CT & MRI of Hemangiomas

the smaller they get, the tougher they are

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

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Clinical Findings

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- 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

Pathology

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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

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- 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

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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

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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

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Typical

- Sharply marginated, round or geographic shape
- T2 homogeneous bright
  - *136 msec $\pm^{26}$; mets 92 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

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- **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

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- I 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!