**TUMORS IN THE LIVER**

- WHO classification
- Benign and malignant
- Hepatocellular
- Biliary
- Mesenchymal
- Metastatic

**CASE 1**

- 41 y/o man
- Rectal cancer
- Proctocolectomy
- Single liver mass
- Normal adjacent liver

**FOCAL NODULAR HYPERPLASIA**

- Reactive (vs. ? neoplastic)
- Males and females
- May be multiple
- Central scar, not always
- Bile ductules
- Large vessels

**Fetal Nodular Hyperplasia - Core Biopsy**

- Clues
  - Clinical/Xray
  - Fibrosis
  - Blood vessels
  - Bile ductules
  - Inflammation/fat
- Pitfalls
  - Cirrhosis/ductopenia
  - Reaction to adjacent lesion
DIFFERENTIAL DIAGNOSIS

- Cirrhosis
  — Diffuse vs. focal
- Hepatocellular adenoma
  — Fibrosis
  — Bile ducts
- Well differentiated HCC
  — Hepatocyte cytology
  — Cell plate thickness/reticulin
- Nodular regenerative hyperplasia

CASE 2

- 30 y/o woman
- OCP
- RUQ pain
- CT single liver mass
- Normal adjacent liver
- Hemorrhagic mass

HEPATIC ADENOMA

- Well circumscribed, round
- Usually single nodule
- Cell plates up to 2-3 thick
- Reticulin mostly intact
- No mitotic figures
- Cell size approximately normal, but some can be smaller or larger

DIFFERENTIAL DIAGNOSIS

- FNH
  — Fibrosis
  — Bile ducts
- Well differentiated HCC
  — Hepatocyte cytology
  — Cell plate thickness/reticulin

CASE 3

- 45 y/o man
- Cirrhosis
- Liver transplant
- Approx 2.0 cm dominant nodule

NODULES IN CIRRHOTIC LIVER

- Hepatocellular carcinoma
- Other nodules (not diagnostic of HCC)
  Many terminologies prior to 1994 - 95, so nomenclature was confusing
WORLD CONGRESS OF GASTROENTEROLOGY
OCTOBER, 1994
NOMENCLATURE

• Macroregenerative nodule
• Dysplastic nodule, low and high grade (borderline)
• Hepatocellular carcinoma

Dysplasia

Old Terminology
Cellular change
  — Large cell dysplasia
  — Small cell dysplasia

New Terminology
Cellular changes
  — Large cell change
  — Small cell change
  • Dysplastic foci
  • Dysplastic nodules


LARGE AND SMALL CELL CHANGE
(FORMERLY “DYSPLASIA”)

<table>
<thead>
<tr>
<th></th>
<th>Large cell</th>
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<tbody>
<tr>
<td>↑ N/C</td>
<td>nl</td>
<td>↑</td>
</tr>
<tr>
<td>Cell size</td>
<td>↑↑</td>
<td>nl or ↓</td>
</tr>
<tr>
<td>Nuclear size</td>
<td>↑↑</td>
<td>nl or ↓</td>
</tr>
<tr>
<td>Nucleoli</td>
<td>often enlarged</td>
<td>-</td>
</tr>
<tr>
<td>Nuclear contour</td>
<td>variable</td>
<td>usu. Round</td>
</tr>
<tr>
<td>Clustered</td>
<td>-</td>
<td>+</td>
</tr>
<tr>
<td>Scattered</td>
<td>+</td>
<td>-</td>
</tr>
</tbody>
</table>

SMALL CELL CHANGE

• ↑ N/C
• ↑ Nuclear density
• Regeneration vs. neoplasia

NUCLEAR DENSITY
(DEFINED BY NAKANUMA)

• < 2 x normal: may be regenerative, not diagnostic of HCC
• > 2 x normal: suspicious for HCC in appropriate architectural setting

DYSPLASTIC FOCUS

• Small or large cell change
• Can be less than 1 mm diameter
• Nodule-in-nodule pattern
• Usually a cirrhotic liver
**DYSPLASTIC NODULE**

- **Low Grade:** Mild atypical features suggesting clonality (included in MRN category)
- **High Grade:** Moderate, severe atypical features, but not diagnostic of HCC (borderline nodule)

**MACROREGENERATIVE NODULE**

LARGE REGENERATIVE NODULE, LOW GRADE DYSPLASTIC NODULE

- Occurs in cirrhotic liver
- Approx. 0.8 cm to 3 cm diameter
- Usually contains portal tracts
- Histology like cirrhotic nodule
- Can see multiple MRNs in same liver

