Post-operative Rotator Cuff Repair Rehabilitation

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Rotator Cuff/capsuloligamentous Complex

The Rotator Cuff Tear

What Determines Outcome

- Tissue quality
- Tear size and shape
- Supraspinatus atrophy
- Patient age
- Patient compliance
- Surgeon expertise
- Rehabilitation
- Size/weight of the arm

Rotator Cuff Repair

- ROM exercises and movement can over tension the repair

Dangerous Territory

Release the Rotator interval

External rotation with arm at side will tension interval and cuff repair
Rotator Cuff Repair

Positions of significant length and tension

Re-tear and Outcome

<table>
<thead>
<tr>
<th>N</th>
<th>Retear %</th>
<th>Surgery</th>
<th>Function effected</th>
<th>F/U tech</th>
<th>Tear size</th>
</tr>
</thead>
<tbody>
<tr>
<td>Harryman, 1991</td>
<td>105</td>
<td>1t-20 2t-47 3t-68</td>
<td>Open</td>
<td>Yes</td>
<td>US</td>
</tr>
<tr>
<td>Liu, 1994</td>
<td>35</td>
<td>34</td>
<td>M-open</td>
<td>No</td>
<td>MRI</td>
</tr>
<tr>
<td>Klepps, 2004</td>
<td>32</td>
<td>1t-26 2t-38</td>
<td>M-open</td>
<td>No</td>
<td>MRI</td>
</tr>
<tr>
<td>Galatz, 2004</td>
<td>18</td>
<td>2t-94</td>
<td>Arthro</td>
<td>No</td>
<td>US</td>
</tr>
<tr>
<td>Boileau 2005</td>
<td>65</td>
<td>1t-29</td>
<td>Arthro</td>
<td>No</td>
<td>CTA</td>
</tr>
<tr>
<td>Bishop, 2006</td>
<td>&lt;3cm-16</td>
<td>76</td>
<td>Arthro</td>
<td>No</td>
<td>MRI</td>
</tr>
<tr>
<td>Deutch, 2008</td>
<td>39</td>
<td>1t-10 2t-17</td>
<td>Arthro</td>
<td>No</td>
<td>MRI</td>
</tr>
<tr>
<td>Oh, 2009</td>
<td>78</td>
<td>28</td>
<td>Arthro</td>
<td>CTA</td>
<td>No</td>
</tr>
<tr>
<td>Cho, 2009</td>
<td>169</td>
<td>1t-10 L, 2t-41</td>
<td>Arthro</td>
<td>No</td>
<td>MRI</td>
</tr>
<tr>
<td>Zumstein, 2008</td>
<td>27</td>
<td>2t-37 (3y) 57 (9.9y)</td>
<td>Open</td>
<td>No</td>
<td>MRI</td>
</tr>
</tbody>
</table>

Histology of Repair Healing

Consider rotator cuff repair in primates
- “middle aged” baboons with healthy rotator cuff tissue NOT degenerative tissue
- Healing was incomplete at 8 weeks
- “Sharpey fibers did not appear in any considerable number before 12 weeks”
- Sharpey fibers developed at @ 15 week
- Avoid excessive tension on the repair for 12 weeks or longer
- Sonnabend, JBJS, 2010

Re-tear Rate Timing

- 22 patients were followed following a arthroscopic rotator cuff repair (> 3 cm)
- Serial US examinations performed at 2 days, 2 weeks, 6 weeks, 3, 6 and 12 months
- 9 failed (41%)
  - 7 of 9 occurred within 3 months of surgery
Biomechanics of Tendon

- Cyclic loading results in failure - Burkhart, Arthroscopy, 1994
- Cyclic loading using a dynamic ER model found increased strain and gap formation at the anterior supraspinatus tendon following repair - Park, AJSM, 2007

Increased strain (tension) on the tendon is bad

Micromotion!!

Fixation vs. Tension

- Mechanical fixation - suture/anchor holds tendon to bone
- Biologic Fixation - tendon/bone interface fuse
  - 8 weeks (Thomopoulos, 2003)
  - 3-4 months (Sonnabend, 2007, 2010)
- Avoid cuff overload

What role does therapy have in re-tear rate?

Consider
- ROM exercises
- Strengthening

Should We Encourage Stiffness?

- 48 patients followed post arthroscopic RC repair
- All immobilized for 6 weeks post surgery
- 10 (23%) were considered stiff
  - < 100 degrees FF
  - < 30 degrees ER
- No difference in outcomes at one year
- Except:
  - 70% of stiff group were intact versus only 36% of the non-stiff group

Except:
- Retear rate!

How Long to Immobilize and How Conservative Should We Be??

