

# Comparison of Two Different Implant Materials in Minimally Invasive Facet Fusion: An *In Vitro* Biomechanical Study



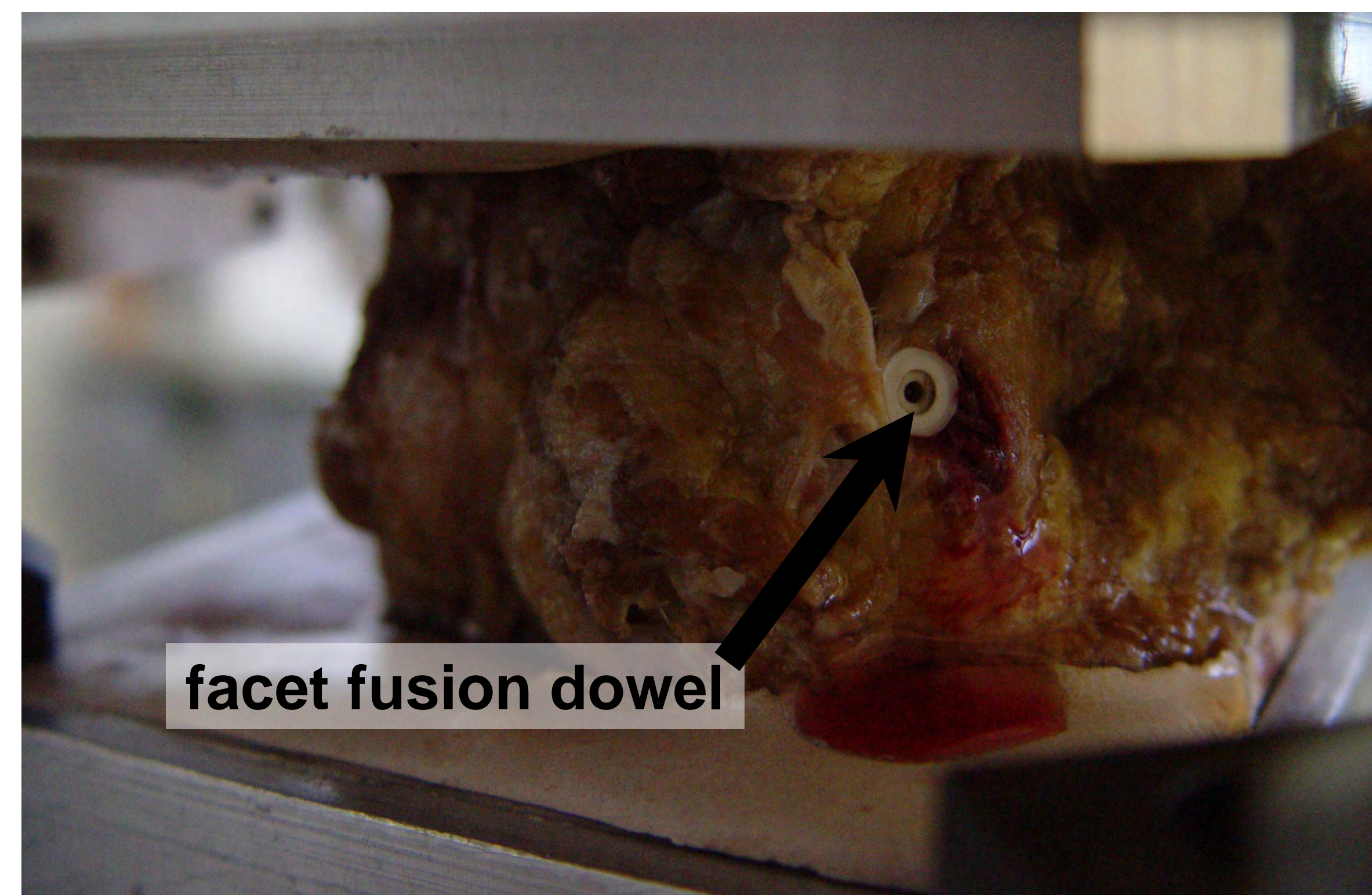
Wesley M. Johnson, PhD



Department of Chemical and Biomedical Engineering, University of South Florida, Tampa, Florida

