Chapter 12. Approach to Liver Masses

12.1 Liver Imaging

Ultrasound (US)

- Advantages
  - Widely available, inexpensive, no radiation
- Disadvantages
  - Operator dependence, obesity can make it more difficult
- Main indications
  - Evaluation of abnormal liver tests
  - Bile duct and gallbladder imaging
  - HCC surveillance
  - Contrast enhanced ultrasound (CEUS) can be done for evaluation of masses and is safe in patients with renal insufficiency

Computerized Tomography (CT)

- Advantages
  - Availability, no or minimal breath holding
- Disadvantages
  - Radiation, dye can cause renal insufficiency
- Main indications
  - Evaluation of liver masses
  - To look for primary malignancy or source of liver abscess

- CT angiography can be done to evaluate blood supply to the liver

Magnetic Resonance Imaging (MRI)

- Advantages
  - No radiation, greater detail, MRCP can non-invasively evaluate bile ducts
- Disadvantages
  - Claustrophobia, must hold breath, can rarely get fibrotic skin reaction to contrast agent if patient has renal insufficiency
- Main indications
  - Evaluation of liver masses
  - Liver specific contrast agents, e.g. gadolinium ethoxybenzyl dimeglumine (Gd-EOB-DTPA or Primovist®) may distinguish FNH from adenoma and assist in HCC diagnosis
  - Elastography can be done for non-invasive fibrosis estimation

Nuclear Medicine Studies

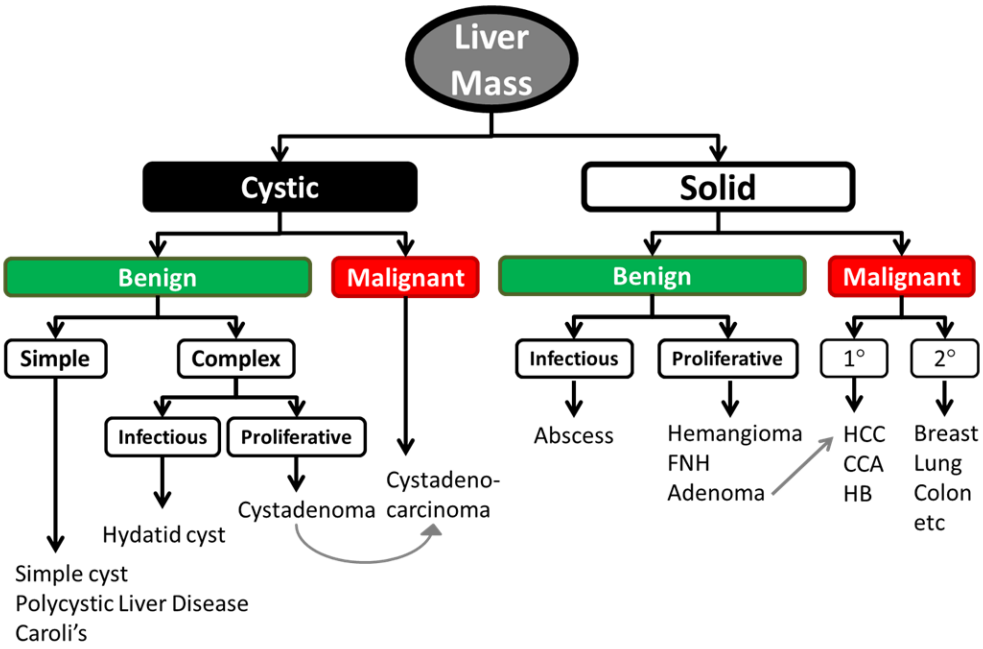
- **Positron Emission Tomography (PET)**
  - Flurodeoxyglucose (FDG) tracer taken up by metabolically active tumours
  - Done with CT scan (CT-PET)
  - Good for liver metastasis but HCC often PET negative
- **Liver Spleen scan**
  - Sulfur colloid tracker is taken up by macrophages of the reticuloendothelial system
  - Can be used to differentiate benign liver tumours (FNH versus adenoma)
- **RBC scan**
  - Technitium^{99} labelled RBC used for diagnosis of hemangioma

