Lurie Children’s Research Projects

### High-Temporal Resolution MR Tissue Phase Mapping in Children and Young Adults - Cynthia K. Rigby, MD

**Goal**
- To determine feasibility of T1m and its role in children and young adults

**Initial Results**
- T1m is technically feasible in age group of our study population
- The regional myocardial velocities measured by the T1m correlate with speckle tracking echocardiography

**Clinical Impact**
- To determine global and regional systolic and diastolic function in various cardiac pathologies
- To optimize therapy management based on myocardial velocities derived from T1m

**Future Perspective**
- To establish clinically reference standard in pediatric population
- To integrate T1m as a part of clinical CMR study

### Feasibility of Ultrafast MRI for Evaluation of Pediatric Head Trauma - M. Ryan, A. Jaju, T. Alden

<table>
<thead>
<tr>
<th>Subject Area</th>
<th>Description</th>
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<tr>
<td>Ultrafast MRI (UFT MRI)</td>
<td>Specifically designed to quantitatively assess the extent of brain injuries and utilizes a rapid T2-weighted imaging sequence (such as HASTE or SSFP) and was initially designed to evaluate ventricular size in motion analysis.</td>
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<tr>
<td>2D-CINE MRI</td>
<td>Encoder gradients are typically optimized for T1-weighted imaging, but can be used for T2-weighted imaging.</td>
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<tr>
<td>3D-CINE MRI</td>
<td>Typically optimized for T1-weighted imaging, but can be used for T2-weighted imaging.</td>
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**Total scan time ~30 min, so can be done without sedation.**
**Gradient sequences can be added to increase sensitivity to hemorrhage, but are often motion-degraded.**

**Conclusions**
- Total scan time ~30 min, so can be done without sedation.
- Gradient sequences can be added to increase sensitivity to hemorrhage, but are often motion-degraded. 

### T2 Quantification of Myocardial Perfusion - Cynthia K. Rigby, MD

**Purpose**
- Validation of T2 mapping in pediatric population
- Determination of normal pediatric T2 values
- Assess variability with age, heart rate, and myocardial insult
- Compare the normal myocardial T2 expected abnormal T2 values

**Quantitative T2 map in feasible.**
- Normal pediatric myocardial T2 values are reliable without variability by age, heart rate or location.
- Statistically significant differences exist between normal and abnormal myocardium.

### Imaging Evaluation of Spondylolisthesis in the Pediatric Population - Comparative Analysis of MRI, CT, and SPECT - E. Ro, K. Ryan

**Purpose**
- Spondylolisthesis: a common cause of back pain in the pediatric population, in particular the athletic adolescent. Historically, CT and bone scan have been the methods used for the diagnosis of spondylolisthesis.
- Recently, MRI has been used to detect changes of stress reaction (marrow edema), which represents the earliest manifestation of pain sufferers.

**Conclusions**
- Comparative T2 mapping addressed well-known problems of T2-weighted imaging and offers potential for increased accuracy in detecting myocardial abnormalities.
- Normal T2 value can serve as a reference to quantitative abnormal myocardium.

### T3 Mapping in Children and Young Adults - Non-invasive Detection of Myocardial Fibrosis - Cynthia K. Rigby, MD

**Goal**
- To establish clinical utility of T3 mapping in children and young adults

**Where we are:**
- Analyzed more than 50 patients with a wide spectrum of cardiac disease
- Preliminary results show T3 cutoff value of 956 ms to identify patients with cardiac disease

**What more to do:**
- To guide cardiac risk stratification and clinical decision making
- To explore the role of T3 mapping in a subgroup of population in children and young adults

### Research Interests
- 1. Neuro Oncologic Imaging
- 2. Fetal MRI

### Current Projects
- 1. Role of quantitative OAW imaging in characterization of orbital masses
- 2. Imaging correlates for tumor biology in a subset of patients
- 3. Treatment-related changes in ALL - Role of MRI screening
- 4. Educational exhibit - Imaging of sinus anomalies in pediatric patients

