



**THE SHOULDER EXAMINATION: A CASE
BASED APPROACH**
Matthew Silvis MD
PAPP Conference, Kalahari
November 19th, 2016

DISCLOSURE

- I have no financial or any other interest in any commercial product mentioned in this presentation.

**Remember to Complete Online Session Evaluation
https://www.surveymonkey.com/r/Nov19_1015_Silvis



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LEARNING OBJECTIVES

- Perform a detailed shoulder examination.
- Describe the pertinent underlying anatomy and explain your approach to the evaluation and management of: shoulder impingement, rotator cuff disorders, adhesive capsulitis, acromioclavicular joint separations, clavicle fractures, shoulder instability, biceps tendon rupture/tendinosis, and referred pain.
- **Disclaimer:**
 - *"The use of any single ShPE test to make a pathognomonic diagnosis cannot be unequivocally recommended."*
 - Combination of tests.
 - **History and Exam!**

Br J Sports Med 2012; 46: 964-978.

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“WHICH PHYSICAL EXAMINATION TESTS PROVIDE CLINICIANS WITH THE MOST VALUE WHEN EXAMINING THE SHOULDER?”

Test	SN	SP	+LR	-LR
Neer	0.72	0.60	1.79	0.47
H-K	0.80	0.56	1.84	0.35
Painful Arc	0.53	0.76	2.25	0.62
Active compression	0.67	0.37	1.06	0.89
Speeds	0.20	0.78	0.90	1.03
Yergason's	12.4	95.3	2.49	0.91
Biceps Palpation	38.6	66.7	1.06	0.95
Relocation	64.6	90.2	5.48	0.55
Apprehension	65.6	95.4	17.2	0.39
Surprise	81.8	86.1	5.42	0.25

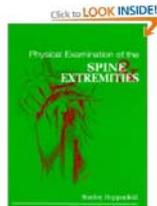
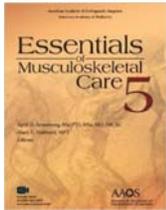
Br J Sports Med 2012; 46: 964-978.

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REFERENCES

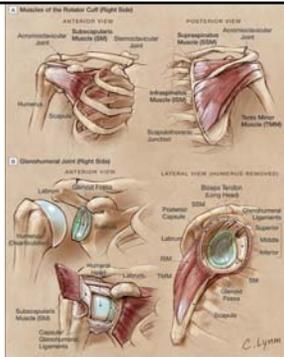
Essentials of Musculoskeletal Care

Physical Examination of the Spine & Extremities



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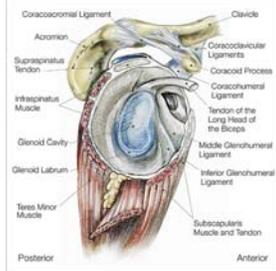
Shoulder anatomy



JAMA 2004; 292 (16): 1989-1990.

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NORMAL ANATOMY OF THE SHOULDER, LATERAL VIEW



JAMA 2000; 284 (12): 1559-1567.

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THE SHOULDER EXAM

o Inspection

- Observation
 - o How does the patient move/carry the shoulder?
- Properly disrobed
- Swelling, asymmetry, muscle atrophy, scars, ecchymosis, venous distention, deformity (scapular winging, etc.)

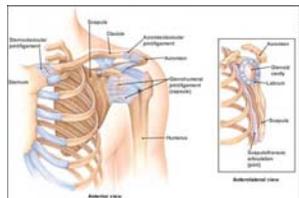


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SHOULDER ANATOMY

o Palpation

- Tenderness?
- Include neck & elbow

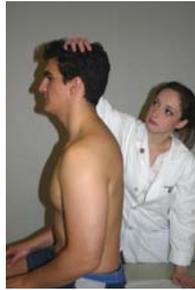


Am Fam Physician 2004; 70 (10): 1947-1954.

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DON'T FORGET THE NECK!

- Inspection
- Palpation
- ROM
 - Flexion: touch chin to chest
 - Extension: look directly at ceiling
 - Rotation: chin almost in line with shoulder
 - Lateral bend: ear to shoulder (45°)
- Compression test



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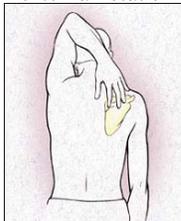
SHOULDER EXAM - ROM

- Extension
 - Zero starting position – arm at side of body
 - Normal = 40°
- Flexion (elevation)
 - Zero starting position – arm at side of body
 - Normal = 160-180° with palms up and 120° with palms down
- Abduction (Normal = 70-180°)
- Adduction (Normal = 30-45°)
- External Rotation
 - Arm abducted to 90°
 - Zero starting position - elbow flexed to 90° and forearm parallel to floor
 - Normal = 90°
 - Arm at side
 - Zero starting position – arm at side with elbow flexed to 90°
 - Normal = 60°
- Internal Rotation
 - Posterior reach along spine (hitchhiking thumb)
 - Young adults – interior tip of scapula (T7)

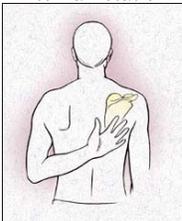
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APLEY SCRATCH TEST

Abduction,
external rotation



Adduction,
internal rotation



© 2005 Mosby HealthBook

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Am Fam Physician 2000; 61 (10): 3079-3088.

SPECIFIC TESTING IN THE CONTEXT OF CASES...



