

clinical conduit

by Ed Mulligan, PT, DPT, OCS, SCS, ATC

Inside this issue

Prognostic Factors that Influence RC Rehab: Part 6: Outcomes	1
ACL Bone Bruises	1
Adolescent Sports Specialization	2
Science vs. Compassion	3
Infraspinatus Strengthening	4

Prognostic Factors that Influence Rehabilitation Success Following Rotator Cuff Repair Surgery: Part 6 – SELF-REPORT OUTCOMES



One of the most important measurements of intervention success is the functional assessment as measured by self-report outcome tools. Healthcare-related outcome tools usually have elements of mobility, pain, strength, and patient satisfaction embedded within their calculation.

Age is commonly referenced as a prognostic factor in the functional outcome following a RCR. Romeo et al⁷⁸ found that women, but not men, had a negative statistically significant relationship between age and shoulder scoring scales. Haviv et al⁷⁹ reported that improvements in post-op function were noticed in all age groups and did

not dramatically influence the final outcome. Oh et al¹² found a lower score on the simple shoulder test (SST) for older patients but lower scores in patients over the age of 60 are expected based on the stratified psychometric properties (construct validity) of this functional assessment tool.⁸⁰ It does not appear that age significantly alters reasonable functional goals.

Gender does seem to be a predictor of terminal functional outcomes. A number of studies have identified the female sex as more likely to suffer a reduced self-report functional outcome following primary RCR.^{78,81-84} Ladermann et al⁸⁵ also found poorer functional outcomes in females with rotator cuff revision surgeries. Nho et al⁸⁶ found that females had lower ASES scores at baseline, 1, and 2 years post-op but did experience a greater

improvement than men during this time. As women appear to be more disabled both before and after rotator cuff surgery, Razmjou et al⁸³ recommends a female-specific rehabilitation program with an emphasis on regaining strength, recognition of their unique care-giving responsibilities in family and society, and, if appropriate, structured return to work plans.

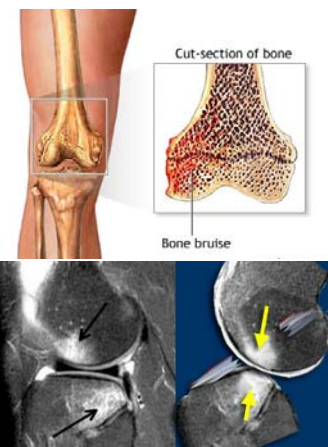
There has been speculation in the literature regarding the effect of somatotype on functional outcomes. Warrender et al⁸⁷ found that obesity, defined as BMI > 30, had a negative impact on functional outcomes and required longer operation times and hospital stays. Conversely, Namdari et al³⁹ found that BMI, as a continuous variable, and ...

- continued on page 3

Lateral Bone Bruising with ACL Trauma

We know that osteochondral contusions (bone bruising) is a common finding following a traumatic injury to the anterior cruciate ligament. These articular cartilage lesions occur in approximately 70% to 92% of traumatic ACL injuries. In fact one study reported a 100% incidence. This type of incidence would suggest that the presence of bone edema following a "pivot and pop" history may be, in fact, a pathognomic sign of the injury. This is germane to the rehab specialist as previous research has shown that severe bone bruising after injury is linked to increased disability, including prolonged knee effusion, pain and increased time to achieve normal range of motion of the joint. When combined with ACL or other ligamentous and meniscal pathology, this may directly influence long it takes for the patient to be ready for an operation and the length of post-operative rehab.

Johnson DL, et al, (*Am J Sport Med*) prospectively evaluated 40 patients who had knee inflammation after isolated anterior cruciate ligament rupture. In the first week after the injury, they divided the subjects into two groups - those with or without an associated "geographic" bone bruise/subchondral fracture of the lateral femoral condyle. The group with the bone bruise had a significant increase in the number of days required to non-antalgic gait without external aids, increased number of days to achieve normal ...



- continued on page 2

Upcoming Courses for 2013

Advanced Manual Therapy Series
Clinical Orthopedic Rehab Education

2013 Dates - Plano, TX

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

Single course attendance is allowed on a space-available basis

Lumbopelvic course is full however we have about 5-6 spots left in the hip/knee and lower quarter courses later this year.

Bone Bruises continued ...

