Abdominal Sonography Registry Review

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Purpose of the Lecture

- Recount rational facts about various organs and systems so that the information may be easily recalled in an assessment situation.
- Utilize the information from this lecture to appropriately respond to clinical situations.
- Recognize important sonographic terminology and definitions.
- Help prepare for national certification.

Importance of clinical correlation...

- In order to do perform well in clinical and on examinations, the sonographer must be capable of correlating clinical history with sonographic findings.
- For example:
  - Clinical history includes:
    - 28 year old female
    - Sudden onset of back pain
    - Elevated amylase and lipase
    - Nausea and vomiting

Importance of clinical correlation....

- Sonographic findings:
  - Enlarged hypoechoic pancreas
  - Peripancreatic fluid collection
- Diagnosis:
  - Acute pancreatitis

Liver Review

Stages of liver damage

Healthy Liver
Fatty Liver
Liver Fibrosis
Cirrhosis

- Deposits of fat lead to liver enlargement
- Scar tissues form
- Growth of connective tissue destroys liver cells
Fatty Liver

- Definition: a reversible disease characterized by deposits of fat within the liver cells.
- AKA – hepatic steatosis
- Clinical findings:
  - May be clinically silent
  - Can produce elevation in LFTs
- Sonographic findings:
  - Diffusely echogenic liver
  - Difficult to penetrate
  - Difficult to visualize hepatic architecture, vasculature, and diaphragm.

Fatty Liver

- Causes:
  - Obesity
  - Alcohol abuse
  - Chemotherapy
  - Diabetes

Focal Fatty Sparing

- Common Locations
  - Adjacent to the gallbladder
  - Adjacent to the porta hepatitis
  - Caudate lobe may be spared
  - Can resemble a hypoechoic mass

Focal Fatty Infiltration

- Common locations:
  - Same as focal fatty sparing
  - Can resemble a hyperchoic mass

Cirrhosis

- Definition: hepatocyte death, fibrosis and necrosis of the liver, with the subsequent development of regenerating nodules.
- Clinical findings:
  - Ascites
  - Elevated LFTs
  - Jaundice
  - Fatigue
  - Weight loss
  - Initial hepatomegaly (chronic stages produced shrunken right lobe / the caudate may be enlarged)

Which of the following is typically not a potential cause of cirrhosis?

1. Chronic hepatitis
2. Alcoholism
3. Cholangitis
4. von Hippel-Lindau disease
Cirrhosis

- Most common cause is alcoholism.

Sonographic Findings of Cirrhosis

- Shrunken right lobe (enlarged caudate)
- Nodular surface irregularity
- Coarse echotexture
- Splenomegaly
- Ascites
- Monophasic flow in the hepatic veins
- Hepatofugal flow in the portal veins

Portal Hypertension

- Definition: elevation of blood pressure within the portal venous system
- The most common cause is cirrhosis, though it can be caused by portal vein thrombosis or tumor compression of the portal vein.
- Normal flow toward the liver = hepatopedal or hepatopetal flow.
- Reversed flow away from the liver in the portal vein = hepatofugal flow.
- Portal hypertension can produce hepatofugal flow.

Which of the following is not a common sequela of cirrhosis?

1. Hepatic candidiasis
2. Portal vein thrombosis
3. Portal hypertension
4. Splenomegaly

Portal Hypertension

- As the liver becomes more resistant to flow, there is a reopening or recanalization of the paraumbilical vein seen here....

What structure should you investigate to demonstrate this finding?

1. Right hepatic vein
2. Main portal vein
3. Middle hepatic vein
4. Left portal vein
Portal Hypertension

- Leads to the development of abdominal varices:
  - Examples include esophageal varices and splenorenal varices.
  - Be sure to analyze the splenic hilum and GE junction.

The portal vein should not exceed:

1. 10 mm
2. 5 mm
3. 13 mm
4. 6.5 mm

Focal Solid Liver Lesions

- Key points:
  - Many of these can appear sonographically similarly, so you need to know specific keywords and clinical findings to help differentiate the following tumor:
    - Cavernous hemangioma
    - Hepatic adenoma
    - Focal nodular hyperplasia
    - Abscesses
      - Hydatid
      - Pyogenic
      - Amebic
      - Candidiasis

Focal Nodular Hyperplasia

- Second most common liver tumor.
- Mostly asymptomatic.
- Called the stealth lesion.
- Contains a central scar noted (possibly) on sonography, but typically better seen on CT or MRI.

Hemangiomas may result from the use of birth control pills.

1. True
2. False
FNH may result from the use of birth control pills.

1. True
2. False

Hepatic Adenoma

• Typically asymptomatic.
• Typically hypoechoic (but can vary).

Hepatic adenomas may result from the use of birth control pills.

1. True
2. False

Summary….

• The hepatic adenoma does have a causal link with oral contraceptive use.
• While the hemangioma and FNH are not caused by birth control pills, they may enlarge secondary to estrogen stimulation.

Liver Abscesses or Parasitic Cysts

• May present clinically similar:
  – Elevated LFTs and WBC
  – Nausea & vomiting
  – Fever

• Here are some key words/information for each of these.