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CASE #1

- 64 year old retired female lawyer, RHD, complaining of right shoulder pain for 4 months.
- No trauma or acute onset; aggravated by getting dressed, “lifting things”, driving; now having trouble sleeping.
- No radiation or distal weakness or paresthesias.
- **What is the most likely diagnosis?**

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SPECIFIC TESTING – ROTATOR CUFF

- Painful Arc
 - (60-120° abduction)
- Rotator cuff muscle testing
- Impingement Signs
 - Neer’s Test
 - Hawkins’ Test
- Drop Arm Test
 - Likelihood of complete rotator cuff tear is >95% if +
 - *J Fam Pract* 2002; 51 (7): 605-611.

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ROTATOR CUFF MUSCLES

- Supraspinatus, abduction.
- Infraspinatus, external rotation.
- Teres minor, external rotation.
- Subscapularis, internal rotation.

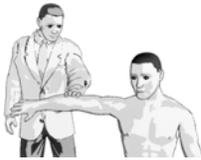


Am Fam Physician 2004; 70 (10): 1947-1954.

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JOBE'S SUPRASPINATUS MUSCLE TEST

- First assess deltoid with arm at 90° abduction and neutral rotation.
- The shoulder is then internally rotated and angled forward 30° with thumbs pointing towards the floor.
- Supraspinatus...**

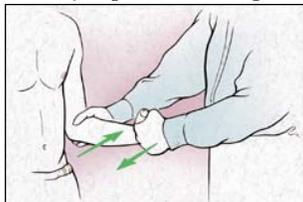


Am J Sports Med 2003; 31 (1): 154-160.

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EXTERNAL ROTATION AGAINST RESISTANCE

Infraspinatus testing...



Am Fam Physician 2000; 61 (10): 3079-3088.

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LIFT-OFF TEST

- Patient with a subscapularis rupture is unable to lift the dorsum of the hand off the back.
- **Subscapularis...**



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Am J Sports Med 2003; 31 (1): 154-160.

BELLY PRESS TEST

- Patient presses the abdomen with the flat of the hand and attempts to keep arm in maximal internal rotation.
- If active internal rotation is strong, the elbow does not drop backward – stays in front of the trunk.
- If impaired, the elbow drops back behind trunk.
- **Subscapularis...**



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Am J Sports Med 2003; 31 (1): 154-160.

IMPINGEMENT TESTING



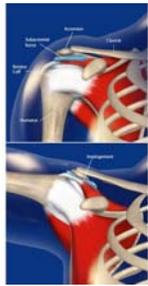
Neer's impingement test Hawkins' impingement test

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Am J Sports Med 2003; 31 (1): 154-160.

IMPINGEMENT SYNDROME (ROTATOR CUFF TENDINITIS, SHOULDER BURSITIS)

- Rotator cuff, primarily supraspinatus tendon, pulled repetitively under the coracoacromial arch
- Gradual onset anterior/lateral shoulder pain with overhead activity
 - Difficulty sleeping on side
- + impingement signs
- NL strength
- Conservative approach!



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pinterest

ROTATOR CUFF

Diagnosis	Non-surgical	Surgical
Acute tear	Not recommended	Prompt in active persons (< 6 weeks)
Partial thickness tear	Flexibility, posterior capsule	Often not needed
Degenerative tear without arthritis	Physical therapy	Often not possible, depends on quality and quantity of tissue
Arthritis with massive tear	Physical therapy	Humeral hemiarthroplasty

- Chronic shoulder pain; weakness, catching, grating.
- Full thickness tears uncommon < 40 y/o but are present in 25% of individuals > 60 y/o
- Most asymptomatic

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N Engl J Med 2008; 358: 2138-47.

CASE #2

- Same patient in Case #1, who improved with appropriate management, returns to the office one year later again complaining of right shoulder pain that recurred ~ 4 months ago.
- No trauma or acute onset; feels similar but this time any shoulder activity or movement is painful.
- She has developed mild DM type 2 which is well controlled; no other new medical history.
- **What is the most likely diagnosis now?**

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ADHESIVE CAPSULITIS (“FROZEN SHOULDER”)

- Idiopathic loss of both active and passive motion
 - 40-60 y/o, women > men
- Associated with Type 1 DM (40-50% bilateral), hypothyroidism, Dupuytren disease, cervical disk herniation, Parkinson disease, cerebral hemorrhage, and tumors.
- Freezing phase: pain and loss of motion
- Thawing phase: slow improvement in ROM
 - 6 months – 2 years
- Minimal long term pain or functional deficit
- Examination reveals at least 50% reduction in both active and passive ROM
 - *Loss of external rotation with arm at side is c/w condition due to contracture of the coracohumeral ligament (limits external rotation)*

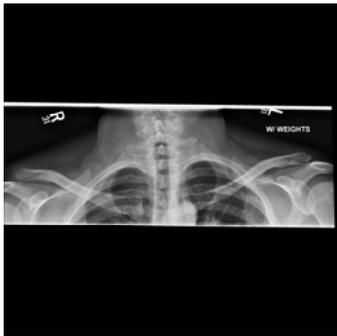
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J Bone Joint Surg Am 2011; 93: 1727-33.

CASE #3

- 42 y/o RHD painter travels to Ocean City, New Jersey
- Struck by a wave and knocked into the hard sand shoulder first... Pain over right superior shoulder with slight swelling noted
- No skin tenting
- Range of motion full but hesitant due to pain
 - Worst with adduction
- Neurovascular exam intact
- ***What is the diagnosis and how are these injuries graded?***

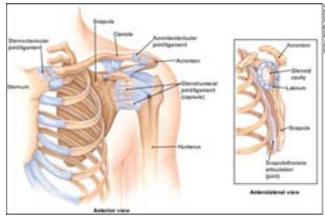
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ACROMIOCLAVICULAR SEPARATION

- Damage to AC ligaments
- Pain and/or deformity over AC joint
- Graded I-VI

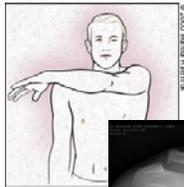


Am Fam Phys 2004;70 (10): 1947-1954.

