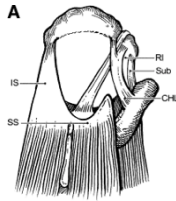


Post-operative Rotator Cuff Repair Rehabilitation

Martin J. Kelley, PT, DPT, OCS



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Dangerous Territory

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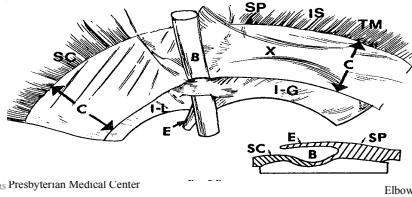
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Rotator Cuff/capsuloligamentous Complex



Interactive Shoulder C
lit.

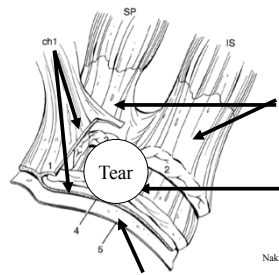
ymal Pictures



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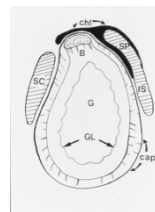
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The Rotator Cuff Tear



Tendons in parallel

Tendon obliquely oriented and fans out



Harryman JBS, 1992

Nakajima, JSES, 1994

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What Determines Outcome Quality

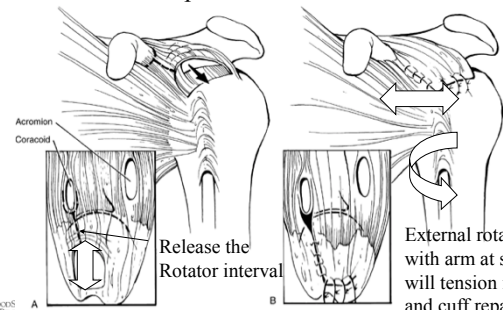
- Tear size and shape
- Supraspinatus atrophy
- Patient age
- Patient compliance
- Surgeon expertise
- Rehabilitation
- Size/weight of the arm



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Rotator Cuff Repair

- ROM exercises and movement can over tension the repair

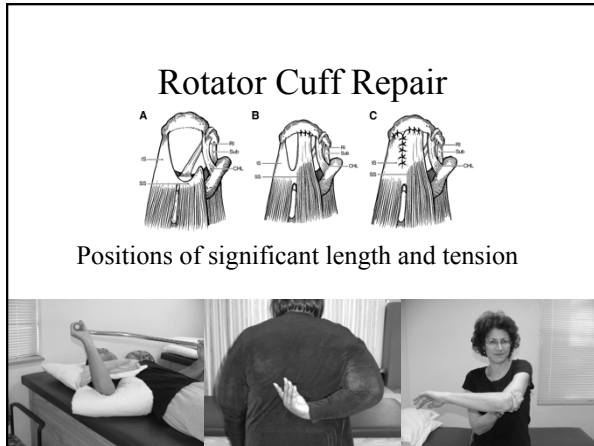


Release the Rotator interval

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

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Re-tear and Outcome

	N	Retear %	Surgery	Function	F/U tech	Tear size
Harryman, 1991	105	1t-20 2t-47 3t-68	Open	Yes	US	Yes
Liu, 1994	35	34	M-open	No	MRI	Yes
Klepps, 2004	32	1t-26 2t-38	M-open	No	MRI	Yes-NS
Galatz, 2004	18	2t- 94	Arthro	No	US	Yes
Boileau 2005	65	1t- 29	Arthro	No	CTA	Yes
Bishop, 2006		<3cm-16 3cm-76	Arthro	No	MRI	Yes

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Re-tear and Outcome

	N	Retear %	Surgery	Function effected	F/U tech	Tear size
Deutch, 2008	39	1t – 10 2t- 17	Arthro	No	MRI	No
Oh, 2009	78	28	Arthro		CTA	No
Cho, 2009	169	1t- 10 L, 2t- 41	Arthro	No	MRI	Yes
Zumstein, 2008	27	2+t- 37 (3y) 57 (9.9y)	Open	No	MRI	?

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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

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PARTY!!!

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Re-tear Rate Timing

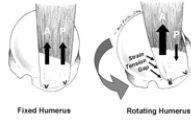
- 22 patients were followed following a arthroscopic rotator cuff repair (> 3 cm)
- Serial US examinations performed at 2 days, 2 weeks, 6 weeks, 3, 6 and 12 months
- 9 failed (41%)
 - 7 of 9 occurred within 3 months of surgery

Miller, J Am Sports Med, 2011

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Biomechanics of Tend



- 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!!



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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



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What role does therapy have in re-tear rate?

