Bioengineering 278
Magnetic Resonance Imaging

Winter 2013
Lecture 7

• Cardiac Imaging
  • Gating
  • Cine
  • Myocardial Tagging
  • Cardiac ASL
• Cine Phase Contrast MR Angiography
# Cardiac MRI - Goals

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<thead>
<tr>
<th>Metric</th>
<th>MRI</th>
<th>Competing</th>
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<td>Function - Ejection Fraction</td>
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**Main Challenge:** MOTION  
- Beating  
- Respiration  
- Patient
Gating

Prospective

Retrospective
Phase Contrast MRA

- Phase is proportional to velocity
- Quantitate velocity from phase images and/or:
  - Construct angiograms by MIP of velocity maps
Gating/Navigation

- Cardiac Gating
- Respiratory Gating
- Breath hold
- Navigation
- Data filtering
Coronary Arteries
Myocardial Tagging

ECG Trigger
RF
Slice
Phase
Readout

Tagging → Imaging

90° -90°
RF
Grad

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Perfusion – Gd Bolus
Arterial Spin Labeling

1. Tag Arterial Blood by magnetic inversion
2. Wait for delivery of tagged blood (1-2s)
3. Image myocardium + tagged blood

Tag Image

Control Image

Image myocardium

ASL Image of tagged blood

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ASL Tagging Schemes

- Pulsed Slab Tag Along Aorta
- Pulsed Slab Tag Across Aorta
- Pseudo-continuous Tag Plane
- Imaging Volume
- Pulsed 2D Tag Along Aorta
- Pulsed 2D Tag Across Aorta

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2D Pulsed Tagging
## Cardiac MRI – Current Status

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