Pitfalls in Liver Imaging: Cirrhosis

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Slides online: https://www.radiology.uchicago.edu/page/faculty-lectures
URL address in RSNA Meeting On-Line Program
Background: HCC in Cirrhosis

- 10 – 14% of advanced cirrhosis harbors HCC
- 25% of Hepatitis B/C patients develop HCC within 10 years
- Compare to risk of colon cancer in 50 y.o.: ≤ 1% prevalence, 7% lifetime incidence
How Good Are We at Imaging Cirrhotic Liver?

- Triaging patient care now with noninvasive imaging diagnosis of HCC

- Most HCC are hypervascular and well seen on arterial phase imaging: But 10–15% of HCC are hypovascular

- What are implications of finding more lesions?
  - Reliance on accuracy, specificity

- Up to 75% of small arterially enhancing lesions in cirrhosis are benign!
Pitfalls in Cirrhotic Liver Imaging

• Technical
  – Optimizing HCC detection

• Pathology and Natural History of HCC
  – Regenerative nodule transformation to HCC
  – Unusual imaging variants of HCC

• Simulators of HCC and other adverse conditions
  – Benign vascular lesions
  – Cirrhotic processes
    ▶ Focal Confluent Fibrosis
    ▶ Infarcted Regenerative Nodules
    ▶ Arterio-portal shunts
    ▶ Peribiliary cysts
    – ...

• ...
Siderotic Nodules: CT

Non Contrast  Portal Venous Phase
Pitfall: Mistaking siderotic nodule for enhancing HCC

Case courtesy of Giuseppe Brancatelli, M.D.
Benign Regenerative Nodules
MR Excels in Detecting Siderotic Regenerating Nodules

Pitfall: Mistaking iron susceptibility for areas of tumoral decreased perfusion!
HCC Dx: AASLD CRITERIA

> 10 mm Liver Lesion, chronic liver disease

One imaging technique with typical HCC
(AP hypervascularity & PV/EQ washout)
If atypical on CT or MR, recommends utilizing the other for possible characterization

UNOS/OPTN and LI-RADS accepts capsule formation

American Association for the Study of Liver Diseases (AASLD) Practice Guideline. 2010
Arterial Phase Imaging:
Pitfall: Inadequate Rate of Contrast infusion

2.5 ml/sec

5.0 ml/sec
Pitfall: Timing for arterial phase tumor enhancement

Bolus Tracking: 100 – 150 HU $\uparrow$ aorta, + add 18 secs

18 sec

35 sec
Pitfall: Inadequate attention to EQ Phase
HCC Enhancement
Pitfall: Assuming all enhance and washout similarly

- Majority show classic pattern ....... BUT

- 10 – 15% are hypovascular at presentation
- Occasionally HCC can demonstrate peliotic changes and delayed enhancement
- Technical pitfall: PV Phase scan may be too early and simulate retained contrast enhancement
HCC simulating blood pool enhancement

Case courtesy of Dr. Hyun-Jung Jang, University of Toronto
Pitfall -- Regenerating nodules enhance
HCC: Best Visualized with MR Gadolinium Contrast?
Pitfall: Assuming there is a specific constellation of MR signal intensities to characterize HCC nodule!
## Cirrhotic Nodule MRI signal intensities: 1 - 2 cm

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<tr>
<th></th>
<th>HCC</th>
<th>Benign Nodule</th>
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<tbody>
<tr>
<td>AP Hyperintensity</td>
<td>84%</td>
<td>42%</td>
</tr>
<tr>
<td>T2 Hyperintensity</td>
<td>60%</td>
<td>16%</td>
</tr>
<tr>
<td>Washout</td>
<td>79%</td>
<td>65%</td>
</tr>
<tr>
<td>Hepatobiliary Delay</td>
<td>79%</td>
<td>51%</td>
</tr>
<tr>
<td>Hypointensity</td>
<td></td>
<td></td>
</tr>
<tr>
<td>All 4 signs</td>
<td>42%</td>
<td>0%</td>
</tr>
<tr>
<td>≤ 1 sign</td>
<td>9%</td>
<td>64%</td>
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**DWI Hyperintensity**

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<th>Benign Nodule</th>
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<tbody>
<tr>
<td></td>
<td>81%</td>
<td>27%</td>
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*Kim TK, Radiology, 2011*  
*Lee MH, AJR, 2011*
Diagnosing HCC: Value of T2 characteristics
Pitfall: T2 characteristics are NOT seen on SSFSE
Pitfall: Biological Variation

Arterial Phase

July, 2007

December, 2007

2010

Delay Phase
Pitfall: Other malignancies in Hepatitis C

Follicular Hepatic Lymphoma: Associated with hepatitis C, usually polyclonal, but can progress to monoclonal malignancy
Hemangioma in cirrhosis: Uncommon!
Pitfall in cirrhosis: Think twice before suggesting hemangioma

Close attention to EQ and T2 will show characteristics diagnosing HCC!

509 Consecutive transplant specimens
Pathology: 9 patients
Imaging: 3 patients (< 1%)

Miller et al, Radiology, 1994
HCC and Hemangioma in Cirrhosis Screening
HEMANGIOMA LIKE LESIONS IN CIRRHOSIS

From Caturelli et al, Radiology, 2001; 220:337-342

- 1982 patients
- 44 hemangioma like lesions
- 22 hemangiomas; 22 HCC

- 1648 patients followed
- 26 hemangioma like lesions
- 22 HCC; 4 dysplastic nod.

DYSPLASTIC NODULE

HCC

HEMANGIOMA
Parenchymal Cysts in Cirrhosis are Uncommon
Peribiliary Cysts
Peribiliary Cysts
Pitfall: Simulate Biliary Obstruction
Avoiding Pitfall: Septations separate Cysts
Avoiding Pitfall:
Cysts on Both Sides of Portal Vein
False Positive CT Diagnosis

**Hypervascular**
- Reg/Dysplastic Nodules
- Focal Fibrosis
- Peliosis
- A-P Shunting/THAD

**Hypovascular**
- Focal Fibrosis
- Reg Nodules (and infarcted nodules)
- Fibrosoed Hemangiomomas
Focal Confluent Fibrosis

- Characteristic Location
  Segs 8, 4 & 5

- Capsular Retraction
- Trapped/crowded vessels

Wedge Shaped
Focal Confluent Fibrosis
Focal Confluent Fibrosis: Enhancement
Cirrhosis truly complicates liver imaging!

- Incidence and prevalence of HCC puts imagers on high alert for suspicious findings
  Not all HCC follow classic early enhancement pattern or show a specific MR signal intensity pattern!

- Attention to imaging techniques are critical for detection of HCC
  Contrast infusion rate; AP timing; Importance of T2 FSE c/w SSFSE

- Remember decreasing prevalence of hemangiomas and cysts

- Be aware of characteristics of benign lesions to avoid misdiagnosis of HCC and biliary obstruction