Massive Rotator Cuff Tears: When is Reverse TSA the only option?

DISCLOSURES

1. Royalties: Arthrex, Elsevier
2. Consultant: Arthrex
3. Miscellaneous Support: Arthrex
4. Basic Science/Research Support: Arthrex, Smith and Nephew, Ossur, Misonmed, DJOrtho, Conmed Linvatech, Athletic}
5. Editorial Board: Orthopedics Today (Chief Medical Editor), Journal of Shoulder and Elbow Surgery, Techniques in Shoulder and Elbow, Techniques in Sports Medicine, Sports Health, Orthopedics
6. Publisher Support: Elsevier (Textbook), Orthopedics Today

Algorithm for Massive RCT's

Not this Patient

Pseudoparalysis

Arthroscopic RCR has been reported to successfully treat pseudoparalysis


Pseudoparalysis

With primary repair of massive rotator cuff tear, pseudoparalysis was reversed in 90% of cases

Type A: Supraspinatus and Superior Subscapularis Tears

% of Pseudoparalysis

Type A = 0%

Type B: Supraspinatus and Entire Subscapularis Tears

% of Pseudoparalysis

Type B = 80%
Fatty Infiltration (NOT Degeneration)

CT and MRI:

Low intra-observer and inter-observer reliability

Must view same oblique sagittal views consistently to assess fatty infiltration


- MRI and CT analysis
- Photoshop Software
- Oblique sagittal images
- Calculation: divide the area of supraspinatus muscle by the area of the supraspinatus fossa
- Reliability and Correlation to tear size
Is Fatty Infiltration reversible?

- Generally not reversible
- If the tendon heals, the muscle is moved further lateral, and may increase the fill of the fossa
- Using occupation ratio, some improvement in muscle atrophy

Functional Outcome

Burkhart SS, Barth JR, Richards DP, Zlatkin MB, Larsen M.

Arthroscopic repair of massive rotator cuff tears with stage 3 and 4 fatty degeneration.


22 Massive Rotator Cuff Tears

Fatty degeneration of Grade 3 or 4

Improved functional outcome in 86.4% of patients who were classified as likely to fail based on Goutallier criteria

Reverse Total Shoulder Arthroplasty

- Safe and Reliable
- Rehabilitation is FASTER and EASIER than Scope RCR
- Functional results are more reliable with Massive RCT's
- 90% Longevity at 10 years, 70% at 15 years
- Can be performed as an outpatient
Reverse TSA for Massive RCT’s


- Higher Constant Score
- More reliable outcome
- Lower Revision surgery rate

Indications for Reverse TSA

- Rotator Cuff Arthropathy (Massive RCT + Glenohumeral Arthritis)
- Massive, irreparable rotator cuff tear (chronic, 2+3 tendons)
- Anterior-superior Instability
- Pseudoparalysis (with or without instability)
- Multiple Failed RCR’s
- Grade 3/4 Fatty infiltration of rotator cuff (f)

Irreparable RCT?

- Pseudoparalysis
- Grade 3 or 4 Fatty Infiltration (more fat than muscle)
- Retraction to the glenoid with chronic tear
- No acromiohumeral space on radiographs
### Imaging Findings Suggestive of Irreparability

- Medial/lateral tear size
- Retraction to glenoid rim
- Fatty infiltration
- Superior migration of humeral head

*Imaging Findings Suggestive of Irreparability*

<table>
<thead>
<tr>
<th>Findings</th>
<th>References</th>
</tr>
</thead>
<tbody>
<tr>
<td>Medial/lateral tear size</td>
<td>Dwyer et al., KSSTA, 2013</td>
</tr>
<tr>
<td>Retraction to glenoid rim</td>
<td></td>
</tr>
<tr>
<td>Fatty infiltration</td>
<td>Yoo et al., Arthroscopy, 2009</td>
</tr>
<tr>
<td>Superior migration of humeral head</td>
<td></td>
</tr>
<tr>
<td>Supraspinatus Fatty index &gt; 3</td>
<td></td>
</tr>
<tr>
<td>Coronal oblique tear distance &gt; 31mm</td>
<td></td>
</tr>
<tr>
<td>Sagittal oblique tear distance &gt; 32 mm</td>
<td></td>
</tr>
</tbody>
</table>

### Influence of Age on Cuff Healing

#### Clinical Outcome and Repair Integrity After Rotator Cuff Repair in Patients Older Than 50 Years Versus Patients Younger Than 50 Years

<table>
<thead>
<tr>
<th>Age Group</th>
<th>Healing Rates</th>
<th>Re-tear Rates</th>
<th>Pain Relief</th>
<th>Functional Recovery</th>
</tr>
</thead>
<tbody>
<tr>
<td>≤ 50</td>
<td>87.8%</td>
<td>High</td>
<td>Reliable</td>
<td>Reliability</td>
</tr>
<tr>
<td>51 to 60</td>
<td>79.4%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt; 61</td>
<td>65.4%</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Influence of Age on Cuff Healing*

#### But successful clinical outcome is possible

SANE score: 87.1
Age


- Size of the tear, not age associated with poor repair rates.
- Multivariate analysis
- Greater retraction
- Higher fatty infiltration of infraspinatus
- Lower bone mineral density

NOT Age

Does the cuff need to heal to get a good clinical outcome?

