

# Cirrhosis of the Liver

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Radiology 3030

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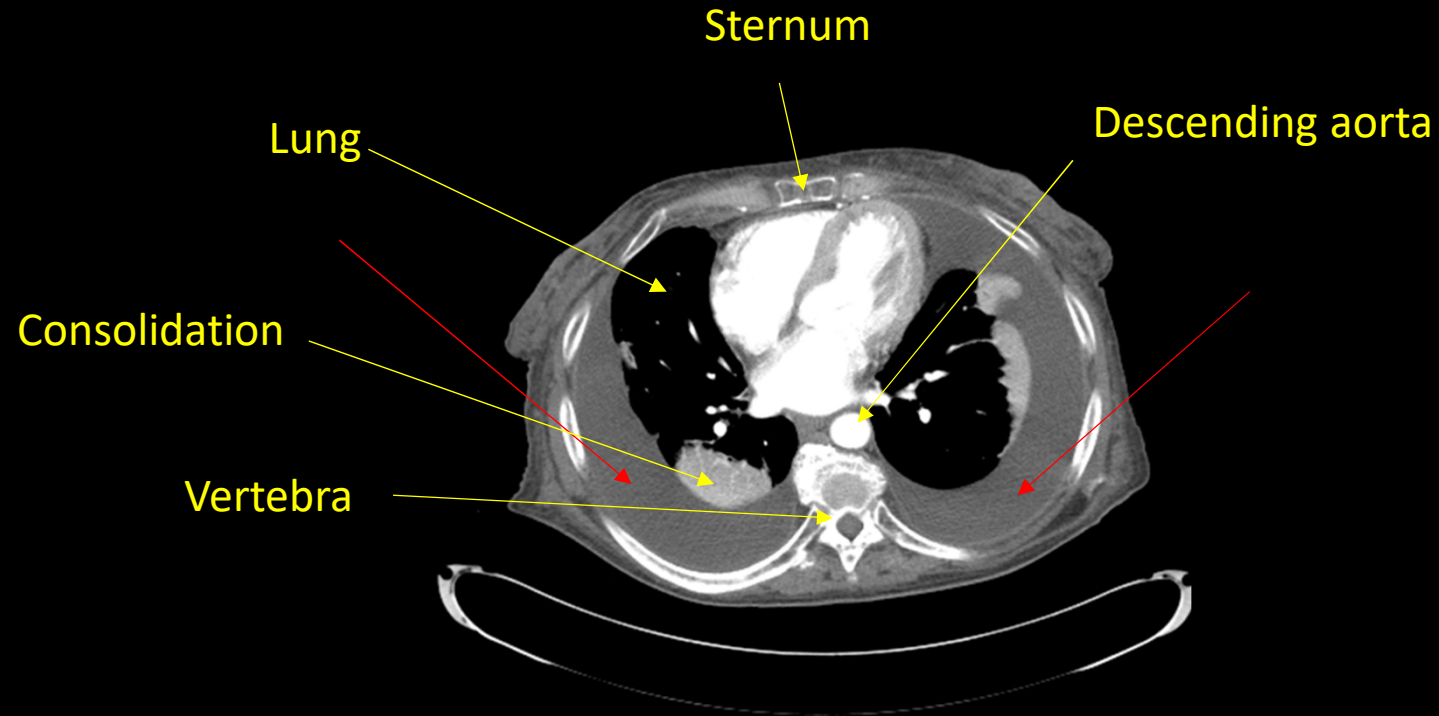
# Patient VR – Clinical History

- 66 year-old Caucasian female
  - Currently undergoing evaluation for liver transplant
  - History of end-stage liver disease secondary to alcoholic cirrhosis
    - Initial diagnosis in September 2018 – Presented to Memorial Hermann Greater Heights with bleeding esophageal varices
  - Former heavy drinker – last drink in September 2018
  - Former smoker – ages 19 – 20
  - Denies illicit drug use
  - Significant medical history: Diabetes Mellitus

