Posterior Glenoid Wear in Total Shoulder Arthroplasty:

Eccentric Anterior Reaming is Superior to Posterior Augment

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Disclosures

Wang, Behn, Abrams: No Relevant Disclosures

Cheung: Consultant Exactech

Introduction

http://shoulderarthritis.blogspot.com/2011_11_01_archive.html

- Glenohumeral OA accounts for 77% of TSA
- Up to 50% have posterior glenoid wear or posterior subluxation of the humeral head

- Failure most often attributed to glenoid component
  - Radiolucent lines in nearly 80% of shoulders at 10yr
  - Radiographic and clinical loosening of glenoid seen in up to 34% of failures

→ TSA in the setting of posterior glenoid bone loss associated with increased glenoid component loosening

Neer JBJS 1974
Kim et al JBJS 2011
Walch et al J Arthroplasty 1999
Bohsali et al JBJS 2006

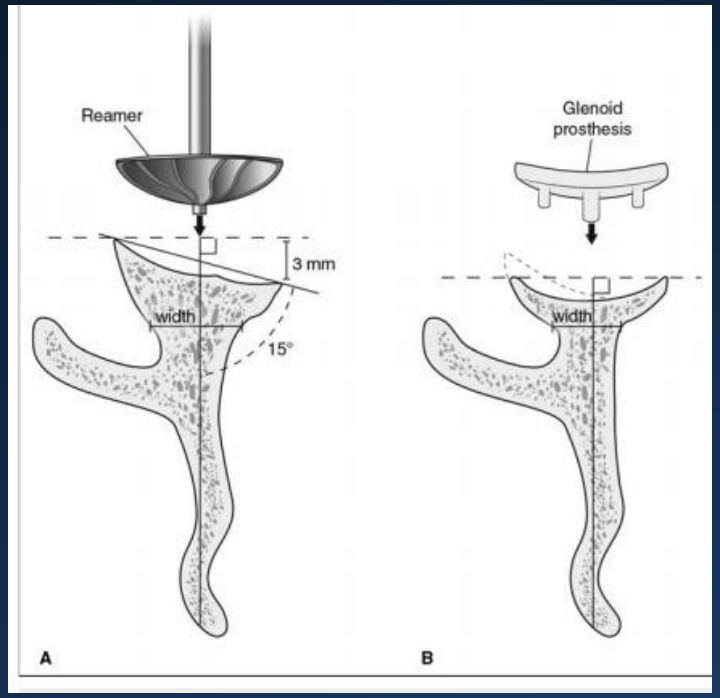
Addressing Posterior Glenoid Bone Loss

1. Eccentric Anterior Reaming

2. Posterior Augmented Glenoid
   - 86% of patients excellent/satisfactory results but instability not reliably corrected

3. Corticocancellous bone graft
   - Loosening, lucency, and/or resorption has been observed in nearly 54% of patients

→Treatment guidelines for glenoid bone loss have not been clearly established.



http://www.depuy.com/healthcare-professionals/product-details/global-steptech-apg
http://www.exac.com/products/shoulder/augmented-glenoids