**MRN OR LOW GRADE DYSPLASTIC NODULE**

- May contain bile, iron, Mallory’s hyaline, fat, clear cell change
- Nuclear density < 2 x normal

**BORDERLINE, OR HIGH GRADE DYSPLASTIC NODULE**

- May contain:
  - Focal decrease or absence of reticulin
  - Increased nuclear density < 2 x normal
  - Cell plates up to 3 cells thick, but not arranged in groups of trabeculae

**BORDERLINE, OR HIGH GRADE DYSPLASTIC NODULE**

- Rare pseudoglands (acini) may be present
- Bile, iron, Mallory hyaline, fat, clear cell change
- Edges of nodule may be irregular

**HEPATOCELLULAR CARCINOMA**

- Small HCC: < 2-3 cm
- HCC may contain:
  - Thick plates > 3 cells
  - Nuclear density > 2 x normal
  - Decreased or absent reticulin (rare cases with fibrous stroma)
**MICROFOCUS OF HCC**

- < 1 mm
- Fully developed cytologic and histologic features of HCC

**SUMMARY**

- MRN, Low Grade DN
  - Minimal cytologic/architectural abnormalities
- Borderline, High Grade DN
  - Moderate cytologic/architectural abnormalities with small/large cell change, decreased reticulin framework
- Well-differentiated HCC
  - Small/large cell change
  - Zones of thick plates (>3)
  - Decreased or absent reticulin

**Hepatocellular Carcinoma Architectural Patterns**

- Trabecular (most common)
- Acinar, pseudoglandular
- Solid, compact
- Scirrhous

**Hepatocellular Carcinoma Architectural Patterns**

- Trabecular (most common)
- Acinar, pseudoglandular
- Solid, compact
- Scirrhous
Hepatocellular Carcinoma Nuclear Changes

- Generally round nuclei with nucleoli
- Small or large cell changes
- Multinucleation and pleomorphism can occur
- Intranuclear vacuoles/clearing

Hepatocellular Carcinoma Cytoplasmic Changes

- Variable in amount and staining: clear (glycogen or fat), eosinophilic, granular
- Inclusions
  - Mallory hyaline
  - Pale bodies
  - Eosinophilic globules
  - HBV (ground glass cells)

Hepatocellular Carcinoma Pigments

- Bile
  - Cytoplasmic
  - Canalicular
  - Within gland-like spaces
- Iron almost NEVER present

Hepatocellular Carcinoma Other Features

- Multinodularity
- Vascular invasion (especially venous)

Hepatocellular Carcinoma Histologic Grading

- Grade 1: Very well-differentiated
- Grade 2: Larger nuclei, ↑ N/C, bile often present
- Grade 3: ↑ cytologic atypia, bile often absent, thicker trabeculae
- Grade 4: Anaplastic

Fibrolamellar HCC Clinical Considerations

- Non-cirrhotic liver
- Younger patients
- Normal AFP
- Better prognosis
Fibrolamellar HCC

Mandatory Features

- Enlarged nuclei with prominent nucleoli
- Large polygonal tumor cells with eosinophilic/granular cytoplasm
- Sheets, nests of cells, embedded in dense, lamellar collagen

Combined HCC
Cholangiocarcinoma

- Collision tumors not in WHO classification
- Incidence 3-5% ??
- Similar risk factors as HCC
- Poorer prognosis than HCC suspected
- Criteria for diagnosis
  - Mucin production (exception: Fibrolamellar variant)
  - Cytokeratin 19+ (??)

CASE 4

- 62 y/o man
- History colon cancer
- RUQ/shoulder pain
- 3-5 cm liver mass
- Surgery
  - Liver mass
  - Adjacent liver ? nodular

MICROSCOPIC FINDINGS

- Pseudoglands or acini
- Proteinaceous
- Eosinophilic cytoplasm

CLEAR CELL PATTERN

- Trabeculae and nests
- Distinct cell borders
- Clear cytoplasm
- Endothelial cells

HCC- PSEUDOGLANDULAR
AND CLEAR CELL

- HCC Variants
- Clear cell change due to glycogen or fat
- Pseudoglandular/acinar
  - Dilation canaliculi
  - Necrosis
  - Degenerative change
  - May contain bile, protein, cellular debris
DISTINCTION OF TUMORS IN THE LIVER

- Most cases not a problem
  - Clinical history and X-ray findings
  - Clues
    - Background liver: cirrhosis or normal
    - Number of lesions
- Small biopsy, poorly differentiated tumors, HCC variants
- Immunohistochemistry

HCC vs. ADENOCARCINOMA

- Adenocarcinoma = metastatic and cholangiocarcinoma
- HCC variant: Pseudoglandular
- Adenocarcinoma variant: hepatoid
  - Stomach, pancreas, gallbladder, etc
- Poorly differentiated

IMMUNOHISTOCHEMISTRY

Use and Abuse

ARE YOU KIDDING??

