 15.7 (H)

- **Additional Hepatic Testing**

- Gamma Glutamyl Transferase - 150 (H)

What Imaging Should We Order?

Select the applicable ACR Appropriateness Criteria

Variant 1: Jaundice. No known predisposing conditions. Initial imaging.

Procedure	Appropriateness Category	Relative Radiation Level
US abdomen	Usually Appropriate	0
CT abdomen with IV contrast	Usually Appropriate	⊕⊕⊕
MRI abdomen without and with IV contrast with MRCP	Usually Appropriate	0
MRI abdomen without IV contrast with MRCP	May Be Appropriate	0
CT abdomen without and with IV contrast	Usually Not Appropriate	⊕⊕⊕⊕
CT abdomen without IV contrast	Usually Not Appropriate	⊕⊕⊕
ERCP	Usually Not Appropriate	⊕⊕⊕
US abdomen endoscopic	Usually Not Appropriate	0

This imaging modality was ordered by the ER physician



Findings (unlabeled)

Ped Abd
C9-2
40Hz
RS

2D
57%
Dyn R 55
P Low
HRes



TIS0.3 MI 1.3



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Ped Abd
C9-2
27Hz
RS

2D
68%
Dyn R 55
P Low
HRes



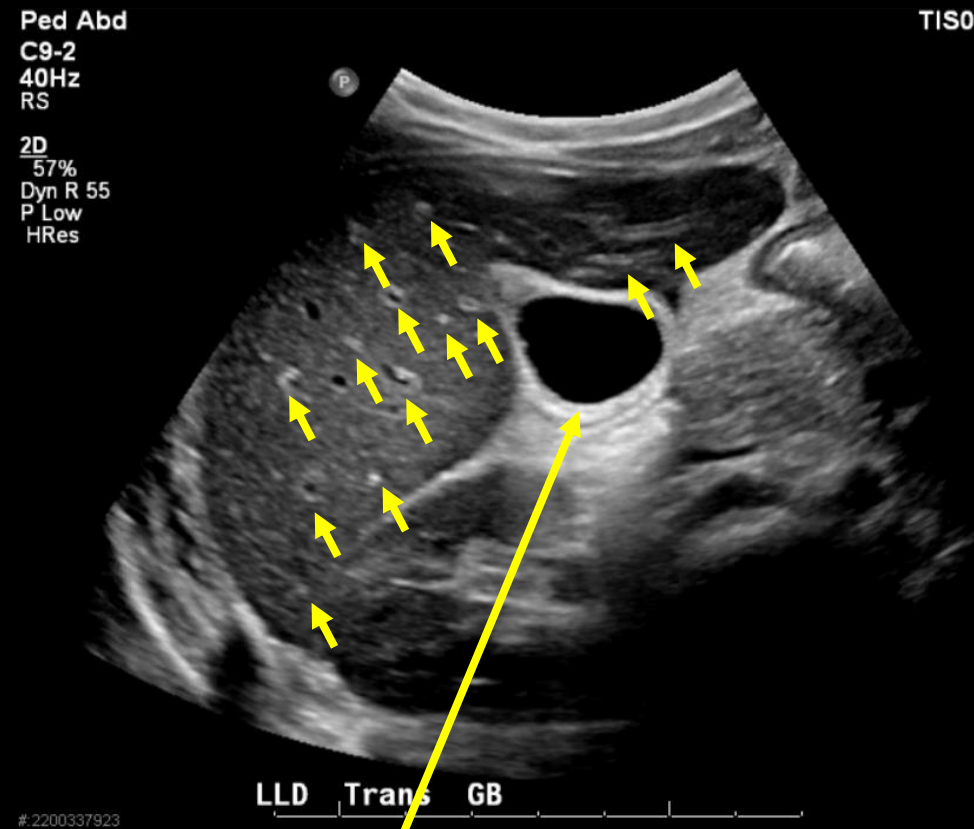
TIS0.4 MI 1.3



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↑ Centrilobular hyperechogenicity/periportal edema with decreased parenchymal echogenicity (classic “starry sky” appearance)