Rice et al CORR 2008
Sears et al JAAOS 2009

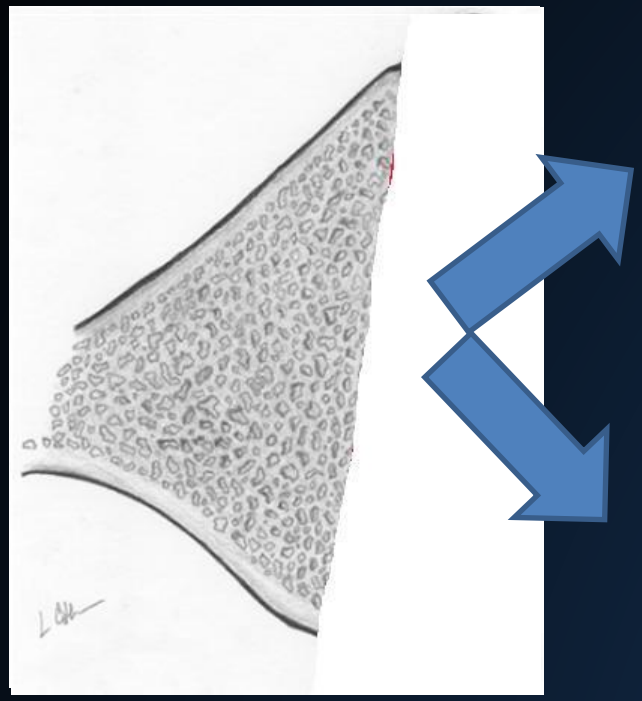
Hypothesis

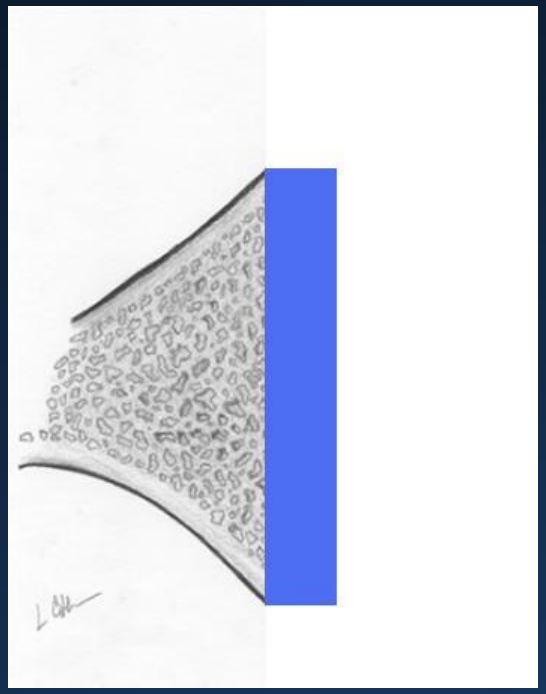
When performing TSA in the setting of posterior glenoid erosion:

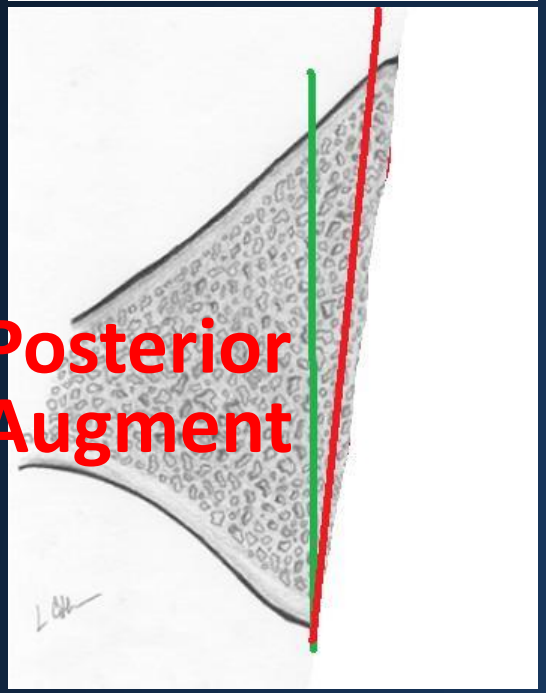
- A Posterior-Augmented glenoid component provides no difference in translational motion and failure rates compared to Eccentric Anterior Reaming

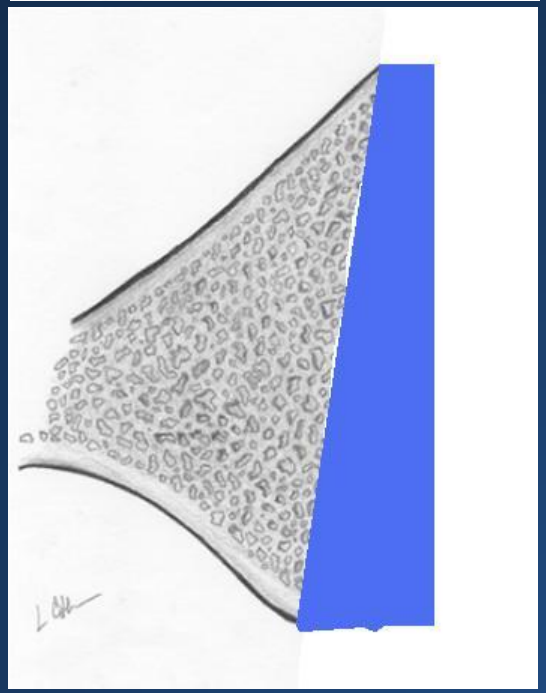
- Also will provide decreased risk of glenoid vault penetration during preparation