REFERENCES

Johnson DL, et al. The effect of a geographical lateral bone bruise on knee inflammation after ACL rupture. *Am J Sports Med.* 2000 28(2):152-5.

Wilk KE, et al. Recent advances in the rehabilitation of anterior cruciate ligament injuries. *J Orthop Sports Phys Ther.* 2012 Mar;42(3):153-71

Bisson LJ, et al. Prospective Study of the Association Between Bone Contusion and Intra-articular Injuries Associated With Acute Anterior Cruciate Ligament Tear. *Am J Sports Med.* 2013 Jun 6. [Epub ahead of print].

ROM, and a higher pain score measured at weekly intervals in the first month after injury. This study was one of the first to alert us that patients with more severe bone bruising may take a longer time to reach normal homeostasis (ROM, pain, neuromuscular control). This means that not only the decision for surgery, but the timing of any surgery deemed necessary may be delayed. If the patient has an ACL reconstruction (regardless of graft choice and surgical technique) the presence of a bone bruise should require modification to the rehab schedule. For instance, closed-kinetic chain activities (weight-bearing rehab) that produce higher axial loads should be cautiously introduced. Possibly, protected-arc open chain exercise may be preferable early in the rehab process. Additionally, weaning from weight-bearing assistance may be delayed as the patient may take a longer time to normalize their FWBing gait pattern.



In the current concepts article on ACL rehab in the 2012 knee-themed issue of *JOSPT*, Wilk recommends delaying or slowing weight bearing progression to allow adequate bone bruise healing. They also are very cautious in the introduction of plyometric training because of its potential negative effect on the articular surfaces later in the rehab process. Since it is not common to have follow-up MRIs, the therapist needs to use their clinical skills in determining when the articular lesions are beginning to heal. I use de-creasing pain and warmth to palpation around the lateral joint line pain along with improved quad firing as my signal that progressive WBing activities will be better tolerated and not interrupt bone healing.

A recent study from the *Am J Sports Med* provided us with additional information on bone bruising patterns and risk factors associated with specific demographic attributes. In this case control study the presence and severity of bone bruising was evaluated by pre-op MRIs in 171 patients. The frequency of bone bruising was 85% on the lateral tibial plateau, 77% in the lateral femoral condyle, 26% on the medial plateau, and just 6% on the medial femoral condyle. From a demographic standpoint the odds of bone bruising was more common and severe in young men (under 18) and lateral bone bruising was associated with lateral meniscal tears. The presence of a concurrent medial meniscal tear was associated with an increased severity of lateral compartment bruising (probably representing a more severe injury). For me, the moral of these studies is to honor lateral knee joint pain during the rehab process and trust its tolerance to your rehabilitation progression.

When should my child begin specializing in sports?



Reference:

Jayanthi N, et al. Sports specialization in young athletes: evidence-based recommendations. *Sports Health.* 2013 May;5(3):251-257.



Commentary on Sports Specialization

Last month I listened to a pediatric sports medicine surgeon speak out against early athletic specialization and lamented about the "old days" when the sport you participated in was dependent upon the weather. This is much the way I grew up in the 60-70s. In reflecting on my high school days I calculated that 75% of the starting positions on the varsity football, basketball and baseball teams were occupied by 12 players. Most of us started in a least two sports and a few in all three. This wasn't because we were a small school (ours was equivalent in size to a 5A school in Texas) or because we weren't very good (state champs in football and state playoffs in basketball and baseball) - I think it was because we enjoyed the change of season and new athletic challenge the calendar brought to us.

We wouldn't dream of working on football skills in the spring or baseball skills in fall - we were too busy practicing or playing the game of the season. I attribute some of our success to the crossover skills that came from multi-sport participation, the lack of staleness, and the relatively low injury rates because we didn't play a sport long enough into the year to develop "overuse" injuries.

A recent article from *Sports Health* had an excellent review article looking at the benefit of sports specialization. They found that some degree of sports specialization is necessary to develop elite-level skills but the authors recommended that intense, single-sport training (to the exclusion of others) be delayed until at least adolescence to optimize success, minimize the risk of injury, decrease psychological stress, and avoid burnout. They found that for

most sports there is no evidence that intense training and specialization before puberty are necessary to achieve elite status. Risks of early sports-specialization include higher rates of injury (marked increase if training more than 16 hours/week in a single sport), increased stress, and the likelihood of quitting a sport at a younger age.

