To Biopsy or Not to Biopsy?

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Liver biopsy

• Highly variable and difficult
• Subject to sample adequacy
• Considerable overlap in the appearance between benign and malignant lesions
  - Interpretive errors
• Almost always depends on the specific clinical scenario

Arguments against biopsy sampling:

• A) sampling error may leave the diagnosis in doubt
  (wrong location; insufficient tissue volume; hemorrhage)
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• B) there appears to be a small, but definite risk of tumor seeding of the needle track through which the biopsy was procured

A picture says a thousand words

HCC biopsied: seeded track
Arguments against biopsy sampling:

• A) sampling error may leave the diagnosis in doubt (wrong location; insufficient tissue volume; hemorrhage)

• B) there appears to be a small, but definite risk of tumor seeding of the needle track through which the biopsy was procured

• C) HCC recurrence rates after liver transplantation are significantly higher among patients with tumors larger than 3 cm, (pTNM) I-III stage, Child class B or C cirrhosis, and AFP >200 ng/mL who underwent biopsy


HCC- bled after biopsy
HCC (biopsied): peritoneal recurrence

To Biopsy or Not to Biopsy

- The distinction between various forms of hepatocellular lesions in the pathway from regenerative nodule to early HCC can be very challenging histologically

- In our experience both the appearance at MRI and the short term change in appearance of these nodules may be much more informative than the static histologic picture
Patients with cirrhosis/ CLD
Multi-step Hepatocarcinogenesis

Regenerative Nodules

Commonly are small in size

Most are isointense in T1 and T2wi

Occasionally very hypointense on T1 and T2wi (Fe++)

Occasionally hyperintense on T1wi (protein)

Minimum arterial phase enhancement - similar SI with the liver parenchyma in all phases of enhancement
Regenerative Nodules

- Iron-containing RNs
- Fat-containing RNs

In-phase

Out-of-phase
Low-Grade Dysplastic Nodule

Most are isointense in T1 and T2wi
Occasionally very hypointense on T1 and T2wi (Fe ++)
Occasionally hyperintense on T1wi
Minimum arterial phase enhancement - similar SI with the liver parenchyma in all phases of enhancement

Low-Grade Dysplastic Nodule (LGDN) - T1wi hyperintense nodules larger than nodular background (usually lesions >2cm)
Hyperintense Nodules on Non-Enhanced T1wi

T1wi hyperintense nodules without T2wi hyperintensity or arterial hypervascularity in the cirrhotic liver are benign in most cases

In younger patients with numerous macronodules, almost all of these lesions follow a benign course

Hyperintense Nodules on Non-Enhanced T1-Weighted Gradient-Echo Magnetic Resonance Imaging of Cirrhotic Liver: Fate and Clinical Implications. Jeong-Sik Yu. JMRI 2006
Hyperintense Nodules on Non-Enhanced T1wi

• Fat-containing nodules
• T1wi in-phase / out-of-phase

In the cirrhotic liver, large size (≥ 15 mm) fat-containing nodules strongly suggest malignancy. The presence of numerous fat-containing nodules < 1 cm suggests that the lesions are benign.

Fat-Containing Nodules in the Cirrhotic Liver: Chemical Shift MRI Features and Clinical Implications. Jeong-Sik Yu. AJR 2007
Dysplastic Nodule

- Near isointense on T2wi
- Near isointense on T1wi

- Diagnostic feature: transient arterial enhancement that fades quickly
- NO WASHOUT

- $3T > 1.5T$


Dysplastic Nodule

Enhancing nodules < 1.0 cm described as dysplastic nodules (DN)

Enhancing nodules > 1.0 and < 2.0 cm described as high-grade DN

Enhancing nodules > 2.0 cm be cautious (may represent HCC)
**Hypervascular Nodules <2cm**

**Clinical Implication**

- Cirrhosis or chronic hepatitis: evaluation of small ($\leq 2 \text{ cm}$) early-enhancing hepatic lesions with serial contrast-enhanced dynamic MR imaging.

