1. Clinical and pathology aspects
2. US and CT appearance
3. Typical and atypical MR findings
4. Summary
Clinical Findings

- Hemangioma: very common benign liver tumor; 1%-20%
  - Highest prevalence in meticulous pathology study in 95 livers (Karhunen)
  - Increasing radiological prevalence as imaging increases and improves
  - $F:M = 2-5:1$ (especially <40yrs)
- May be present at birth; higher prevalence in elderly
- Majority stable in size, some may grow
- May grow in pregnancy
- Spontaneous involution, especially in children
- Vast majority is small (< 3 cm) and asymptomatic
- Giant (>4, 6, 10 cm?) more often symptomatic
  - Coagulopathy, mass-effect, seldom bleeding, 2 malignant cases
- Rarely pedunculated
Cavernous hemangioma:

- Solitary, circumscribed, blood-filled tumor, lined by endothelium on thin, fibrous stroma and composed of large cavernous spaces. It may have a capillary network. (AFIP, Tumors of the Liver)
- Majority found on surface of liver
- Blood vessels and bile ducts in septae
- May have arterio-portal venous communication with shunting
- Fibrosis with centrifugal progression, necrosis, inflammation, Ca++
  - May lead to sclerosed cavernous hemangioma
- DD
  - Peliosis (blood filled cavities, incomplete endothelial lining, no stroma)
  - Infantile hemangioendothelioma (more fibrotic nodules)
  - Osler-Weber-Rendu (no stroma, no separate lesions)
  - Diffuse systemic hemangiomatosis (multiple organs, thicker septae)
Radiology

- Ongoing, daily challenge due to:
  - High prevalence (approaching 1/5 patients)
  - Significant proportion ≤1cm
  - Significant proportion atypical appearance on imaging

- Consensus
  - Typical US appearance, no malignancy: no FU (Leifer et al, Rad 2000)
  - Pathognomonic on CT or MRI in oncology patient; no follow-up

- No clear consensus:
  - <1 cm, difficult to characterize, hemangiomas
  - Atypical Hemangiomas
US and CT imaging findings

**US**
- Small: round, homogeneous echogenic
- Larger (>2-4 cm)
  - Echogenic border, or inhomogeneous; geographic, no mass-effect
  - Increased through-transmission

**CT**
- Non-contrast: well-circumscribed, homogeneous hypodense, geographic
- Dyn fases: peripheral, discontinuous, globular, intense enhancement, spreading out into the lesion, eventually leading to vascular density.
- Peripheral nodularity 70% (art)-60% (portal) < aorta (Oto, AJR 2010)
- May have non-enhancing centre, especially in larger hemangiomas.
- 10-15% early, complete enhancement, persisting into late phase
  - DD HCC or hypervascular mets, showing wash-out in late phase.
Hemangiomas, delayed enhancement

Delayed enhancement (hyper, not isodens)

- Very suggestive for hemangioma; vascular space
- CT (Honda, AJR 1992)
  - Hemangioma 12/39 (31%)
  - HCC 1/72 (1.4%)
  - Mets 0/28 (0%)
- Chemotherapy treated mets (Semelka Abd Imaging 1999; Burkholz, AJR 2008)
  - may show late enhancement
  - Art phase: peripheral continuous rim, some nodularity
MRI imaging findings

Typical

• Sharply marginated, round or geographic shape
• T2 homogeneous bright
  • $136\text{ msec}^{\pm 26}; mets 92\text{ msec}^{\pm 22}, Cyst 284^{\pm 38}$ (Tello, AJR 2001)
  • TSE: “Intermediate lightbulb”
• T1 dynamic series after Gd-DTPA: as in CT

Atypical

• Larger hemangiomas: central area T1 hypo, T2 hyper
• Fast filling hemangioma, or flash hemangiomas, as in CT
• Hyalinized hemangiomas
  • Typical enhancement lacking; sometimes slight nodular, or rim
  • Capsular retraction
• Very rare: fluid-fluid level
Sclerosed or hyalinized hemangiomas

• **Sclerosed hemangioma**: predominantly fibrosed, near complete obliteration of vascular spaces (**Sclerosing hemangioma**: partially fibrosed)
  - Geographic outline
  - Capsular retraction
  - Decrease in size over time
  - Loss of enhancement over time
  - Enhancement, if present
    - Rim
    - Nodular, non-progressive
    - Late: areas of mild enhancement (fibrosis)
• T1: low
• T2: intermediate or high, as in other hemangioma’s (Doyle, AJR 2007)
Summary on Hemangiomas: CT and MRI

- on CT and Gd-DTPA on MRI:
  - Nodular, discontinuous, intense enhancement, slowly progressive
  - Late: homogeneous hyperdense = vascular space
  - Central necrosis or liquefaction, if larger
- CT, T1, T2: Round or geographic shape
- T2: Bright, sharply demarcated, homogeneous
- T1: Homogeneous low (black on MPRE)

- Sclerosed hemangioma behaves differently; more prevalent than expected

Take care and evaluate each feature meticulously, and you will do fine!