

# clinical conduit

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## Prognostic Factors that Influence Rehabilitation Success Following Rotator Cuff Repair Surgery: Part 2 - STIFFNESS



My orthopedic physical therapy residents and I recently conducted a comprehensive review of the literature on the factors that predict success following the surgical repair of the rotator cuff (RC). We organized our findings into six categories and submitted our findings for publication in the *The Physician and Sports-medicine*. The variables we discussed included tendon healing, restoration of strength and mobility, pain levels, patient satisfaction, and functional outcomes. While these factors are inter-dependent they each influence the final result. This second chapter describes the short and long-term healing

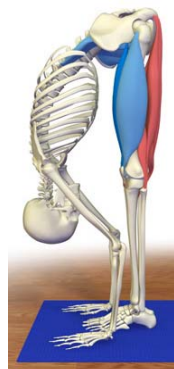
outcomes patients should anticipate based on their unique presentation.

Post-op shoulder stiffness is the most common complication following RCR with a prevalence ranging from 5-32%.<sup>30-32</sup> With the advent of an arthroscopic approach to RCR there has been an increased scrutiny on the ideal amount of immobilization to ensure healing yet avoid post-op stiffness. Many recent studies have found transient stiffness may be a positive attribute to retain the structural integrity of the repaired tendon(s). Huberty et al<sup>30</sup> found that 96% of patients needing an arthroscopic capsular release secondary to stiffness had rotator cuff tendons that had healed. Similarly, Parsons et al<sup>33</sup> found MRI evidence of post-op cuff healing in 70% of patients with transient, early stiffness as compared to only 36% of patients

in whom stiffness did not develop. In his study he found that early restriction of motion did not lead to long-term stiffness and recommends sling immobilization for six weeks. In animal studies, Peltz et al<sup>34</sup> found that immediate post-op passive motion was detrimental to passive shoulder mobility and speculated that passive ROM increases scar formation in the subacromial space. Additionally, passive motion had no effect on collagen organization or tendon mechanical properties measured six weeks after surgery.

Denard et al<sup>31</sup> concludes in a systematic review that stiffness should be considered a complication whereas recurrence in rotator cuff tearing should be considered a failure. Their rationale is that stiffness can be successfully treated with time,

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## Hamstring Rehabilitation

Hamstring strains are notorious for recurrent injury. Look at any NFL football roster (Cowboys fans know what I mean) and someone is always on the disabled list (again) with a hamstring strain. A recent systematic review of prospective studies was published in the *Scand J Med Sci Sports* to see if we could identify consistent Intrinsic (patient-specific findings such as weakness, tightness, knee instability, etc) or extrinsic (environmental-specific findings such as insufficient warm-up, training habits, playing surfaces, etc) risk factors. In addition, some risk factors such as age, sex and ethnicity which are non-modifiable were evaluated. Seven high quality studies involving 1775 athletes and 344 hamstrings using both uni- and multi-variate analysis were summarized and discussed.

The authors found that the "previous hamstring injury" was the most consistent risk factor to predict strain pathology of the hamstrings. In other words, supporting our notion that once injured – you're at high risk for reinjury. The only other trend of any significance was older age which is of course an unmodifiable finding. Interesting that hamstring flexibility, hamstring strength, and quad/ham imbalances did not have a significant relationship with the risk of injury. This finding may explain my bias about rehabilitating the hamstrings – the best way to treat a hamstring injury is to ignore it. Let me explain what I mean on the next page.

- continued on page 2

## Upcoming Courses for 2013

Advanced Manual Therapy Series  
Clinical Orthopedic Rehab Education

2013 Dates - Plano, TX

- Part 1: Cervicothoracic/TMD- Apr 20-21
- Part 2: The Upper Quarter- Jun 1-2
- Part 3: Lumbopelvic Spine- Jul 13-14
- Part 4: Hip/Knee- Aug 24-25
- Part 5: The Lower Quarter- Oct 19-20 (Leg, Ankle, and Foot)

A detailed description of the course content and learning objectives is available at our web site — [www.continuing-ed.cc](http://www.continuing-ed.cc)

Single course attendance is allowed on a space-available basis

## Hamstring continued ...

## REFERENCES

van Beijsterveldt AM, et al. Risk Factors for Hamstring Injuries in Male Soccer Players: A Systematic Review of Prospective Studies. *Scand J Med Sci Sports*. 2012 Jun 21. [Epub ahead of print]

Cipriani D. Pulling through. <http://www.momentummedia.com/articles/tc/tc/1609/pullingthrough.htm>. Accessed 10/18/12.