# Abdominal CT – February 4, 2020

## Bilateral Pleural Effusions

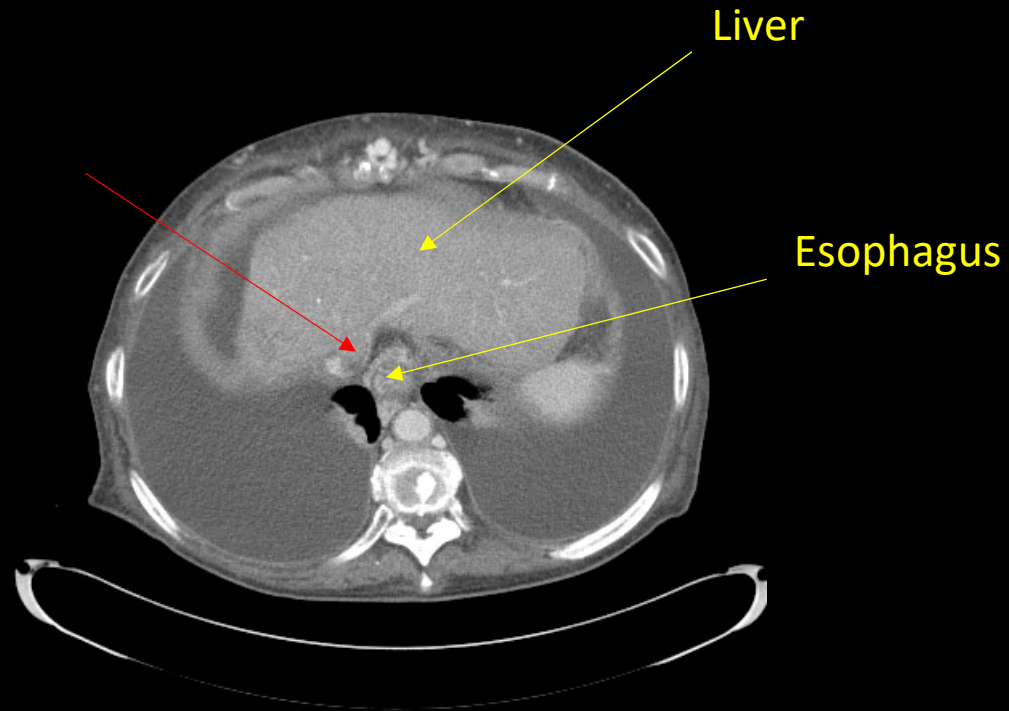
**Warning: Not for diagnostic use**



# Abdominal CT – February 4, 2020

## Esophageal Varices

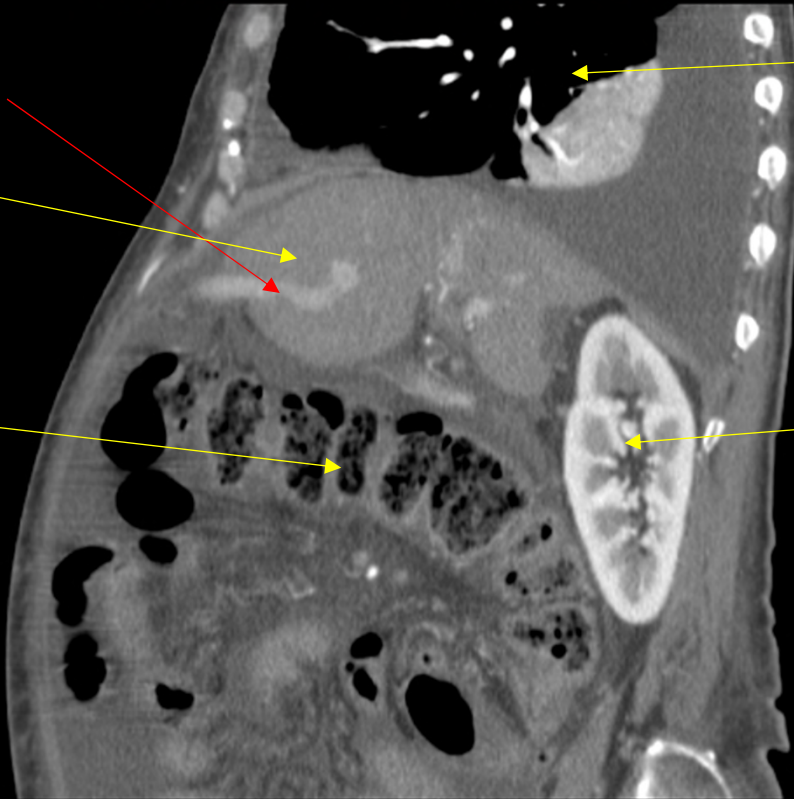
