Let's Start at the Top: Cervical and Thoracic Spine

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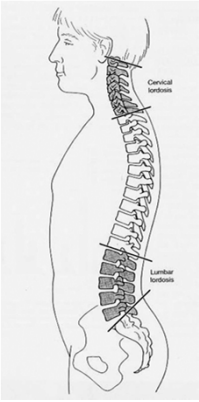
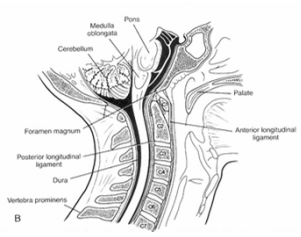
Overview

- Anatomy & Biomechanics
  - C-T-L
- Understanding pain
- How to assess patients
- Specific conditions



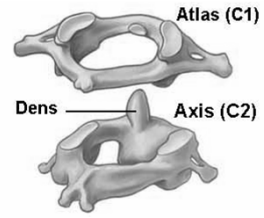
Cervical Spine

- 7 vertebrae
- Spinal cord
- Structurally unique
  - A-O junction
  - C1-2
  - Uncinate processes
  - Disc structure

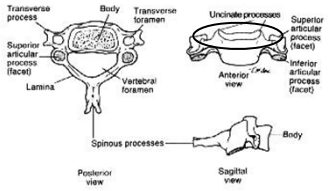


Cervical Spine

- C1-2 (Atlas-Axis)
- C1 is a ring
- C2 has dens
  - Essentially body of C1
- Head nodding
  - Atlanto-occipital
- Cervical rotation
  - C1-2



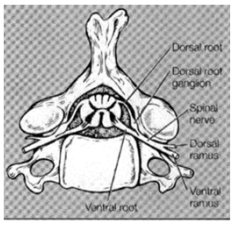
Cervical Spine



- Small vertebral body compared to T & L
- Short, bifid spinous process
- Transverse foramen- vert art/vein, symp nerves
- Uncinate processes

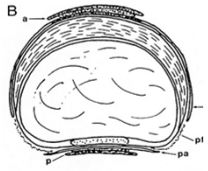
Cervical Spine

- Spinal cord
- Nerve roots
  - 7 vertebrae
  - 8 roots
  - Numbering different after C7
  - C7 root above C7 vert
  - C8 root below C7 vert

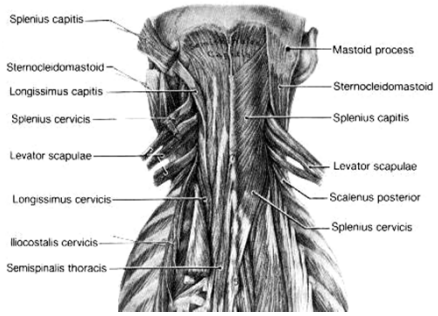


Cervical Spine

- Cervical discs
  - Crescentic, thick anterior anulus
  - Thin posterior anulus
    - Posterior longitudinal ligament
  - Vulnerable postero-laterally



Cervical Spine



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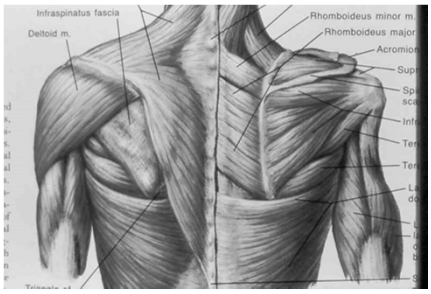
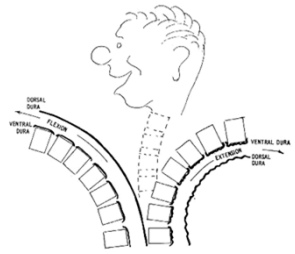


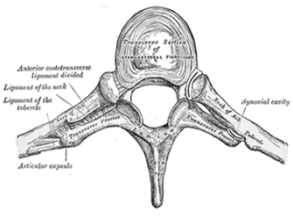
Cervical Spine

- Basic motions
  - Flexion
    - Compress anterior structures
    - Tension posterior structures
  - Extension
    - Compress posterior structures
    - Tension anterior ligaments
    - Narrow spinal canal

