

Title: Virtual simulation of Angio- and Perfusion MRI

OVERVIEW: The purpose of your project is to implement a model of tissue that simulates angiography and perfusion and image it with contrast enhanced MRI using an exogenous contrast agent. Assume that this agent reduces the T1 of tissue and you are using a T1-weighted MRI protocol (so the agent will increase the signal intensity – SI- of tissue). Figure 1 shows a model of a heart.

Phantom: Figure 1 shows the phantom that will have the following features (note that those are simplifications of what is actually happening in the real tissue):

- The phantom does NOT move (it does not simulate cardiac beating) and will have two compartments, one representing tissue with normal perfusion and the other with abnormal perfusion.
- In the part with normal perfusion the blood (+ agent) enters and then leaves without returning again.
- The part with abnormal perfusion will have two characteristics: the blood will enter slower than in this of normal tissue and then it will come back again and accumulate there (i.e. stay!)
- Before the injection of the contrast agent assume that the tissue has a signal of 1.0 and the background (empty space) is 0.0 (as shown in figure 2)

Tissue characteristics:

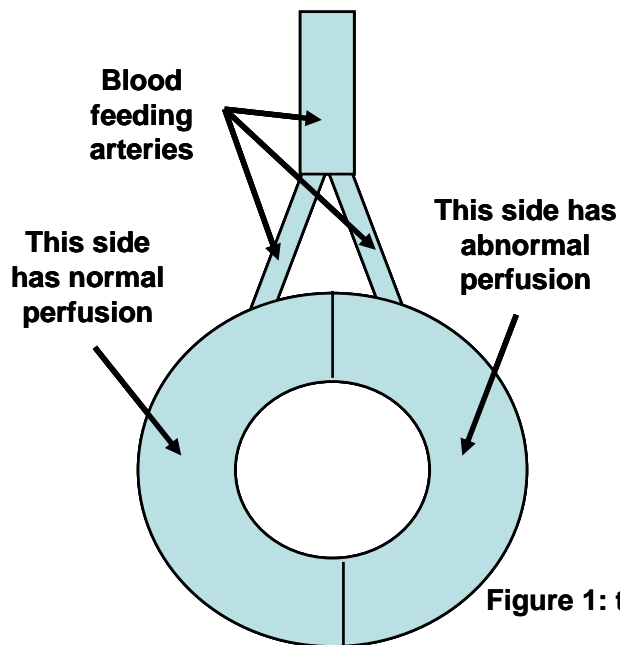


Figure 1: the phantom

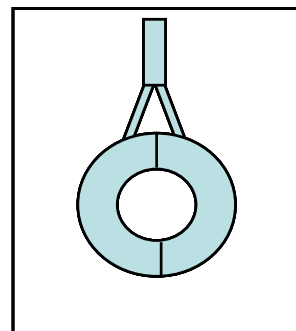


Figure 2: The image frame relative to the phantom. Assign 0.0 signal to the “empty” space.

Output:

- Create a movie that shows how the SI of your phantom changes in time. The frames of this movie will be images of the phantom “taken with your scanner” at different instances (starting from before the injection of the agent)
- Generate a graph that shows the signal intensity versus time in your three compartments: vessel, normally and abnormally perfused tissue.