Characterizing the Mechanical Effects of Bone Substitute Material and Far-Cortical Locking Techniques in Proximal Humerus Fracture Reconstructions: A Cadaveric Study

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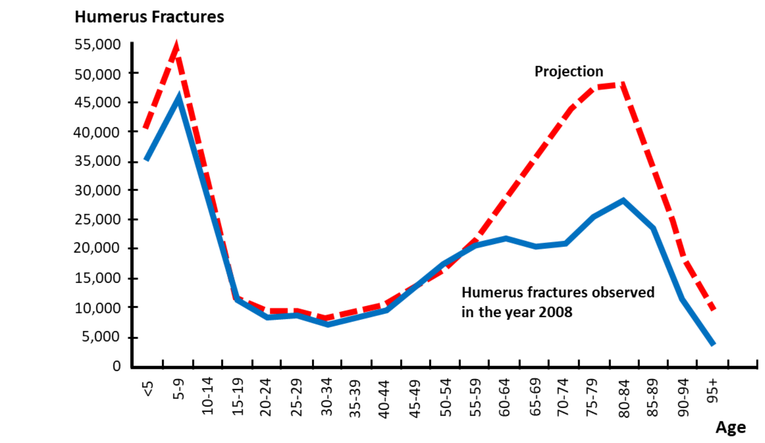
Proximal humerus fractures: One of the most common fractures among the elderly

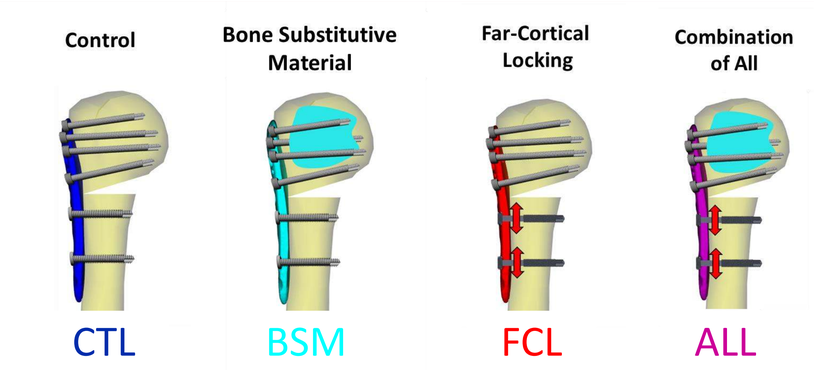
Projected number of emergency department humerus fractures in 2030



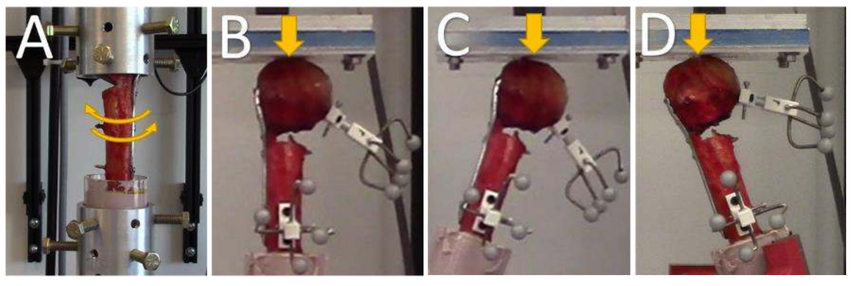
Adapted from Kim et al. Arthritis Care & Research. (2012)

<u>Purpose</u>: Determine which fixation method is biomechanically more effective at reducing implant failure.

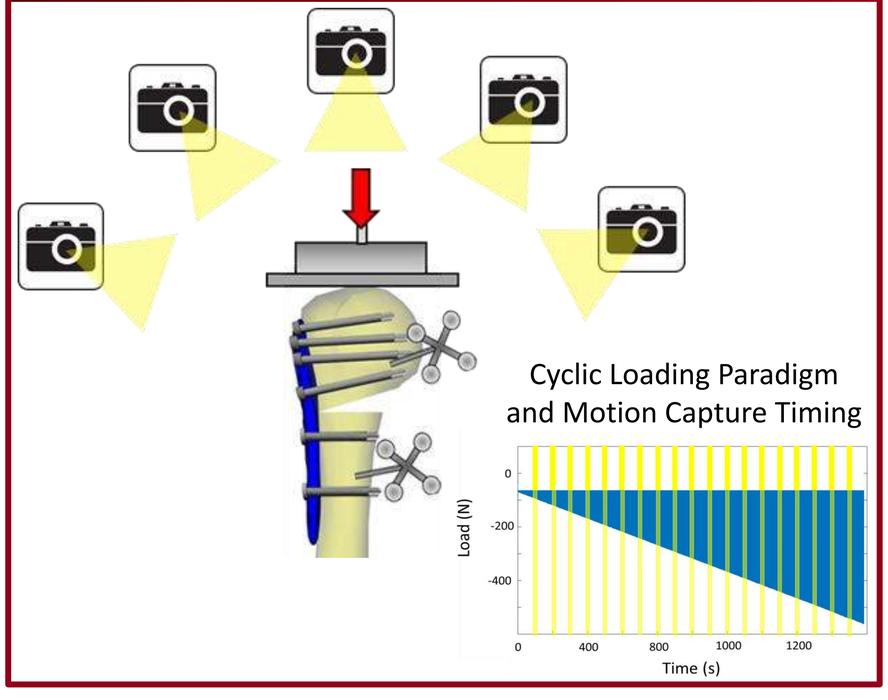
Experimental Groups (n = 8)