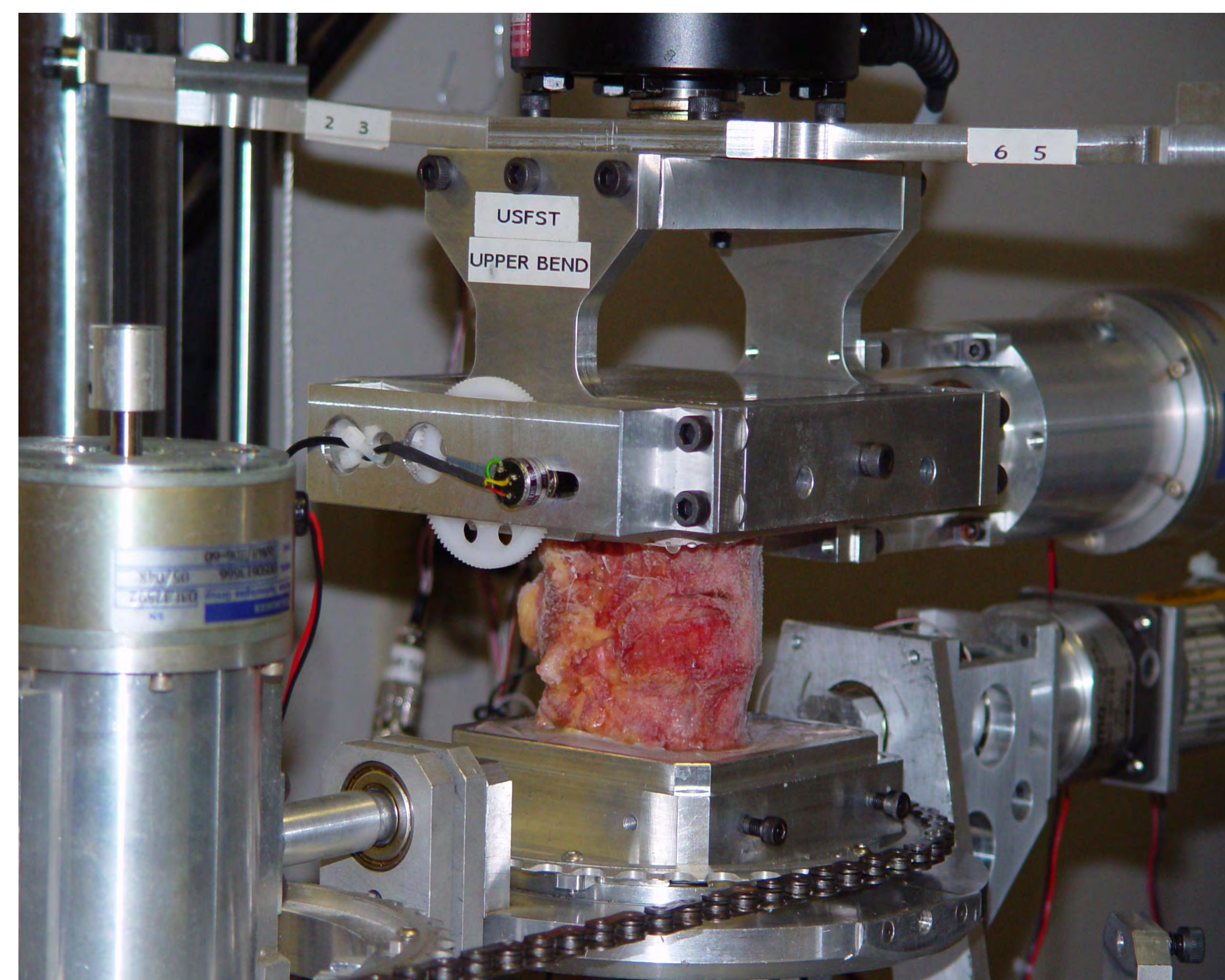
## Introduction:

Facet fusion has played an important role in spine surgery. A novel method has been developed, in which tapered cortical allograft dowels are impacted bilaterally into lumbar spine facet joints. Biomechanical studies have confirmed increased stiffness and reduced range of motion following the procedure. The technique has been adapted to allow minimally invasive or percutaneous implantation of the dowels. Low availability of cortical allograft requires development of alternate materials for the procedure. Consideration was given to a tri-calcium phosphate infused hydroxyapatite-polyethylene resorbable composite which has had successful use in orthopaedic surgery and demonstrated accelerated bony fusion. The purpose of this study was to compare in vitro biomechanical responses of each material.



