



CALIFORNIA STATE SCIENCE FAIR 2013 PROJECT SUMMARY

Name(s) Sameer U. Khan	Project Number J1213
Project Title Weight-Bearing or Not Weight-Bearing?	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals This project is designed to determine if a weight bearing device can be used in a regular MRI machine to mimic or resemble the effect of gravity on spinal anatomy as seen in the Upright MRI machine.</p> <p>Methods/Materials After getting consent from 15 subjects to participate in this project, their MRIs were scheduled at Vital Imaging Center in Bellflower, CA. Three methods of MRIs were taken of each subject: 1) Recumbent MRI with no compression, 2) Recumbent MRI with the Dynawell device, which increased the compression of the lumbar spine by 40% of the subjects' body weight and 3) A natural Upright position MRI, utilizing the Fonar Stand-Up machine. After the imaging, I gathered the data from the MRI tests and calculated the difference in sizes of the disc herniations between the 3 methods. I then used Microsoft Excel to graph the data and averages in order to show the results.</p> <p>Results In the 15 subjects tested, a total of 29 levels of disc herniations were seen. With the exception of 2 levels, all other recumbent (not loaded) method disc herniation measurements were either equal to or less than the loaded or Upright weight-bearing methods. Seven disc herniations measured higher on the Dynawell device (loaded) recumbent MRI compared to the Upright MRI method. Twenty-one disc herniations measured higher on the Upright MRI method in comparison to the Dynawell device (loaded) method. One level was equal. The average disc measurements for the recumbent (not loaded), loaded and Upright methods were 2.2mm, 2.79mm, and 2.88mm respectively. In comparison to the recumbent (not loaded) method, the average disc herniation was 26.6% higher in the Dynawell (loaded) method and 30.8% higher in the Upright MRI method. There is only a 4.2% differential between the loaded and Upright MRI methods.</p> <p>Conclusions/Discussion Studies have shown that the true extent of a back injury is better visualized with weight-bearing conditions compared to not weight bearing conditions. This leads to more accurate treatment planning and outcomes for patients. When an Upright MRI machine is too expensive or not available, an external loading device such as Dynawell is a good alternative to produce results closer to natural weight-bearing. This leads to greater accessibility, more accurate diagnoses, and better treatment planning for back injury patients.</p>	
Summary Statement This project is designed to determine if a weight bearing device can be used in a regular MRI machine to mimic or resemble the effect of gravity on spinal anatomy as seen in the Upright MRI machine.	
Help Received Dr. Aziza Qadeer who is the director of research at Vital Imaging MRI Center (who provided equipment) gave me the opportunity to participate in her research and utilize the data for analysis and presentation. The Department of Orthopedic Surgery at UC San Diego provided consenting volunteers.	