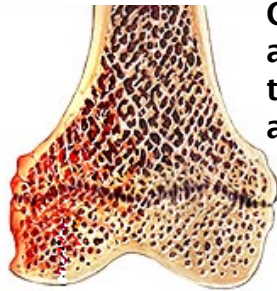


# clinical conduit



## Inside this issue

ACL Bone Bruising	1
Preparticipation Screening	1
Statistical Truth	2
Thera-Band Conversion	4
Foot-Ankle Anatomy Home Study	4



## Can an accelerated rehab approach be detrimental to the long-term outcome of the acute ACL rupture?

A common, but maybe underappreciated, sequela of an acute anterior cruciate ligament rupture is a bone bruise on the lateral femoral condyle and/or the posterior portion of the lateral tibial plateau. The bone bruise is a trabecular micro-fracture that damages the osteochondral surfaces as a result of the violent pivot shift phenomena that accompanies the trauma. The prevalence of this co-morbidity has been estimated to be present in about 80% of complete ACL injuries. Partial tears seem to not be as susceptible to significant bone contusions.

The problem is difficult to appreciate because there are not any obvious visible signs of the lesion and it can only be accurately recognized and

classified with the assistance of an MRI examination. Histological analysis through biopsy reveals the bone bruise to have significant chondrocyte damage with marrow hemorrhage and edema in the absence of cortical disruption of the overlying articular cartilage.

The question for therapists is how this finding might affect the conservative or post-surgical management and the progression of the subsequent rehabilitation. First, I think it is important to be alert to the typical presentation findings of the bone bruise. Research demonstrates that patients with geographical bone bruises tend to present with some or all of the following findings:

1. increased or prolonged joint effusion
2. inability to assume a

non-analgesic gait without the assistance of an external aid (pain is particularly noticeable in the lateral compartment)

3. delayed reacquisition of range of motion

Since this injury pattern has only been appreciated in the past 10-15 years we probably do not fully understand the natural history of bone bruising. For instance, does the extent of the bruise predict future articular cartilage health or the accelerated development of osteoarthritic change in the post-traumatic knee? It may be possible that the commonly held belief that the chronically deficient ACL knee is at increased risk for cartilage wear because of increased laxity is better explained by many factors

- continued on page 2

## Upcoming Course Schedule

### Pilates Course

Aug 18-19 - Plano, TX

### Knee Course

June 9-10, 2007 - Plano, TX  
Jul 14-15, 2007 - San Antonio

### Foot-Ankle Course

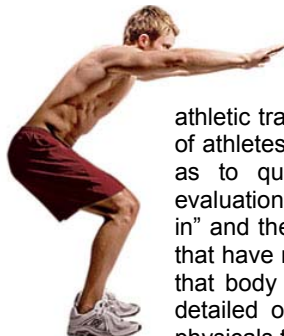
Sep 29-30, 2007 - Grapevine

### Cervical Course

Nov 3-4, 2007 - Grapevine

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)

## Pre-Participation Physical Examinations



It's that time of year when we're all called upon to help with the preseason physicals at the local high school. Typically they are organized in a station-to-station format with physical therapists and athletic trainers asked to conduct a brief musculoskeletal screen. With hundreds of athletes to process time efficiency is of paramount importance. I view my role as to quickly screen for conditions that require more extensive medical evaluation. I start the screen with the questions "what sport(s) do you participate in" and then ask whether or not the athlete has had any bone or joint conditions that have not completely healed in the past year. If so, I will do a quick screen of that body part and if not, move on to my 2-minute orthopedic screen which is detailed on page 3. I hope you find it helpful if you're asked to assist with physicals this year.

- continued on page 3

## Bone Bruising with Acute ACL Tears continued ...

### References

Johnson DL, et al. Articular cartilage changes seen with MRI detected bone bruises associated with acute anterior cruciate ligament rupture. *Am J Sports Med.* 1998; 26(3):409-414.

Johnson DL, et al. The effect of geographical lateral bone bruise on knee after acute anterior cruciate ligament rupture. *Am J Sports Med.* 2000; 28(2):152-155.