POORLY DIFFERENTIATED NEOPLASM

VALID USE

IMPOX - HCC vs. ADENOCARCINOMA

- Polyclonal CEA
- MOC31, Ber-EP4, Leu-M1
- Cytokeratins
  - LMWCK, CAM5.2
  - AE1/AE3
  - CK7, CK20, CK19, CK5/6
- AFP, Hepatocyte (Hep Par 1)
- CD10

PCEA-UNCLEAR PATTERNS IN HCC

LUMINAL MEMBRANOUS
**MOC31**

- Poor sensitivity <50%
- Fairly specific, some adenocarcina
m stain

**HEPATOCYTE - HCC**

- Granular cytoplasmic
- Much better sensitivity than AFP >90%
- Specificity
  - Hepatoid adenocarcinoma
    - Maitra, AJCP, 115,689, 2001
  - Stomach, pancreas, biliary, lung
    - Fan, Mod pathol, 16,137, 2003

**CYTOKERATINS**

- AE1/AE3 cocktail
- CAM5.2 (8,18)
- Low molecular weight
- High molecular weight
- Cytokeratin 7
- Cytokeratin 20 (colorectal)
- Cytokeratin 19
- Cytokeratin 5/6 (mesothelioma)

**CYTOKERATIN 7, 20 PROFILES - site origin**

<table>
<thead>
<tr>
<th></th>
<th>HCC</th>
<th>Colon</th>
<th>Stomach</th>
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<tbody>
<tr>
<td>7- 20-</td>
<td>77%</td>
<td>15%</td>
<td>10%</td>
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<tr>
<td>7+ 20-</td>
<td>17%</td>
<td>0%</td>
<td>17%</td>
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<tr>
<td>7+ 20+</td>
<td>7%</td>
<td>10%</td>
<td>38%</td>
</tr>
<tr>
<td>7- 20+</td>
<td>0%</td>
<td>75%</td>
<td>35%</td>
</tr>
</tbody>
</table>


**AFP - HCC**

- Often negative in HCC but can be +
  - Adenocarcinoma

**CAM 5.2**

- + HCC
  - + Adenocarcinoma
**HCC- CYTOKERATIN 7**
- Negative in many but focal staining
- Smaller tumor cells (? oval cells)
- Pseudoglands, focal staining
- Focal clusters
- Not specific for cholangiocarcinoma
- CK19 less staining HCC

**HCC- CYTOKERATIN 20**
- Usually negative
- Mallory hyaline may be +
- Many adeno are negative
- Colorectal +
- - Not useful
  + Useful

**IMPOX HCC vs. ADENO SUGGESTED PANEL**
- Always use panel approach
- Panel to include + and – markers
  —Hepatocyte
  —Polyclonal CEA
  —MOC-31
- Site of origin add CK7 and 20

**HEPATOID ADENOCARCINOMA**
- Morphology like liver
- Aggressive adenocarcinoma
- Stomach, gallbladder
- Common vascular invasion and metastasis
- Liver metastasis vs. HCC

**CASE 5**
- 53 y/o man
- CT scan mass in liver
- 3 cm yellow hemorrhagic mass
- Normal adjacent liver

**MICROSCOPIC FINDINGS**
- Nests
- Prominent vascular pattern
- Clear cytoplasm
**METASTATIC RENAL CELL CARCINOMA**

- Usually history of renal cell carcinoma
- Differential of clear cell tumors
  - Renal cell carcinoma
  - Clear cell HCC
  - Adrenal cortical carcinoma

**CLEAR CELL CARCINOMA**

- Renal cell carcinoma
  - + Vimentin, EMA, CD10, LMWCK
- Hepatocellular carcinoma
  - + Hepatocyte, pCEA, some CD10, LMWCK
- Adrenal: - for most but inhibit
- Suggested panel: pCEA, hepatocyte, EMA (or vimentin)