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SPECIFIC TESTING – AC JOINT

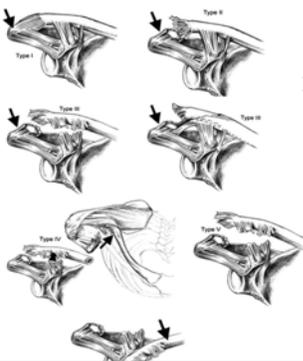
- Cross-Arm Test
 - Elevate shoulder to 90° and then adduct the arm across the body in a horizontal plane
 - + if pain over AC joint



Am Fam Phys 2000;61 (10): 2079-2088.

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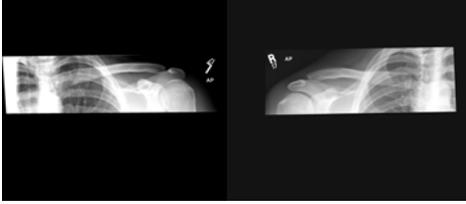
Rockwood Classification System



J Bone Joint Surg Am 2014;96: 73-84.

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GRADE 1 & 2 AC SPRAINS



Grade 1 AC Sprain

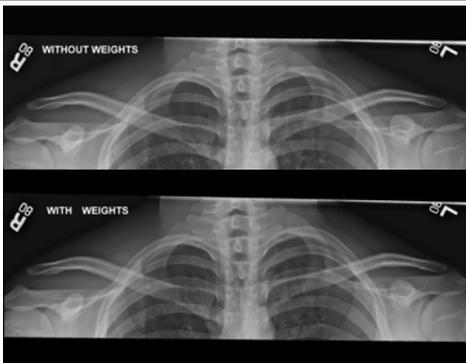
Grade 2 AC Sprain

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TREATMENT: GRADE 1 & 2 AC SPRAINS

- Shoulder sling for pain reduction/comfort for 3-7 days max
- Early ROM – the sooner, the better
- PT for rotator cuff, scapular stabilizers and trunk strengthening as pain resolves
- RTP when normal shoulder ROM and strength and shoulder asymptomatic

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GRADE 3 AC SPRAIN AND MORE

- Typically conservative management
- Zanca views, weighted may be helpful
- Consider referral on a case by case basis for surgery
 - Hand dominance
 - Occupation
 - Heavy labor/sport requirements
 - Scapulothoracic dysfunction
 - Risk of reinjury
- Fracture injuries in 5% of patients with type III-V
- Intra-articular injuries in 18% of type III-V (SLAP in 5-14% and RC tears in 4%)
- Type IV-VI managed surgically
 - Surgical reduction and coracoclavicular ligament reconstruction
 - Significant morbidity associated with persistently dislocated joints and severe soft tissue disruption



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CLAVICLE FRACTURES



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CLAVICLE FRACTURES

- Most common bony injury
 - Middle third (80%)
 - Distal third (15%)
 - Proximal third (5%)
- Bony deformity and shoulder droop on exam
 - Skin tenting?
- Radiographs, AP and 10° cephalic tilt views
- DDX
 - AC separation
 - SC dislocation
- Nonunion is rare, 1-4% patients
- Malunion is common
 - Permanent "lump"
- Treatment
 - Most mid-shaft nonsurgical
 - Sling for comfort only
- Referral
 - Severely shortened, open, nv injury, associated rib fractures/flail chest
 - Comminuted, highly displaced fractures
 - Distal third fractures

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Curr Sports Med Rep 2008; 7 (5): 275-280.

CASE #4

- o 19 year old male baseball player fell on his outstretched left arm while diving for a catch last week.
- o Immediately felt left shoulder pain and “like it was out of place”; spontaneously reduced a few minutes later as he was being evaluated by the athletic trainer.
- o History of prior documented glenohumeral dislocation.
- o **What is the likely diagnosis and is this likely to recur?**

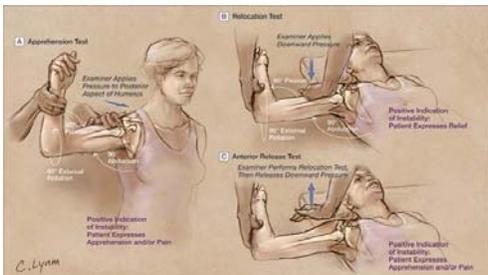
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IMAGES



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ANTERIOR INSTABILITY TESTING

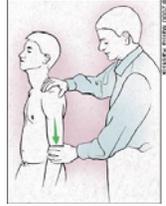


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INFERIOR INSTABILITY

○ Sulcus Sign

- Shoulder at 0° flexion; examiner stabilizes arm at acromion while pulling inferiorly at the elbow
- Evaluates for inferior subluxation or laxity

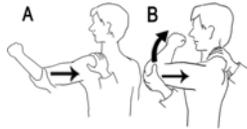


Am Fam Physician 2000; 61 (10): 3079-3088.

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POSTERIOR INSTABILITY: JERK TEST

- Examiner grasps scapular spine and clavicle with one hand while holding elbow with other
- Arm flexed to 90° and internally rotated with elbow flexed to 90°
- Shoulder girdle pressed anterior with one hand and elbow posterior with other
- Causes posterior subluxation
- Arm then abducted as it is pushed posteriorly
- If sudden painful jerk, + test



Sports Health 2011; 3 (3): 253-263.