### Evaluation of Simulation Education to Improve Performance of Fluoroscopic Upper Gastrointestinal Procedure in Infants with Bilious Emesis - Ellen C. Bemya, MD

**Conclusions**
- Residents who received drills and feedback with the model VR software had significantly higher scores on written test and improved evaluation
- Differences in the diagnostic accuracy scores for the residents with active training compared to the learning residents were close to significant

### Measuring Human BAT Volume and Activity by Quantitative and Functional MRI - Jie Deng, PhD, MRI Physicist

**Purpose**
- To differentiate BAT tissue types using myelograms and quantitative MRI measurements
- To measure the tissue characteristics changes in BAT tissue type under the cold environmental conditions
- To compare the degree of BAT activity

**Advanced Diffusion MRI for Differentiation of Pediatric Brain Tumors and Assessment of Treatment - Jie Deng, PhD, MRI Physicist**

**Conclusion**
- We are comparing findings in patients with MRI and CT/CT bone scan to evaluate:
  - The sensitivity and specificity of the MRI for identifying patients who differ in primary tumor location and with the CT
  - The prevalence of other pathologies identified by MRI (such as disc disease) that is occult by CT bone scan

### 3. Other Researches
- The first study for the disease and have various abnormalities
- Cardiac ischemic OBQF ICA qualitative & quantitative (7/15/73) imaging, embolization, free breathing cine (C) cardiac (4D-MRA), post contrast delayed imaging optimization, cine perfusion, etc.
- Cardiac ischemic OBQF ICA quantitative (non-contrast MRA/MRA/VCT) imaging, embolization, QCA, QSD, MRA, etc.
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### Alok Jaju, MD

### Andra P. Popescu, MD

**Research Interests**
- 1. Assessment of Two Different MRI Techniques: Standard Dynamic Gradient Echo with Extracellular Contrast Agent versus Gradient Echo with Blood Pool Contrast Agent
- To compare imaging quality of non-contrast MRA (NCP-MRA) in our pediatric and young adult population.
- To determine the feasibility of using a contrast agent to enhance the visibility of small or subtle lesions.

**Conclusions**
- Standard Dynamic Gradient Echo with Extracellular Contrast Agent is superior to Gradient Echo with Blood Pool Contrast Agent in the visualization of various anatomical structures.

### Jennifer Nicholas, MD

**1. Efficacy of a Year-Long Call Preparation Curriculum delivered by iPads**
- Paper in progress
- Nicholas JS, Jaffe J.

**2. Efficacy of Global Health Programming on Self-Reported Global Health Competencies**
- Data collected in progress
- Nicholas JS, Jaffe J.

**3. Can the Choice of Nomogram Used to Interpret Sonographic Renal Measurement in Children with Dysmorphology affect Clinical Management?**
- Paper in progress
- Nicholas JS, Jaffe J.

**4. Effect of Teamwork on Decreasing Length of Stay in Newborns with Neonatal Intensive Care**
- Paper in progress
- Nicholas JS, Jaffe J.

**5. Fracture Patterns in Patients with Osteopenia**
- Paper in progress
- Nicholas JS, Jaffe J.

### Christina Sammet, Ph.D., DABR

**Medical Physicist, Radiation and Laser Safety Officer**

**1. An imaging strategy for lower dose cardiac CTA in infants**
- To achieve ultra low dose multi-detector cardiac angiography utilizing a low x-ray tube voltage (LVP) technique

**2. Improving Neurologic Outcome Measurement for Interventional Research in Children in India**
- To improve neuroimaging research capacity at the University of the University of Benin, Nigeria and a research collaboration from the children’s hospital and stroke

**3. Radiation dose optimization for pediatric neuro-interventional procedures**
- To promote dose performance, low dose, and dosimetric image quality in pediatric neuro-interventional studies and neurointerventional procedures