While each sport is somewhat different early, intense focus does not guarantee success - talent does. In fact there is decent evidence that elite-level athletes benefit from early diversification which provides valuable physical tools, cognitive awareness, and psychosocial happiness. It's a pretty easy recipe - more free-play and participation for the sake of the sport - not the victory. Besides, who remembers any of your junior high game outcomes anyway?

Questions you would like addressed in a future issue can be sent to mulliganpt@tx.rr.com

References

All references for the post-operative rotator cuff prognostic factors article are available on line at www.continuing-ed.cc/newsletter.htm



"Featured Internet Link"



www.physioedge.com.au

I've burned through all the recordings I mentioned in the last issue from www.ptpodcast.com and will start listening to some recordings provided by an Australian physiotherapist named David Pope. He is the managing director of Clinical Edge which is a continuing education company providing both on-line and on-site course work in Australia. While I can't provide an individualized review of the content, the 17 recordings all seem to cover topics of interest and relevance to the orthopedic physical therapist and feature internationally-known speakers. According to the web site these presentations are designed to facilitate our thinking about why we do what we do through discussion forums, blogs, and pre-recorded lectures. Best of all it's free.

Rotator Cuff Success Prognosis: Patient Satisfaction continued -



obesity, as a dichotomous variable, were not significantly related to self-report early outcomes after controlling for confounding variables. McRae et al⁸⁸ and Prasad et al⁸⁹ also could not find a significant direct correlation between BMI and pain or function. There is also conflicting evidence in regards to arm dominance and functional outcomes.

Multiple authors have correlated pre-op stiffness with decreased clinical outcomes. Ellman et al⁴⁶, Feng et al⁹⁰, and Pai and Lawson⁹¹ all showed a much greater risk of worse clinical outcomes if the pre-op abduction ROM is less than 90°.

Functional outcomes may also be highly dependent upon psychosocial variables. This may include fear behavior tendencies, patient expectations, and sociolegal (workers' compensation) status. There is no consensus regarding the influence of psychological variables on functional recovery in patients with shoulder pathologies, yet pain-related fear has been shown to predict disability for patients with low-back and cervical pain.⁷⁴ Voerman et al⁹² found that cognitive-behavioral factors correlated better with intervention success than did changes in muscular activation patterns. These studies, while not specific to rotator cuff repairs, hint at the value of recognizing and addressing the unique psychological make-up of each patient. Recently, Oh et al⁹³ found that patient expectations and concerns could be predictors of outcomes. Their state of employment, direct medical advice, and poorer pre-op level of function all contributed to a higher outcome expectation. Females with a higher SF-36 mental component summary score showed more pre-op concern regarding their outcome. This study provides further evidence regarding the importance of patient education.

The literature consistently suggests that rotator cuff repairs treated under the coverage of workers' compensation have reduced functional outcomes.^{31,39,88,94-96} Henn et al⁶⁹ conducted a prospective study and controlled for age, sex, co-morbidities, smoking, marital status, education, duration of symptoms, work demands, expectations, and tear size to confirm that workers' compensation status was an independent predictor of functional outcomes as evidenced by elevated Disabilities of Arm, Shoulder and Hand (DASH) scores. McRae et al⁸⁸ also found that work comp status was negatively correlated with ASES and SST scores. A possible explanation for these decreased functional outcomes may be the higher rate of non-compliance with PT rehabilitation as found by Cuff and Pupello.⁹⁷

Haviv et al⁷⁹ reported unexpectedly good results with their workers' compensation patients and attributed this success to their younger age and higher concentration of small-sized tears. A level IV case series article by Bhatia et al⁹⁸ showed that worker's compensation patients returned to their preoperative level of work at a mean time of 7.6 months following their surgical intervention.

Despite the popularity of nutraceutical supplements there

Science vs. Compassion



The "Science of Healing. The Art of Caring." is a tag line of the APTA and I think it really embodies the correct approach to therapeutic interventions offered by PTs. Therapists are generally kind and compassionate people with a great capacity for empathy and concern. Consequently we do a wonderful job of communicating and displaying to the patient that we are fully invested in their well-being.

