Image Fusion and Interventional Ultrasound

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Fusion Imaging / Volume Navigation

Tough question:
Is this what we have been waiting for?
Just another gadget you never knew you needed?
Judge for Yourself!!

Theory behind

- Volume Navigation:
  - Fusion Imaging
  - GPS markers
  - Needle tracking

Clinical examples related to Interventional US
Volume Navigation Fusion Imaging

US is the Master  CT is the slave

Technique that merges real-time US with previously acquired CT, CT/PET or MRI
Volume Navigation
Fusion Imaging
Step 1

- Load a dataset (CT, CT/PET or MRI) into the US-system
  - Hard drive
  - USB memory stick
  - CD
  - Dicom query/retrieve network
Volume Navigation Fusion Imaging

Step 2

- Connect the transmitter to the US-system
- Attach the sensors to the transducer and connect them to the US-system
Volume Navigation
Fusion Imaging
Step 3

- Register the real time US-image to the loaded data-set (previously acquired CT, CT/PET or MRI)

- Lock plane
Volume Navigation Fusion Imaging

Step 4

- Register the real time US-image to the loaded data-set (previously acquired CT, CT/PET or MRI)

- Lock point
Fusion Imaging

US is the Master

CT is the slave
CT is easy:
No problems with bones and air
Monitor Display of Fusion Imaging: Side-by-Side and Overlay
Fusion Imaging: US and PET/CT
Volume Navigation and Interventional Ultrasound
Identifying Lesions

case 1: New Liver Metastasis?
Identifying Lesions

case 2: Bx from Lymphnode
Identifying Lesions

case 3: Bx from Liver Tumor
Identifying Lesions

case 4 : Bx from Liver Tumor
Bx from Liver Met seen on PET/CT

Case 5: Patient with 2 primary cancers
Abscess Drainage

case 6: Air filled cavity
Needle Tracking
eTRAX
Needle Tracking

In plane puncture
Needle Tracking

In plane puncture
Needle Tracking

Out of plane puncture
Needle Tracking

Out of plane puncture
Needle Tracking

Out of Plane puncture with CT correlation
GPS markers

Marking of an Anatomical Structure
GPS markers

Marking of an Anatomical Structure
GPS markers
Subcostal and Intercostal View
GPS markers
Subcostal and Intercostal View
Mapping of Lesions
US-guided ablation and GPS markers

Case 7: Small HCC
Case 9: 6 weeks post ablation of liver metastasis
Challenges in Fusion Imaging

- Respiratory movements
- Fast and user friendly setup
Respiratory movements
Fast and user friendly setup

- Hardware
- Upload of images (dataset)
- Registration
Registration

- Skin markers for CT
- Autoregistration
Fusion Imaging

Is helpful

In Interventional US
FIN
Fusion Imaging and GPS
Case 8: RF ablation of Liver Met
GPS marking of the lesion
Puncture line for Needle Guidance
Insertion of RF Needle
RF Needle is Deployed
RF heating is going on
Fusion Imaging Post Ablation with CEUS