HEPATO-BILIARY IMAGING

BY

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CT ABDOMEN

- **Indications**
- **Patient preparation**
- **Patient position**
- **Scanogram**

- To assess equivocal imaging findings
- Staging of hepatic neoplasms
- Metastatic workup of primary malignancies
- Diagnosis of diffuse hepatic diseases
- Assessment of biliary problems
- Assessment of suspected post-traumatic injury
CT ABDOMEN

- Indications
- Patient preparation
- Patient position
- Scanogram

No required preparation unless the patient is going to be sedated or injected with contrast material

FASTING FOR 4 - 6 HOURS
Scanning techniques

- Standard Examination
- Spiral, Helical, volumetric CT
- Multi-Detector, Multi-Slice CT
Normal pulmonary vascularity
Detailed examination of the Superior Mesenteric Artery and Celiac Artery.
Scan time = 9.4 seconds. 1mm slice thickness
Non-contrast Study

- The inherent difference between attenuation value of normal liver parenchyma and most of the lesions is low.
- Old indications for NCCT
  - Hypervascular metastases
  - Quantification of liver iron in cases of hemochromatosis
  - Detection of confluent fibrosis in cirrhotic liver
Value of precontrast study
Arterial phase

Hypervascular deposits
Single phase CECT

- 80% of hepatic parenchymal blood flow is supplied by portal vein
- Lesions are detected in the portal phase of enhancement [60 seconds after bolus contrast injection]
Dual-phase CECT

- Scanning the liver **twice** with a single contrast bolus
- **Arterial phase** [the 1st 20-30 seconds of contrast injection]
- 20% of liver parenchymal blood flow comes from the hepatic artery
- Most of hepatic tumours receive their main blood supply from the **hepatic artery**
CT Portal venography in a 56Y Male with portal vein thrombosis
Hepatic pathology

- Focal lesions
  - Cystic
  - Solid
  - Mixed
- Diffuse lesions
Judgment is based only on either

- Contrast enhanced CT
- Contrast enhanced MRI
Cystic lesions of the liver

**Hepatic cysts**

- Congenital lesions but detected late
  - Isolated or associated with congenital cystic disease
- Usually asymptomatic
- Complications [rupture or hage] lead to symptoms
- Few mms to several cms in size
Hepatic cysts

Typical cyst criteria
- Sharply defined margin
- Paper-thin wall
- Clear water contents 0-15 HU
- Absent Septations
  - Calcification
  - Enhancement
  - Mural nodules
Cystic lesions of the liver

Liver abscess [Pyogenic]

- Frequently indolent with no signs of infection
- May present with profound septicemia
- Microabscesses (>2cm) cluster or widely scattered
- Macroabscesses: Hypo dense lesion, unilocular or multilocular
- Marginal enhancement 6% ?!
- Gas containing abscesses uncommon
Gas containing hepatic abscess
Multiple Pyogenic hepatic abscesses
Cystic lesions of the liver

Liver abscess [Amebic ] Entameoba Histolytica 10% world wide

- Patients are more often acutely ill
- Single or multiple near the liver capsule
- Enhancing wall is evident with peripheral zone of edema [Common findings in amebic abscess]
Amebic abscess
Benign lesions of the liver

Hemangioma

- 20% of hepatic tumours
- The most common benign liver tumour
- 85% are asymptomatic  Female: male = 5:1
- 50% are multiple
- Giant hemangioma 6-10 cm in diameter
Hemangioma with central area of fibrosis
Hemangioma
Hemangioma
Cystic lesions of the liver

Echinococcal disease [Hydatid cyst]

- Larval stage of E. granulosus
- Well defined unilocular or multilocular cyst
- Central and peripheral calcification
- Daughter cysts can be inside the large cyst
Hydatid cyst
Hydatid cyst
Cystic lesions of the liver

**CT FEATURES TO DIAGNOSE HYDATED CYST**

- Other cysts specially in the lung
- Unilocular or multilocular cyst with marginal calcification
- Internal floating shadows
- Daughter cysts within the large cyst
35Y Male patient with lung cancer suspected to have liver deposits by US
Rare cystic lesions

- Biliary cystadenoma / carcinoma
- Cystic deposits
Biliary cystadenoma, cystadenocarcinoma

- 90% occur intrahypatic
  - With ovarian stroma [seen in females+ good prognosis]
  - Without ovarian stroma [males and females + bad prognosis]
- Large [3 – 40 cm] cystic multilocular tumour with mural nodularities [seen better by US]
- Distinction between cystadenoma and cystadenocarcinoma may not be possible by imaging and is not clinically critical, both will be excised
Biliary cystadenoma
Biliary cystadenoma
Malignant Hepatic Lesions

