Portable Low Field Strength MRI: Preliminary Experience in Neonates and Children

Johnston Fite

Research Abstract Title

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Submitting/Presenting Author (must be a trainee): John Fite
Primary Email Address: Jkfite@cmh.edu

☐x Fellow

Primary Mentor (one name only): Dr. Sherwin Chan
Other authors/contributors involved in project: Amie Robinson, Maura Sien, Amit Jain, Harry Hu, John Pitts

IRB Number: 00001356

Describe role of Submitting/Presenting Trainee in this project (limit 150 words):

I've worked on most facets of the project from obtaining and optimizing images, comparing images to standard of care imaging, brainstorming and developing new implementations and working to improve image quality. I've also worked to review and characterize data from other radiologist in the project who have evaluated the quality of the portable MRI images.

Background, Objectives/Goal, Methods/Design, Results, Conclusions limited to 500 words

Background:

High field strength MRI (HF-MRI) is a pediatric imaging staple. However, HF-MRI access is limited by strong (1.5 – 3.0 T) magnetic fields with associated safety concerns, space requirements, and cost. To address these limitations, Hyperfine (Guilford, CT) developed a low magnetic field (0.064 T) portable MRI device, named Swoop. Preliminary data in adults shows benefits despite decreased image quality. In this study, initial evaluation of Swoop's image quality in pediatric patients was assessed.

Objectives/Goal:

The objective in this study was the initial evaluation of Swoop's image quality in pediatric patients to serve as a baseline.

Methods/Design:

The study was a single-site prospective cohort evaluating the quality of the Swoop's adult sequences in pediatric subjects (0-4 years) at a tertiary pediatric medical center. NICU/PICU patients with standard of care (SOC) brain imaging (CT, HF-MRI or US) were considered for the study. Axial FLAIR T2, T2, T1 and DWI/ADC Swoop sequences were performed within +/- 24 hours of SOC imaging. 10 consecutive scans were evaluated independently by 5 attending pediatric radiologists. They graded image quality of each sequence on a five-point Likert scale from: 1) none (no artifact) to 5) extensive (images are non-diagnostic). They also graded if each total scan was diagnostic. Radiologists were blinded to clinical picture and SOC findings.

Results:

Individual quality scores (average +/- SD) for each sequence were FLAIR: 3.6 +/- 0.8, T2: 3.6 +/-0.7, T1: 4.6+/-0.6, and DWI/ADC 4.2+/-0.6. 48% of scans were of diagnostic quality. Written feedback stated that the sequences were adequate for diagnosis of large or global processes but lacking detail for smaller or subtle abnormalities.

Conclusions:

In conclusion, Swoop's adult sequences were suboptimal in a pediatric population. T2 and T2 FLAIR sequences performed better than T1 and DWI sequences. This initial data demonstrates the pressing need for development of neonatal and pediatric specific sequences for the Swoop. Overall, we felt that the Swoop is a promising technology with further research efforts warranted by its potential to provide quick, safe, accessible, and cost-effective MRI.