**Warning: Not for diagnostic use**



# Abdominal CT – February 4, 2020

## Distended Epigastric Veins

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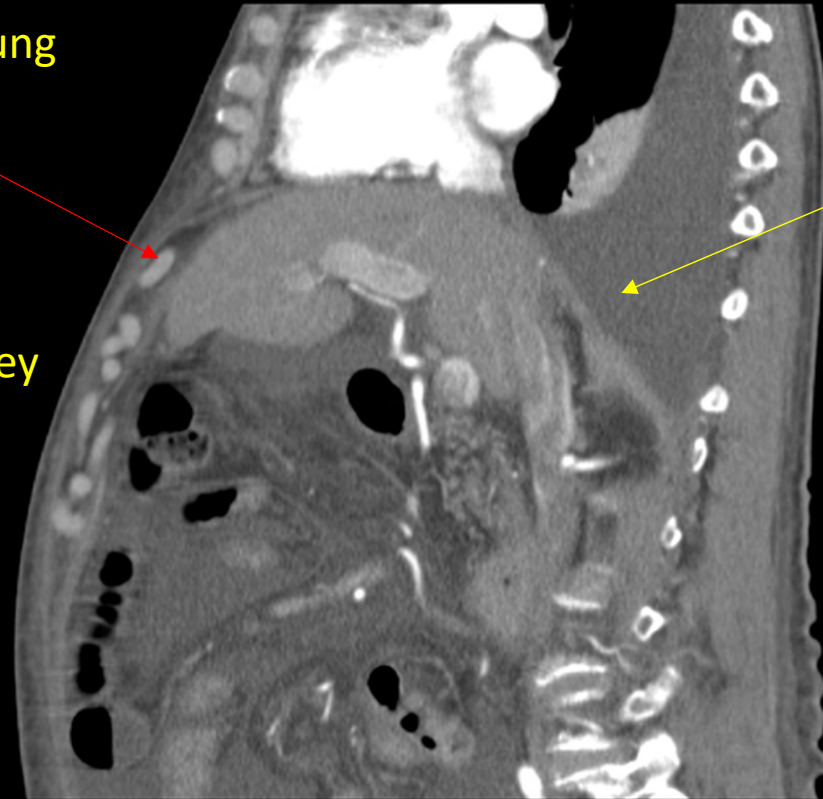
Lung