Schmitt B, et al. Hamstring injury rehabilitation and prevention of re-injury using lengthened state eccentric training: a new concept. *Int J Sports Phys Ther*. 2012. 7(3):333-43.

Mendiguchia J, et al. A return-to-sport algorithm for acute hamstring injuries. *Phys Ther Sport*. 2011. 12:2-14

Best and Sherry were the first to show the superiority of a functional agility and core stabilization program in preventing recurrence ([discussed in Vol 1, Issue 1](#)). I believe this program was better than the traditional philosophy of treating the hamstring like a knee muscle. The key is restoration of pelvic position and control. Functionally, particularly in weight-bearing, the hamstrings are “hip” muscles which are very sensitive to alterations or deficits in their antagonists – the quadriceps and hip flexors. Because the hamstrings function predominately in an eccentric fashion any anterior muscle length restriction will result in an anterior pelvic tilt and “pre-tense” the hamstrings. This elevated tonicity will promote spasm and trigger points in the muscle. This can be addressed with soft tissue mobilization techniques and controlled, dynamic, multi-plane dynamic rehabilitation of the lumbopelvic complex.

Once neuromuscular retraining techniques are initiated the focus should be on eccentric contractions. Traditional hamstring curls should be replaced by progressively higher speed combinations of hip flexion/knee extension limb swings in non-weight bearing and multi-plane, single and double limb deadlifts in a weight bearing posture. All of these exercises need to be performed with attention to pelvic control through ancillary stabilization muscles in the trunk. A recent clinical commentary article in the *Int J Sports Phys Ther* provides an excellent example of a rehab program emphasizing a “lengthened state eccentric training” to prevent hamstring injuries. Another valuable resource is a return-to-sport algorithm for acute hamstring injuries published last year in *Phys Ther Sport*. The authors provide a model developed on objective and quantifiable functional tests to develop an algorithm with a step-by-step structured approach to the rehabilitation process. The references for these articles are to the left.



Snap Kicks

Single limb deadlifts



## Question of the Month: Compression Garments for Runners

*I've seen a lot of runners using compression socks – what do you think about these?*

*S.B., ATC*



We reviewed an interesting article at our Sports Medicine journal club a couple of weeks ago regarding the use of compression stockings in distance runners. I first noticed the popularity of this “ergogenic” garment when we covered the Rock n’ Roll ½ marathon last spring. Based on anecdotal reports, runners feel that it improves performance and aids in recovery. While I respect

the possible placebo impact these stockings may have on the runner’s perception I prefer to look to studies of adequate scientific rigor to base my decision on recommendation. Amjol Ali is probably the world’s most prolific author on this topic and we reviewed one of his best designed studies.

He conducted a randomized controlled trial evaluating “high socks” of different gradations in terms of performance (time in a 10K), post-exercise power (vertical jumping height), heart rate, blood lactate levels, and the subjective impressions of comfort, arousal, and exertion. The bottom line was that there was no significant difference in all dependent variables between control (no compression) and low, medium, or high pressure gradation garments. The two exceptions were in post-race power production loss as measured by the vertical jump

(but who cares how high you jump right after a 10K race?) and comfort level. The participants preferred the control (no pressure) or low compression stockings (15 mm Hg pressure at the ankle and 12 mm Hg at the knee) over the medium and high pressure stockings.

What I took away from this article is the following findings. 1) If you like the feel of the compression socks pick ones that have a relatively low compression quality (certainly < 30 mm Hg) and don’t buy them for their performance value. 2) We probably need more studies on the exercise recovery aspect (myofascial sarcomere damage impact) but it doesn’t appear that the compression socks effect post-race blood lactate levels. Hopefully, a future study will look at differences in sprinting power at the immediate conclusion of the race because of its specific performance implications.

Questions you would like addressed in a future issue can be sent to [mulliganpt@tx.rr.com](mailto:mulliganpt@tx.rr.com)

## References

All references are available on line at [www.continuing-ed.cc/newsletter.htm](http://www.continuing-ed.cc/newsletter.htm)



### "Featured Internet Link"



American Physical Therapy Association

With everyone focused on the election this past month I thought this would be a good forum in which to remind you of resources that both our national and state organizations provide to heighten your awareness of their impact on our practice. The APTA site has multiple resources including summaries of federal and state legislative and regulatory issues, grass root toolkits, schedule of upcoming events and activities, and automated mechanisms for you and your patients to contact your legislators and representatives.