**ACINAR OR NESTED PATTERN**

**IMMUNOHISTOCHEMISTRY**

- Neuroendocrine carcinoma
  - + Chromogranin, synaptophysin
  - - Polyclonal CEA, hepatocyte
- Hepatocellular carcinoma
  - Similar cytokeratin profile
- Adenocarcinoma
- Bile duct adenoma

**IMMUNOHISTOCHEMISTRY OTHER**

- ER/PR
  - Beware more than breast is +
- Her2-Neu
- TTF-1
  - Nuclear in lung, thyroid
  - Cytoplasmic in HCC not adenocarcinoma
  - Wieczorek, AJCP 118, 911, 2002
  - Bejarano, Arch Pathol 127,193, 2003
- Albumin in-situ correlates with hepatocyte
  - Kakar, AJCP 119,361, 2003

**IHC- SUMMARY**

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<th>RCC</th>
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<td>- (+hepatoid)</td>
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<tr>
<td>MOC31</td>
<td>-</td>
<td>+</td>
<td>+/+</td>
<td>-</td>
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<tr>
<td>PCEA</td>
<td>+e</td>
<td>+</td>
<td>-</td>
<td>-/+</td>
</tr>
<tr>
<td>LMWCK</td>
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<td>+</td>
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<td>+/-</td>
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<tr>
<td>CK20</td>
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<td>+/-</td>
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**IHC- SUMMARY**

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<td>EMA</td>
<td>-/+</td>
<td>+/-</td>
<td>+</td>
<td>+/-</td>
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<tr>
<td>Vimentin</td>
<td>-</td>
<td>+/-</td>
<td>+</td>
<td>+/-</td>
</tr>
<tr>
<td>TTF-1</td>
<td>+/-cyt</td>
<td>-</td>
<td>-</td>
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</table>
CASE 6

- 40 y/o man cirrhosis
- Liver transplant
- Explant- 1 cm tan nodule different from cirrhotic nodules

MICROSCOPIC FINDINGS

- Round and uniform
- Cuboidal epithelium
- No atypia
- No mitosis
- Lymphocytes

BILE DUCT ADENOMA

- Not true neoplasm
- Incidental
- 10 % multifocal
- 93 % are 1-10 mm diameter
- 95 % subcapsular
- Other findings- scar, AAT globules, mucinous change, lymphoid aggregates

BILIBILIARY LESIONS

- Bile duct adenoma
- Biliary microhamartoma
  (von Meyenburg complex)
- Hepatobiliary cystadenoma

DIFFERENTIAL DIAGNOSIS: Proliferation Small Ducts

- Bile duct adenoma
- Biliary microhamartoma
- Bile duct proliferation
- Well differentiated adenocarcinoma
- Neuroendocrine tumor
**BILIARY HAMARTOMA**
- Duct plate malformation
- Frequently multiple
- Less than 0.5 cm

**BILIARY HAMARTOMA (VMC)**
- Dilated irregular ducts
- Dense collagen
- Inspissated bile or eosinophilic debris

**CASE 7**
- 32 y/o woman
- Asymptomatic
- 8 cm mass in liver
- Cystic

**HEPATOBILIARY CYSTADENOMA**
- More common in women
- Counterpart in pancreas
- No connection biliary tract
- Gross findings
  - Usually multilocular, fluid
  - Walls trabeculated
- Microscopic
  - Ovarian stroma and columnar epithelium

**DIFFERENTIAL DIAGNOSIS: Cystic Lesions**
- Infectious
- Simple cyst
- Congenital cystic disease
- Cystadenoma
- Cystadenocarcinoma- solid areas
POLYCYSTIC LIVER

- Usually subcapsular and incidental
- If multiple, association polycystic disease
- Cuboidal or low columnar, fibrous wall

SIMPLE CYST

- Usually subcapsular and incidental
- If multiple, association polycystic disease
- Cuboidal or low columnar, fibrous wall

CYSTADENOCARCINOMA

- 54 y/o woman with ulcerative colitis and cirrhosis
- CT scan biliary dilation ?obstruction
- Papillary excrescences in several ducts
- Liver transplant

CASE 8

- 54 y/o woman with ulcerative colitis and cirrhosis
- CT scan biliary dilation ?obstruction
- Papillary excrescences in several ducts
- Liver transplant

BILIARY PAPILLOMATOSIS

- Multiple lesions in extra and intrahepatic location
- Multifocal and recur
- Cure unlikely without liver transplant
- Papillae lined by mucinous epithelium with fibrovascular stroma
- Intraductal cholangiocarcinoma