- **HIDA scan**
  - Used to evaluate function of gallbladder & biliary system

12.2 Approach to Liver Masses

- Liver mass can be:
  - Cystic (fluid filled) or solid
    - Cystic lesions are simple or complex
  - Benign or malignant
    - Benign solid lesions are infectious or proliferative

- **Scheme for Approach to a Liver Mass**



12.3 Cystic Liver Masses

- Cystic liver lesions can be simple or complex (containing internal septations or debris)
- **Simple cysts**
  - Single (or a few)
  - Very common
  - Usually asymptomatic and of no consequence
  - Can become infected and may cause pain or early satiety if very large
  - If symptomatic they should be drained surgically (marsupialization) as they tend to recur after percutaneous drainage
- **Polycystic Liver Disease (PCLD)**
  - Autosomal dominant condition that cause multiple simple cysts to occur within the liver ± kidneys (PCLKD)
  - Can result in early satiety and complications of portal hypertension
  - Surgical removal of dominant cysts can be done but the others tend to grow afterwards
  - Rare indication for liver transplant or combined liver-kidney transplant if PCLKD
- **Caroli's Disease**
  - Rare inherited disorder characterized by dilation of the intrahepatic bile ducts
- **Hydatid cysts**
  - Tapeworm infection (*Echinococcus*) with intermediate host being sheep or goats and definitive host being dogs or other carnivores

- When infects humans it can cause complex cystic lesions (daughter cysts within cysts) in the liver and lung
- Echinococcal serology can assist in the diagnosis
- Treatment is with albendazole (anti-parasite drug) and surgery or **PAIR therapy** = **P**ercutaneous **A**spiration, **I**njection (3% normal saline to kill parasite), followed by **R**e-aspiration

- **Cystadenoma**
  - Rare cystic neoplasm, typically with thick wall or septations (complex)
  - Has a potential to become malignant (**cystadenocarcinoma**) and therefore should be removed surgically

12.4 Solid Liver Masses

- Solid liver lesions can be benign or malignant

Benign solid liver lesions

- **Abscess**
  - May present with fever and RUQ pain
  - Usually due to gram negative bacillus (GNB) / anaerobes from an obstructed biliary system or from the gut (e.g. diverticulitis)
  - Amoeba can cause colitis and a liver abscess filled with “anchovy paste”
  - Treatment is with antibiotics and percutaneous or surgical drainage
- **Hemangioma**
  - Most common benign liver lesion, composed of dilated vascular channels

- Usually asymptomatic but can become giant (causing early satiety, abdominal discomfort or high output heart failure)
- CT, MRI, or CEUS show puddling of contrast at periphery and RBC scan can confirm
- Usually only require observation

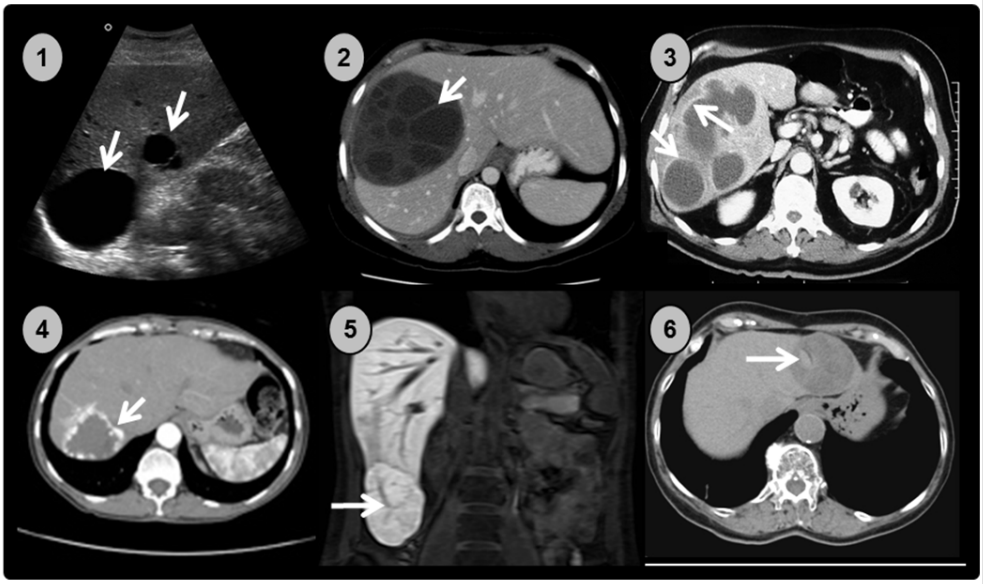
- **Focal Nodular Hyperplasia (FNH)**
  - 2nd most common, with 80-90% occurring in women
  - Made up of all normal liver components of liver (including normal hepatocytes and Kupffer cells) growing in an aberrant manner
  - Thought to be due to clotting of small branch of portal vein in that area of the liver
  - May have central scar on CT or MRI
  - Sulfur colloid scan shows normal or increased uptake by Kupffer cells
  - Primovist® MRI shows uptake of liver specific contrast agent by normal hepatocytes (to distinguish from adenoma)
  - Typically require only observation and are not usually hormone responsive

