



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 contains 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 

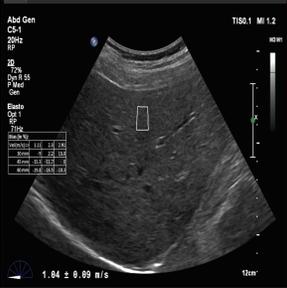
- **Patient position**
 - Supine or left lateral decubitus position
 - Decubitus more ergonomic
 - Have patient raise right arm above head to widen rib space
 - Interrogate the right lobe
 - Segment 7 or 8
 - Intercostal approach
 - Avoid biliary, vascular structures and ligaments

Protocol 

- **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

Protocol 

- **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

Protocol 

- **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 

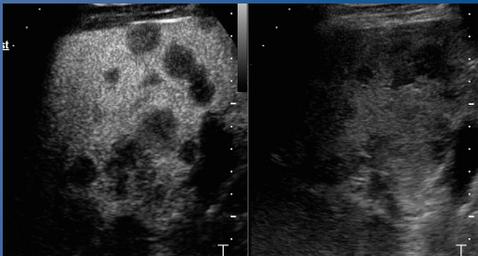
- Time to import images
- Registration process
 - Automated
- Equipment bumped during procedure
- More cords
 - Sensors inside transducer

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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