Gill T. Commentary and Perspective on "Effect of full-early weight-bearing after joint injury on inflammation and cartilage degradation. *J Bone Joint Surg.* Nov 2006.

including the initial impact of the bone bruise at the time of the original injury.

I think the day will come when we know how our rehabilitation program should be influenced by the presence of a significant bone bruise. My suspicion is that we will find that some of the "protocols" and early weight bearing philosophies used today are too aggressive. At the very least, prolonged swelling, lateral compartment pain with weight bearing, and constant warmth to palpation on the posterolateral part of the knee should direct us to slow down our rehabilitation progression. The use of an assistive device (crutches or cane) to unload the lateral compartment until gait is asymptomatic and the delay of a running progression should be considered. In other words, in the presence of a large bone bruise, we should not expect an accelerated biological recovery and our rehabilitation program should be slowed down accordingly.



*What's the difference between sensitivity/specificity and positive and negative predictive validity?*

*K.V., PT - TX*

### Question of the Month

Let's start with what sensitivity and specificity tell us. Sensitivity is defined as the proportion of people with a condition correctly identified by a test ( $a/a+c$ ). It measures the proportion of false negatives. In other words, a sensitive test is good at ruling **out** a condition because it's unlikely that the test will falsely indicate the presence of a condition. Conversely, specificity is the proportion of people without the condition correctly identified by the test ( $d/b+d$ ). It measures the proportion of false positives. In other words, a specific test is good at ruling **in** a condition because it's unlikely that the test



will falsely indicate the absence of a condition. Now to the predictive value of a test. The positive predictive value is the value of the test in predicting a positive result ( $a/a+b$ ). A test with a high positive predictive value is good at predicting the presence of the disease or condition. A test with high negative predictive value ( $d/c+d$ ) is very accurate in predicting the absence of the condition.

on negative predictive values. Although you didn't ask I think it is important to say a word or two about likelihood ratios (LRs). If you know the specificity and sensitivity of a test it is easy to calculate the positive and negative likelihood ratios. These ratios tell you the "likelihood" of someone without the condition having a positive test or the "likelihood" of someone with the condition having a negative test. Positive LRs above 10 are considered very significant while negative likelihood ratios are significant when less than .1. A likelihood ratio can be plotted on a nomogram so as to evaluate the usefulness of a test. Obviously if a test's finding significantly alters the pre-test probability of having (or not having) the condition it is a test that would be useful for the clinician.

For sensitivity and specificity the reference variable was the disease or condition while the predictive value's variable is the test itself. As you might suspect the positive predictive value of a test is influenced by the prevalence of the problem in a population. Even a test with very high specificity may have low positive predictive value if it is an uncommon condition. However low prevalence does not have as much influence

I hope that this brief explanation helped clarify your confusion. There are a number of good statistical textbooks and web sites if you'd like further information.

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

### 2 x 2 contingency table

		Criterion According to Gold Standard		
		Positive	Negative	
Condition according to the test being evaluated	Positive Test	True Positive <b>a</b>	True Negative <b>b</b>	Total Who Test + a + b
	Negative Test	False Negative <b>c</b>	True Negative <b>d</b>	Total Who Test - c + d
		Total with Condition a + c	Total Without Condition b + d	Total Population a + b + c + d

**2-minute Musculoskeletal Screen** continued -

**Additional Resources:**

Boyajian-O'Neil L, et al. Determining clearance during the preparticipation evaluation. *The Physician and Sportsmedicine*. 2004; Nov 32:11.

Garrick JG. Preparticipation orthopedic screening evaluation. *Clin J Sport Med*. 2004 May;14(3):123-6. Review.

Metzl JD. Preparticipation examination of the adolescent athlete: parts 1-2. *Pediatr Rev*. 2001 Jun;22(6):199-204 and Jul;22(7):227-39

Sweeney SA. Value of preparticipation physical examination. *Am Fam Physician*. 2002 Mar 15;65(6):1037.

