CALIFORNIA STATE SCIENCE FAIR
2010 PROJECT SUMMARY

Name(s)
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Project Number
S0916

Project Title
The Use of Background Suppression in MRIs to Increase Signal

Abstract

Objectives/Goals
The objective of this project is to increase the efficiency of ASL (Arterial Spin Labeling) perfusion imaging. This is done through the application of Background Suppression (BGS) in MRI to decrease the signal and the excess noise, but overall increase the signal to noise ratio.

Methods/Materials
First, the volunteer must be informed of the proper safety and given the consent form to sign. Then a localizer scan is performed to get a general image of the brain. After that, the 4 ASL scans are conducted: a control (no BGS), traditional BGS (tag location and up), extended BGS (+100mm area) and global BGS (maximum area). The raw data from the scans must be extracted and then converted to number/picture form through a Matlab code. Lastly, the Signal to Noise ratios of each scan are compared to find which produces the greatest ratio to make a conclusion.

Results
Format = experiment: signal/noise/ratio
Trial 1:
Control: 34.7345/22.3955/1.5063 : 1, Trad. BGS: 26.7062/12.6313/2.1143 : 1
Ext. BGS: 23.9428/8.5707/2.7936 : 1, Global BGS: 33.0131/7.2024/4.5836 : 1
Trial 2:
Control: 29.4384/22.3672/1.3161 : 1, Trad. BGS: 23.6377/10.5630/2.2378 :1
Ext. BGS: 21.8008/8.3783/2.6021 : 1, Global BGS: 28.7263/5.8229/4.9333 : 1
Trial 3:
Control: 29.4355/15.3740/1.9146 : 1, Trad. BGS: 21.2455/9.2045/2.3082 : 1
Ext. BGS: 19.3661/10.8103/1.7914 : 1, Global BGS: 33.2441/5.3993/6.157 : 1

Conclusions/Discussion
The 3 trials unanimously showed that BGS did increase the signal to noise ratio. The general trend found was that the greater the area covered by BGS, the higher the signal to noise ratio. Thus, global BGS was the best option. This finding is beneficial to the world of medicine in that currently, doctors use the traditional BGS, but if they switched to global BGS, the ratio would increase 4 to 6 fold. Thus, that create higher quality images purely from signal. The global BGS is easy to use: it can be activated with a click of a button.

Summary Statement
The use of background suppression to increase the signal to noise ratio in ASL scanning so that images are more efficient and better quality.

Help Received
Used MRI equipment at UCSD under the supervision of Dr.Eric Wong and his student Guo Jia