Multiple studies have shown similar outcome scores without correlation to cuff integrity

Cuff integrity is correlated with better function, but not better overall outcome scores

rTSA as a primary treatment?

Reverse Shoulder Arthroplasty for the Treatment of Irreparable Rotator Cuff Tear without Glenohumeral Arthritis

Reverse total shoulder arthroplasty for massive irreparable rotator cuff tears in patients younger than 65 years old: results after five to fifteen years


Cost?

Morbidity?

Function?
Indications for rTSA for Massive Cuff Tears

- Massive Rotator Cuff Tear with Arthritis
- Hamada stage 4 & 5
- Failed Rotator Cuff Surgery
- Irreparable Massive RCT and SCR indicated

Intraop

Final Repair
Rotator Cuff Tear

Intraop

Superior Capsular Reconstruction
Which is more cost-effective?

Hypothesis:
Arthroscopic rotator cuff repair, given its decreased cost and high rates of symptomatic relief, despite high re-tear rates, is more cost effective than primary reverse total shoulder arthroplasty.

Methods
• Expected value decision analysis
• Base Case: 65 year-old patient with symptomatic massive RCT:
  ➢ No cuff tear arthropathy
• Societal perspective of costs
• Primary outcome = ASES scores converted to health utility scores
Results

<table>
<thead>
<tr>
<th>Strategy</th>
<th>Cost ($ / case)</th>
<th>Effectiveness</th>
<th>Incremental Cost Effectiveness</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-operative</td>
<td>$15,000</td>
<td>11.80</td>
<td></td>
</tr>
<tr>
<td>Initial arthroscopic rotator cuff repair</td>
<td>$22,300</td>
<td>11.79</td>
<td>$-65.96/UAH</td>
</tr>
<tr>
<td>Primary reverse shoulder arthroplasty</td>
<td>$37,500</td>
<td>11.72</td>
<td></td>
</tr>
</tbody>
</table>
Limitations

• Scarcity of true quality of life data

• Heterogeneity of large/massive RCT

• Cost data derived from literature
Conclusion

- Arthroscopic RCR is largely more cost effective than primary rTSA for large RCT without significant arthritis (Hamada 1 – 2, maybe 3)

- rTSA becomes increasingly cost effective when:
  - Very High re-tear rates
  - High rates of progression RCT \(\rightarrow\) CTA

Reverse TSA
Thank you!

Denver in May…

Anthony A. Romeo, MD
Professor, Department of Orthopedics
Head, Section of Shoulder and Elbow Surgery
President-Elect, American Shoulder Elbow Surgeons
Team Physician, Chicago White Sox and Bulls
Chief Medical Editor, Orthopaedics Today

Thank you!

Chicago in May…

Anthony A. Romeo, MD
Professor, Department of Orthopedics
Head, Section of Shoulder and Elbow Surgery
President-Elect, American Shoulder Elbow Surgeons
Team Physician, Chicago White Sox and Bulls
Chief Medical Editor, Orthopaedics Today

Anthony A. Romeo, MD
Section Head, Shoulder and Elbow Service
Professor, Dept. of Orthopaedic Surgery
Rush University Medical Center
1611 W. Harrison St., Suite 300
Chicago, IL 60612
312-243-4244
Anthony.Romeo@rushortho.com
www.ShoulderElbowSports.com

Anthony A. Romeo, MD
Professor, Department of Orthopedics
Head, Section of Shoulder and Elbow Surgery
President-Elect, American Shoulder Elbow Surgeons
Team Physician, Chicago White Sox and Bulls
Chief Medical Editor, Orthopaedics Today

Thank you!

Chicago in May…

Anthony A. Romeo, MD
Professor, Department of Orthopedics
Head, Section of Shoulder and Elbow Surgery
President-Elect, American Shoulder Elbow Surgeons
Team Physician, Chicago White Sox and Bulls
Chief Medical Editor, Orthopaedics Today

Anthony A. Romeo, MD
Professor, Department of Orthopedics
Head, Section of Shoulder and Elbow Surgery
President-Elect, American Shoulder Elbow Surgeons
Team Physician, Chicago White Sox and Bulls
Chief Medical Editor, Orthopaedics Today

Thank you!

Chicago in May…

Anthony A. Romeo, MD
Professor, Department of Orthopedics
Head, Section of Shoulder and Elbow Surgery
President-Elect, American Shoulder Elbow Surgeons
Team Physician, Chicago White Sox and Bulls
Chief Medical Editor, Orthopaedics Today

Anthony A. Romeo, MD
Professor, Department of Orthopedics
Head, Section of Shoulder and Elbow Surgery
President-Elect, American Shoulder Elbow Surgeons
Team Physician, Chicago White Sox and Bulls
Chief Medical Editor, Orthopaedics Today

Thank you!

Chicago in May…

Anthony A. Romeo, MD
Professor, Department of Orthopedics
Head, Section of Shoulder and Elbow Surgery
President-Elect, American Shoulder Elbow Surgeons
Team Physician, Chicago White Sox and Bulls
Chief Medical Editor, Orthopaedics Today

Anthony A. Romeo, MD
Professor, Department of Orthopedics
Head, Section of Shoulder and Elbow Surgery
President-Elect, American Shoulder Elbow Surgeons
Team Physician, Chicago White Sox and Bulls
Chief Medical Editor, Orthopaedics Today