<http://www.apta.org/Advocacy/>



The TPTA has similar resources including an e-newsletter and loads of information on our primary agenda (to gain direct access) during the upcoming 83<sup>rd</sup> legislative session in 2013. <http://www.tpta.org/displaymon.cfm?an=1&subarticlebr=251>

## Rotator Cuff Success Prognosis: Tendon Healing continued -



modified physical therapy rehabilitation protocols, and, if necessary, an arthroscopic capsular release. Additionally, overall outcomes can be satisfactory, and not unexpected, even with small amounts of painless motion loss.

While a conservative immobilization protocol seems indicated it is important to be aware of risk factors that may lead to post-op stiffness. Huberty et al<sup>30</sup> identified a cluster of findings that identified patients with dissatisfaction regarding their motion restrictions. These factors included patients under the age of 50, workers' compensation payer class, adhesive capsulitis or calcific tendinitis at the time of surgery, partial articular-side tendon avulsions (PASTA) or single tendon tear defects, and concurrent capsulolabral surgical repairs. Based on the risk factors identified in this study, Koo et al<sup>35-36</sup> found that the addition of an accelerated motion protocol reduced the risk for post-op stiffness without adverse influence on the repair's healing status. Specifically, these patients were instructed in an early program of passive table slides in the sagittal plane and the addition of limited and careful passive external rotation if the subscapularis was involved (Figure 3).

There is conflicting evidence regarding the relationship of motion loss and handedness. Huberty et al<sup>30</sup> did not find this to be a predictor for motion loss, while Charouset et al<sup>11</sup> found better motion on the non-dominant side and Namdari<sup>37</sup> found a greater loss of passive internal rotation on the dominant side.

In another study, Seo et al<sup>32</sup> found additional factors that may predispose a patient to increased post-op stiffness. Based on a multivariate analysis, the likelihood for stiffness was affected by the type and direction of the tear. The odds ratios favoring post-op stiffness were 6.2 times higher for full thickness tears, 2.6 times higher for tears sustained by traumatic onset, and 1.8 times higher for tears extending in a posterosuperior direction.

Cho et al<sup>38</sup> showed that patients with significantly less pre-op ROM that required a concomitant manipulation with their RCR were able to regain most of their ROM. Stiff patients lagged approximately 20° behind in elevation and rotation range at 3 months as compared to those who did not require the manipulation, but were within 5° of their counterparts at one year. Oh et al<sup>21</sup> found similar results with significant differences in internal rotation (but not elevation) mobility at 3 months that had essentially resolved by 12 months post-op.

Namdari et al<sup>37</sup> conducted a study to identify factors that correlated with limited motion following RC surgery. While most of the shoulders with motion loss recovered approximately 90% of their motion by one year as compared to the contralateral side, there were a number of factors that were associated with limited motion at 3-months post-op. These factors included limited pre-op ROM, workers' comp coverage, and increased pain. These individuals continued to have slightly elevated pain levels at 1 year post-op.

Stiff shoulders can be complicated to treat and painful for the patient during their post-op recovery. Efforts to alleviate significant restrictions through pre-op rehabilitation should be strongly considered. Trenerry et al<sup>39</sup> found that the best indicator of post-op stiffness was limited behind-the-back reaching (internal rotation) pre-operatively. These subjects also had significantly more frequent and higher levels of pain at 6 weeks following surgery. While pain had normalized at 26 weeks, it took 76 weeks to restore the motion loss. Despite these concerns it is important to be careful with early passive range behind the back as these maneuvers may place unwanted tension on the repair. Conversely, passive external rotation in the scapular plane up to 60° for those at risk for stiffness may be a relatively safe activity.<sup>40</sup>

It is important to differentiate transient stiffness (responding slowly, but steadily to treatment) from contractures that are resistant to multiple rehabilitation strategies, which may require surgical intervention to restore functional mobility. The most important interventions to restore mobility may be soft tissue mobilization and articular manual therapy. Joint mobilization within and up to the physiological end range can provide pain relief, alter afferent input, and minimize capsular restrictions. These types of "hands-on" techniques should be used to address joint stiffness and PROM deficits. Muraki et al<sup>41</sup> showed that glenohumeral distraction as well as anterior and posterior translational glides did not significantly strain repaired supraspinatus tendons if the arm is placed in a resting position. In particular, posterior translational glides, in an end-range abducted and externally rotated position, are effective at increasing external rotation ROM in patients with stiff shoulders.<sup>42</sup> In addition, attention to the cervico- and scapulothoracic mobility in the early phase of rehabilitation is safe and beneficial in regaining overhead mobility.