Hepatocellular carcinoma

- The most common primary malignant hepatic neoplasms
- 3\textsuperscript{rd} – 4\textsuperscript{th} decades
- male: female 8:1
- 80\% of HCC occur in cirrhotic liver
- Serum AFP and ultrasound [screening]
Hepatocellular carcinoma

CT

- Single or multiple masses that are hypo dense to normal liver
- Calcification may be seen
- After contrast injection [better triphasic study]
  - Arterial phase heterogeneously enhancing lesion with hypo dense capsule
  - Portal phase hypo dense lesion
Hepatocellular carcinoma

CT [arterial phase]

- Detects a greater number of HCC than usual scanning
- Detects intravascular thrombosis [portal vein]
- Better delineation of tumour capsule in capsulated lesions
- Detects early arteriovenous shunting [sign of malignancy]
Hepatocellular carcinoma
Hepatocellular carcinoma
Poorly differentiated Hepatocellular carcinoma
HCC
Hepatocellular carcinoma
M 49Y with elevated AFP
M 59 Y with liver cirrhosis, splenomegaly and suspected focal lesion on US
Malignant Hepatic Lesions

Cholangiocarcinoma

- The 2nd most common primary malignant tumour
- Arise from bile duct epithelium [3 TYPES]
  - Intrahepatic tumour arisen from small peripheral ducts
  - Or the major ducts near the helium
  - Or at the bifurcation of the common hepatic ducts [Klatskin tumour]
- HCC: intrahepatic cholangiocarcinoma = 10:1
- No strong association between the lesion and cirrhosis
Cholangiocarcinoma

CT

- Hypo dense lesion that shows heterogenous enhancement
- Portal vein invasion is rarely seen
- Small dilated ducts around the lesion may be seen
Cholangio carcinoma
Lymphoma

- Primary hepatic lymphoma is rare compared to the 2ry type
- AIDS and organ transplant patients have an increased risk
- Non specific CT and MR appearance
- Diffuse hepatic lymphoma → hypo dense liver similar to fatty infiltration
Lymphoma
Lymphoma
Hepatic deposits

- Liver is the 2nd most common site for deposits after nodes
- 30% - 70% of patients who die of cancer have liver deposits

**CT**

- **NCCT** hypodense lesions, calcification in mucin producing metastases
- **CECT** Dynamic bolus contrast injection with helical scanning in a single breath hold of 15-30 seconds
  - Single phase
  - Dual phase
  - Triphasic study
  - CTHA & CTAP
Contrast enhanced CT

- **Single phase** [portal phase]
  
  Maximal enhancement of liver tissue
  150ml. Pump injector 3ml/sec delay time 70 sec

- **Dual phase** [arterial & portal phase]
  
  150ml. Pump injector 4ml/sec delay time 25/60 sec

- **CTHA**
  Selective enhancement of tumour

- **CTAP**
  Selective enhancement of liver tissue
Hepatic deposits

- Most of hepatic deposits are hypovascular
- Hepatic neoplasms receive most of their blood supply via hepatic artery
- Hypervascular deposits should be assessed by dual phase CT or dynamic MRI
- At present CTAP and intra operative US are the most sensitive methods for detection of hepatic deposits
Hyper vascular deposits
Hepatic deposits
M 54Y with liver deposits and cyst
Calcified hepatic metastases in a patient with mucinous adenocarcinoma of the colon
Multiple discrete hepatic metastases
From segmoid cancer
M 83Y with abdominal pain, US showed 2 focal hepatic lesions
36Y Male with testicular tumor evaluated postoperatively
Benign solid lesions of the liver

Rare lesions

- Hepatic adenoma
- Focal nodular hyperplasia [FNH]
- Angiomyolipoma  Fat containing lesion occurs in patients with tuberous sclerosis where other lesions are present in the kidney
Focal nodular hyperplasia (FNH)

- 8% of all hepatic tumours
- 2nd most common benign hepatic tumour after hemangioma
- 80%-90% in women 3rd–5th decades
- 80%-90% are solitary lesions <5cm in diameter
- Central fibrous scar is a characteristic feature
Focal nodular hyperplasia (FNH)

- Precontrast CT: iso or hypodense lesion
- Arterial phase CT: Marked enhancement

Focal nodular hyperplasia dual phase helical CT.
Hepatocellular adenoma
سبحانك اللهم و بحمده نشهد أن لا إله إلا أنت نعتذر و نتوب إليك

Thank you