Single Row or Double Row Rotator Cuff Repair
“How I Choose”

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Current Concepts Shoulder and Elbow Surgery
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Disclosures

• ZimmerBiomet- Royalties
• Wright Medical –Consulting
• VuMedi

• I routinely use double row transosseous knotless techniques whenever possible

The issues

• Science
• Technology
• Pathologic Anatomy
Rotator Cuff repairs fail to heal in an alarmingly high rate

- Harryman '91
- Gerber '00
- Galatz '04
- Fealy'06
- 20-50% for large-massive tears

Do radiologic failures correlate with patient outcomes

- Dodson '10
- Harryman '91
- Galatz '04
  - Most happy but!
  - Deteriorated over time
  - Tear size increased
  - Better if healed

What We Know

- Patients can do well after an anatomically failed repair
- Pain operation
- Small tears (supra and some infra)
- Older patients
- More sedentary
- However, in younger, higher demand patients, cuff healing is essential to a good result.

Optimum Rotator Cuff Repair

- Tension-free repair
- Optimize the biology of tendon to bone healing interface—"cuff heals to bone"

High initial fixation strength
  - Minimal gap formation
  - Maintain stability under cyclic load
- Proper Rehab

Double Row Repairs address only one of these factors
Double vs. Single Row


- ADVANTAGE DOUBLE ROW - WHEN POSSIBLE!
  - BETTER BIOMECHANICAL STRENGTH
  - FAILURE
  - GAP FORMATION
  - BETTER FOOTPRINT RESTORATION

Double Row vs Single Row: Biomechanical Testing

Double-row vs single-row rotator cuff repair: A review of the biomechanical evidence
Wall JSES 2009

- 5 studies looked at footprint restoration.

<table>
<thead>
<tr>
<th>Study</th>
<th>Type</th>
<th>Outcome Variable</th>
<th>Footprint Coverage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brady 2006</td>
<td>SR vs DR</td>
<td>M+L coverage</td>
<td>SR = 47% DR = 100%</td>
</tr>
<tr>
<td>Mazzocca 2005</td>
<td>SR vs DR</td>
<td>Mean area</td>
<td>SR = 51% DR Diamond = 101% DR MDA = 82%</td>
</tr>
<tr>
<td>Meier 2006</td>
<td>SR vs DR vs TOS</td>
<td>Mean Area</td>
<td>SR = 46% DR = 106%</td>
</tr>
<tr>
<td>Nelson 2008</td>
<td>SR vs DR</td>
<td>Mean Area</td>
<td>DR 74% more than SR</td>
</tr>
<tr>
<td>Tuoheti 2005</td>
<td>SR vs DR vs TOS</td>
<td>NA</td>
<td>DR 60% more than SR</td>
</tr>
</tbody>
</table>

Does Footprint Restoration Correlate to Improved Clinical Results?

Outcomes of single-row and double-row arthroscopic rotator cuff repair: A systematic review
Saridakis JBJS-Am 2010

- Review of 6 papers:
  - No differences in functional scores in any of the studies.
  - However, Parks et al found better functional scores with DR in patients with large (>3cm) tears.
  - 2 of 4 showed improved radiographic healing.
Double Row vs. Single Row

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Saridakis JBJS-Am 2010

- Review of 6 papers
- 2 of 4 showed improved radiographic healing

<table>
<thead>
<tr>
<th>Study</th>
<th>Failure Rate</th>
<th>Imaging</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Burks</td>
<td>40%</td>
<td>MRI</td>
<td>NR</td>
</tr>
<tr>
<td>SR DR</td>
<td>40%</td>
<td></td>
<td>0.03</td>
</tr>
<tr>
<td>Cherouset</td>
<td>30%</td>
<td>CT Arthro</td>
<td>0.05</td>
</tr>
<tr>
<td>Dr CT Arthro</td>
<td>30%</td>
<td>MRI</td>
<td>&gt;0.05</td>
</tr>
<tr>
<td>Franceschi</td>
<td>46.2%</td>
<td>MRI</td>
<td>&gt;0.05</td>
</tr>
<tr>
<td>Sugiya</td>
<td>25.6%</td>
<td>MRI</td>
<td>&lt;0.01</td>
</tr>
</tbody>
</table>

Double Row vs. Single Row

- Systematic Review of 1252 Rotator Cuff Repairs
- Tears < 1 cm
  - No difference
- Tears 1-5 cm
  - SR: 17% retear
  - DR: 7%
- Tears >5 cm
  - SR: 69%
  - DR: 41%

Potential Downside of DR

- May compromise vascularity of cuff
- Potential to over-tension the cuff
- May lead to muscle-tendon junction tear
  - No bail out > RSA
Potential Downside of DR

- Can cost $1000 more per case when compared to SR
- What do we gain for that?
- Is that economically viable
- Paucity of data on cost effectiveness on SR vs. DR

Conclusions

- Tension-free repair and maximizing biology more important than fixation type.
  - DR results in better mechanics, but that is least important

TEAR CONFIGURATION MATTERS!
"CANT MAKE A ROUND PEG FIT INTO A SQUARE HOLE"

Tear configuration dictates type of repair in many cases
Technology has improved our ability repair

- Implants
- Knots vs. knotless
- Type of double row
  - Transosseous Equivalent Repairs—suture bridge technology
  - Double Row with Separate knots

Single row suture anchor
Double row suture anchor
Transosseous suture bridge
Anchor suture bridge

Double-row sharing load
ER with less load-sharing
Interconnected construct with less “tension mismatch” & better load-sharing
Therefore I prefer a Suture Bridge Double Row Repair
Especially in younger patients when possible

Conclusions
• SR for small tears (<1cm)

Conclusions
• For medium tears (1-5cm)
  – Healing trends towards better with DR
  – Difficult to show better clinical results
    • Therefore, SR may be fine in older, more sedentary patients
    • DR in more active patients
• Large tears (>5cm)
  – Studies show better results with DR
  – However, can be technically difficult to achieve
Thank You

Transosseous Equivalent: “Suture Bridge”