Methods









Methods

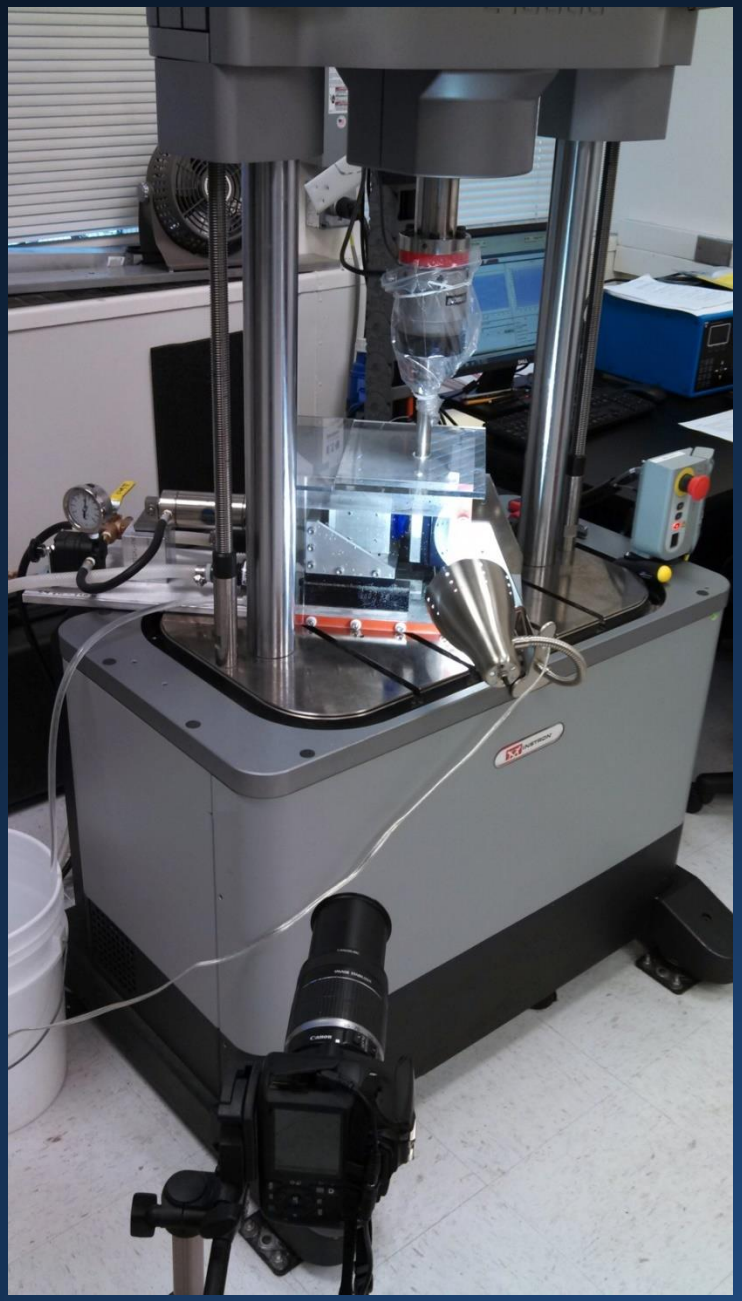
Testing via ASTM standard F2028

- Axial load of 750N
- Humeral head translation superior-inferior at 90% subluxation distance for 100,000 cycles at 2 Hertz
- Aligned Perpendicular to glenoid face

Final outcomes

- Glenoid Edge Displacement after cyclic testing in superior-inferior direction
- Glenoid Edge Load

Pilot testing: n=6/group would provide power 0.80 to 0.20mm difference at 100,000 cycle assuming a SD 0.10mm.