American College of Sports Medicine - [www.acsm.org](http://www.acsm.org)



**"Featured Internet Link"**



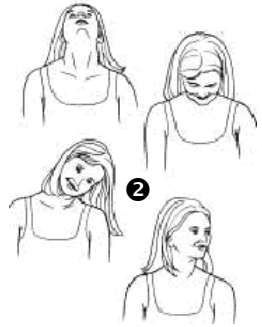
<http://highwire.stanford.edu>

A division of Stanford University Libraries, High-wire Press hosts the largest repository of high impact, peer-reviewed content, with over 1000 journals from 130 scholarly publishers. Of the 4,000,000 million full-text articles, Highwire hosted publishers have collectively made over 1,600,000 of these articles free. Go to <http://highwire.stanford.edu/lists/freeart.dtl> for a full listing of all journals and articles that can be accessed without charge.



**1 - General Posture – Anterior View**

Observe for symmetry and anomalies. Look at AC joint position, extremity alignment, and check arch status. Evaluate overall muscle development and body type.



**2 - Cervical ROM**

- Chin to chest flexion/extension
- Ear to shoulder R/L lateral flexion
- Twist R/L rotation

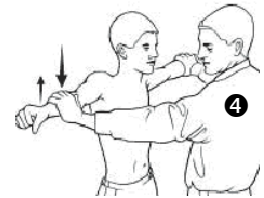
Evaluate quality, quantity, and symmetry of motion



**3. Shoulder ROM**

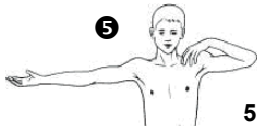
- Cross Body Hug for Horizontal Adduction
- Behind Back for Extension/Adduction/Int. Rot.
- Behind Neck for Flexion/Abduction/Ext. Rot.

Evaluate Quality/Symmetry of Motion – check IR/ER and elevation range if functional reaches were asymmetrical



**4. Shoulder Strength**

Deltoid (or supraspinatus) MMT. Evaluate strength and symmetry. If an overhead athlete may also want to check rotator cuff strength.



**5. Elbow ROM**

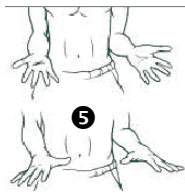
- Reciprocal Flexion/Extension
- Palm Up/Palm Down Pro-Supination

Evaluate Quality/Quantity of ROM



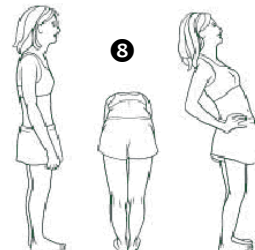
**6. Wrist/Hand**

Clench Fist – Squeeze finger and Spread Hand/Fingers  
Evaluate grip strength and hand/finger mobility. Look for finger deformities.



**7. General Posture – Posterior View**

Observe for symmetry and anomalies. Look for presence of kyphosis or scapular malalignment.



**8. Spine ROM**

Back Bend and Forward Bend

Assess quality and quantity of motion at lumbar spine and hips (hamstring tightness). Evaluate for presence of scoliotic rib hump while in the flexed position. Look for evidence of spondylosis.

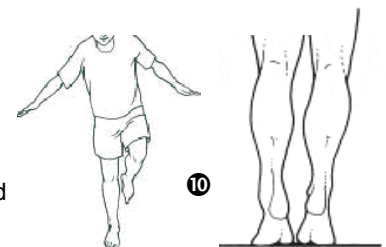


**9. Hip/Knee/Ankle ROM**

Perform a deep squat. Evaluate for full, symmetrical motion at hips, knees, and ankle. Lower extremity strength evaluated by good eccentric control and concentric return. Duck walk 3-4 steps from fully squatted position

**10. Single Limb Stance Balance and Strength**

Assess balance and control with eyes open and/or closed. Then perform a unilateral Heel Raise on each side followed by hopping in place 2-3 times. Evaluate strength, coordination, and balance





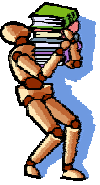
Please note our new email address  
[mulliganpt@tx.rr.com](mailto:mulliganpt@tx.rr.com)

## continuing ED

1901 Pintail Parkway  
 Euless, TX 76039

Phone: 817-488-2061  
 Fax: 817-684-7201  
 Email: [mulliganpt@tx.rr.com](mailto:mulliganpt@tx.rr.com)  
[www.continuing-ed.cc](http://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](mailto:mulliganpt@tx.rr.com)