Findings (labeled)



Mild gallbladder wall thickening (~3mm) without evidence of gallstones



Hepatomegaly (upper limit of normal = 12.8cm for patient's age)

Findings (unlabeled)

Ped Abd
C9-2
40Hz
RS

2D
60%
Dyn R 55
P Low
HRes



Trans Right GB
Patient

TIS0.3 MI 1.3 Ped Abd
C9-2
43Hz
RS

2D
61%
Dyn R 55
P Low
HRes



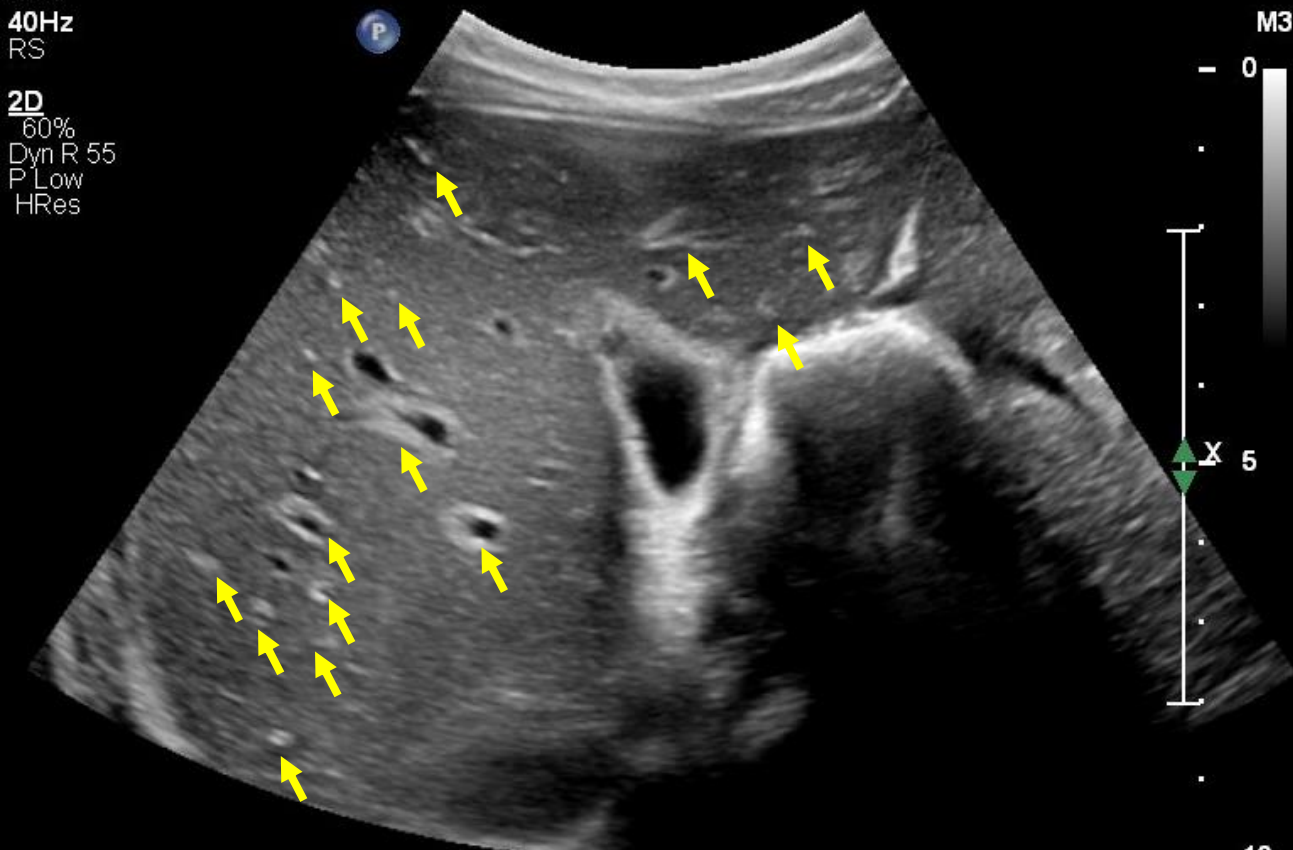
Trans Liver Right HV's
Normal study done in an 8 year old boy for screening due to chronic Hep B infection