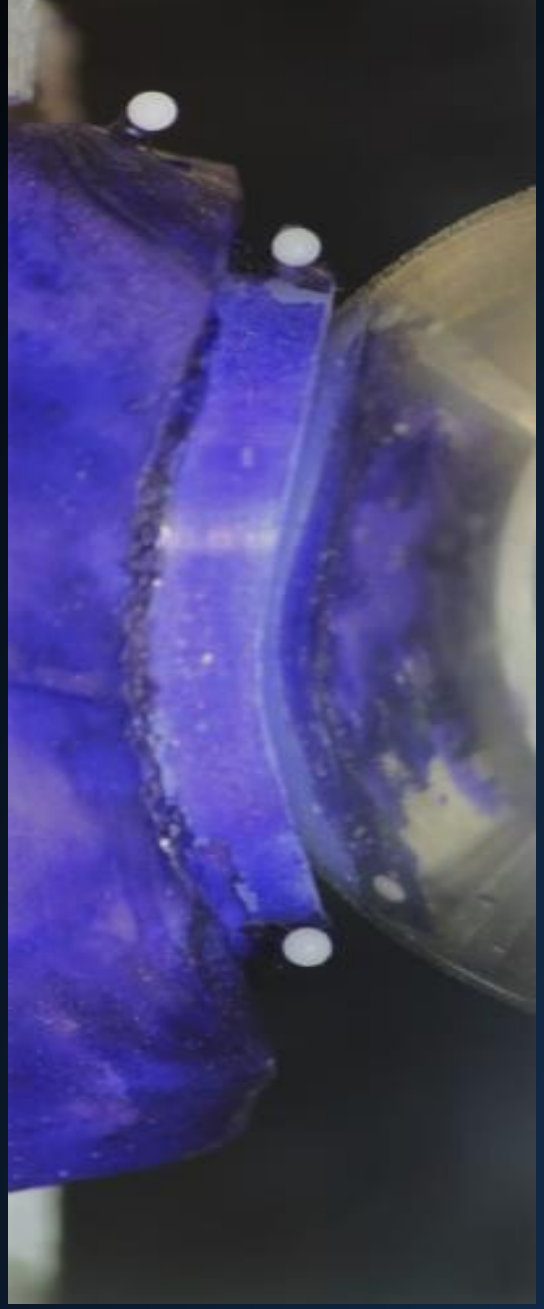


Centered

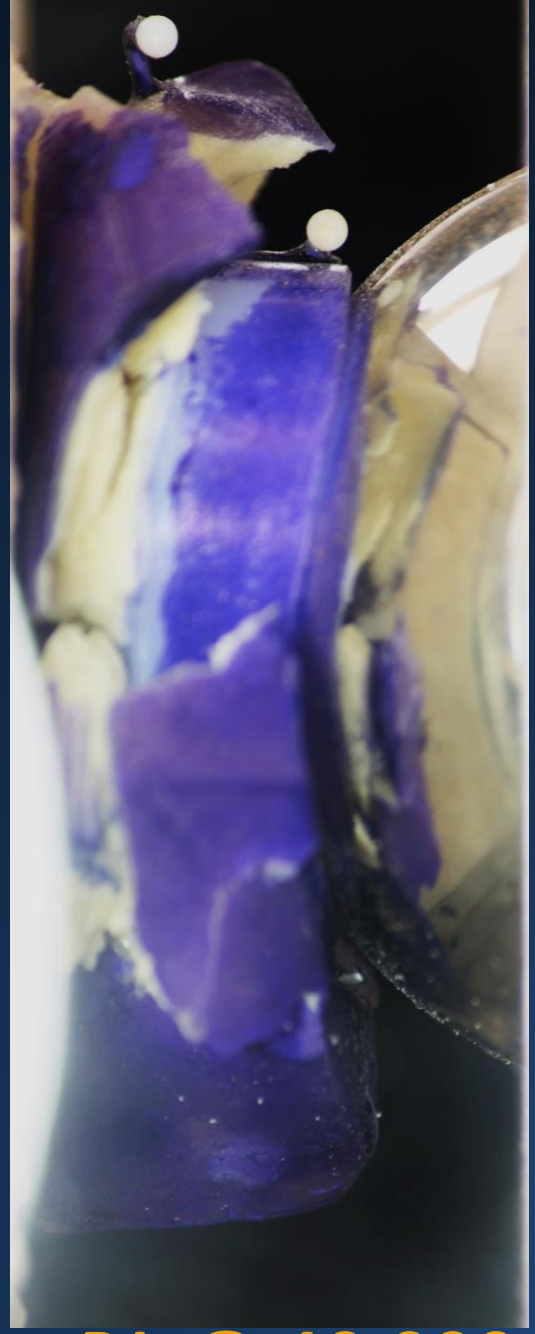
Inferior

Superior

Results



RDHS @100,000 cycles



PA @ 40,000 cycles

Specimen Survival Rate

Total Cycles:	1	100	1,000	10,000	50,000	100,000