Any fool can know ...  
 the point is to  
 understand

  
 continuing ED

## Thera-Band Force-Elongation Conversion Chart

Using the step-wise regression equations constructed by Page, et al from the J Orthop Sports Phys Ther in 2000 you can estimate the pound equivalents for dosing therapeutic exercise when using Hygenic's theraband as the form of resistance. As you can see from the chart on the right elastic tubing offers predictable, and quantifiable linear increases in resistance. This conversion chart may be helpful in gauging the appropriate tensile stiffness of the tubing you prescribe for your patient based on their current capabilities demonstrated in the clinic. As you can see there is approximately a 20-30% increase in force as you progress between T-band colors. The gold resistance is closer to a 60% increase from the silver.

**% Elongation**  
 $\% \text{ elongation} = \frac{(\text{final} - \text{resting length})}{\text{resting length}} \times 100$

	Yellow	Red	Green	Blue	Black	Silver	Gold
25%	1.1	1.5	2	2.8	3.6	5	7.9
50%	1.8	2.6	3.2	4.6	6.3	8.5	13.9
75%	2.4	3.3	4.2	5.9	8.1	11.1	18.1
100%	2.9	3.9	5	7.1	9.7	13.2	21.6
125%	3.4	4.4	5.7	8.1	11	15.2	24.6
150%	3.9	4.9	6.5	9.1	12.3	17.1	27.5
175%	4.3	5.4	7.2	10.1	13.5	18.9	30.3
200%	4.8	5.9	7.9	11.	14.8	21	33.4
225%	5.3	6.4	8.8	12.1	16.2	23	36.6
250%	5.8	7	9.6	13.3	17.6	25.3	40.1

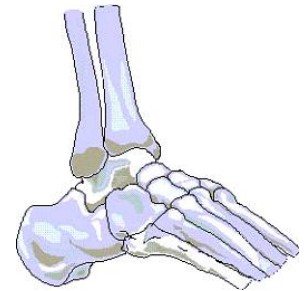
Theraband Color

pound equivalents



## Featured Home Study Program Anatomy of the Foot and Ankle

There has been a lot of debate the last few years on the concept of a positional fault that may be associated with lateral ankle sprains. In an interesting case controlled study published last year in the Journal of Orthopedic and Sports Physical Therapy the authors found that (on average) the fibula was positioned more anteriorly than a control group, however, because of the study's prospective nature it is impossible to determine if the injury caused the change in position or if the change in position predisposed the individual to ankle injury.



It is also important to note that only 17 of the 30 individuals in the chronic instability group had the "anterior positioning" and in only 6 of these subjects was the difference more than 2 mm. Because this was only a 2 dimensional (not 3-D) analysis and the assessment was made in full dorsiflexion which may have differed between groups I think it would only be appropriate to conclude that the ankle sprain group had an "altered" (but not necessarily anterior) fibular shift. The study certainly indicates the a trial of posterior fibular mobilization and proprioceptive stimulating taping may be worth a try if the patient has decreased symptoms and increased range of motion with this fibular posterior glide. Hubbard TJ, et al. JOSPT 2006; 36:3-9.

If you are interested in learning more about the structural anatomy of the foot and ankle and how it affects function you may want to look at our on-line home study entitled "Anatomy of the Foot and Ankle". This inservice can viewed or read free of charge. A post-test for CEU credit is available at <http://www.continuing-ed.cc/homestudy.htm> for a reasonable fee for clinicians licensed in Texas.

### Home Studies Now Available

Study and learn at your own pace at home!

Foot-Ankle Anatomy	.3 CEUs
Achilles Tendinopathy	.2 CEUs
Lateral Ankle Instability	.2 CEUs
Knee Meniscal Injuries	.2 CEUs
Orthopedic Hip Injuries	.2 CEUs
Goniometric Examination	.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
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.<sup>50</sup> per contact hour to meet your relicensure requirements.

[www.continuing-ed.cc](http://www.continuing-ed.cc)