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SHOULDER DISLOCATION

- Shoulder most commonly dislocated joint
 - 54.9% of sports related dislocations in high school athletes
 - Recurrence rate reported as high as 94%
 - One 25 year prospective study noted 50% recurrent rate...
- Greatest ROM of any joint – places at risk
- Majority anterior, inferior, medial direction (>95%)
- Result from forceful abduction and external rotation
- Hesitant to move shoulder
 - Held in adducted, cradle-like position

J Bone J Surg Am 2008; 5: 945-952.
Sports Health 2014; 6 (3): 246-255.

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POST-REDUCTION RADIOGRAPHS



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CASE #5

- 40 y/o RHD male was carrying a heavy piano when his partner dropped the other side...
- Immediate anterior shoulder and arm pain
- Felt a “pop” and had significant bruising
- Also surprised to see that one arm appeared stronger than the other
- **What is the difference between the pathology seen with the long head of the biceps (LHB) versus the short head of the biceps (SHB)?**

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BICEPS TENDON

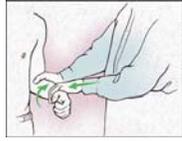
- SHB
 - Distal biceps rupture has a low annual incidence, 1.2/100,000
 - Result of overwhelming eccentric load applied flexed elbow
 - Acute avulsion of distal biceps from bicipital tuberosity
 - Dominant arm (86%), male, tobacco use
- LHB
 - Proximal biceps
 - Tendinopathy over anterior aspect of shoulder, specifically bicipital groove
 - Overuse injury associated with RC pathology, SLAP lesions, biceps tendon subluxation or rupture



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SPECIFIC TESTING - BICEPS

- **Yergason Test**
 - Evaluates biceps tendon
 - Elbow flexed to 90° and forearm pronated; active supination against resistance
 - + if pain in biceps region
- **Speed Test**
 - Evaluates long head of biceps
 - Arm positioned in 90° forward elevation with elbow extended and forearm supinated; resist downward pressure
 - + if pain in biceps region
- **Hook test**

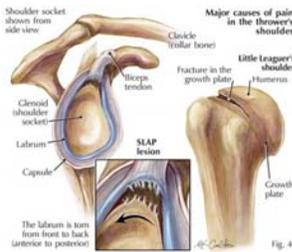


Am Fam Phys 2000; 61 (10): 3079-3088.

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BICEPS TENDON RUPTURE COMMONLY ASSOCIATED CONDITIONS

- **RC impingement**
 - Can lead to biceps tendon degeneration
- **SLAP lesion**
 - Can disrupt biceps anchor
- **Subscapularis rupture/partial rupture**
 - Subluxation of biceps tendon out of bicipital groove

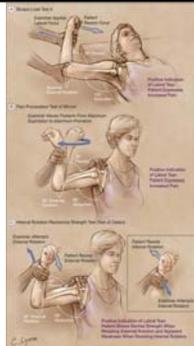


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TESTING THE LABRUM

- Many types of physical examinations have been used to diagnose superior labrum anterior and posterior lesions (SLAP)
- **O'Brien Test**
 - Arm positioned at 90° flexion and 10-15° adduction with thumb down
 - + if pain with resisted flexion
- **Difficulties**
 - Concomitant pathology
 - Various studies looking at these examinations
 - Arthroscopy 2003; 19 (5): 517-523

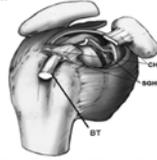
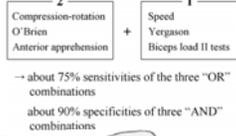


JAMA 2004; 292 (16): 1989-1999.

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"THE EVALUATION OF VARIOUS PHYSICAL EXAMINATIONS FOR THE DIAGNOSIS OF TYPE II SUPERIOR LABRUM ANTERIOR POSTERIOR LESION"

- 297 patients undergoing shoulder arthroscopy 1/04-7/05
- 68 patients with type II SLAP lesions and 78 age matched patients without
- 10 well established physical tests studied
- No single test with both high sensitivity and specificity
- "We believe this to be practical in that just 3 physical examinations that are familiar and consistent to the examiner would be sufficient to guarantee substantial sensitivity and specificity in a busy outpatient clinic."



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○ Am J Sport Med 2008; 36 (2): 353-359.

J Bone Joint Surg Am. 2007; 89 (8): 1644-55.

BICEPS TENDON RUPTURE TREATMENT

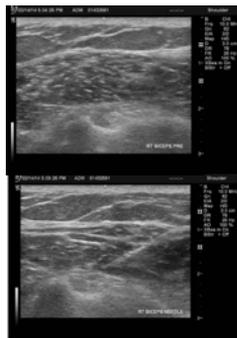
- Acute
 - < 4 weeks; antecubital pain, loss of function, weakness
- Chronic
 - > 4 weeks; lack pain/swelling
- For comfort, posterior elbow splint at 90° and sling
- Early shoulder and elbow passive ROM exercises
- Traditionally, managed non-operatively
 - Morbidity from extensive dissection
 - 30%/40% decreased flexion/supination strength
- Currently, more managed operatively
 - Exceptions: low demand, sedentary, medical complications

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J Bone Joint Surg Am 2014; 96 (e170): 1-11

BICEPS TENDINITIS

- Rest, NSAIDs, PT
- Steroid injection
- U/S – avoid intratendinous injection and potential iatrogenic tendon rupture
- Biceps tenotomy
 - Cutting LHB at superior labrum
 - Potential decreased strength and pain with repetitive activity
- Biceps tenodesis
 - Reattach LHB to either soft tissue or proximal aspect of humerus
 - Greater surgical morbidity



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CASE #6

- 30 y/o LHD white female with left lateral shoulder pain and weakness after painting her ceiling
- Weakness with abduction
- You suspect RTC syndrome
- However, you complete a thorough exam of her left upper extremity using the right side for comparison
- She also has a decreased biceps reflex and decreased sensation of her lateral upper arm
- **What cervical nerve root is involved?**

