Radiographic evaluation of hepatocellular carcinoma

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Mr. B.

**HPI:**
- 71 yo man with mild diarrhea and R sided rib discomfort

**PMH:**
- Prostatectomy in 1995 for early stage prostate CA
- Superficial melanoma removed in 1998
- Hx of benign colon polyps
- No risk factors for liver disease

? Liver metastases from melanoma or prostate cancer
Mr. B. - RUQ ultrasound

Large lesion in R hepatic lobe, solid with heterogeneous echotexture
DDx of Solid Liver Mass

What types of cells are in the liver?

- **Hepatocytes**
  - Adenoma, hepatoblastoma
  - Focal nodular hyperplasia
  - Hepatocellular carcinoma

- **Bile ducts**
  - Cholangioma
  - Cholangiocarcinoma

- **Blood vessels**
  - Hemangioma, hemangioendothelioma
  - Angiosarcoma

- **Invading cells**
  - Metastases
  - Lymphoma
  - Carcinoid

Normal liver histology

http://mycourses.med.harvard.edu/collection_display.asp, HMS #61
DDx of Liver Mass in Adult

> 50 yo (Mr. B.)
  - Common
    • Hemangioma
    • Metastases
  - Uncommon
    • Angiosarcoma
    • Hepatocellular carcinoma
    • Intrahepatic cholangiocarcinoma

< 50 yo
  - Common
    • Focal nodular hyperplasia
  - Uncommon
    • Fibrolamellar carcinoma
    • Hepatocellular carcinoma

Mr. B.’s diagnosis

- Ultrasound-guided biopsy demonstrated hepatocellular carcinoma

Example of HCC on liver biopsy

http://www.kumc.edu/instruction/medicine/pathology/ed/ch_14/c14_s35a.html
Hepatocellular carcinoma

• Epidemiology:
  • Most common primary cancer worldwide
  • ↑ incidence: China, Sub-Saharan Africa
  • ↓ incidence: N and S America, Europe, Australia
  • 4:1 (M:F)

• Risk factors:
  • Cirrhosis, HBV, HCV, alcohol, hemochromatosis, environmental toxins, etc.

• Growth patterns:
  • Solitary mass, multifocal masses, diffuse infiltrating

• Treatment:
  • Surgical resection, local ablation (chemo, alcohol, radio)

• Prognosis:
  • 5 yr survival < 5%
  • High mortality due to late clinical presentation

Schwartz JM, Carithers RL. UpToDate Online 10.3
Imaging modalities for HCC

- Ultrasound
  - Most frequently used for detection of HCC
  - Appearance of HCC is non-specific
    - Small tumors hypoechoic and homogeneous
    - Large tumors isoechoic or hyperechoic and heterogeneous with coarse-irregular internal echoes
  - Doppler used to evaluate tumor vascularity, not always accurate
  - Sensitivity 71%, specificity 93% (noncirrhotics)
  - Sensitivity 47%, specificity 98% (cirrhotics)
  - New contrast agents may improve accuracy of diagnosis of HCC

Kim TK, Kim AY, Choi BI. Abdominal Imaging 2002; 27:129
Imaging modalities for HCC (cont’d)

- **CT**
  - Often performed secondary to abnormality seen on U/S
  - May be used as primary screening modality in cirrhotics
  - Features of HCC more specific than U/S
    - Hypodense lesions, hypervascular, enhance in arterial phase, hypodense in equilibrium phase
  - Sensitivity of helical CT may be as high as 90%
  - 3 mm HCCs detectable
  - Biphasic CT - CTHA and CTAP

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Mr. B. - Abdominal CT

1. Multiple hypoattenuating lesions pre-contrast

2. Early arterial enhancement

3. Hypodense in portal venous and equilibrium phases
Imaging modalities for HCC (cont’d)

• **MRI**
  • High resolution image w/o nephrotoxic contrast agents
  • T1: hyperintensity (35%), isointensity (25%), hypointensity (40%)
  • Contrast-enhanced dynamic MRI has similar sensitivity for diagnosis as helical CT
  • Better than CT at differentiating dysplastic nodules from HCC
  • New hepatocyte-specific contrast agents

• **Angiography**
  • Used for chemoembolization of tumors and to control bleeding of ruptured HCC
Patient 2 - HCC on MRI

Central area of T2 hyperintensity suggestive of necrosis
Mr. B. - Angiography

R hepatic artery angiogram - Hypervascularity of HCC
Mr. B. - Post-chemoembolization

1. 1% lidocaine

2. Chemotherapeutic (doxorubicin, lipiodol) + contrast
Other imaging modalities

- FDG PET - useful for determining histologic differentiation of HCC, and HCC mets
- 99mTc-labeled AFP (experimental)

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Findings associated with HCC

- Mass effect or local invasion
- Often secondary to underlying cirrhosis
Patient 2 - Mass effect

Compression of portal vein

BIDMC PACS
Patient 3 - Vascular invasion

- Ascites
- Portal vein invasion
Patient 2 - Portal hypertension

Caput Medusae seen on CT reconstruction
Patient 3 - Portal hypertension (cont’d)

Varices
Non-HCC liver masses

DO NOT BE FOOLED!

• Metastases
  • Spectrum of appearances, usually low attenuation on CT, contrast may or may not enhance
• Hemangioma
• Focal nodular hyperplasia
Patient 4 - Hemangioma

Hypodense on pre-contrast scan

Peripheral enhancement during bolus phase of IV contrast
Patient 5 - Focal Nodular Hyperplasia

Hyperdense lesion in setting of fatty liver

Enhances in arterial phase, accentuates central fibrous scar

Scar enhances during late arterial phase... enhancement washes out during portal venous and equilibrium phase
Summary

- Incidence of HCC is increasing in the U.S.
- Due to high mortality, early detection is essential
- U/S
  - Cheap, primary mode of detection, lower sensitivity and specificity compared to CT
  - Aids in obtaining pathological diagnosis
- CT
  - Higher sensitivity with advances in speed of imaging and dual phase imaging
- MRI
  - Useful for differentiating dyplastic nodules from HCC
- IR
  - Useful for local ablation of HCC in non-surgical candidates
References

1. Schwartz JM, Carithers RL Jr. *Clinical features, diagnosis, and screening for primary hepatocellular carcinoma.* UpToDate Online 10.3.


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