Findings (labeled)

Ped Abd
C9-2
40Hz
RS
2D
60%
Dyn R 55
P Low
HRes

TIS0.3 MI 1.3
M3
Ped Abd
C9-2
43Hz
RS
2D
61%
Dyn R 55
P Low
HRes

TIS0.3 MI 1.3



Trans Right GB

Trans Liver Right HV's

Patient

Normal study done in an 8 year old boy for screening due to chronic Hep B infection

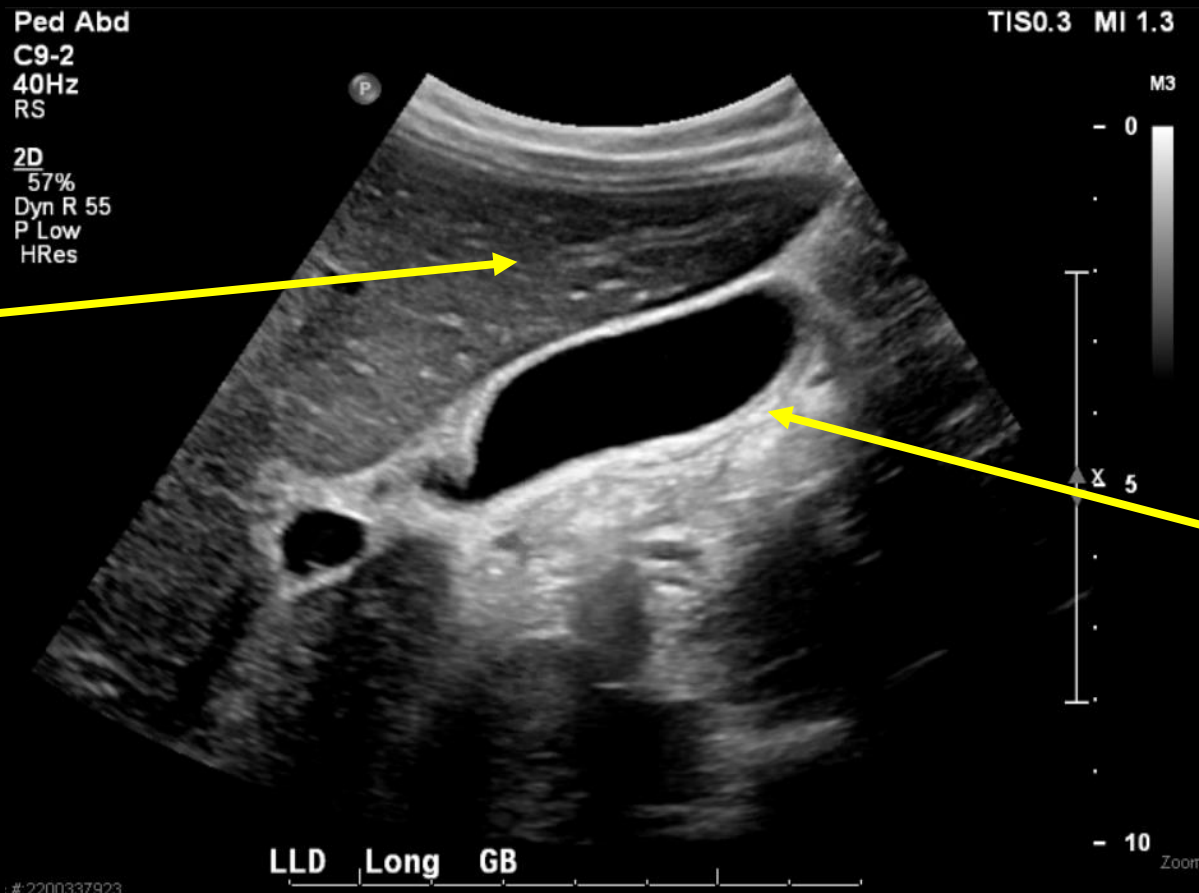
↑ Centrilobular hyperechogenicity/periportal edema with decreased parenchymal echogenicity (classic "starry sky" appearance).