A recent study suggested the use of sodium hyaluronate as an anti-adhesion viscosupplement. Oh et al<sup>43</sup> detailed preliminary evidence to support this agent as a means to prevent early post-op stiffness. While there were no long-term benefits in pain, rotation ROM, or functional outcomes, they did report earlier recovery of passive forward flexion ROM at 2 weeks post-op. **The next issue will present prognostic factors that impact post-operative restoration of strength.**



Don't forget to exercise your democratic right to cast your votes on Tuesday, November 6<sup>th</sup>.

Previous issues are archived at  
[www.continuing-ed.cc/newsletter.htm](http://www.continuing-ed.cc/newsletter.htm)



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# 2013

### Clinical Orthopedic Residency Education Series: An Advanced Manual Therapy Education Track



These courses are designed to provide a comprehensive overview of orthopedic physical therapy (from head to toe) based on the APTA's definition of advanced specialty practice. We've had a number of clinicians from the community take the series in the past two years and received excellent feedback on the content and format. In fact, we've had 15 clinicians from our first two classes pass the orthopedic specialty (OCS) exam this past spring. We anticipate another 5-10 from the 2012 class to be sitting for the exam next spring. If you'd like a mechanism by which to prepare for the exam or would simply benefit from advanced coursework with expert colleagues, we hope you'll consider joining us next year. These courses are taught by the orthopedic faculty at UT Southwestern. Next year's series will begin again in April. The course content includes examination and intervention strategies for the cervicothoracic spine, upper quadrant (shoulder, elbow, hand), lumbopelvic spine, and lower quarter (hip, knee, ankle/foot). All of the material is based on current evidence with over 50% of the on-site course work devoted to lab demonstration and practice. For more information on the 2013 advanced clinical orthopedic education series please visit our web site at [www.continuing-ed.cc/residencycourse.htm](http://www.continuing-ed.cc/residencycourse.htm). The courses are designed as a series but attendance at singular courses is allowed on a space available basis.

Don't waste time learning  
 the "tricks of the trade."  
 Instead, learn the trade.



continuing ED



Happy Thanksgiving



## Medical Screening

### Does disability from chronic neck pain predict cerebral hypoperfusion?



We all recognize that decreased blood flow (cerebral hypoperfusion) to the brain can cause cellular damage and increase the risk for dementia or stroke. There is also research to suggest a link between cerebral hypoperfusion and migraine headaches. Now, a recent article from the *J Manipulative Physiol Ther* reports a strong association between chronic neck pain, vertebral restrictions, self-report ratings of disability and cerebral hypoperfusion.

This cross-sectional correlation study enrolled 45 subjects (29 women/16 men) with chronic neck or upper thoracic pain. The subjects were grouped according to NDI [Neck Disability Index] scores as mild, moderate, or severe. The number of painful/blocked segments in the cervical and upper thoracic spine and costovertebral joints and pain intensity on a visual analog scale were compared to regional cerebral blood flow of the brain as measured by a single-photon emission computed tomographer (SPECT).

Group 1 (mild) consisted of 14 patients. Cerebral perfusion measured by SPECT was normal in all 8 brain regions. Group 2 (moderate) consisted of 16 patients. In this group, a 20-35% decrease in cerebral perfusion was observed, predominantly in the parietal and frontal zones. Group 3 (severe) consisted of 15 patients. In this group, observed cerebral perfusion decreased even further to 30-45%, again predominantly in the parietal and frontal zones. A significant difference was found between NDI groups with the 'moderate' and 'severe' groups showing greater hypoperfusion than 'mild.' In a multivariate analysis, NDI scores contributed 39% of the variance to the SPECT scores. In other words, in this study, NDI scores strongly predicted cerebral hypoperfusion. The authors speculated that spinal articular dysfunction may be involved via hyperactivity in the regional sympathetic nervous system. This is interesting research and I'm looking forward to future studies to help us establish if there is a cause and effect that could be addressed through therapeutic interventions

If you're interested in medical topics such as this you may enjoy our home study on Medical Screening for the Physical Therapist. This inservice can be read and/or viewed free of charge. A post-test for CEU credit is available at <http://www.continuing-ed.cc/homestudy.htm> for a reasonable fee.

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