PA	6 100%	6 100%	6 100%	6 100%	5 83%	3 50%
RDHS	6 100%	6 100%	6 100%	5 83%	5 83%	5 83%

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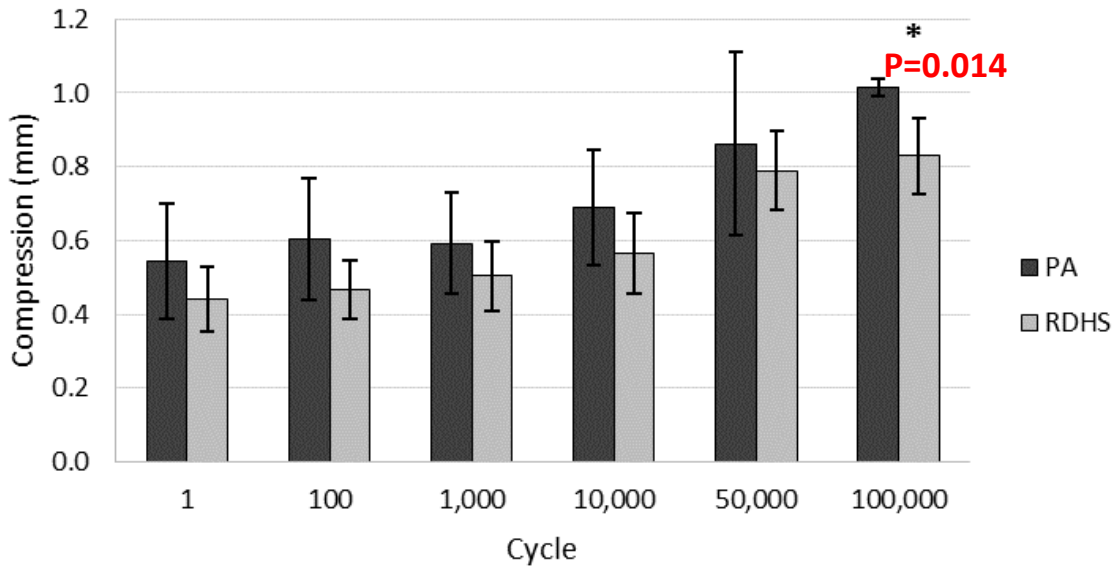

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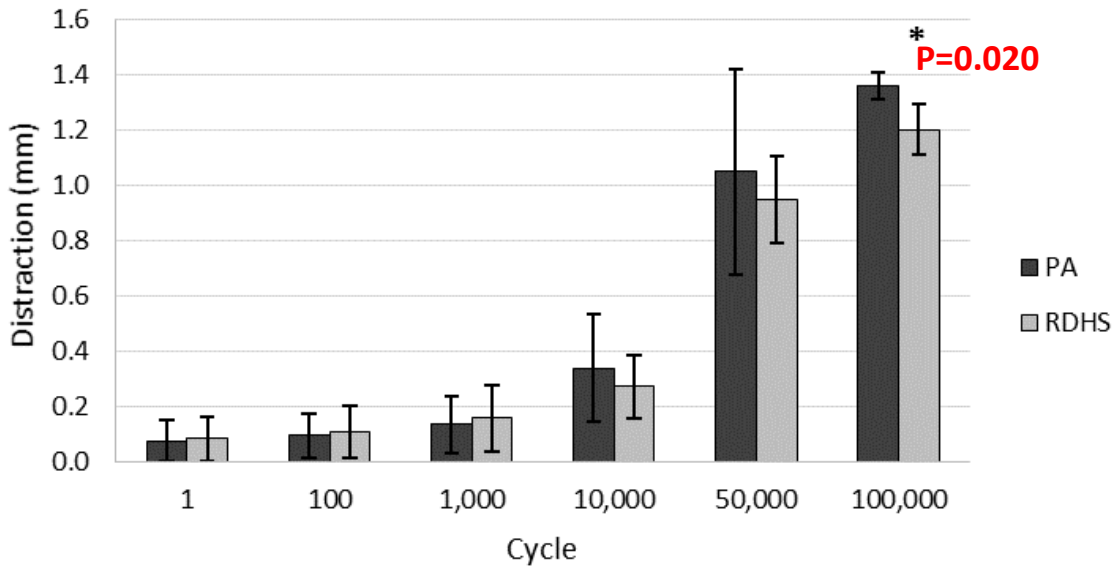

