



Project: Sacroiliac Joint Fusion Minimally Affects Adjacent Lumbar Segment

Motion: A Finite Element Study

Site: University of Toledo	
Site Director: Vijay Goel, PhD	
PI's name: Vijay K. Goel, PhD	Proposed/Tentative Budget: (including 10% indirects): \$40,000
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<p>Need and Industrial Relevance: While the lumbar spine is the most significant source of low back pain, the SI joint has been recognized as a pain generator in 14.5% to 22.55% of patients. SI joint fusion may be required if non-operative treatments (e.g. anti-inflammatory medications, physical therapy, steroid injections) fail. Surgical treatment of the SI joint can be performed using either open or minimally invasive surgical (MIS) techniques. Recent studies comparing the two fusion techniques found the MIS procedure resulted in larger improvements in ODI and pain relief, as well as shorter surgical times and hospital stays. Although SI joint fusion is effective, the potential for adjacent segment disease is unknown. The purpose of this study is to quantify the changes at the adjacent lumbar motion segments after SI joint fusion and compare them to the changes reported for lumbar arthrodesis procedures that have increased risk for ASD.</p>	
<p>Project Goals: An experimentally validated finite element model of the ligamentous lumbar segment, sacrum, pelvis, and femurs along with hip joints will developed. Male and female models will be included. These models will be modified to simulate fusion of the SI joint using several devices currently on the market.</p>	
<p>Objectives/Hypotheses: The motion in the lumbar region for the intact and stabilized models will be compared to assess the effects of stabilized SIJ on the adjacent segment disease (ASD). Our hypothesis is that unlike the contribution of the arthrodesis in the lumbar region to ASD, contribution of SIJ fusion will be minima to the ASD.</p>	

Approach (Research Methods): To investigate the changes, a minimally invasive SI joint fusion procedure will be simulated in a three-dimensional, experimentally validated lumbar spine-pelvis finite element model; finite element modeling is a very good tool to estimate the limited range of motion (ROM) observed in the SI joint (2°). The angular motions of the SI joint and lumbar motion segments will be computed and compared between the intact and treated conditions. The potential for ASD will be assessed by comparing the changes with previous lumbar arthrodesis studies.

Milestones:

- Develop the male and female models – Jan 2016
- Simulate SIJ fusion using several devices currently on the market – Feb 2016
- Analyze motion at the adjacent lumbar segment – April 2016
- Publications, including project report – Aug 2016

Outcome/Deliverables:

Including:

- *Presentation Update* - beginning of 2016 at the University of Toledo, Ohio
- *Final Report including results* - Aug 30, 2016

Impact: SIJ fusion to resolve pain is becoming main stream and it is essential to understand the biomechanics of SIJ fusion.

Project Duration & General Budget Outline: Just a suggestion but the total should not exceed \$40K

Personnel	\$	26,000
Desk top computer	\$	5,000
Software license	\$	3,000
Total Direct	\$	34,000
Indirects (10%)	\$	3,400
Total	\$	37,400

Duration: 1 year

Start Date: October 1, 2015

End Date: Aug 30, 2016