Bioengineering 278: Magnetic Resonance Imaging Laboratory
Winter 2013
Lab 7

For this lab you will be using stock GE pulse sequences to examine the heart. Place a live human in the scanner, use the 8 channel torso array coil, and connect the pulse oximeter or ECG leads to the subject. Use breath holding for all data, and the automatically reconstructed dicom images.

1. **iDrive.** Use the iDrive real time imaging protocol to find long axis and short axis planes to use as localizers. Write a summary of your impression of how cool iDrive is. Please limit your summary to one word. (2 points)
2. **Measure the torsion of the heart using myocardial tagging**. Prescribe a 2 slice short axis scan, with one near the apex and one near the base. Specify approximately 10 phases across the cardiac cycle.
    a. Estimate the torsion between diastole and systole. Relative to diastole, how many degrees of twist is present between apex and base at end systole? A simple way to measure the rotation in each slice is to identify two points on opposite sides of the ventricle, and measure the rotation of the line between those two points. Twist is the difference in rotation between apex and base. Compare your value to a literature value for the twist. (6 points)
3. **Ejection Fraction**. Ejection fraction is defined as the fraction of the left ventricular blood volume at end diastole that is ejected by end systole. Collect at least 5 short axis cine images with 10 or more cardiac phases. For each slice, measure the area of the blood pool at the largest and smallest cardiac phases, and use these to estimate the ventricular volume at these phases.
    a. Estimate the EF and the absolute stroke volume of the subject and compare to literature values. (6 points)
4. **Flow through aorta.** Collect a cine phase contrast image at the root of the aorta. Use the FastCard cine phase contrast pulse sequence, the 'phase difference' option, and under 'User CVs' disable the magnitude masking option.
    a. Integrate the flow through the aorta across space and time in order to estimate the total blood flow through one cardiac cycle. Compare with the measurement of total blood expelled from the heart during one cardiac cycle with the stroke volume from part 3a. (6 points)