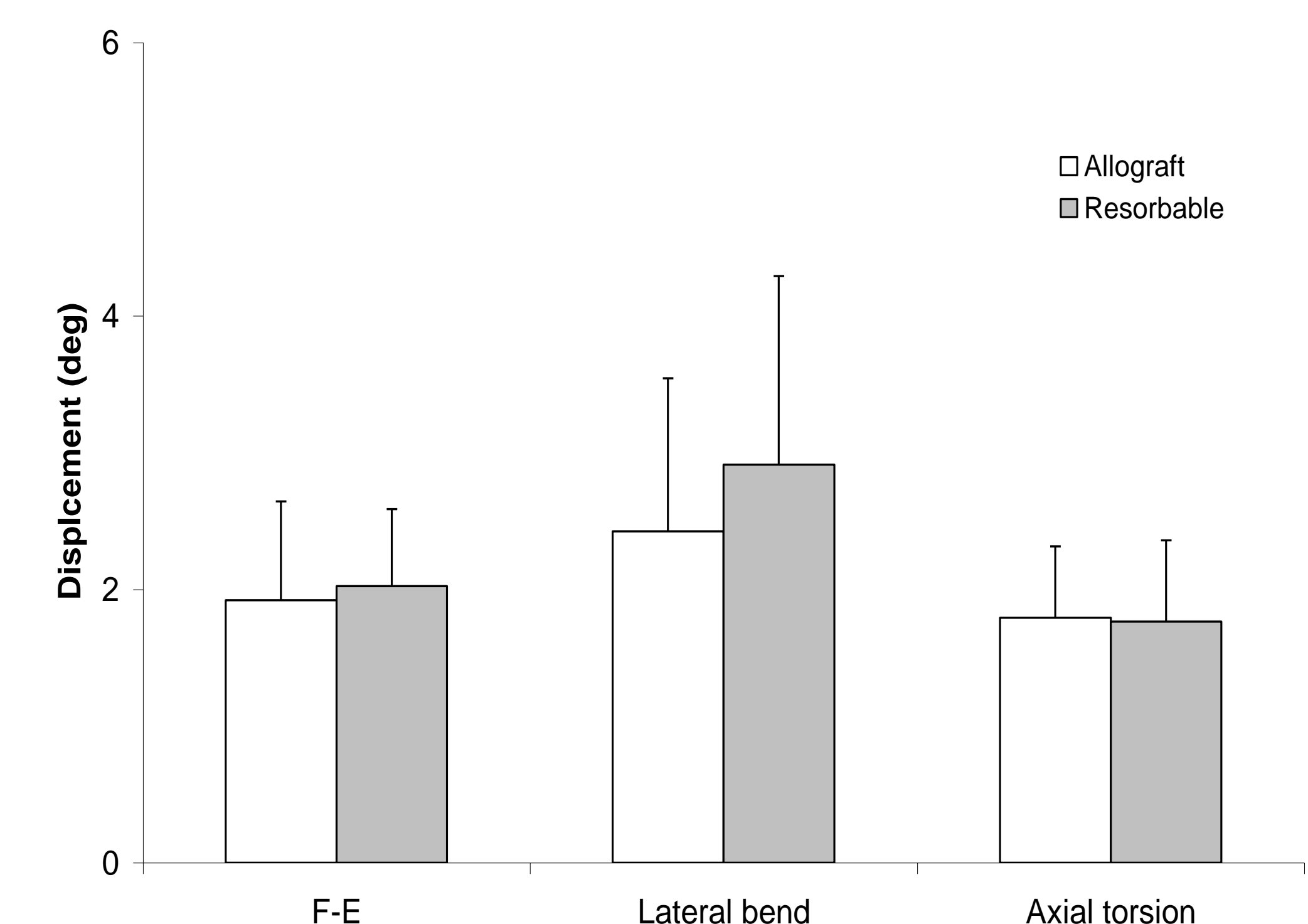
## Methods:

Twelve (12) cadaveric lumbar spine sections were prepared into L3-L4 and L4-L5 functional spinal units (FSUs). The 12 FSUs were divided into 2 material groups. Five L3-L4 and one L4-L5 FSU constituted the allograft group while two L3-L4 and four L4-L5 FSUs constituted the resorbable group. Each FSU was subjected to physiological moments ( $\pm 7$  Nm) in flexion-extension, lateral bending, and axial rotation in both intact condition and after implanting (upper image). The testing was performed using a custom spine testing fixture at the University of South Florida Spine Biomechanics Laboratory (lower image).



## Results:

Allograft and synthetic resorbable facet fusion devices were both shown to provide increased stiffness during testing. There were no statistical differences in biomechanical ROM responses between the two materials as tested (figure below). Attained significance values (“p”) were: 0.68 for flexion-extension; 0.88 for lateral bending; and 0.21 for axial rotation.



## Conclusion:

Choice of material, either allograft or hydroxyapatite resorbable, does not statistically affect biomechanical responses of cadaveric lumbar spine specimens. Therefore, the two implant materials can be considered biomechanically interchangeable in the immediate post-op period.

**Acknowledgement:** Study funded and instrumentation provided by MinSURG, Inc., Clearwater, Florida