  - 158 lesions in 75 patients - Follow up of 12–64 months:
    - 104 round or oval (54 (52%) disappeared or decreased in size; 2% (28%) progressed to HCC / 21 (20%) stable in size
    - 30 wedge-shaped (73% disappeared or decreased in size; 27% stable in size)
    - 18 geographic/irregular (78% disappeared or decreased in size; 22% stable in size)
    - 6 triangular-shaped (67% disappeared or decreased in size; 33% stable in size)

  - 112 patients (HCC screening). 175 arterially enhancing nodules
  - Follow-up (14–41.8 months)
  - 101 (57.7%) disappeared; 34 (19.4%) persisted
  - 40 (22.9%) progressed to HCC
  - The presence of coexistent HCC is an independently significant risk factor for future development of HCC.
Liver Cirrhosis - Alcoholic Liver Disease

Hypervascular nodule ≤ 1 cm. Washout?

Follow-up 4 months later

14 Nov 2011: Dysplastic nodule

15 Oct 2012 Washout

DN → HCC
Certain appearances on MRI are absolutely definitive for HCC that biopsy is absolutely unnecessary (possibly also unethical)

Organizations that do not require biopsy for the diagnosis of HCC accepting imaging as a “biopsy” equivalent

American Association for the Study of the Liver (AASLD)
http://www.aasld.org/
European Association for the Study of the Liver (EASL)
http://www.easl.eu/
United Network for Organ Sharing (UNOS)
http://www.unos.org/
Definite HCC

![Image of liver images]

Definite HCC

![Image of liver images]
Definite HCC
Diffuse HCC

- Although more challenging, diffuse HCC is also often characteristic on MRI, and supported by evidence of a very high AFP
Diffuse HCC with malignant PVT: CT vs. MR

MRI may increase sensitivity for the detection and characterization of <2cm HCCs

Early detection of HCC at early stages is the only viable possibility for recurrence-free and long-term survival

• Current state of the art MRI is a highly accurate diagnostic method for the preoperative evaluation of HCC, and the detection of small tumors (<2 cm) was significantly improved compared with previous studies.

- 101 patients, 34 diagnosed with HCC (explant)
- DC-MR total number of lesions, sensitivity and specificity of 97.1% (34/35) 100% (66/66)
- Lesions >2cm, sensitivity and specificity of 100% (23/23) and 100% (78/78)
- Lesions <2cm, sensitivity and specificity of 82.6% (19/23) and 100% (78/78)

MRI may increase sensitivity for the detection and characterization of <2cm HCCs

Research is ongoing.
The presence of ancillary features (such as mild T2wi hyperintensity) and the use of Liver-Specific Contrast Agents may also increase the detection and diagnostic rate of HCCs <2cm.

Hypervascular Hepatocellular Carcinomas 1 cm or Smaller in Patients With Chronic Liver Disease: Characterization With Gadoxetic Acid-Enhanced MRI That Included Diffusion-Weighted Imaging. Kim JE. AJR 2011
Because of the problem of needle track seeding and higher HCC recurrence rates after liver transplantation in patients who underwent biopsy, some major transplant centers contraindicate transplant if the patient had a history of biopsy (eg: Emory).

Currently their criteria is loosened and transplant is delayed > 6 months after the biopsy.

….. a lot of bad things can happen in 6 months.
To Biopsy or Not to Biopsy

Some MR experts believe biopsy is never indicated in liver evaluation if the patient can undergo state-of-the-art MRI.

... My opinion is more middle of the road.

Although I do not advocate biopsy to distinguish liver nodules in the HCC pathway. To distinguish between liver lesions of differing histologic type is an important role that biopsy is useful for.
Hepatitis C, 63 y/o male

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Conclusions

MRI provides a specific diagnosis of a large number of benign and malignant masses

In general biopsy is not indicated for the evaluation of HCC. The appearances on MRI are as (more) reliable as histology. But, in early experience it is reasonable to obtain histology at the time of focal ablative therapy

Biopsy should be used exceptionally for managing patients with liver masses. At times histology may be important. It is important to know when that is the case

Thank You

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