However, we cannot confuse "care" and "science". The best of therapists recognize the similarity and differences in these two tenets of management. Patients appreciate and long remember who you treated them with respect, dignity, and intelligence. However, your level of concern does not mean that an intervention works. That requires an understanding of science – beginning with an appreciation of the null hypothesis. Scientific investigation begins with the premise that X does not cause Y. Only after multiple randomized controlled trials can we make the connection between physiological (and/or functional change) and the intervention offered – and then only at the probability level used in the investigations ($p < 0.01$ or 0.05) meaning we're still only 95-99% sure of the direct cause and effect relationship.

Admittedly, I'm a skeptic when it comes to novel therapeutic approaches. I'm always the last one on a band wagon for the latest, greatest method of treatment so the adoption of the null hypothesis (X **does not** cause Y) fits nicely into my paradigm of reasoning. I need "proof" that the intervention will cause the intended therapeutic effect before investing a lot of time, money, and/or energy in learning this new treatment technique or philosophy. I applaud those with alternative perspectives and recognize this is the way our professional effectiveness will grow and thrive. I would just ask those that champion these new treatments to rigorously test these concepts against the harsh judge of high quality, scientific trials of their theories. I only have blind faith in God - everyone else must show me "proof".

The best way to grow in your professional expertise is to evaluate your bias against scientific scrutiny. Whenever you think you are absolutely right – ask this question. What evidence would it take to prove you wrong? Then go to the literature and see if that evidence is, in fact, in place (and/or there is absolutely no proof to support your bias). I think all of us would be amazed at what "faith healers" a lot of us have become.

- completed on page 4

Previous issues are archived at
www.continuing-ed.cc/newsletter.htm



Extraordinary claims require
 extraordinary evidence



2013

Clinical Orthopedic
 Residency Education Series

We have about 3 spots left for Part IV of our Clinical Orthopedic Residency Education series. This hip/knee course is scheduled for August 24-25th in Plano, TX. This course is designed to focus on the evaluation and management of common pathologies of the hip and knee.

This course will be taught by Ed Mulligan and resident faculty from UT Southwestern Medical Center. All of the material is based on current evidence with over 50% of the on-site course work devoted to lab demonstration and practice.



Home Studies Now Available Study and learn at your own pace at home!

Medical Screening for the PT	.3 CEUs
Knee Osteoarthritis	.2 CEUs
Pharmacology for the PT	.2 CEUs
Radiology for the PT	.3 CEUs
Goniometry 101	.2 CEUs
Foot-Ankle Anatomy	.3 CEUs
Achilles Tendinopathy	.2 CEUs
Lateral Ankle Instability	.2 CEUs
Plantar Fasciitis	.2 CEUs
Knee Meniscal Injuries	.2 CEUs
Orthopedic Hip Injuries	.2 CEUs
Principles of Joint Mobilization	.2 CEUs
Functional Anatomy of the Shoulder	.3 CEUs
Scapular Significance: Ortho Perspective	.2 CEUs
Proximal Humerus Fracture Rehab	.2 CEUs
Subacromial Impingement Syndrome	.2 CEUs
Examination-Treatment of Hand/Wrist	.3 CEUs
Ethics and Professional Responsibility	.2 CEUs

Convenient access to web based content relevant to your practice needs. Only \$12.⁵⁰ per contact hour to meet your relicensure requirements.

continuing ED

1901 Pintail Parkway
 Euless, TX 76039

Phone: 817-488-2061
 Fax: 817-684-7201
 Email: mulliganpt@tx.rr.com
www.continuing-ed.cc

The "Clinical Conduit" newsletter is an every other month publication available to any allied health care provider free of charge upon request. Individuals who would like to be included on the email distribution list should contact the editor at mulliganpt@tx.rr.com



Infraspinatus Strengthening

Interesting article in the current issue of the *J Athl Train* 2013 (48:346-52). The authors evaluated a variety of common shoulder external rotation exercises to compare the infraspinatus EMG activity that each exercise created. This is a particularly important muscle in patients with anterior instability as it can act as a dynamic synergist in offering stability. I've always been an advocate of the sidelying position with the arm supported in slight abduction. But as you can see in the table below the best exercise was external rotation in sidelying with the shoulder flexed to 90°. Not only did it generate a higher % of the MVIC, it did so with little contribution from the posterior deltoid. I suspect you could also increase mid trap scapular retraction if you performed the exercise with the proximal unsupported. This "Side-Lying Wiper" might be a good activity to throw into your exercise toolbox.