CHOLANGIOCARCINOMA

- Occur after 6th decade
- PSC, Clonorchis, biliary anomaly
- Hilar, peripheral, extrahepatic, intraductal
- Pathology
  - Gross firm and fibrotic
  - Morphology may be bland and fibrotic
DIFFERENTIAL DIAGNOSIS:
Malignant Glands

- Cholangiocarcinoma
  - Intraductal CC
  - Invasive CC
- Metastatic adenocarcinoma
- Intraductal HCC

<table>
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<tr>
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<th>Bile duct Adenoma</th>
<th>Hilary Hamartoma</th>
<th>Bile Duct Prolif</th>
<th>Cholangiocarcinoma</th>
<th>Metastatic Adenoma</th>
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<td>yes</td>
<td>no</td>
<td>no</td>
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<td>rare</td>
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<td></td>
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<tr>
<td>Lymphs</td>
<td>yes</td>
<td>no</td>
<td>no, PMNs</td>
<td>no</td>
<td>no</td>
</tr>
</tbody>
</table>

CASE 9

- 50 y/o man
  - hematemesis and epigastric pain
  - Gastric mass
  - 5 cm liver mass

SPINDLE CELL AND EPITHELIOID TUMORS

- Primary or metastatic sarcoma
  - Liposarcoma, MFH, fibrosarcoma, etc
  - Gastrointestinal stromal tumor
- Spindle cell carcinoma or melanoma
- Inflammatory pseudotumor
- Angiomyolipoma
- Vascular neoplasm

INFLAMMATORY PSEUDOTUMOR

- Inflammatory myofibroblastic tumor
- Pseudosarcoma
- In most anatomic sites
- Children/adolescents
- Inflammation and fibrosis
- Many Alk positive
**ANGIOMYOLIPOMA**
- Occur in 30-40 yo
- Perivascular epithelioid cell
- Lymphangioleiomyomatosis
- Tuberous sclerosis
- Smooth muscle, fat, blood vessels
- HMB-45, SMA


**IMPOX- SPINDLE CELL NEOPLASMS**
- Carcinoma- CK
- Melanoma- S-100, HMB-45
- Vascular- CD31, CD34
- Primary or metastatic soft tissue sarcoma
  - Muscle markers, S-100, etc.
- Gastrointestinal stromal tumor (GIST)
  - CD34, Ckit (CD117), Bcl-2
  - Neg or focal SMA, S-100

**IMPOX- SPINDLE CELL**
**SUGGESTED PANEL**
- Cytokeratin
- S-100
- SMA
- C-kit
- CD34

**CASE 10**
- 36 y/o woman
tumor right lobe
liver and smaller
tumors left lobe
- Liver transplantation
- White firm surfaces

**EPITHELIOID HEMANGIOENDOTHELIOMA**
- Rare, low grade malignancy
- Adults, women > men
- Incidental, pain, mass
- Treatment- resection, transplantation
- Prognosis
  - With transplant similar to HCC
  - Better than angiosarcoma

**EPITHELIOID HEMANGIOENDOTHELIOMA**
- Gross findings
  - Multifocal, right and left
  - Firm white to yellow
  - Ill defined borders
- Microscopic
  - Epithelioid and dendritic, vacuoles
  - Myxoid stroma
  - Predilection involve vessels
  - Mimic thrombus
OTHER VASCULAR TUMORS

- Hemangioma
  - Common
  - Endothelial lined spaces
- Angiosarcoma
  - Polyvinyl chloride, thorotrust
  - Pleomorphic endothelial cells

HEMANGIOMA

ANGIOSARCOMA

KAPOSI SARCOMA

- Usually in HIV
- Other known site
- Microscopic
  - Slit-like spaces
  - Extravasation RBC
  - Eosinophilic globules
  - Follow sinusoidal spaces

CASE 11

- 22 month boy
  - Down’s syndrome
- Failure to thrive
- Liver mass

HEPATIC TUMORS

CHILDREN: BIRTH TO 20 YEARS

<table>
<thead>
<tr>
<th>Type</th>
<th>Frequency</th>
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<tbody>
<tr>
<td>Hepatoblastoma</td>
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<tr>
<td>Infantile hemangioendothelioma</td>
<td>18.6 %</td>
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<tr>
<td>Hepatocellular carcinoma</td>
<td>18.1 %</td>
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<tr>
<td>Mesenchymal hamartoma</td>
<td>8.2 %</td>
</tr>
<tr>
<td>Focal nodular hyperplasia</td>
<td>7.5 %</td>
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</table>

