REVERSE DESIGN RATIONALE: GLENOID-SIDED LATERALIZATION

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2017 Current Solutions in Shoulder & Elbow Surgery

NORMAL SHOULDER
Medialized Glenosphere
Lateralized Humerus

LATERALIZING RSA

OUTLINE

1. Benefits of Lateralization
2. Methods of Lateralization
3. Theoretical Pros/Cons
4. Conclusion
1. Decreased Scapular Notching (adduction deficit) - Glenoid & humeral side
2. Improved impingement-free ROM
3. Minimizing alteration of shoulder contour
   - Both glenoid and humeral side
   - Allows for optimization of deltoid function
   - Allows for minimizing rotational weakness
4. Improved stability - Both glenoid and humeral side

“GLOBAL” LATERALIZATION

Glenoid + Humeral Lateralization

2. METHODS OF LATERALIZATION
METHOD OF LATERALIZATION

Humeral Component
• Neck/Shaft Angle
• Augments
• Humerosocket medially offset pivot point

Glenoid Component
• Lateral offset increased with glenosphere>hemisphere
  • Prosthetic versus “biologic”/bony lateralization

HUMERAL SIDED LATERALIZATION

• Inset vs onset humerosockets
• Medialized humerosocket pivot point (relative to intramedullary axis)

Neck Shaft Angle
• Valgus Implant: Inferior displacement 4mm
• Varus Implant: Greater lateral displacement 7 mm
10 MM HUMERAL INSERT WITH
VALGUS HUMERAL DESIGN

Effect to lateralize 5 mm and distalize 8 mm

10 MM HUMERAL INSERT WITH
VARUS HUMERAL DESIGN

Effect to lateralize 7 mm and distalize 6 mm

LATERALIZATION FROM GLENOID SURFACE

Lateral COR offset
GLENOID LATERALIZATION

Prosthetic Lateralization

Biologic Lateralization

3. THEORETICAL PROS/CONS

Does the literature support the claimed benefits for all three methods?

HUMERAL LATERALIZATION

- Inferior impingement occurred at the same arc of motion regardless of the humeral tray positioning.
- Possible notching?
- Asymmetric loading proportional to offset
- The most balanced shoulder was result of no offset
LATERALIZING THE HUMERUS IS NOT SIMPLE

Lateralizing the humerus pushes the humerus distal as well as lateral.

HUMERAL LATERALIZATION

- Overlengthening may increase chance of complications
- May also affect shoulder contour

GLENOID-SIDED LATERALIZATION WITH BIO-RSA

No significant differences:
- FF
- ER
- IR
- Strength
- DASH score
- ASES score
- SSTest score
- Constant score
- Global Rating of Change scale score
• **NO** significant differences in performance

• Both had high rates of notching:
  • Standard: 75%
  • Bio-RSA: 40%

**BIO-RSA & STRESS SHIELDING**

Theory: Distal placement and increased lateral offset of glensphere induce higher stress over the glenoid-baseplate junction.
BIO-RSA & STRESS SHIELDING

- Fixation occurs at native glenoid
- Fixation is strong!
- Stress shielding and graft resorption eventually occurs

METALLIC LATERALIZATION

- Less force to initiate motion from rest
- Greater ROM
- Less notching
- Normalized rotator cuff length
- Limited stress on deltoid

Are there increased forces at the fixation that lead to failure?

Baseplate design factors

- Compression can be achieved with central or peripheral compression screws
- Central 6.5 screw provides 2.3x stronger fixation than central peg
- 5.0mm locking screws ↓ micromotion -- 21%-35%
Revision Reverse Arthroplasty – A 12 Year Review of a Metallic Lateralized Implant

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<td>locking screws</td>
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CLINICAL OUTCOMES OF METALLIC LATERALIZATION

- ASES Total: 32—75
- Motion:
  - FF: 64°—144°
  - ABD: 61°—128°
  - ER: 15°—51°
- Complication rate = 0.05%

HOW DO THE METHODS COMPARE TO A MEDIALIZED PROSTHESIS?

<table>
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<th>Humeral Lateralization</th>
<th>Bio-RSA</th>
<th>Metallic Lateralization</th>
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<td>Minimize Scapular Notching</td>
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<td>Improve ROM</td>
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<tr>
<td>Minimize Alteration of Shoulder Contour</td>
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<td>Improve Stability</td>
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CONCLUSION

• Metallic lateralization of glenoid is good for motion & stability
• Does not predispose to failure
• Humeral Lateralization
  ➢ Complicated
  ➢ Distalizes the tuberosities and may lengthen the humerus
• BIO RSA
  ➢ Unnecessarily complex for surgeon
  ➢ Does not have a lot of evidence to support it yet
• Metallic Lateralization
  ➢ Simple
  ➢ Has both clinical and biomechanical evidence to support it

THANK YOU