Subluxation edge displacement and load only able to be tested on surviving specimens

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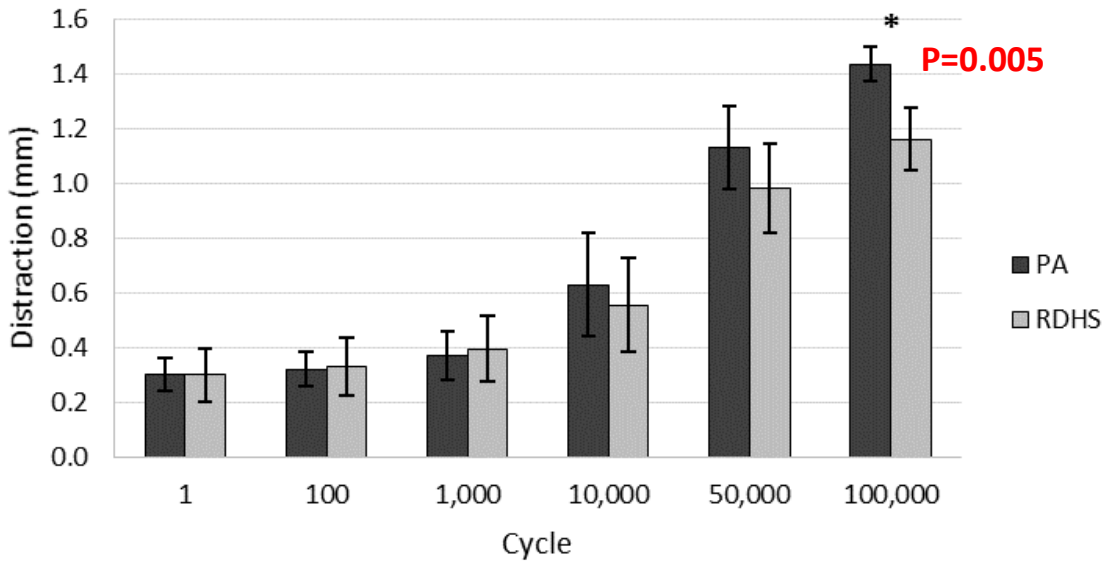

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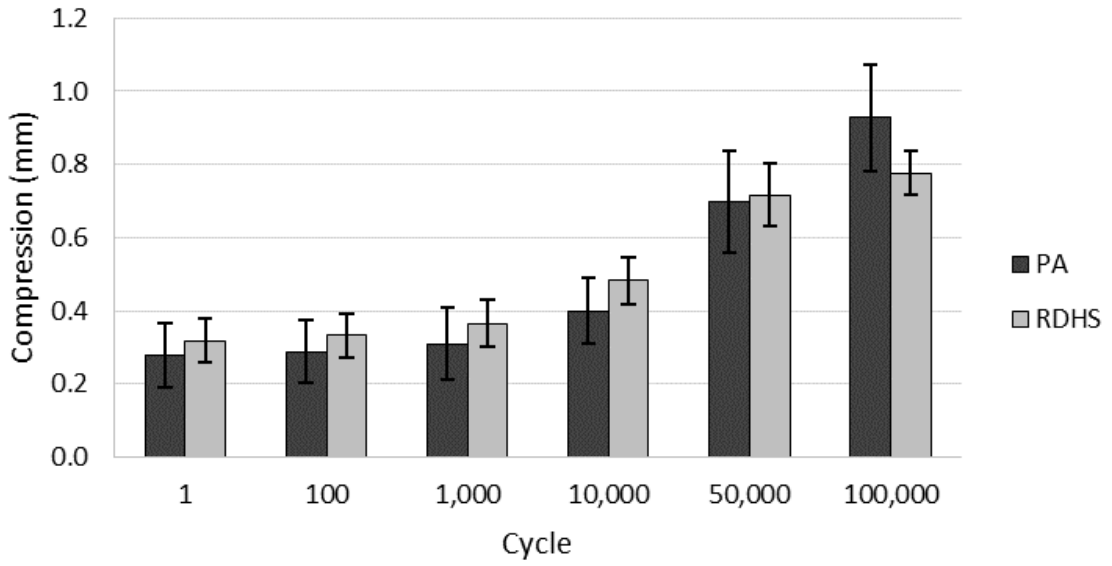