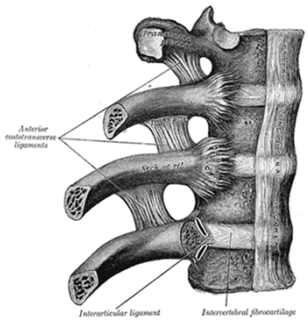


Thoracic Spine

- 12 vertebra
- Ribs
  - Costovertebral jts
  - Jxn pedicle/ body
  - Tip transverse proc
- Long spinous process
- Limited motion



Thoracic Spine



Epidemiology

- Neck pain
  - Up to 71% lifetime incidence
  - 10% with chronic neck pain
- Neck/shoulder/arm pain
  - Prevalence 25% females & 15% males
    - In Sweden
    - Leijon et al Spine 2009

Epidemiology

- Thoracic pain
  - Niemelainen et al, Spine 2006
  - 600 Finnish men age 35-70
  - 1 year prevalence
  - Thoracic pain – 17%
  - Neck pain – 64%
  - LBP – 68%

Acute Spine Pain

- Anything with a nerve supply can hurt
  - Musculotendinous units
  - Ligaments
  - Disc
  - Facet joint
  - Nerve root
  - Vertebrae
  - Others

Understanding Pain
Convergence

- Skin
- Muscle
- Fascia
- Periosteum
- Disc
- Facet

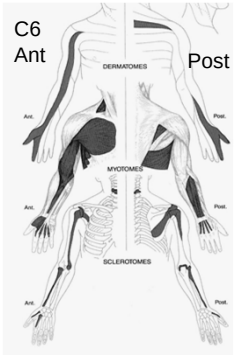
Understanding Pain

- It is not the structure that determines the pattern of pain stemming from it: rather, the pattern of pain is determined by the nerve supply of the structure.

  – Bogduk, 2003

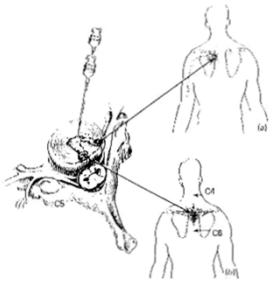
Understanding Pain

- Pain referral patterns
- Dermatomal
- Myotomal
- Sclerotomal
- Segmentally based



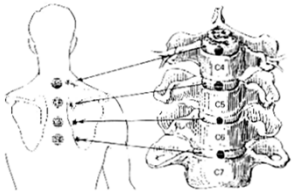
Understanding Pain

- Cervical discogenic pain
  – Cloward, 1959
- Felt along scapula



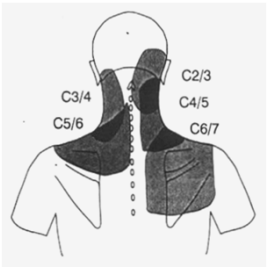
Understanding Pain

- Cervical discogenic pain
  - Cloward, 1959
- Felt along scapula
- Level varies by level of the disc



Understanding Pain

- Cervical zygapophyseal joints (facets)
  - 49% of chronic neck pain after whiplash
  - 50% of headache (C2/3 joint) after whiplash
  - Lord, et al, 1996

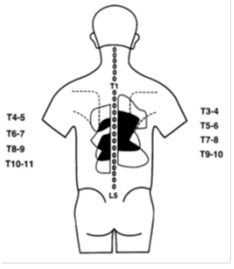


Understanding Pain

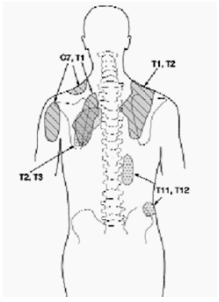
- Thoracic pain particularly difficult to sort out from an anatomical perspective
  - Cervical structures often refer pain to thoracic region
  - Multiple muscular, bony, other structures
  - Limited cortical representation
  - Limited mobility
  - Limited access for exam

