Advances in Liver Sonography

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What Are These Advances

1. Elastography
2. Fusion for Biopsies

Liver Disease

- Liver fibrosis consequence of chronic liver disease
- Leads to cirrhosis
- Increased risk for HCC

- Caused by
  - Alcoholism
  - Hepatitis B and C
  - Metabolic disorders
    - Fatty liver
    - Hepatotoxic drugs
Liver Core Biopsy

- Liver biopsy gold standard to stage liver disease for treatment
- Invasive procedure
  - Risks and complications
- Only samples a small piece of the liver
  - Leads to incorrect staging up to 30% of samples
- Wait days for results

Elastography

- Non-invasive
- No sedation required
- Much quicker
- Less expensive
- Results are instantaneous

Metavir Score

- F0 = no fibrosis, normal
- F1 = portal fibrosis without septa, mild
- F2 = portal fibrosis with few septa, mild – moderate
  - Scarring has occurred and extends outside the areas in the liver that contain blood vessels
- F3 = numerous septa without cirrhosis, moderate
  - Bridging fibrosis is spreading and connecting to other areas that contain fibrosis
- F4 = cirrhosis, severe
Goal

• Monitor progression or regression of disease

Transient Elastography

• Fibroscan device
  – Measures shear wave velocity to assess stiffness of liver tissue
  – Stiffer tissue has increased velocities
  – Converts shear wave velocity into kilopascals
  – Correlates value to liver stiffness
  – Blind technique
  – Unable to perform when ascites is present

Shear Wave Elastography

• Uses a special pulsing sequence
  – Push pulse
  – Detector pulse
• Shear wave generation is depth limited
• Sensitive to tissue motion
**Protocol**

- **Patient position**
  - Supine or left lateral decubitus position
  - Decubitus more ergonomic
  - Have patient raise right arm above head to widen rib space
  - Interrogate the right lobe
  - Segment 7 or 8
  - Intercostal approach
  - Avoid biliary, vascular structures and ligaments

- **Patient breathing**
  - Hold their breath in neutral position
  - Somewhere between middle of inspiration and expiration
  - Quiet breathing
  - Taking a measurement in deep inspiration or expiration will give inaccurate measurements
  - Patient only needs to hold their breath for a few seconds
  - Wait a few seconds for unit to cool down

- **Measuring**
  - ROI box should be placed approximately 2 – 3 cm below liver capsule
  - Not skin surface
  - ROI box should be placed so that it is perpendicular to liver capsule
**Protocol**

- **Documentation**
  - 5 - 10 measurements
  - In the same area
  - Reporting the average value

- **Numbers / Values**
  - m/sec or kPa
  - I do my 10 and look at the range
  - Delete any outliers
  - 1-2
  - Add measurements to get back to 10

**Pitfalls**

- Sampling on or near vessels
- Sampling on or near bile ducts
- Sample too shallow
- Sample too deep
- Sample too close to edge of sector
- Sampling near ribs
- Patient motion
- User motion
- Patient breathing
To Learn More

- Elastography Assessment of Liver Fibrosis: Society of Radiologists in Ultrasound Consensus Conference Statement
  - September, 2015 Radiology

Fusion

- Simultaneous scanning of ultrasound and MRI or CT images
- Allows us to expand biopsy service
  - Isoechoic lesions
  - Lesions only seen on contrast CT
  - Saves patient from open surgical biopsy

Extra Equipment

- Electromagnetic transmitter
- Electromagnetic sensors
  - Attached to transducer
- Position-sensing unit
The Process

- Import data
  - MRI
  - CT
  - US
- Format
  - CD / DVD
  - PACS / Network

- Register data
  - Identify common anatomy
- Lock in points
- Scan together
  - Locate area of interest

Benefits of Fusion

- Radiologist
  - Have CT or MRI on screen
  - Increases their comfort level
  - Maintains patient throughput in CT scanner
- Patient
  - No radiation
  - Biopsy team always in room

- Sonographer
  - Expand their knowledge of other imaging modalities
  - Find and correlate pathology easier
  - Decrease MSK pain / injury

Pitfalls of Fusion

- Time to import images
- Registration process
  - Automated
- Equipment bumped during procedure
- More cords
  - Sensors inside transducer
Conclusion

• Exciting technologies to help us take better care of our patients
  – Reduce biopsies
  – Reduce CT biopsies
  – Reduce surgical biopsies
• Understand all the potential complications of portal hypertension and work the patient up thoroughly
  – Don’t stop at the portal vein

Future: Contrast

Thank You

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