• Hold on……………..

Hydatid Liver Cyst

• Echinococcus granulosus – the parasite that causes the cyst
• Found most often in sheep and cattle-raising countries:
  – Middle East
  – Australia
  – Mediterranean
Hydatid Liver Cyst

- Sonographic findings:
  - Water lily sign (cyst floating in a larger cyst)
  - Mother cyst containing a daughter cyst
  - Hydatid sand

Pyogenic Abscess

- Bacterial infection that spreads to the liver.
- Typically from predisposing bacterial conditions like cholecystitis, appendicitis, diverticulitis, or even endocarditis.
- Complex appearing.

Amebic Abscess

- Caused by a parasite.
- Typically found in contaminated water.
- Causes dysentery (bloody diarrhea, abdominal pain, fever).
- Recent travel to another country:
  - Mexico
  - Central or South America
  - India
  - Africa

Hepatic Candidiasis

- Fungal infection (Candida albicans)
- Immunocompromised:
  - Cancer patient
  - AIDS patient
  - Transplant patient

Which of the following would most likely be seen in a patient following appendicitis?
1. Pyogenic abscess
2. Amebic abscess
3. Hydatid cyst
4. Candidiasis

Liver Cancer (key points)

- Most common liver cancer is metastasis from:
  - Colon – tend to be target or bulls-eye lesions
  - Breast - hypoechoic
  - Lung - hypoechoic
  - Pancreas – hyperechoic
- Can also have cystic appearing mets
Liver Cancer (key points)
- Most common primary: Hepatocellular carcinoma
  - Most commonly caused by cirrhosis
  - Mostly appears solid and hypoechoic
  - Patients have a history of weight loss
  - Patients will have elevated LFTs

Which of the following can be used as a tumor marker for HCC?
1. Lactate dehydrogenase
2. Serum bilirubin
3. hCG
4. Alpha-fetoprotein

One more important connection...
- Hepatoblastomas
  - Pediatric liver carcinoma
  - Elevated AFP
  - Increased risk for kids who have Beckwith-Weidemann syndrome (growth disorder consisting of macroglossia and enlargement of several organs)

Urinary Tract Review
What is the most common cause of fungal urinary tract infections?
1. Echinococcus garnerosis
2. Staphylococcus
3. Candida albicans
4. Streptococcus

Renal Fungal Disease
- Typically found in immunocompromised patients:
  - Also diabetics
  - Ill infants
  - Patients with long-standing indwelling catheters
- You may see fungal balls too!
What is the accumulation of calcium within the renal parenchyma?
1. Calcemic renunculitis
2. Nephrocalcinosis
3. Urolithiasis
4. ARPKD

Nephrocalcinosis
• Two types:
  – Medullary nephrocalcinosis
    • Most commonly caused by medullary sponge kidneys
    • Can be caused by hyperparathyroidism (which produces hypercalcemia)
  – Cortical nephrocalcinosis

Which renal mass is most likely associated with a stellate central scar?
1. Hypernephroma
2. Renal adenoma
3. Angiomyolipoma
4. Oncocytoma

Oncocytoma
• Benign renal tumor
• Often found in men in their 60s
• Difficult to differentiate sonographically from RCC

Which of the following has a link with tuberous sclerosis?
1. Angiomyolipomas
2. Renal cell carcinomas
3. Renal hemangiomas
4. Renal adenomas

Angiomyolipomas
• Tuberous sclerosis
  – Neurocutaneous lesion disorder that leads to the development of tumors in various organ systems including the kidneys, skin, and brain
  – AMLs appear as echogenic tumors on the kidneys
Renal Cystic Disease

ADPKD
- ADPKD – autosomal dominant polycystic kidney disease (Think adults are dominant!)
  - Characterize sonographically by multiple cysts of varying sizes on both kidneys.
  - In fact, to be diagnosed with ADPKD, the patient should have at least one cyst on both kidneys or two cysts on one kidney.
  - Associated with cysts in other organs, especially the liver and pancreas
  - May not manifest until the 4th decade of life.
  - Clinical symptoms include hypertension, palpable abdominal mass, and possibly impaired renal function

ARPKD
- ARKD – autosomal recessive polycystic kidney disease (infantile)
  - Dilation of the renal collecting tubules
  - Cyst may be too small to be differentiated with sonography
  - Kidneys appear ENLARGED and ECHOGENIC!

MCDK
- MCDK – multicystic dysplastic kidney disease
  - Caused by an early embryonic urinary tract obstruction
  - No function renal tissue
  - Sonographically appears as multiple cysts of varying sizes in the renal fossa (not consistent with life if bilateral)

Gallbladder and Biliary Review

Which of the following is associated with comet tail artifact emanating from the gallbladder wall?
1. GB carcinoma
2. Adenomyomatosis
3. Chronic cholecystitis
4. Gallbladder polyp
Adenomyomatosis

- Adenomyomatosis – the accumulation of cholesterol crystals within the gallbladder wall
  - The crystals are located within pockets referred to as Rokitansky-Aschoff sinuses.
  - These crystals produce comet tail artifact.