Consider

- ROM exercises
- Strengthening



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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

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Parsons, JSES, 2010
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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- 1t-20%, 2t-47%, 3t-68%
 - Galatz, 2004- 2t- 94%
 - Bishop, 2006- <3cm-16%, >3cm-76%
 - Cho, 2009 - 1t- 10%, 2t- 41%
- Bone – tendon healing studies indicate immobilization is good
 - Thomopoulos, 2003
 - Saver, 2007
 - Sonnabend, 2007, 2010
 - Peltz, 2009, 2010

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Stiffness

- Symptomatic stiffness resolves over time or does not occur often
 - Trenery, CORR, 2005
 - Tauro, J Arthroscopy, 2006
 - Huberty, J Arthroscopy, 2009
 - Parson, JSES, 2010
 - Koo, J Arthroscopy, 2011
 - Kim, AJSM, 2012
- Recalcitrant FS- capsular release

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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

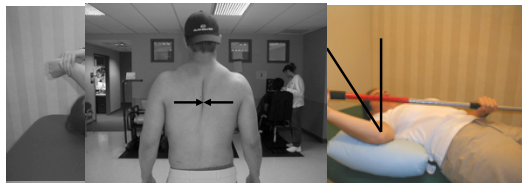
Case 4- ER @ 20: 45, elevation, 120

“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

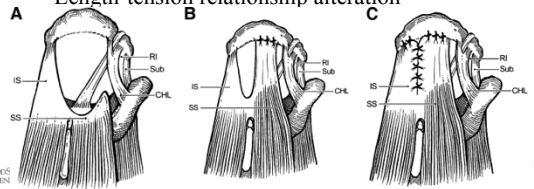


Phase II Weeks 6-12

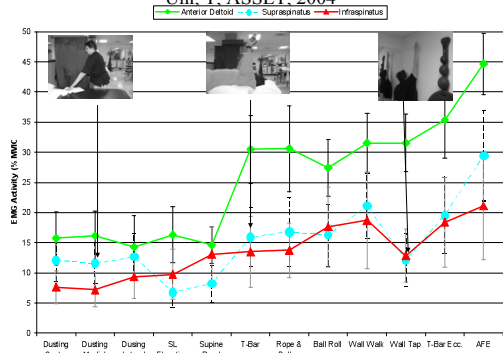
- Progress to elevation progression
- Protect the repair with *gradual loading*
- AROM is considered strengthening
 - Remember the weight of the extremity is significant resistance
- Must use gravity to increase or decrease resistance

Large and Massive Tears

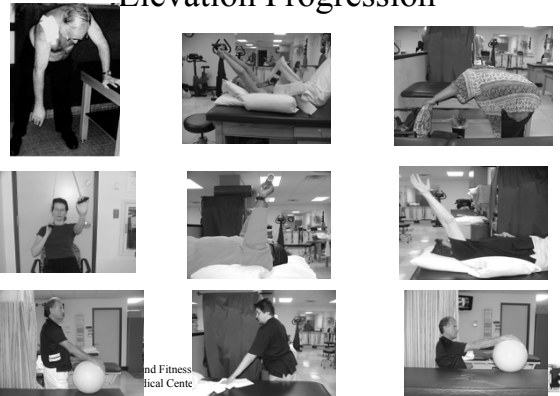
- What to expect before and after 6 weeks
- EXPECT AND RESPECT LIMITATIONS!!!**
 - Especially if cuff was repaired under tension
 - Cuff tissue does not have normal length
 - Length-tension relationship alteration



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



Elevation Progression



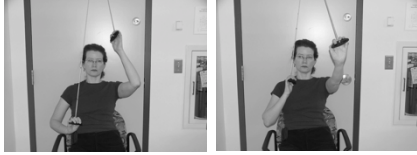
Elevation Progression (continued)



Elevation Progression (continued)



Pulley



Use if stiff

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 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



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



Submaximal Manual Resistance- Short-arc Less Stressful Than Isometric



Warning Signs

- Increased irritability/reactivity
- Excessive ER ROM with : abruptly 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!



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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

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Phase III

Phase II strengthening



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Phase III



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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

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Accelerated Progressive Programs

- May be appropriate for some younger patient < 40
- Athlete
- Small rotator cuff tears

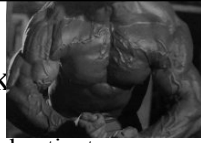
NOT

- Older degenerative rotator cuff
- Degenerative moderate size tears
- Large and massive cuff tears

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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**

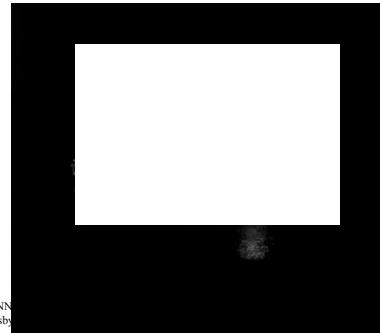
Phase IV- 16 weeks 6 months

- 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

Thank You



Contact Information

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– www.rehabed.com