Liver

Transverse  
colon

Kidney

Warning: Not for diagnostic use

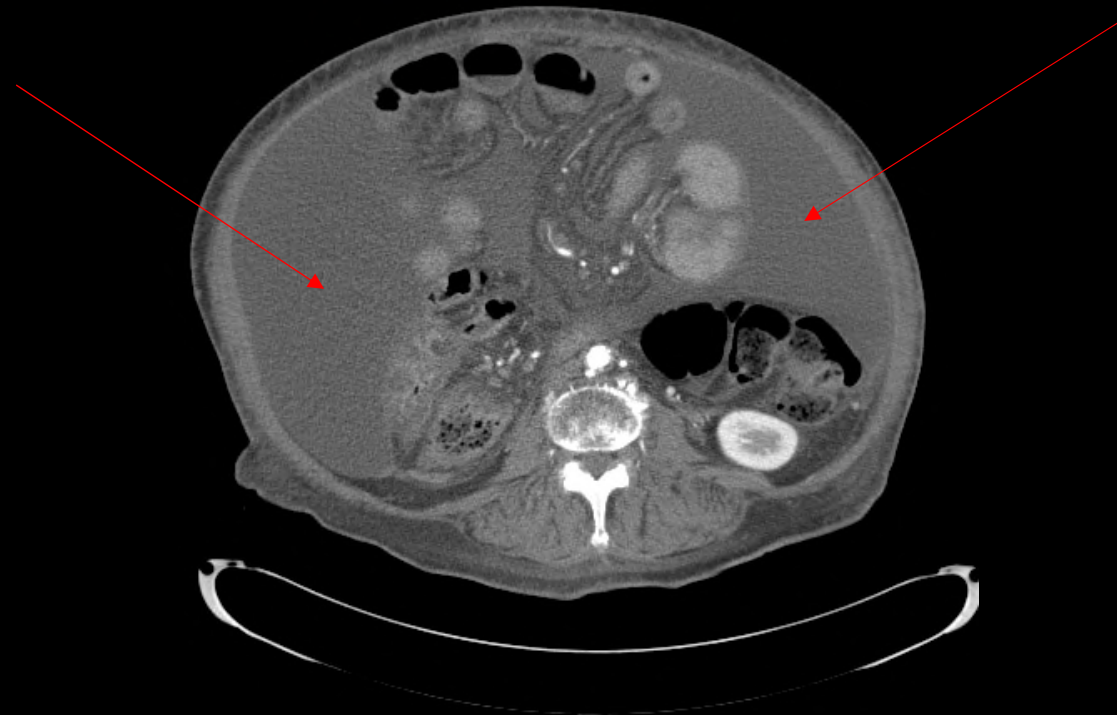


Pleural  
effusion

# Abdominal CT – February 4, 2020

## Abdominal Ascites

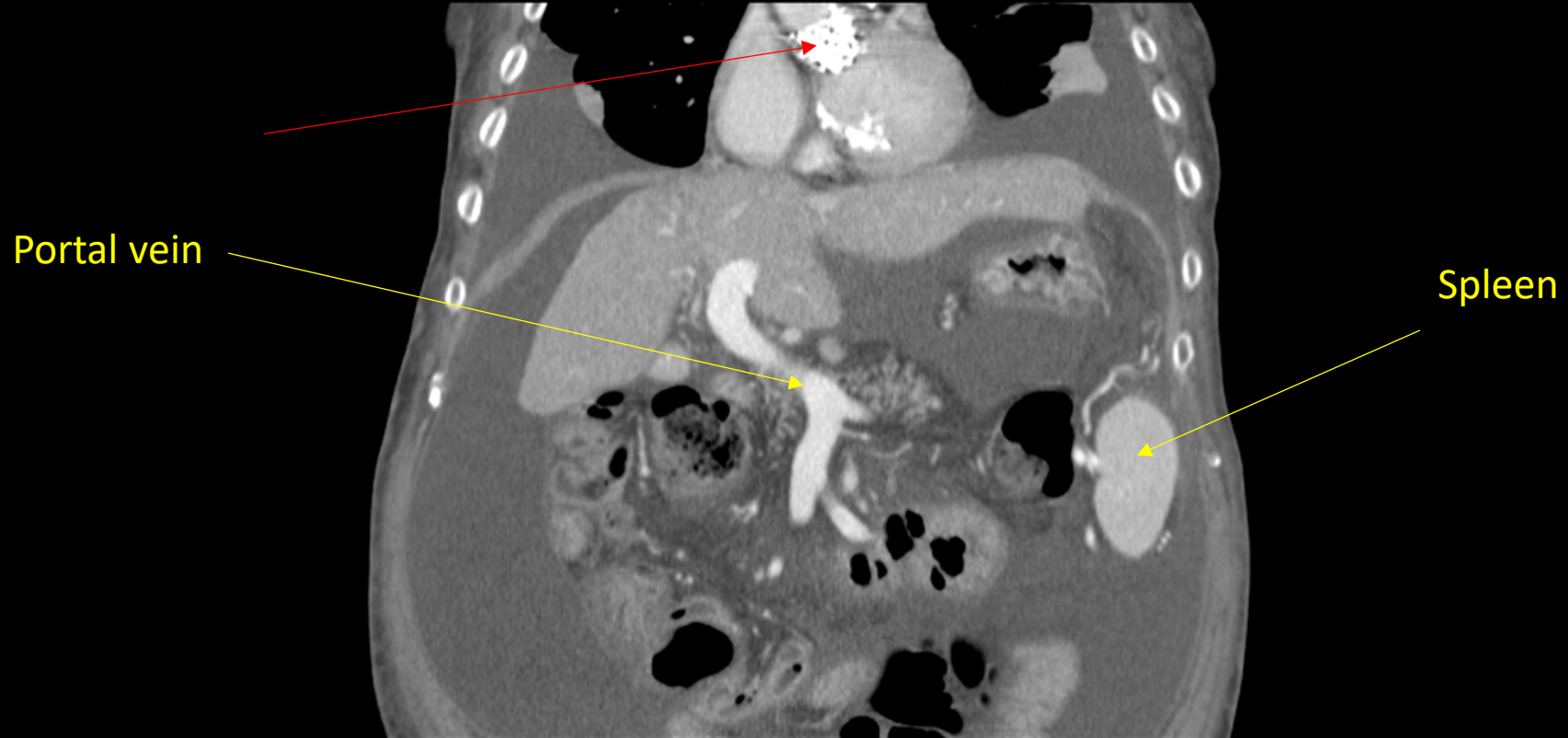
**Warning: Not for diagnostic use**



# Abdominal CT – February 4, 2020

## Aortic Valve Replacement

**Warning: Not for diagnostic use**



# Key Finding – Portal Hypertension

## Definition and Pathophysiology

- Portal Vein – Superior Mesenteric and Splenic Veins
- Portal vein transports blood from gastrointestinal tract to liver.
- Next, blood is drained from liver to hepatic veins and then to the inferior vena cava.
- Normal portal vein pressure: 5 – 10 mmHg
- Cirrhosis leads to increased resistance, creating venous collaterals.
  - Esophageal varices, ascites and dilated epigastric veins



# Differential Diagnosis

- Hepatic steatosis
  - Fatty liver; upper right abdominal tenderness; often asymptomatic
- Alcoholic hepatitis
  - Abdominal tenderness, nausea, vomiting, jaundice, weight loss, fever
- Cirrhosis leading to end-stage liver disease
  - Irreversible scarring of liver leading to shrunken and non-functioning tissue
  - Portal hypertension
  - Varices
  - Escaped ammonia
  - Hepatocellular carcinoma

# Discussion – Stages of Liver Failure

- Stage 1 – Inflammation