Understanding Pain

- Thoracic facet pain



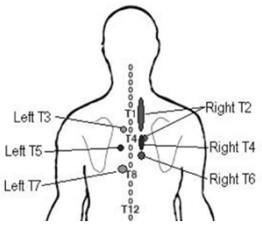
Dreyfuss et al 1994, w/o pain



Fukui et al 1997, w/ pain

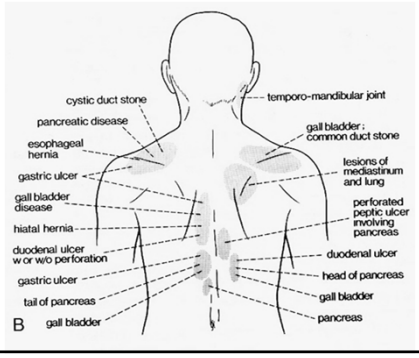
Understanding Pain

- Costotransverse pain referral patterns
  - Young BA et al, 2008



Thoracic Spine

- Visceral referral patterns
  - Nakkano 1993

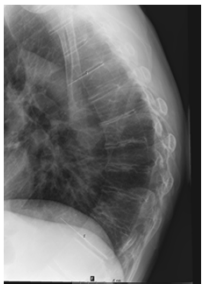


Thoracic Spine

- Fractures
  - Compression
    - Osteopenia/ osteoporosis
  - Trauma

Thoracic Spine

- Scheuermann's kyphosis
  - 5^{o} x 3 consecutive veterbrae
  - ? Developmental
  - Symptomatic in teens/ 20's



Thoracic Spine

- DISH
  - Diffuse Idiopathic Skeletal Hyperostosis
  - Right-sided flowing syndesmophytes in T spine
  - Generally painless
  - Increased fracture risk

Understanding Pain

- Pain is a sensory and emotional experience
- Direct nociception
- Cortical modulation
- Psychological factors
- Acute pain is distinct from chronic pain
- Pain is distinct from suffering

Understanding Pain

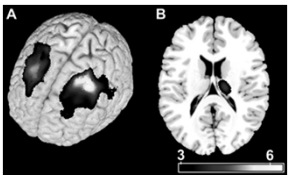
- Acute pain
  - Pain associated with tissue injury
  - Acute inflammatory response
  - Withdrawal from exacerbating activities helpful
  - Passive modalities can be helpful
- Chronic pain
  - Pain occurs without tissue injury
  - Acute inflammatory response often resolved
  - Withdrawal is maladaptive
  - Over-reliance on passive or interventional care is maladaptive

Chronic Pain

- Physiological changes
  - Sensitization of peripheral nociceptors
    - norepenephrine
  - Sympathetic in-growth to DRG
  - Central changes
    - Receptor up-regulation
    - Windup
    - Enlargement of receptor fields
    - Cortical changes

Chronic Pain

- 5-11% less neocortical gray matter
  - DLPFC
- Pattern distinct for chronic pain
- Equal to gray matter lost in 10-20 years
- 1.3 cm^3/yr of CLBP



Apkarian et al, J Neurosci 2004;24:10410-5

Chronic Pain

- Physiologic changes
  - Deconditioning
  - Soft tissue contracture
  - Atrophy
  - Loss of bone mineralization
  - Abnormal/ sub-optimal movement patterns

Chronic Pain

- Psychosocial changes
  - Depression & anxiety
  - Fear
  - Altered social roles
  - Financial loss
  - Loss of avocational activities
  - Loss of control

Chronic Pain

Pain is a complex perception- an experience- not a *thing* that can be surgically excised or pharmacologically "killed."

- Sinclair 2003

Assessment

- Rule out bad things
- Establish diagnosis
- Understand scope of the problem
  - Pain
  - Disability
  - Psychosocial barriers
- Initiate treatment plan

Assessment

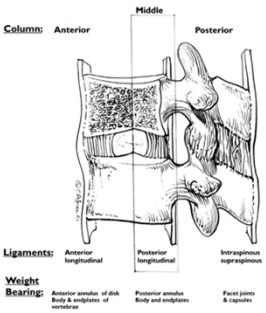
- Red Flags
  - Fracture
  - Tumor or infection
  - Significant neurologic injury
    - Cauda equina injury
    - Radiculopathy
    - Myelopathy
- AHCPR guidelines