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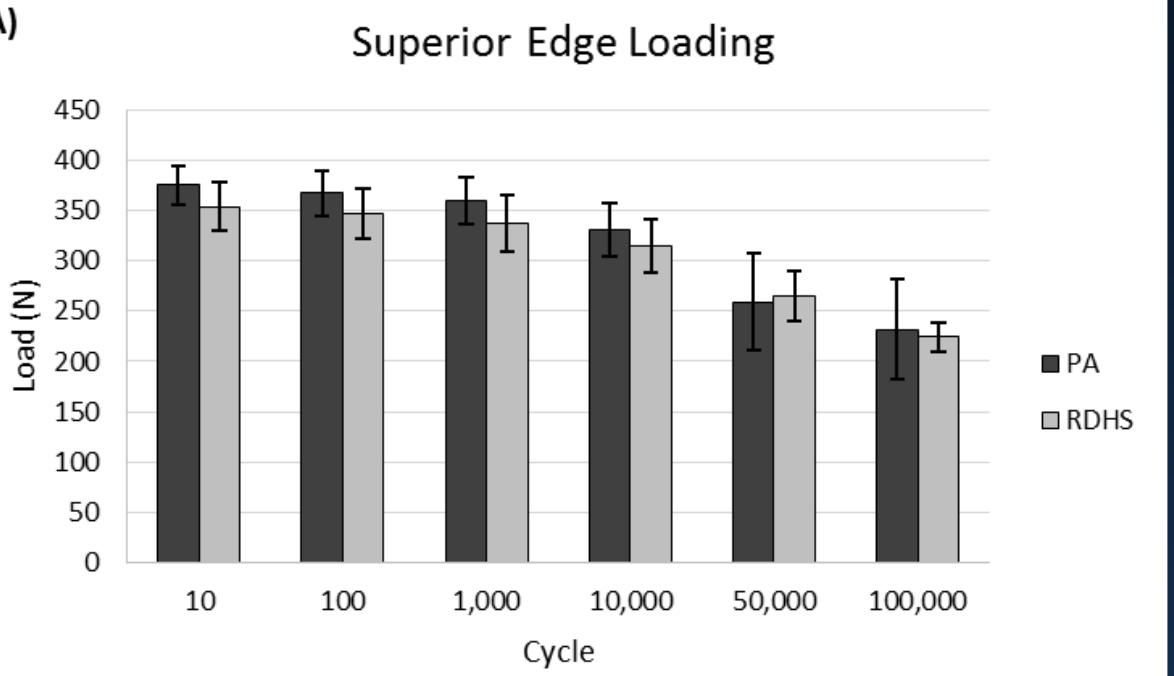