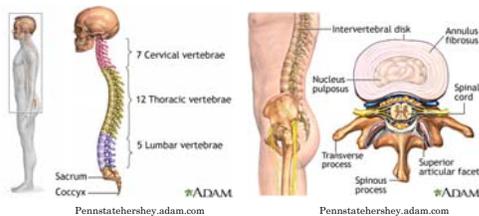
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CERVICAL RADICULOPATHY

- **Referred neurogenic pain in distribution of cervical nerve root (s) with or without associated numbness, weakness, or loss of reflexes**
 - Young (disk)
 - Old (foraminal narrowing)
- Symptoms
 - Neck/radicular pain with numbness/paresthesias
 - Muscle spasms
 - Weakness, lack of coordination, changes in handwriting, diminished grip strength, dropping objects, etc.
 - *Relieve pain with hands above head*

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THE SPINE: RELEVANT ANATOMY



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Nerve roots from the cervical spine are named for the vertebra below them as they pass through the intervertebral foramen. However, 7 cervical vertebra and 8 cervical nerve roots. All nerve roots caudal to C8 are named for the vertebra above them as they pass through the foramen.

Nerve Root	STRENGTH	SENSATION	REFLEXES
C5	Deltoid (shoulder abduction), biceps (elbow flexion)	Lateral arm	Biceps
C6	Wrist extensors	Lateral arm; thumb, index, and half of middle finger	Brachioradialis
C7	Triceps, wrist flexors, finger extensors	Middle finger	Triceps
C8	Finger flexors	Ring and little fingers, medial forearm	
T1	Interossei muscles (finger abduction)	Medial side upper half of forearm and arm	

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MOTOR EXAM

- Median nerve
 - Resisted thumb abduction (palmar)
 - Muscle belly palpated
- Ulnar nerve
 - Index finger abducted against resistance
 - 1st dorsal interosseous muscle belly palpated
- Radial nerve
 - Thumb repulsed dorsally against resistance
 - EPL palpated



Sports Health 2009; 1 (6): 469-477.

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CERVICAL RADICULOPATHY

- Treatment
 - Spontaneous resolution 2-8 weeks in most
 - NSAID's, traction, PT
- Referral
 - Non-surgical approach fails
 - Atrophy, weakness, myelopathy (trunk/leg dysfunction, gait disturbance, bowel/bladder changes), signs of demyelinating lesion condition/infection/tumor
 - Intolerable pain

Spurling Sign



Am Fam Phys 2010; 81 (1): 33-40.

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WHEN SHOULD YOU CONSULT ORTHOPEDICS?

- Uncertain diagnosis
- Worsening clinical course despite appropriate treatment
- Unclear as to optimal management
- Clinician discomfort



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TAKE HOME POINTS

- Shoulder complaints are very common in primary care
- The history of the patient presenting with shoulder pain is key to determining the diagnosis
- A thorough, efficient physical exam will support the suspected diagnosis and help rule out other etiologies
- Practice, practice, practice
- Accurate diagnosis is critical to determining the optimal management
- Management goals should include: restoring function, maximizing function, and preserving function

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THANK YOU! ANY QUESTIONS?



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**THE KNEE EXAMINATION:
A CASE BASED APPROACH**

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Penn State Hershey
November 19th, 2016

DISCLOSURE

- I have no financial or any other interest in any commercial product mentioned in this presentation.

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LEARNING OBJECTIVES

- Perform a detailed knee examination.
- Describe the pertinent underlying anatomy and explain your approach to the evaluation and management of: patellofemoral disorders, ACL tear, PCL tear, MCL tear, meniscal pathology, knee osteoarthritis, and IT band inflexibility.

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THE IMPORTANCE OF PALPATION: BURSITIS

- Bursae
 - Sacs that lie between skin and bony prominences or between tendons, ligaments, and bone
 - Lined by synovial tissue
 - Decreases friction
 - Chronic pressure/friction (overuse) causes thickening and excessive fluid formation which leads to pain and swelling
- Prepatellar bursitis
 - Anterior knee between skin and patella
 - Inflamed (trauma/chronic irritation) or infected (direct penetration; *staph aureas, strep*)
- Pes anserine bursitis
 - Lies under insertion of sartorius, gracilis, and semitendinosus muscles on the medial tibia just below the plateau
 - Overuse or early arthritis

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KNEE RANGE OF MOTION: EXTENSION LEFT (0°), FLEXION RIGHT (135-145°)



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SPECIFIC TESTING IN THE CONTEXT OF CASES...

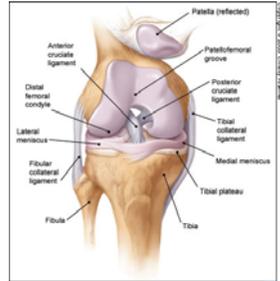


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A2ua.com

KNEE EXAM

- Specific Testing
 - Patellofemoral Assessment
 - Cruciate Ligaments
 - ACL
 - PCL
 - Collateral Ligaments
 - MCL
 - LCL
 - Menisci
 - Medial meniscus
 - Lateral meniscus



Am Fam Phys 2010; 82 (8): 917-922.

70

CASE #1

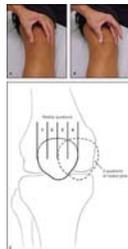
○ 21 y/o female runner presents to clinic with progressive anterior knee pain, feelings of instability. You are concerned she may have runner's knee.

○ **How do you assess the patellofemoral compartment?**

71

PATELLA MOBILITY TESTING

- Medial glide of the patella
- Patella grasped in resting position
- Translated medially
 - < 1 quadrant
 - Tight lateral structures
 - > 3 quadrants
 - Hypermobile



Am Fam Phys 2007; 75: 194-204.