- Many surgeons are immobilizing for the first 3-6 weeks following cuff repairs
  - None or limited ROM
- Why?????
  - Retear rate!
  - Harryman, 1991 - 1-20%, 2-47%, 3-68%
  - Galatz, 2004 - 2-94%
  - Bishop, 2006 - <3 cm-16%, >3 cm-56%
  - Cha, 2009 - 16-10%, 2-41%
- Bone - tendon healing studies indicate immobilization is good
  - Thomopoulos, 2003
  - Saver, 2007
  - Sonnabend, 2007, 2010
  - Petrz, 2009, 2010

Stiffness

- Symptomatic stiffness resolves over time or does not occur often
  - Trenerry, CORR, 2005
  - Tauro, J Arthroscopy, 2006
  - Huberty, J Arthroscopy, 2009
  - Parson, JSES, 2010
  - Koo, J Arthroscopy, 2011
  - Kim, AJSM, 2012
- Recalcitrant FS - capsular release
Stiffness???
We need a better definition of “appropriate stiffness”
• Assess irritability- low, little pain
• Response to stretching inter and intra session
• Functional motion
Encourage stiffness?
• If “loose” then “dial out” motion
• If achieve ROM goal- stop passive stretching
Should we limit motion on all patients???
• Maybe just the large and massive tears

Intervention

Rehabilitation
Phase I - Goals: Week 0 – 6 weeks
• Patient education- precautions/exercise
• Permit healing- Avoid cuff loading/limit ER-30°
• Control pain and inflammation- meds/therapy
• Achieve appropriate passive ROM and prevent stiffness- initiate “passive” range of motion exercises

Presentation and frequency of treatment in first 6 weeks
At 2 weeks post-op- PROM

Case 1- ER @ 20: 20-30, elevation: 130 – 140
Case 2- ER @ 20: 10-15, elevation: 100-120
Case 3- ER @ 20: -5-5, elevation: < 90
Case 4- ER @ 20: 45, elevation, 120
“Dial out motion”

Phase I

Phase I ROM
30 degrees

Supervised program
- modalities
- joint mobilization
- gentle stretching
- active scapular retraction

Elevation ROM- Alternative
• Chair stretch
• Progress to supine forward elevation
Phase II  
**Weeks 6-12**

- Progress to elevation progression
- Protect the repair with *gradual loading*
- AROM is considered strengthening
  - Remember the weight of the extremity is significant resistance
- Must use gravity to increase or decrease resistance

Large and Massive Tears

- What to expect before and after 6 weeks
  - **EXPECT AND RESPECT LIMITATIONS!!!**
  - Especially if cuff was repaired under tension
  - Cuff tissue does not have normal length
  - Length-tension relationship alteration

EMG Activation During Elevation Progression. Gaunt, B and Uhl, T. *ASSET, 2004*

Elevation Progression

Elevation Progression (continued)
Pulley

Use if stiff

Phase II 6 - 12 weeks
- Progress to Phase I strengthening (ER, IR, Ext) in small and medium size tears
- Strengthening may be deferred until 12 weeks especially large and massive tears

Criteria
- ER lag sign is negative
- Minimal reactivity
- No pain with submaximal resistance
- Good passive elevation - > 140
- If criteria not satisfied then modify

Submaximal Manual Resistance-
Short-arc Less Stressful Than Isometric

After 6 weeks
- Progress to Phase II ROM
- The larger the tear then add later
- HA and IR should be introduced slowly in > 4 cm tears
  - Significantly lengthens the posterior-superior cuff

Phase II
- Phase I Strengthening
  - May start with IR and extension
  - Use bolster to reduce tension
  - Integrate scapular retractors
  - Move through pain free arcs and avoid repetitive “clicking and clunking”
  - Limit ER to @ 20 –30 degrees

Warning Signs
- Increased irritability/reactivity
- Excessive ER ROM with abrupt between sessions
- Near normal functional IR
- Limited active elevation to less than 100 degrees beyond 8 weeks
- ER lag sign beyond 8-10 weeks
- Poor deltoid activation
- The weaker the patient the slower the progress
  - Use very light manual resistance
Speed Kills
Just because you can doesn’t mean you should!

Phase III
10(12) -16 Weeks
Goals:
• Expected relatively pain free ROM
  – some stiffness of ER at the side and in
  functional IR is acceptable and expected in
  large cuff tears
• Optimize neuromuscular control
  – progress strengthening from non-provocative to
  provocative
• Improve endurance
• Initiate return to functional/work activities

Phase III
Phase II strengthening

Phase III
• Progress to variable resistance machines if
  appropriate
  – Curls
  – Triceps
  – Rows
  – Lat pull down in front
  – Work simulated activities-push/pull
• Lifting/carrying- boxes

Accelerated Progressive Programs
• May be appropriate for some younger patient < 40
• Athlete
• Small rotator cuff tears
  NOT
• Older degenerative rotator cuff
• Degenerative moderate size tears
• Large and massive cuff tears
Reality Check

- Many of the older, low demand patients require little beyond Phase I strengthening or light Phase II strengthening.
- Functional strength and other compensation continues to occur
- Do not be tempted to progress to the point of CUFF OVERLOAD

Phase IV - 16 weeks
6 months

- Return to recreational activities (usually 6 months)
  - Golf: begin swinging golf club → tee up on fairways
  - Tennis: can swing racquet → forehands → two hand backhand → easy serves
- Work
  - Patient to modified duty → light lifting → progress as tolerated
  - Some patients may begin work conditioning
  - Some patients should not go back to heavy repetitive lifting

Summary

- Follow the guides
- Respect healing - tendon to bone
- Progress the patient based on THEIR shoulder
- Look out for the warning signs
- There is nothing wrong with being conservative even if you are a democrat

Contact Information

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- Seminars → www.rehabed.com

Thank You