Hepatobiliary Scintigraphy

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Outline

- What are the studies?
- For each study:
  - Tracer(s)
  - Physiology
  - Protocol
  - Cases
What are the studies?

- HIDA scan
- Hemangioma scan
- Liver-spleen scan
What are the studies?

- HIDA scan
  - Acute cholecystitis
  - Acute acalculous cholecystitis
  - Chronic cholecystitis
  - Biliary duct obstruction
  - Sphincter of Oddi dysfunction
  - Biliary atresia
  - Postoperative biliary tract (i.e., biliary leak)
  - Evaluation of liver lesions

- Hemangioma scan
HIDA Scan
HIDA scan

- What is the isotope?
- What is the energy of the isotope?
- What is the half-life?
- What is the tracer?
HIDA - Radioisotopes

Lidocaine

HIDA (dimethyl IDA)
Lidofenin
Technescan

DisIDA (disopropyl IDA)
Disopenin
Hepatolite

Bromotriethyl IDA
Mebrofenin
Cholotec

Biological activity
Radioactivity
Biological activity
Hepatobiliary Physiology
HIDA - Protocols

- Acute cholecystitis
- Acute acalculous cholecystitis
- Chronic cholecystitis
- Biliary duct obstruction
- Biliary atresia
- Postoperative biliary tract (i.e., biliary leak)
- Evaluation of liver lesions
HIDA – Key principles

- Should be NPO > 4 hrs but < 24 hrs
- CCK causes gallbladder constriction
- Morphine (and other narcotics) cause Sphincter of Oddi constriction
- Bilirubin should be < 27
HIDA – Normal times

- Blood pool clearance: 5-10 min
- Gallbladder filling: 10-30 min (max 1 hr)
- Common bile duct filling: 20 min
- Common bile duct T1/2: 60 min
- Transit to small bowel: 60 min
- Transit to large bowel: 3 hrs
Acute cholecystitis protocol
Acute cholecystitis protocol

Basic outline

<table>
<thead>
<tr>
<th>CCK?</th>
<th>Morphine? Readminister Choletec?</th>
<th>Stop if no Morphine</th>
</tr>
</thead>
<tbody>
<tr>
<td>-0.5</td>
<td>Administer Choletec</td>
<td></td>
</tr>
<tr>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Stop post Morphine</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Acute acalculous cholecystitis protocol
Acute acalculous cholecystitis protocol

Basic outline

CCK? → Morphine? Readminister Choletec? → Stop if no Morphine

Hrs: -0.5 0 1 2 3

-0.5: Administer Choletec
0: Stop post Morphine
Acute acalculous cholecystitis protocol

Exclusion of false-negative outline

<table>
<thead>
<tr>
<th>Hrs</th>
<th>-0.5</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3-4</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>CCK?</td>
<td>Administer Choletec</td>
<td>CCK? Tc-99m or In-111 WBC?</td>
<td>Administer tagged-WBCs</td>
<td>Re-image if Tc-99m WBC given</td>
<td>Re-image if In-111 WBC given</td>
<td></td>
</tr>
</tbody>
</table>
Chronic cholecystitis protocol
Chronic cholecystitis protocol

Basic outline

- Pre-treatment?
- Administer Choletec?
- CCK? Morphine???
- Readminister Choletec?
- Stop post CCK or Morphine

Hrs
-0.5 0 1 2

Administer Choletec

Stop post CCK or Morphine
Biliary obstruction protocol
Biliary obstruction protocol

Basic outline

No CCK!

Stop or continue dynamic imaging? CCK or alter pt. position?

Delayed static imaging

Hrs: -0.5 0 1 2 24

Administer Choletec

Delayed static imaging

CCK or alter pt. position?
Sphincter of Oddi dysfunction protocol
Sphincter of Oddi dysfunction protocol

Basic outline

- CCK
- Stop dynamic imaging

Hrs: -0.5  0  1  2

Administer Choletec  Perform TAC analysis
Biliary atresia protocol
Biliary atresia protocol

Basic outline

Phenobarbital 5mg/kg x 5 days

Stop dynamic imaging

Delayed static imaging

Hrs: -5 d 0 1 24

Administer Choletec
Biliary leak protocol
Biliary leak protocol

Basic outline

Administer Choletec

Stop dynamic imaging

Delayed static imaging

Hrs -0.5 0 1 2-24
# Evaluation of liver lesions

## 2. RBC scan, HIDA scan, and sulfur colloid scan in hemangiomas, FNH, adenomas, & hepatomas.

<table>
<thead>
<tr>
<th></th>
<th>Hemangioma</th>
<th>FNH</th>
<th>Adenoma</th>
<th>Hepatoma</th>
</tr>
</thead>
<tbody>
<tr>
<td>RBC scan</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Flow</td>
<td>normal</td>
<td>increased / nl.</td>
<td>increased / nl.</td>
<td>increased / nl.</td>
</tr>
<tr>
<td>Uptake</td>
<td>delayed</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Clearance</td>
<td>delayed</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HIDA scan</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Flow</td>
<td>normal</td>
<td>increased</td>
<td>normal</td>
<td>increased / nl.</td>
</tr>
<tr>
<td>Uptake</td>
<td>none</td>
<td>immediate</td>
<td>none</td>
<td>delayed</td>
</tr>
<tr>
<td>Clearance</td>
<td>-</td>
<td>delayed</td>
<td>-</td>
<td>delayed</td>
</tr>
<tr>
<td>Sulfur Colloid</td>
<td>Uptake</td>
<td>2/3, 1/3</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Physiology: RBC \(\rightarrow\) vasculature; HIDA \(\rightarrow\) hepatocytes; Sulfur colloid \(\rightarrow\) Kupffer cells
Hemangioma scan

- What is the isotope?
- What is the energy of the isotope?
- What is the half-life?
- What is the tracer?
Hemangioma scan – Key issues

- No preparation
- Sensitivity directly related to size
- SPECT/CT?
  - Size
  - Location

<table>
<thead>
<tr>
<th>Lesion (cm)</th>
<th>Sensitivity (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt;1.4</td>
<td>100</td>
</tr>
<tr>
<td>&gt;1.3</td>
<td>91</td>
</tr>
<tr>
<td>1.0–2.0</td>
<td>65</td>
</tr>
<tr>
<td>0.9–1.3</td>
<td>33</td>
</tr>
<tr>
<td>0.5–0.9</td>
<td>20</td>
</tr>
</tbody>
</table>
Hemangioma scan protocol
Hemangioma scan protocol

Basic outline

Start flow study (1 s/f x 60 sec) → Delayed static planar image, followed by SPECT(CT)

Administer Tc99m-RBCs → Static planar image

Min 0 1 60-120
Hemangioma scan protocol
Cases