Pre-hospital Ultrasound

Sound Diagnosis in a Noisy Environment

Virginia EMS Symposium 2009

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What can Ultrasound tell us in the Emergent Setting?

- FAST Exam- Focused Assessment with Sonography in Trauma
  - Intraperitoneal blood
  - Pericardial Tampanade
  - Hemothorax
  - Pneumothorax

How does Ultrasound Work?

- Ultrasound imaging uses ultra-high-frequency sound waves (3-10 MHz)
- Sound Waves reach an object or surface with a different texture or acoustic nature, a wave is reflected back
- Reflected Echoes changed into electric current and a 2-D image is produced

How about the Equipment

- Laptop Sonograph
- Transducers
  - Different transducers for different exams
  - Medical Ultrasound is 2.5- 15 MHz

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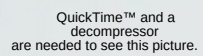
Choosing the Correct Frequency

- The higher the Frequency the Higher the resolution
- The higher the Frequency the lower the penetration



Transducer Capabilities

- The length of the beam is the length of the transducer
- The Width of the beam is 1mm

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Transducer Technique

- Angle and rotation of the transducer determines the direction of the beam
- Depth is determined by frequency

Transducer Types

- Linear array
  - Typically used for vascular and superficial viewing

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- Curved Array
  - Larger field of view both close and at distance because of curvilinear shape
  - Often used for OB and abdominal exams

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- Phased Array
  - Provides a wider view with a smaller footprint
  - Often used for abdominal, cardiac and pediatric applications

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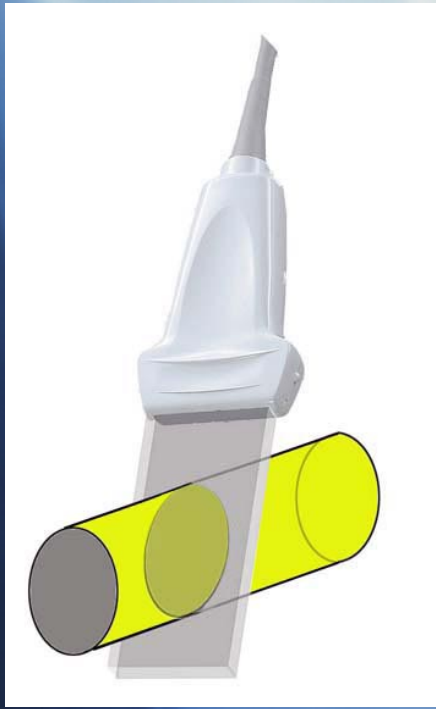
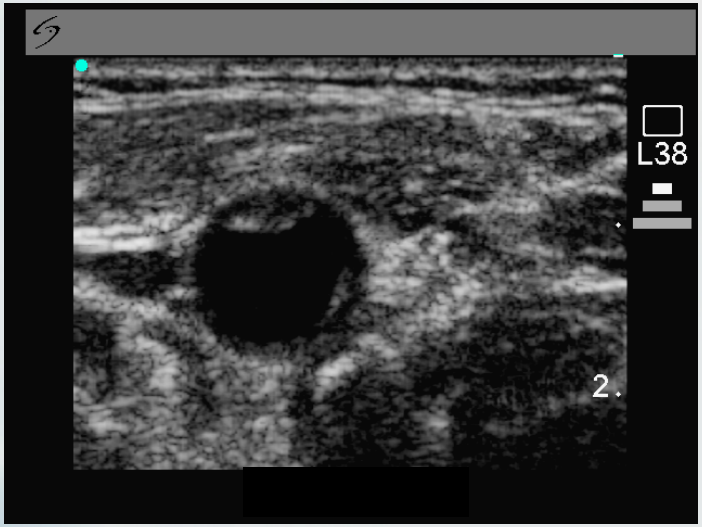
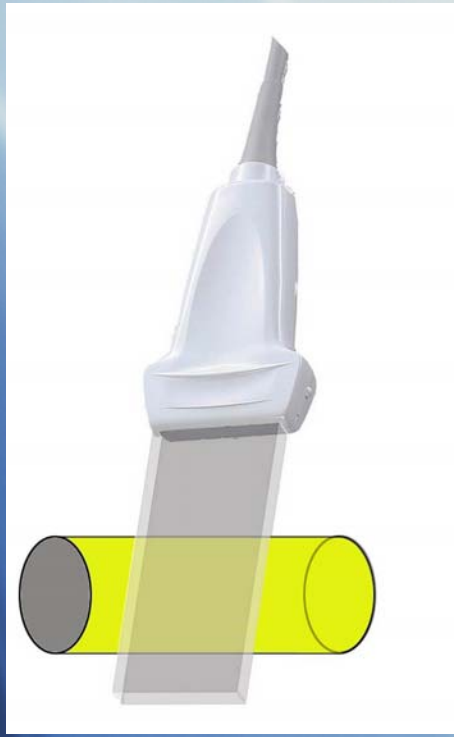
Transducer Orientation

