ULTRASOUND IN SPACE MEDICINE

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WINFOCUS
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Research Goals

Determine accuracy of ultrasound in novel clinical conditions

Determine optimal training methodologies

Determine microgravity associated changes

Develop intuitive ultrasound catalog to enhance autonomous medical care
Ultrasound Protocols: ADUM

- Cardiac
- Abdominal
  - Spleen
  - Liver
  - Gallbladder
- Retroperitoneal
  - Kidneys
  - Pancreas
  - Abdominal Aorta
  - IVC
- Genitourinary
  - Bladder
  - Prostate
- Musculoskeletal
  - Rotator Cuff
  - Knee, Ankle, Elbow
- Thyroid
- Dental
- Sinus
- Eye
- Peripheral Vessels
  - Carotid/Jugular
  - Maneuvers
  - DVT R/O
Cue Card and Reference Image sets

HREF Ultrasound Keyboard

Probe Application Points

Probe Manipulation

Pan
Tilt
Rotate
### ISS Technical challenges

<table>
<thead>
<tr>
<th>Time (GMT)</th>
<th>Event</th>
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<tbody>
<tr>
<td>08</td>
<td>ISS CDR Running SDPC, MS-1, IMS-ORLAN-INV, CMS-TVIS CHAS-INSPECT, EXERCISE-TVIS</td>
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<tr>
<td>09</td>
<td>FE-1 Running SDPC, HRF/MED-OPS, USND, HRF US, HRF/MED-OPS, USND, C/O, HRF MID</td>
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<td>10</td>
<td>FE-2 Running SDPC, MS-1, IMS-ORLAN-INV, CMS-TVIS CHAS-INSPECT, EXERCISE-VELO+HC</td>
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**Ku-band = VIDEO**  
**S-band = AUDIO**

**Hardware assembly / set up time**  
**Data transmission**  
**Video Degradation**
ISS Crewmembers in Ultrasound Operations
Leroy Chiao: “ADUM was the single most valuable piece of scientific and operational work that came out of my expedition”
1/09/07
Focused Assessment with Sonography for Trauma (FAST)
Example: FAST (Focused Assessment by Sonography for Trauma)

- Where does the fluid go?
- No “dependent” locations
- With no gravity, weaker forces come into play and determine fluid distribution

Musculoskeletal Ultrasound

FASTER Exam
Just in time training videos
Fracture Healing

Ultrasound image of a fracture of the 5th metacarpal which also shows the callus formation around the fracture. Ultrasound image was taken 1 month after fracture.
Dental and Sinus Infections
Terrestrial Applications
XX Olympic Winter Games
10-26 February 2006
Human Anatomical Ultrasound Guide
Probe position:

Place probe in C2 position pointing towards the right shoulder with marker to 3 o'clock. Actual position and orientation may vary among subjects. The position/orientation of the heart is also expected to change in 0G.
Discussion