    NOTE: DO NOT perform follow up imaging for hemangioma or FNH *(Choosing Wisely Canada™ Recommendation)* as the only indication for intervention is the development of symptoms (not a change in size)

- **Adenoma**
  - 3rd most common (rare), with 99% occurring in women and tend to grow with birth control pills (BCPs) or pregnancy, but can occur in men on anabolic steroids or in those with glycogen storage disease
  - They are composed of abnormal hepatocytes and can rupture, bleed or undergo malignant transformation (to HCC), especially if >5cm

- They may have intra-lesion fat or hemorrhage (best seen on MRI) and typically have no uptake on sulfur colloid scan or Primovist® MRI (to distinguish from FNH)
- Must stop BCP and surgery is recommended if approaching 5cm or if complicated

- Below are examples of benign liver masses on imaging
  1) Simple cysts (arrows) on US
  2) Complex cysts due to Echinococcus with daughter cysts (arrow) on CT
  3) Liver abscesses with ring enhancement (arrows) on CT
  4) Hemangioma with puddling of contrast at periphery (arrow) on CT
  5) Focal Nodular Hyperplasia (FNH) with central scar (arrow) on MRI
  6) Adenoma complicated by hemorrhage (arrow) on CT



Adapted from Burak KW. Chapter 23: Neoplasms of the Liver. In: First Principles of Gastroenterology & Hepatology. 2012: 463-473.

Malignant solid liver lesions

- **Primary liver cancer**
  - Hepatocellular carcinoma *[see Chapter 13.1]*
  - Intrahepatic cholangiocarcinoma *[see Chapter 13.2]*
- **Metastases**
  - Due to its rich blood supply many cancers spread to the liver
  - May be solitary or multiple
  - Often ring enhancing and tend to have very rapid washout of contrast
  - Tumour markers may provide clues to the etiology but biopsy is usually need to establish the diagnosis
  - Prognosis depends on the source of primary cancer

Abbreviations

BCP – birth control pills

CEUS – contrast enhanced ultrasound

CT-PET – computerized tomography-positron emission tomography

FDG – fluorodeoxyglucose

FNH – focal nodular hyperplasia

Gd-EOB-DTPA – gadolinium ethoxybenzyl dimeglumine

GNB – gram-negative bacillus

HIDA – hepatobiliary iminodiacetic acid

PAIR – percutaneous aspiration, injection, re-aspiration

PCKLD – polycystic kidney and liver disease

PET – positron emission tomography

RBC – red blood cells

RUQ – right upper quadrant

Figure citations

Benign liver masses. Adapted from **Burak KW**. Chapter 23: Neoplasms of the Liver. In: First Principles of Gastroenterology & Hepatology 2012; 463-473.

References

1. European Association for the Study of the Liver. EASL Clinical Practice Guidelines on the management of benign liver tumours. *J Hepatol* 2016; 65(2): 386-398.
2. Marrero JA, Ahn J, Reddy KR, Practice Parameters Committee of the American College of Gastroenterology. ACG Clinical Guideline: The Diagnosis and Management of Focal Liver Lesions. *Am J Gastroenterol* 2014; 109(9): 1328-1347.