Which of the following would be associated with the development of air within the gallbladder wall?

1. Pyogenic cholecystitis
2. Gallbladder carcinoma
3. Chronic cholecystitis
4. Emphysematous cholecystitis

Emphysematous Cholecystitis

- Caused by bacterial invasion within the gallbladder wall.
- The bacteria produce gas.
- The gas produces ring down artifact.

Emphysematous Cholecystitis

- Most commonly encountered in diabetic patients.
- Patient may be asymptomatic.

Gallbladder enlargement is present when the gallbladder diameter exceeds:

1. 3mm
2. 5cm
3. 30mm
4. 2.7cm

Courvoisier Gallbladder

- Courvoisier gallbladder – an enlarged (hydropic) gallbladder caused by a mass in the head of the pancreas
  - The gallbladder is palpable on physical examination.
  - It is not tender to the touch nor will it illicit Murphy’s sign.
What is the most likely diagnosis?

1. WES sign
2. Surgical clip
3. Porcelain gallbladder
4. Cholecystitis

What is an uncommon cause of jaundice, pain, and fever secondary to choledocholithiasis?

1. Klatskin syndrome
2. Caroli disease
3. Mirizzi syndrome
4. Krukenburg tumor

Mirizzi Syndrome

- Jaundice, pain, and fever secondary to stone lodged in the cystic duct.
- Difficult to diagnose sonographically.

What is the location of a Klatskin tumor?

1. Between the RHD and LHD
2. Distal CBD near the pancreas
3. Proximal CBD
4. Cystic duct

Klatskin Tumor

- Klatskin tumor is located at the junction the RHD and LHD.
- It is the most common form of cholangiocarcinoma.
- Patients present with jaundice, unexplained weight loss, abdominal pain, and pruritus.
- Pruritus is severe itchiness of the secondary to hepatic disease.

One more thing….a few pediatric pathologies to remember….

- Caroli disease is characterized by segmental dilation of the intrahepatic ducts
- Biliary atresia – narrowing or complete obliteration of the biliary ducts – leads to cirrhosis and portal hypertension
- Choledochal cysts – cystic dilation of the common bile duct (most common) - there are several forms of choledochal cysts
Pancreas Review

Pancreatic Carcinoma

- Pancreatic adenocarcinoma
  - Most common form of pancreatic cancer.
  - Most common found in the head of the pancreas.
  - Most common appearance is solid and hypoechoic.
  - Can present with Courvoisier gallbladder.
- Pancreatic cystadenocarcinoma
  - Most commonly located in the body and tail of the pancreas.
  - These patients present later because of the location of the mass.
  - Large, complex mass with cystic components.

Adenocarcinoma vs. Cystadenocarcinoma

A

C

Adenocarcinoma comes before Cystadenocarcinoma.

What is the most common type of islet cell tumor?

1. Gastrinoma
2. Granuloma
3. Insulinoma
4. Adenomyoma

Islet Cell Tumors

- Insulinoma
  - Small, hypoechoic mass
  - Produces excess insulin (leads to hypoglycemia)
- Gastrinoma
  - Small, hypoechoic mass (may contain calcifications)
  - Zollinger-Ellison syndrome – the production of excessive gastric juices that leads to the development of a peptic ulcer

One more thing.....

Von Hippel-Lindau Disease

- Characterized by the development of cysts within the pancreas and other organs.
- Patients are at increased risk for developing RCC.
Adrenal Review

What adrenal tumor is associated with uncontrolled hypertension?
1. Adrenal hematoma
2. Pheochromocytoma
3. Neuroblastoma
4. Adrenal adenoma

Pheochromocytoma
• Benign adrenal tumor
• Also associated with tachycardia, headaches, tremors, anxiety, and excessive sweating.
• Tends to be a hyperechoic mass.

Cushing syndrome
• Results from high levels of cortisol secretion by the adrenal cortex.
• Can be caused by an adrenal adenoma.
• Clinical symptoms:
  – Obesity
  – Thinning arms and legs
  – Buffalo hump
  – Hyperglycemia
  – Fatigue

Conn syndrome
• Results from high levels of aldosterone produces by the adrenal cortex.
• Can be caused by an adrenal adenoma.
• Clinical findings:
  – Excessive thirst
  – Excessive urination
  – Hypernatremia (elevated sodium)
  – Hypokalemia (low potassium)

What lab is used as a tumor marker for a yolk sac tumor in the testicle?
1. LDH
2. Alkaline phosphatase
3. hCG
4. AFP
Which of the following is the most specific finding of an abnormal lymph node?

1. Size
2. Shape
3. Echogenic hilum
4. Color flow

Torsion vs. Epididymitis/Orchitis

- Two vastly different abnormalities can present clinically similar:

What is the most common location of prostatic cancer?

1. Verumontanum
2. Fibromuscular stroma
3. Central zone
4. Peripheral zone

Thanks for listening!
I hope you enjoy the rest of the symposium.

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