72

PATELLAR TILT AND GRIND

o Tilt test

- Compress medial patella
 - Medial patella should compress posteriorly while lateral patella should elevate
- + if lateral does not rise to at least 0°

o Grind or inhibition test

- Patient supine with knee extended
- Displace patella distally into trochlear groove
- Contract quadriceps with slight resistance to superior patella movement
- + if pain



Am Fam Phys 2007; 75: 194-204.

73

Q-ANGLE ASSESSMENT

- o Greater angles increase laterally directed forces on the patella through the pull of the patellar tendon
 - Normal = 10° males
 - Normal = 15° females
- o Make sure patella in trochlear groove... flexion helps with this.
 - Falsely low angle if laterally subluxed patella
- o Check supine and seated!



Am J Sports Med 2008; 36 (3): 577-594.

74

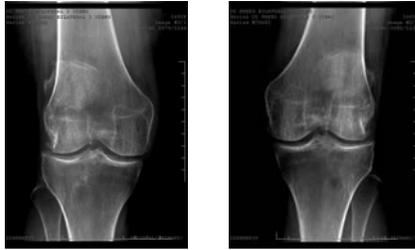
PATELLA APPREHENSION SIGN

- o Patella often reduces spontaneously
- o Apprehension sign
 - Patella translated laterally
 - Patient demonstrates fear/anxiety



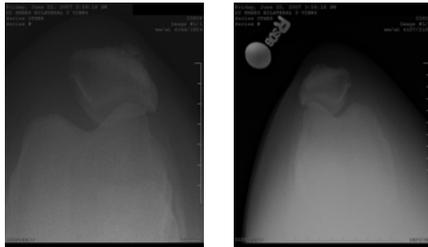
75

PATELLA ALTA



76

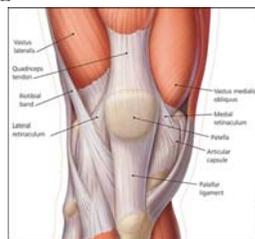
LATERAL PATELLA TILT



77

PATELLOFEMORAL PAIN SYNDROME

- Anterior knee pain made worse with running, jumping, cycling
 - Multifactorial causes
- Pain with climbing or descending stairs
- Pain with prolonged sitting or with knees flexed
 - Movie theater sign
- Prevention
 - Running shoes
 - Proper warm-up
 - Ice after exercise
 - McConnell taping, infrapatellar strap
 - Weight loss if obese
 - Muscle imbalance
 - Stretch hamstring
 - Strengthen VMO
 - Surgery if persistent symptoms



Am Fam Phys 2007; 75: 194-204.

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OTHER PATELLA DISORDERS

Patella Tendinitis ("Jumpers Knee")

- Overuse syndrome
 - Quadriceps tendon at its insertion on the superior pole of the patella
 - Patellar tendon at inferior pole of the patella or tibial tubercle
- Younger adults
 - Jumping, kicking sports
- Treatment (3 phases)
 - Relative rest from aggravating activities
 - Regain pain free ROM, flexibility of quadriceps and hamstrings, and strength
 - Gradual resumption of activities

Patella subluxation or dislocation

- Lateral dislocation is most common
 - Patients frequently think medial dislocation because of unusual prominence of the medial femoral condyle
- If minimal trauma...
 - Predisposing factors include: patella alta, shallow trochlear groove, flat patellar undersurface, laterally tipped patella, "loose ligaments", and hypermobility
- If normal mechanics...
 - Trauma

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CASE #2

- 17 y/o female soccer player twists suddenly during a game and hears a loud "pop" in her right knee. She immediately begins to note swelling of the knee and is unable to continue weight bearing. She follows-up with you in your office the following week.
- ***What is the likely diagnosis and best physical examination technique to assess for this injury?***

80

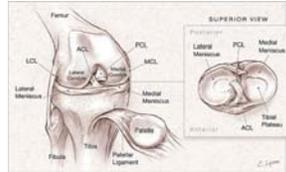
ACL TEAR



81

KNEE LIGAMENTS & MENISCI

- Acute swelling that can accompany injuries may make initial exam difficult
 - Repeat exams
- For knee ligaments, laxity is critical to assess
 - Compared to normal knee
 - **Grade**
 - I = 1-5 mm
 - II = 6-10 mm
 - III = > 10 mm
 - **Endpoint**
 - Firm
 - Soft
 - Absent

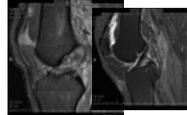


JAMA 2001; 286: 1610-1620.

82

ANTERIOR CRUCIATE LIGAMENT (ACL)

- ACL – prevents anterior translation; tight in flexion
- Sudden pain and giving way
- Twisting or hyperextension injury
- Effusion (hemarthrosis)
 - Develops quickly
 - ACL injury in >70% of acute hemarthroses in young athletes
- **Lachman Test**
 - Injured knee at 30°
 - Stabilize distal femur with one hand and proximal tibia with other
 - Attempt to sublax tibia
 - Difficult to perform if after 2 hours post-injury
 - SN and SP = 95%



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ANTERIOR DRAWER TESTING

- Place injured knee at 90°
 - Fix patient's foot in slight ER (sitting)
 - Need relaxed hamstrings
 - Place thumbs at tibial tubercle and fingers posterior calf
 - Pull anteriorly
- **Limitations (SN = 22-95%):**
 - Posterior meniscal horns, bony contour of joint interferes with isolating ACL
 - Also, practically difficult to place knee in 90° flexion when swollen, painful knee
 - Be wary of false + result
 - Femoral condyles should be one cm posterior to anteromedial tibial plateau



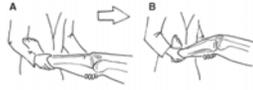
Am J Sports Med 2008; 36 (3): 577-594.