Findings (unlabeled)



Findings (labeled)



Centrilobular hyperechogenicity/periportal edema of the liver on longitudinal gallbladder view

Borderline thickened gallbladder wall (~3mm) without visualized gallstones or sludge

Final Dx:

Acute hepatitis due to hepatocellular injury

Case Discussion

- **Pathology:**

- Inflammation of the liver due to injury of hepatocytes – serum AST and ALT markedly elevated due to release from damaged hepatocytes.
- Alkaline phosphatase would also be elevated in acute hepatitis, if due to cholestasis (i.e. extrahepatic or intrahepatic obstruction).

- **Differential Diagnosis:**

- Viral infection, autoimmune etiology, toxic ingestion (i.e. acetaminophen toxicity), hepatic congestion due to poor hepatic venous outflow (i.e. Budd-Chiari Syndrome).

- **Clinical Features:**

- Jaundice is evident due to systemic build-up of bilirubin.
- +/- abdominal pain, nausea, vomiting.
- Hepatic encephalopathy at presentation is indicative of acute liver failure.

Case Discussion

- **Ultrasonographic Findings:**

- Decreased echogenicity of the liver parenchyma occurs due to hepatic edema (“sky”).
- Relative accentuation in echogenicity of the fibrous walls of the portal veins (“stars”).
 - NOTE: Though the “starry-sky” sonographic appearance initially described by Kurtz, et al. (1980) is a classic finding of acute hepatitis, multiple studies have indicated poor sensitivity and specificity of this finding.
- Hepatomegaly is most common sonographic finding, and typically measured as liver height >15.5cm at the midclavicular line in adults (reduced cutoff criteria in pediatric patients depending on age, see Konus, et al. [1990]).
- Mild gallbladder wall thickening ($\geq 3\text{mm}$) without evidence of gallstones or dilatation is often appreciated.

Case Discussion

- **Further Workup:**

- Toxicology panel/acetaminophen levels
- Viral hepatitis serologies (Hep A IgM, HBsAg, anti-HBc, anti-HCV)
- Autoimmune markers (ANA, anti-dsDNA, anti-smooth muscle antibodies, anti-liver/kidney microsomal antibodies, IgG 1/2/3/4)
- Budd-Chiari syndrome - thrombus can be appreciated in the hepatic veins on U/S

- **Treatment is etiology specific:**

- Acetaminophen toxicity - N-acetylcysteine
- Viral hepatitis - disease-specific antiviral therapy
- Autoimmune hepatitis - glucocorticoids
- Budd-Chiari syndrome - TIPS, surgical decompression, or thrombolysis

Patient Follow-up

- This patient had an elevated IgG1 level of 1482 and an elevated anti-smooth muscle antibody titer of 1:80, suggestive of an autoimmune etiology.
- Patient improved clinically with only supportive care, so glucocorticoids were not provided.
- Patient was discharged after LFTs showed consistent downtrend and abdominal pain had resolved, with close GI follow-up scheduled.

References:

- American College of Radiology. ACR Appropriateness Criteria. Available at <https://acsearch.acr.org/list> . Accessed May 24, 2022.
- Giorgio A, et al. Ultrasound evaluation of uncomplicated and complicated acute viral hepatitis. *Journal of Clinical Ultrasound*. 1986; 14: 675-679.
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- Heller MT, et al. The role of ultrasonography in the evaluation of diffuse liver disease. *Radiologic Clinics of North America*. 2014; 52(6): 1163-1175.
- Konus OL, et al. Normal liver, spleen, and kidney dimensions in neonates, infants, and children: evaluation with sonography. *American Journal of Roentgenology*. 1998; 171(6): 1693-1698.
- Kurtz AB, et al. Ultrasound findings in hepatitis. *Radiology*. 1980; 136(3): 717-723.