  - Liver may become tender and enlarged. Some individuals feel no discomfort.
- Stage 2 – Fibrosis
  - Scar tissue forms and replaces healthy and functioning liver tissue.
- Stage 3 – Cirrhosis
  - Scar tissue continues to form and harden.
- Stage 4 – End-stage Liver Disease
  - Individuals in need of transplant to resume liver functioning.

# Liver Cirrhosis

## Treatment

- Healthy diet low in sodium to reduce ascites
  - Also consider diuretics and paracentesis
- Avoid alcohol
- Discuss prescribed medications with a physician
- Treat portal hypertension with beta blocker
- Treat hepatic encephalopathy with lactulose
- Liver transplant

# MELD Score

## Qualifying for Transplant

- Model for End-Stage Liver Disease
- Score ranges from 6 to 40
  - Acquired based on various tests, including:
    - Creatinine
    - Bilirubin
    - Serum sodium
    - INR
- Score indicates need for transplant
  - For example, patient with MELD of 36 is a more urgent case than a patient with MELD of 22.

# Getting a Liver Transplant

- Discuss candidacy with doctor
- Connect with transplant center
  - Surgeons, social workers, dietitians, psychiatrists
  - Physical exams and other tests
- Must get approval from selection committee
- Get placed on national waiting list for organ from deceased donor
- Wait...