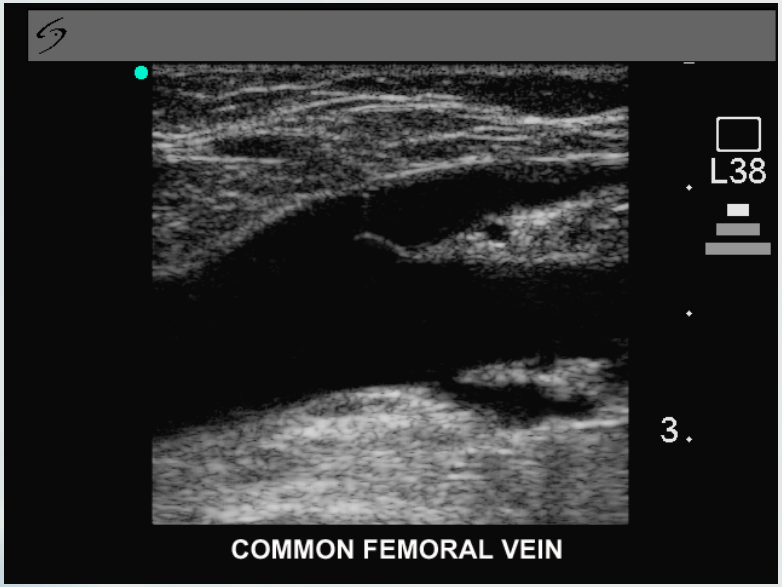
- Transverse





- Longitudinal





What is a “Fast” Exam?

- Focused Assessment with Sonography in Trauma
- Purpose - To rapidly identify peritoneal, pericardial or pleural fluid
  - Specificity
    - Abdominal - 200ml of fluid
    - Pleural - 20ml of fluid
    - Pericardial - 20 ml or less

FAST Cardiac View

- Sub xiphoid vs. transthoracic
- Heart chambers
- Pericardiam

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FAST Left Abdominal view

- Most difficult
- Spleen
- Kidney
- Diaphram

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Bladder / Pelvic View

- Bladder
- Uterus
  - Pouch of Douglas

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Fast Exam Right Abdominal View

- Kidney
- Liver
- Diaphram
- Pulmonary

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What are the benefits of PFAST

- Walcher et al. 2006
  - Much greater then 90% accuracy, specificity, and sensitivity
  - There was a change in therapy or transport destination 30% of the time

Other Uses of Ultrasound

- Use of Ultrasound in Venous Access
  - Central and peripheral approaches

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- Venous access - Peripheral and Central

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Peripheral Access

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Benefits in Central Access

- reduction in needle puncture time
- increased overall success rate (100% versus 94%)
- reduction in carotid puncture (1% versus 11%)
- reduction in haemothorax (0% versus 1.7%)
- decreased pneumothorax (0% versus 2.4%)
- reduction in catheter-related infection (10% versus 16%).

Cardiac Evaluation

- Now incorporated in ACLS algorithm
- Evidence of pericardial effusion
- Presence of cardiac activity

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Pulmonary Evaluation

- Currently non-approved study (off-formulary)
- Presence of “sliding sign”
- Verification of ET placement
- View “sliding” of visceral against parietal pleura
- Presence of “comet” sign


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Pneumothorax

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Uses of Ultrasound in MCI's

- Quick effective secondary triage
- Especially important in destination/transportation determination

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Benefits in other Environments

- Military
  - Short distance networks for triage
- Space
  - Transmission to earth

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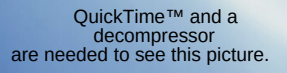
And a special thanks to the teachings and publications of Sonosite.

Questions??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