HEPATIC TUMORS
INFANTS AT BIRTH TO 3 YEARS

- Hepatoblastoma
- Infantile Hemangioendothelioma
- Mesenchymal Hamartoma

HEPATIC TUMORS
CHILDREN: 5-20 YEARS

- Hepatocellular carcinoma
- Undifferentiated embryonal sarcoma
- Focal Nodular hyperplasia


HEPATOBLASTOMA

- Most common pediatric malignant neoplasm
- Boy:girl ratio 2:1
- Associated congenital anomalies
- Typical presentation
  - Enlarged abdomen or mass
  - Anorexia
  - Weight loss

- AFP elevated in 75-96%
- Marker to be followed postop
- Gross findings
  - Noncirrhotic liver
  - Large mass
  - Necrosis, hemorrhage

HEPATOBLASTOMA

- Epithelial
  - Fetal/embryonal
  - Small cell undifferentiated
  - Macrotrabecular
- Epithelial/mesenchymal

MICROSCOPIC
HEPATOBLASTOMA

• Mesenchymal elements
  — Osteoid
  — Cartilage

• Macrotrabecular type
  — Associated with fetal type
  — Trabeculae > 10 cells thick
  — Simulates HCC

HEPATOBLASTOMA

Small Cell Undifferentiated

• Poorest prognosis
• Rule out
  — Lymphoma
  — Rhabdomyosarcoma
  — Neuroblastoma

• Teratoid
  — Stratified squamous
  — Melanin
  — Mucinous epithelium
  — Striated muscle

HEPATOBLASTOMA

PROGNOSIS AND THERAPY

• Stage at diagnosis critical
• Complete surgical excision yields best results
• Lesion may “mature” after therapy

• Confusion with adenoma
• Confusion with HCC
• Confusion with small cell tumors
**Differentiating Features**

<table>
<thead>
<tr>
<th>Feature</th>
<th>HB, fetal type</th>
<th>Adenoma</th>
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<tbody>
<tr>
<td>Patient age</td>
<td>Usually &lt;2 yr.</td>
<td>Usually &gt;10 yr.</td>
</tr>
<tr>
<td>AFP ↑</td>
<td>Often ↑</td>
<td>–</td>
</tr>
<tr>
<td>Cell size</td>
<td>↓ than nl</td>
<td>nl or ↑</td>
</tr>
<tr>
<td>Reticulin</td>
<td>Focally absent</td>
<td>Mostly intact</td>
</tr>
<tr>
<td>Light/dark cells</td>
<td>+</td>
<td>–</td>
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<tr>
<td>Nodularity</td>
<td>+</td>
<td>+</td>
</tr>
</tbody>
</table>

**CASE 12**

- 23 y/o woman
- 40 pound weight loss
- > 10 cm liver mass

**EMBRYONAL SARCOMA**

- Undifferentiated sarcoma
- Occur typically 6-10 y/o children
- Presentation
  - Abdominal pain
  - Abdominal mass
- Treatment- surgical resection

**EMBRYONAL SARCOMA Immunohistochemistry**

- Reactive with alpha-1-antitrypsin, alpha-1-antichymotrypsin, vimentin
- Occasional cytokeratin positivity
- Some CD10 and p53 positivity
- Negative hepatocyte-Ab, muscle, S-100 and CD34

**EMBRYONAL SARCOMA**

- Gross findings
  - Large, soft, cystic and solid
  - Hemorrhage and necrosis
- Microscopic findings
  - Spindle and stellate cells
  - Atypical and multinucleated cells
  - Myxoid stroma
  - Cytoplasmic and stromal PAS+ globules

**EMBRYONAL SARCOMA Immunohistochemistry**

- May help exclude tumors in differential
  - Hepatoblastoma, HCC (hepatocyte)
  - Angiosarcoma (CD34)
  - Rhabdomyosarcoma (myogenin)
  - Carcinoma (cytokeratin)
MESENCHYMAL HAMARTOMA

- Bland hepatocyte cytology
- Ducts in myxoid stroma
- Often cystic

PROBLEMS WITH SMALL SAMPLES

- Stroma with cysts not biopsied well
- Bland hepatocytes confused with normal
- Ducts confused with normal

HEMANGIOENDOTHELIOMA OF CHILDREN

- Solid/cavernous areas
- Central necrosis/calcification or hemorrhage
- Infiltrative edges
- Prominent ductular proliferation