Use of a 1.5 Tesla Dedicated Extremity MR Unit: Experience over the First 1000 Clinical Cases

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Disclosures
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PURPOSE
• Recent introduction of a 1.5 Tesla dedicated extremity MR unit at our institution led to evaluation of advantages and challenges as well as development of methods for image optimization; our purpose is to present our experience in this regard over the first 1000 clinical cases.

Background
• 1.5T dedicated extremity system
  – 1.0T developed initially; 1.5T released 1st quarter 2009
• 3rd 1.5T extremity unit in US installed at Jefferson, 3/2009
• 1000th clinical case performed recently

Select Coil
• Interchangeable cylindrical coils
  – 80mm, 100mm, 123mm, 145mm, 160mm, 180mm
  – Use smallest one that comfortably fits body part

Comfortable patients are more likely to stay still

Graphic User Interface (GUI)

ALTER PARAMETERS TO OPTIMIZE EXAM
Changing TE
Fat Suppression: Effect of Lowering TE
Receiver Bandwidth (BW)
  • What is it?
    – Range of frequencies and time during the ‘listening’ portion or image data collection
  • Effect:
    – Increasing BW decreases SNR but saves time and reduces susceptibility
    – Increasing BW allows reduction in TR which saves additional time
  • When do I want to increase bandwidth?
    – To save time (i.e., moving patient)
    – To image with metal or other artifact
When do I want to decrease bandwidth?
- To improve SNR when time is not as much of an issue

Echo Train Length (ETL)
- FSE can be used for low TE sequences (ie, T1w) but ETL cannot be raised very high (to avoid blur artifact)
- Raising the ETL makes the exam faster

Rules of thumb:
- TE T1 range: no more than 3 ETL
- TE PD range: no more than 10 ETL
- TE T2 range: can go up to 16 or higher

Oversampling (Phase OS)
- What is it: Oversampling adds more data to K space
- Advantages:
  - Improves SNR
  - Improves phase wrap
  - Compatible with all sequences
- Disadvantage: Increasing OS increases scan time

Fat Suppression Artifact
Metal Artifact
- Increase BW
- Decrease TE
- Remove fat suppression or use STIR

CLINICAL EXAMPLES

Ankle

Midfoot / Forefoot

Elbow

Hand and Wrist

SUMMARY

- A dedicated high-field extremity unit has certain advantages and challenges; overall it can provide high quality and consistency in extremity imaging.
- However, there are positional and optimization issues that are unique among MR scanners.