# A Joke!



Your insurance only covered the removal of the damaged organ...you'll have to put the transplant in yourself!

# Discussion – Alcoholic Liver Disease

## Pathophysiology

- Alcohol – absorbed in small intestine and catabolized in liver
- Alcoholic dehydrogenase (ADH) oxidizes it to acetaldehyde
- Acetaldehyde dehydrogenase (ALDH) oxidizes that to acetate
- Generates hydrogen (NAD → NADH)
- This inhibits fatty acid oxidation and gluconeogenesis, leading to fat accumulation in liver

# Final Diagnosis – End-Stage Liver Disease

- Grade 4 End-Stage Liver Disease





# ACR Appropriateness Criteria

- CT of abdomen with or without contrast is “usually not appropriate” according to Variant I of chronic liver disease by the American College of Radiology.
  - <https://acsearch.acr.org/docs/3098416/Narrative/>
- Cost at Memorial Hermann
  - CT abdomen without contrast: \$3,921
  - CT abdomen with contrast: \$5,540

# ACR Appropriateness Criteria

Revised 2019

## American College of Radiology ACR Appropriateness Criteria® Chronic Liver Disease

### **Variant 1:** Chronic liver disease. Diagnosis and staging of liver fibrosis. Initial imaging.

Procedure	Appropriateness Category	Relative Radiation Level
US shear wave elastography abdomen	Usually Appropriate	○
MR elastography abdomen	Usually Appropriate	○
MRI abdomen without and with IV contrast	May Be Appropriate	○
CT abdomen with IV contrast multiphase	May Be Appropriate	⊕⊕⊕⊕
MRI abdomen without and with hepatobiliary contrast	May Be Appropriate	○
MRI abdomen without IV contrast	May Be Appropriate	○
US abdomen	May Be Appropriate	○
US duplex Doppler abdomen	May Be Appropriate	○
US abdomen with IV contrast	May Be Appropriate	○
CT abdomen without and with IV contrast	Usually Not Appropriate	⊕⊕⊕⊕
CT abdomen without IV contrast	Usually Not Appropriate	⊕⊕⊕
FDG-PET/CT skull base to mid-thigh	Usually Not Appropriate	⊕⊕⊕⊕



### **Variant 2:** Chronic liver disease. No prior diagnosis of hepatocellular carcinoma (HCC). Screening and surveillance for HCC.

# Take Home Points

- Patient history is critical
  - For example, knowing patient VR's social history helped build understanding of her separate pathologies.
- Try to recognize major pathology on different imaging modalities
  - Pleural effusions, lung consolidation and ascites are common and shouldn't be missed.
- Help out your radiologist with a proper, yet concise, indication for the study you order
  - This gives the radiologist a better idea of what you're concerned about. Mention pertinent history if necessary.

# References

- Stock Photo
  - [https://www.google.com/search?q=stock+photo+puzzle+piece&source=lnms&tbm=isch&sa=X&ved=2ahUKEwiX7I\\_Z6eHnAhVDPawKHSONADMQ\\_AUoAXoECA0QAw&biw=1163&bih=554#imgrc=gmBvjBDUz5QzrM](https://www.google.com/search?q=stock+photo+puzzle+piece&source=lnms&tbm=isch&sa=X&ved=2ahUKEwiX7I_Z6eHnAhVDPawKHSONADMQ_AUoAXoECA0QAw&biw=1163&bih=554#imgrc=gmBvjBDUz5QzrM)
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  - [https://surgery.ucsf.edu/conditions--procedures/end-stage-liver-disease-\(esld\).aspx](https://surgery.ucsf.edu/conditions--procedures/end-stage-liver-disease-(esld).aspx)
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- Merck Manual
  - <https://www.merckmanuals.com/professional/hepatic-and-biliary-disorders/alcoholic-liver-disease/alcoholic-liver-disease>

# References, continued

- Up-to-Date

- <https://www.uptodate.com/contents/model-for-end-stage-liver-disease-meld>



Questions?