Table 1. Electromyographic Activation for Each Exercise

Muscle	Exercise, % Maximal Voluntary Isometric Contraction (Mean ± SD)				F _{3,87}	P
	Prone Horizontal Abduction With External Rotation	Side-Lying Wiper	Side-Lying External Rotation	Standing External Rotation		
Infraspinatus	46.14 ± 15.65	55.98 ± 18.79	43.38 ± 22.26	26.11 ± 15.00	19.97	<.001
Middle trapezius	19.14 ± 14.85	6.55 ± 6.87	24.14 ± 21.57	19.21 ± 11.90	20.15	<.001
Posterior deltoid	15.31 ± 10.76	7.01 ± 9.26	4.11 ± 4.08	13.09 ± 12.91	25.10	<.001



Rotator Cuff Patient Satisfaction Outcomes continued -

is little evidence in the literature regarding the benefit of nutritional influences on tendon healing or functional benefits. There is a distinct need for future research to demographically evaluate the effectiveness of polyunsaturated fatty acid and anti-oxidant supplements in patients who undergo rotator cuff repairs.

As with rotator cuff healing, the presence of medical comorbidities has been shown to influence functional outcomes.⁹⁹ Bhatia et al⁹⁸ found a history of alcohol use in excess of 6 drinks/week had a significant association with inability to return to pre-op work levels following RCR. Diabetic patients are prone to early motion loss³⁸ and Chen et al¹⁰⁰ found shoulder mobility was significantly reduced at 6 weeks, 6 months, and 3 years. Clement et al⁷¹ reported that while diabetic patients showed improvement at one year in pain and function they did not achieve the same level of function as their non-diabetic counterparts. Chest related comorbidities, including chronic pulmonary disease, ulcer disease, artery disease, heart attack, and congestive heart failure had a significant influence on self-reported function as measured by the Penn Shoulder scale when compared to other general comorbidities.¹⁰¹

Probably the most consistently discussed factor in RCR outcomes is the impact of the innate pathological characteristics of the tear. This not only includes the tear's shape and size but also considers arthritic change, associated labral injuries, and the necessity for concurrent acromioplasty, and/or subsequent revision surgery. Older studies evaluating open rotator cuff repairs generally report lower functional success as the tear size increases.^{78,81,102-104} Conversely, more recent studies examining arthroscopic repair techniques have not found tear size to have a significant impact on functional recovery.^{64,105} Ladermann et al⁶⁴ reported reliable improvements in pain and function following revision surgery; however, he found

many pre-op factors may preclude a complete return to a symmetrically normal status. This outcome is probably attributable to the possibility of underlying problems with healing or previously inadequately addressed pathologies.

In addition to the surgical approach, the timing and fixation method used to secure the tendon may influence recovery. From a biomechanical standpoint, double-row cuff repairs have shown an improved fixation quality yet non-suture-bridging double-row repairs have not demonstrated a better functional outcome.¹⁰⁶⁻¹¹⁰ Earlier surgical interventions have also been associated with a better functional recovery. Hantes et al¹¹¹ found that a delayed diagnosis following a traumatic tear led to a more difficult surgery and fewer results rated as good. Similarly, Petersen et al¹⁰⁵ found that a traumatic, massive tear had a 4-month surgical intervention window before functional outcomes began to deteriorate.

Klintberg et al¹¹² found that early loading and a progressive protocol produced no adverse effects, we recommend a more cautious approach to rehabilitation. Other recent studies have confirmed that delayed or slowed physical therapy protocols will ultimately achieve similar terminal outcomes and may increase the likelihood of structural healing of the repaired tendon(s).^{34,97,113-114} It is possible that aggressive early active motion may decrease the healing response and create an environment in which the therapist is actually recreating or straining the original lesion. As shown by Lisinski et al¹¹⁵ we believe that a supervised rehabilitation protocol is more effective at safely restoring ROM, decreasing pain, and decreasing resting upper trapezius EMG activity than in an uncontrolled and unsupervised post-op exercise therapy progression. Periodic physical therapy sessions also allow personalized counseling on known prognostic factors to provide the patient with a realistic expectation following their surgery.