84

PIVOT SHIFT TEST

- Patient supine and relaxed
 - *Difficult exam to perform in clinic; easier in operating room with sedated patient*
- Examiner holds leg in extension and internal rotation
- Knee is flexed while valgus force applied
- In the ACL deficient knee, the lateral tibial plateau will be anteriorly subluxated at the beginning of the test and will reduce at 30-40° flexion – palpable and sometimes audible...
- SN = 84-98.4%
- SP = 35% alert; 98.4% anesthesia



Am J Sports Med 2008; 36 (3): 577-594.

85

ACL ASSESSMENT

	+ Likelihood Ratio	- Likelihood Ratio	Probability of injury if +	Probability of injury if -
Pivot Shift Test	20.3	0.4	69%	4%
Lachman	12.4	0.14	58%	2%
Anterior Drawer Test	3.7	0.6	29%	6%

Based on overall likelihood of 10% for injury.

MRI sensitivity = 83-91%
MRI specificity = 88-94%

Ann Intern Med 2003; 139: 575-588.
Am Fam Phys 2012; 85 (3): 247-52.

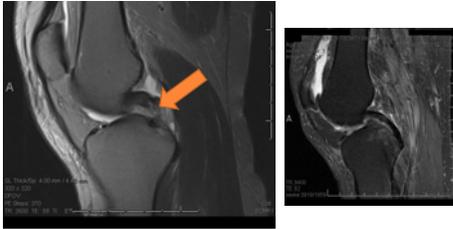
86

CASE #3

- 48 y/o female trips on the bleachers at a high school football game, falling directly onto her right knee. She has pain, mild swelling, and feelings of instability afterwards. You remember a similar patient presenting to you after striking their knee against the dashboard in a motor vehicle accident.
- **What is the likely diagnosis and best physical examination technique to assess for this injury?**

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PCL TEAR



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POSTERIOR CRUCIATE LIGAMENT (PCL)

- PCL – prevents posterior translation
- Less common injury
 - Dashboard injury
 - Fall onto flexed knee
 - Pure hyperflexion
 - Hyperextension
 - ACL torn followed by PCL
- Posterior drawer
 - Patient supine, knee flexed to 90°
 - Anterior tibial plateau is normally 10 mm anterior to femoral condyles
 - Slide tibia posteriorly
 - SN = 90%; SP = 99%
- Sag test (SP = 100%)



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DIAL TEST

- Posterolateral instability
- Mechanisms:
 - Blow to anteromedial knee
 - Varus blow to flexed knee
 - Hyperextension knee injuries
 - Knee dislocation
- Anatomy
 - LCL; popliteus tendon; popliteofibular, arcuate, and fabellofibular ligaments; lateral capsule
 - Biceps femoris, popliteus, iliotibial tract, lateral head gastroc
- External rotation force applied at 30° and 90°
 - Isolated at 30°
- >10° external rotation difference between sides is positive



Am J Sports Med 2008; 36 (3): 577-594.

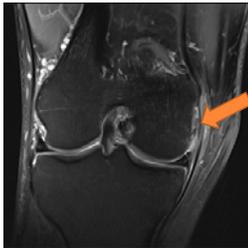
90

CASE #4

- You are covering urgent care clinic and a 20 y/o male ice hockey player presents after an awkward twisting injury during a hockey game the night prior. Pain is located directly over the medial aspect of the knee. No knee effusion.
- *How do you assess for MCL injury?*

91

MCL SPRAIN



92

COLLATERAL LIGAMENTS



- **Varus Stress Test (LCL)**
 - Place one hand over medial aspect of knee and the other hand over lateral distal fibula; varus force applied at 0° and 30°
- **Valgus Stress Test (MCL)**
 - Patient's leg slightly abducted; place one hand over lateral knee and the other hand over medial distal tibia; valgus force applied at 0° and 30°

93

No systematic review has addressed diagnostic accuracy of physical examination findings in patients with collateral ligament injuries.

TREATMENT OF KNEE LIGAMENT & MENISCAL TEARS
(ISOLATED TEARS ONLY!)

- **ACL**
 - "PRICE", crutches, early ROM
 - *Definitive treatment depends on age, activity level, associated injury*
 - Young, active – favor reconstruction
 - Old, inactive – favor PT to control instability
- **PCL**
 - PT, functional bracing
 - If recurrent instability and/or meniscal tears, surgery should be considered
- **MCL**
 - Nonsurgical grades I-III; "PRICE" and rehabilitation
- **LCL**
 - Nonsurgical grades I-II; *grade III likely surgical* (posterolateral capsule complex injuries)
- **Menisci**
 - "PRICE", NSAID's, rehabilitation; if traumatic tears, consider surgical evaluation

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CASE #5

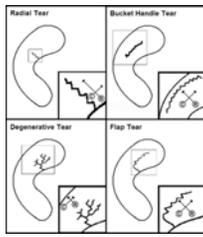


What is the likely diagnosis and best physical examination technique to assess for this injury?

95

MENISCAL TEARS

- Menisci
- Traumatic
 - Twisting
- Degenerative
 - Minimal or no trauma
- Acute
 - Knee swelling and stiffness over 2-3 days
 - Mechanical symptoms
 - Catching, locking, popping
- *Most common finding is TTP of the joint line*
 - Posterior half more specific

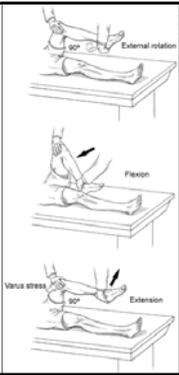


Am J Sports Med. 2007; 35 (1): 103-112.