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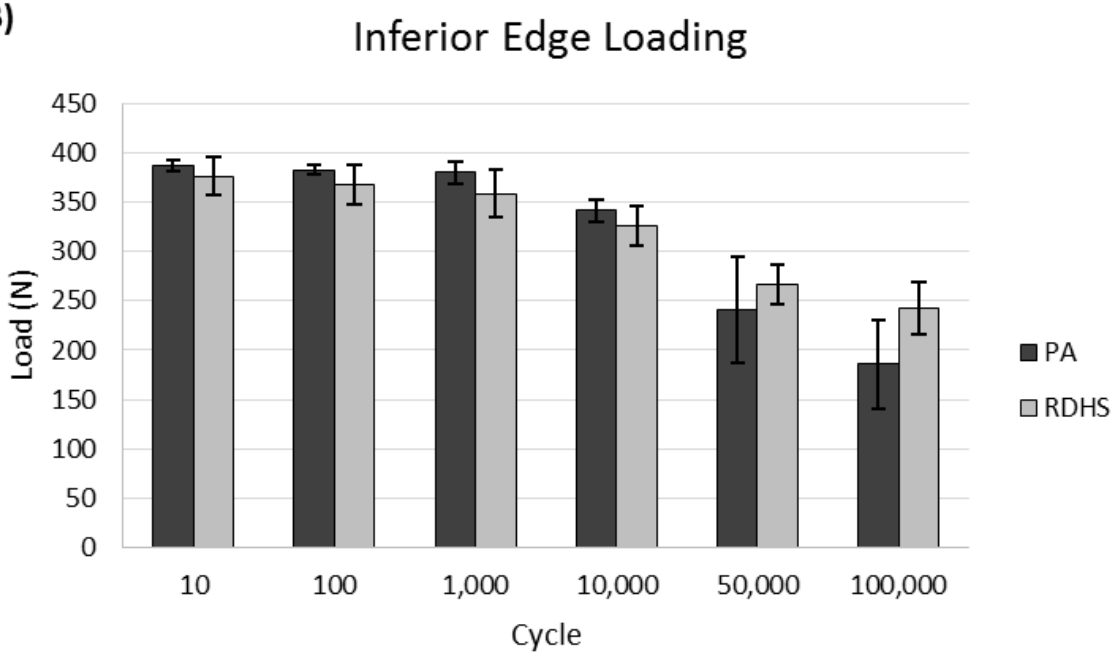


Superior and inferior edge loads at designated time points during cyclic loading = resistance to translation

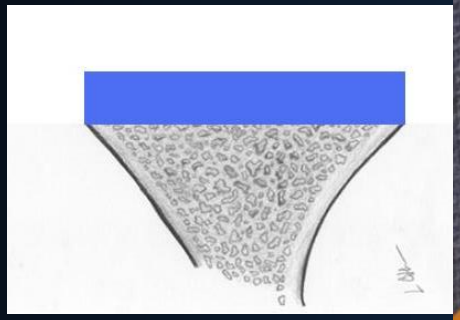
As the number of cycles increases, the load drops for both test groups

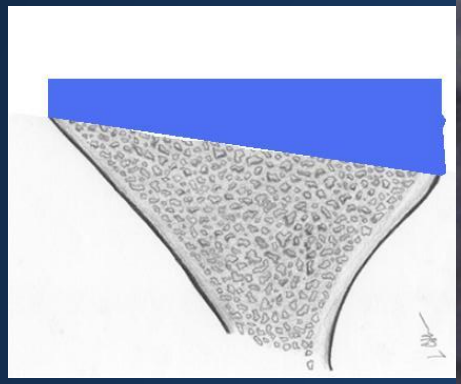
Conclusions

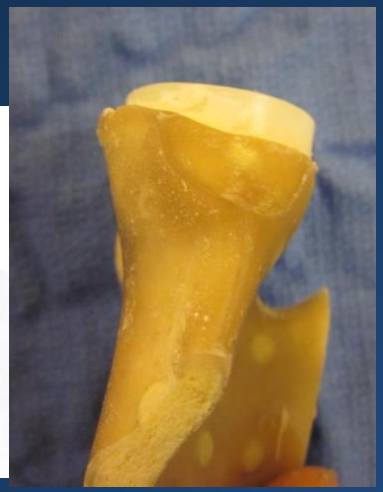
- Concern for early loosening and instability with use of angle-backed glenoid components
  - Increased glenoid displacement
  - Increased gross failure
  - No significant differences in edge load

*For surviving specimens

- Axial load results in shear stress at component-bone interface in PA group
  - Analogous findings seen in Total Knee literature







Limitations

- Synthetic scapula model – chosen due to insufficient prior cadaveric testing
- Perpendicular loading, does not account for posterior subluxation
- Non-arthritic shoulder model

Future steps:

→Evaluation of step-cut glenoids

→Another trial of cadaveric testing

→Clinical Correlation

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