Non-destructive Testing

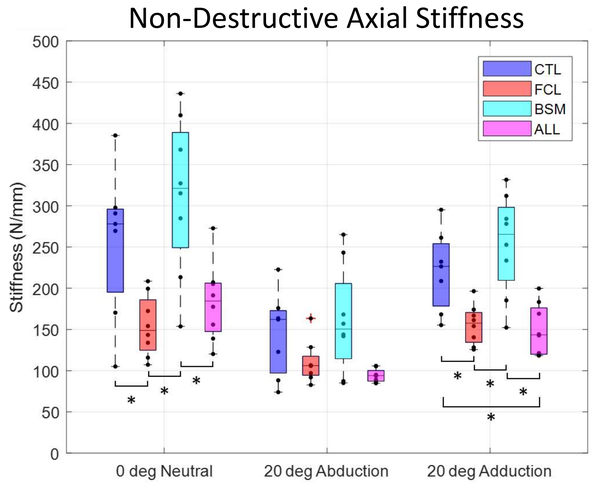


Cyclic Testing to Failure

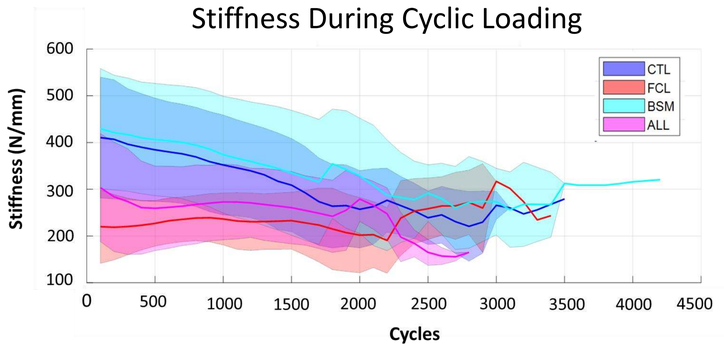


Biomechanical Comparison Between Groups

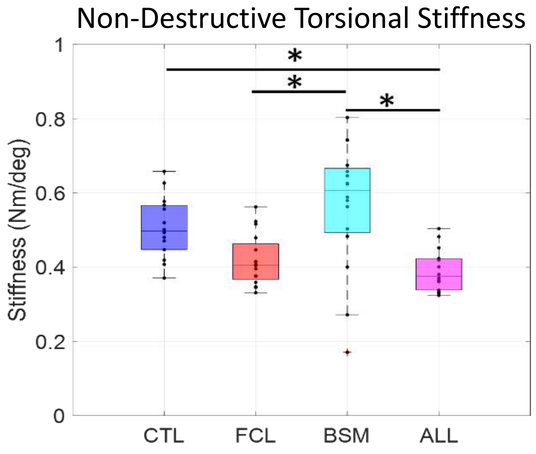
Non-Destructive Axial Stiffness



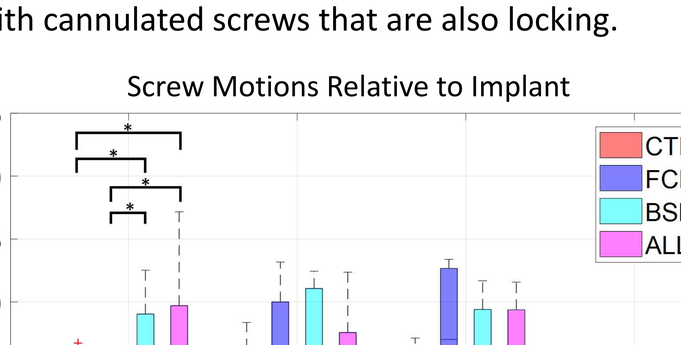
Stiffness During Cyclic Loading



Non-Destructive Torsional Stiffness

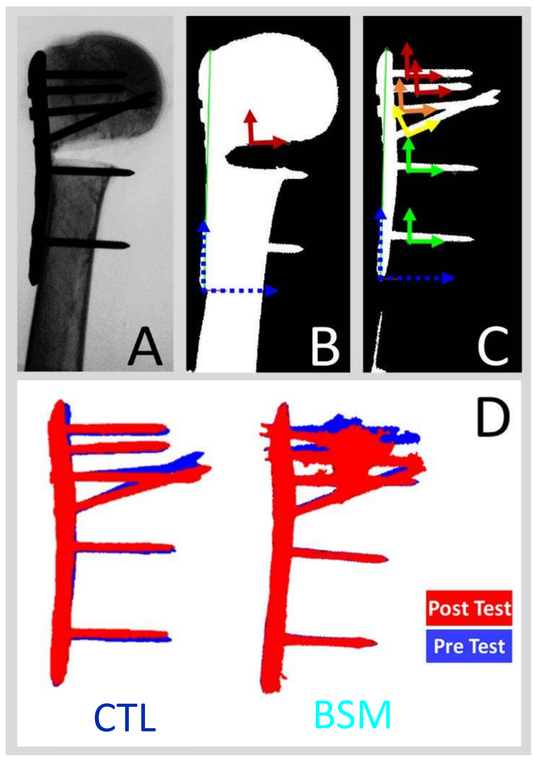


Kaplan-Meier Survival Curve



- Bone substitute material and far-cortical locking resulted in significantly different construct mechanics.
- Initial changes to construct mechanics degraded over time, as the four techniques provided similar long-term stiffnesses and implant fatigue life.

Pre- and Post-Test Screw Tracking



- Proximal screws rotated significantly more than associated locked screws.
- Stiffnesses of BSM and ALL groups could be improved with cannulated screws that are also locking.

Screw Motions Relative to Implant

Take-home messages:

- FCL and BSM techniques change the immediate post-operative mechanics of proximal humerus fracture repairs, however the impact of these changes on fatigue life remain unclear.
- Modulations of construct stiffness create an opportunity for orthopedic surgeons to optimize and personalize proximal humerus fracture fixation.

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