96

MENISCAL TEARS

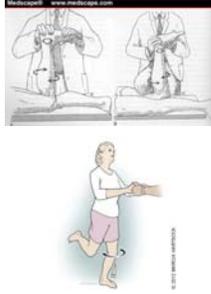
- **McMurray Test**
- **Starting position**
 - Grasp patient's heel with one hand and knee with other – thumb lateral joint line and fingers medial; flex knee maximally
- **Lateral Meniscus**
 - Tibia rotated internally and knee extended with valgus stress
- **Medial Meniscus**
 - Tibia rotated externally and knee extended with varus stress



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MENISCAL TEARS

- **Apley Compression Test**
 - Patient prone with knee at 90°
 - Compress and rotate tibia
- **Thessaly Test**



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Am Fam Phys 2012; 85 (3): 247-252.

MENISCAL ASSESSMENT

	+ Likelihood Ratio	- Likelihood Ratio	Probability of injury if +	Probability of injury if -
Thessaly Test	39.3	0.09	81%	1%
McMurray Test	17.3	0.5	66%	5%
Age > 40, continuation of activity not possible, weightbearing during trauma, pain with passive flexion	5.8	0.9	39%	9%
Joint line tenderness	1.1	0.8	11%	8%

Based on overall likelihood of 10% for injury.

99

Ann Intern Med 2003; 139: 575-588.

JOINT LINE FULLNESS AND MENISCAL PATHOLOGY?

- 100 patients undergoing knee arthroscopy
- Physical examinations documenting: joint line fullness, joint line tenderness, and McMurray sign
- Arthroscopy was the gold standard
- Palpated along joint line
 - Lateral compartment, 30-45° knee flexion (ITB)
 - Medial compartment, 70-90° knee flexion (MCL)

	Accuracy	SN	SP
Fullness	73%	70%	82%
TTP	68%	87%	30%
McMurray	47%	32%	78%

100

Sports Health 2012; 4 (1): 47-50.

MENISCAL FINDINGS AND MRI

Table 3. Prevalence of Meniscal Tears According to the Presence or Absence of Frequent Knee Symptoms and Radiographic Evidence of Osteoarthritis.*

Meniscal Tears	Frequent Knee Symptoms		Prevalence Ratio†	
	Yes no. (%)	No no. (%)	Unadjusted	Adjusted (95% CI)‡
Radiographic evidence of osteoarthritis				
One or more meniscal tears	37 (83)	46 (80)	1.06	1.14 (0.90-1.43)
No meniscal tear	33 (37)	31 (40)		
No radiographic evidence of osteoarthritis				
One or more meniscal tears	41 (32)	146 (23)	1.43	1.43 (1.08-1.90)
No meniscal tear	86 (68)	502 (77)		

* Frequent knee symptoms were defined as knee pain, aching, or stiffness in the right knee on most days. Radiographic evidence of osteoarthritis was considered present if the Kellgren-Lawrence grade was 2 or higher. Data for 49 of the 991 subjects in the community-based sample were not available (because of missing radiographs, responses to the items in the questionnaire regarding frequent knee symptoms, or both).

† The prevalence ratios were calculated as the proportion of subjects with meniscal tears among those with frequent knee symptoms, divided by the corresponding proportion among subjects without frequent knee symptoms.

‡ The prevalence ratio is adjusted for age, sex, and body-mass index.

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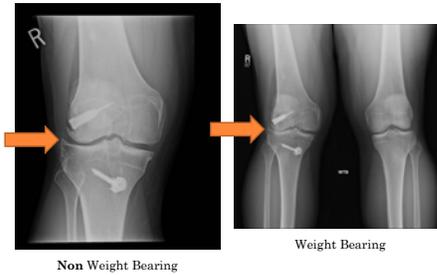
N Engl J Med 2008; 359: 1108-15.

CASE #6

- 45 y/o white male presents to your office with complaints of increasing right lateral knee pain. History of ACL reconstruction at age 21. You note a valgus knee deformity. Tenderness is elicited with palpation along the joint line, both medially and laterally. You also note loss of ROM, flexion limited to 110°.
- **What should you ensure when you order radiographs of the knee?**

102

IF JOINT IS WEIGHT BEARING, OBTAIN WEIGHT BEARING X-RAYS *IF POSSIBLE*...



103

CASE #7

- 25 y/o female runner presents with increasing painful snapping over the lateral aspect of her right knee. You perform a physical examination and are concerned this could represent distal IT band snapping/tightness.
- ***How do you assess the flexibility of the major muscle groups surrounding the knee?***

104

FLEXIBILITY

- Quadriceps (Ely test)
- Hamstrings (popliteal angle test)
- Gastrosoleus (passive ankle dorsiflexion)
- IT Band (Ober's test)
- Hip flexors (Thomas test)

105

QUADRICEP AND HAMSTRING FLEXIBILITY



Soccerreviews.com
Runnersworld.co.za

106

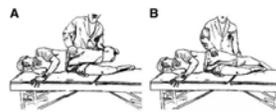
STARTING POINT: DORSIFLEXION OF ANKLE



107

SIDE-LYING EVALUATION

- Ober Test
 - NL = 20° cross adduction
- Abductor strength
 - Runner should be able to maintain the hip in neutral flexion and slight external rotation
 - If flexes or internally rotates, substitution pattern exists



Physio-pedia.com



Strengthrunning.com

108



Hip Extension: The Thomas Test

First maximally flex the opposite hip to lock the pelvis and eliminate all lumbar lordosis (above)



Then extend hip being examined (right)

109

THANK YOU! ANY QUESTIONS?



**Remember to Complete Online Session Evaluation
https://www.surveymonkey.com/r/Nov19_1015_Silvis

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