Assessment

- Fracture
  - Major trauma in younger individual
  - Even minor trauma in older individual
- Significant neurologic injury
  - Saddle anesthesia
  - Bladder or bowel dysfunction
  - Severe or progressive neurologic deficit

Assessment

- Fractures
- Three column model
  - Compression
    - Endplates
    - Anterior cortex
  - Burst
    - Add middle +/- posterior columns
  - 2-3 columns is unstable



Assessment

- Infection or tumor
  - Age >50 or <20
  - History of cancer
  - Night pain
  - Constitutional symptoms
  - Risk factors for infection
    - IVDA
    - Immunosuppression
    - Recent bacterial infection/ fever

Assessment

- Metastatic tumors to bone
  - Breast 40%
  - Lung 13%
  - Prostate 6%
  - Kidney 6%
  - GI 5%
  - Bladder 3%
  - Thyroid 2%

Review of 5006 cases, Lewandrowski et al, in The Spine, 6th ed, 2011

Assessment

- The mystery is in the history
- Ask different questions
  - Belief systems
  - Social supports
  - Family dynamics
  - Work factors
  - Psychological factors
  - Abuse

Assessment
Yellow Flags

- Belief Systems
  - Fear avoidance behavior
  - Catastrophizing
  - Expectation of increased pain with return to work or normal activity
  - Passive attitude to rehabilitation

Understanding Pain

- Fear-avoidance
  - Avoidance due to fear of movement and potential re-injury, leading to greater levels of disability
- Catastrophizing
  - An exaggerated negative orientation toward pain stimuli and pain experience
    - Woby et al, 2004

Assessment
Yellow Flags

- Affective factors
  - Depression
  - Irritability
  - Anxiety
  - Poor adherence to exercise
  - Withdrawal from ADL's
  - Disinterest in social activity
  - History of physical or sexual abuse

Assessment

- Occupational factors
  - Poor job satisfaction
  - Perceived poor quality work environment
  - Absence of light duty alternatives
  - Short time at current position
  - Low level of education
  - Physically demanding work
  - Extensive time off of work

Assessment

- There is no evidence for a "pain-prone" personality
- Depression and anxiety are generally sequelae of chronic pain, not causes
- Psychosocial factors are a better determinant of chronicity than biomedical factors

Assessment

- Physical exam
  - Observation
    - Alignment, gait, spontaneous motion
    - Posture
    - Scapular motion
    - Atrophy, winging, etc
    - Mood, affect

"There's nothing wrong with your reflexes"

Assessment

- Physical exam
  - Palpation
    - Specific structures, focal vs. global tenderness
      - Important with trauma
    - Lymph nodes, soft tissues
    - Abdomen, flank
    - Rib cage

Assessment

- Physical exam
  - ROM
  - Spine (within tolerance)
    - Normal data hard to quantify
    - Careful in setting of trauma
  - Shoulder
    - Always examine in those with neck/ thoracic pain
  - Neurological exam

Assessment

- Provocative manuevers- cervical
  - Lhermitte's sign
    - Neck flexion- cervical cord
    - Trunk flexion- thoracic cord
  - Spurling's
    - Poor sensitivity, good specificity
      - Tong et al, Spine 2002

Assessment
Imaging

- Know what you are looking for
  - You may learn too much
  - You need to know what to do with what you find, intentional or not
- MRI/ imaging "abnormalities" common in the asymptomatic population
  - It is normal to be abnormal

Assessment

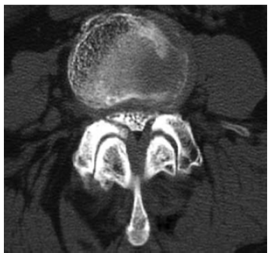
- Imaging
  - Exclude bad things
    - Red flags
    - Pain ≥ 4 weeks
  - Advance the pace of care
    - Diagnosis
    - Pertinent negatives

Imaging

- Plain radiography (X-ray)
  - Reasonable view of bone
  - Alignment
    - Scoliosis
    - Spondylolisthesis
  - Fracture
  - Degenerative change

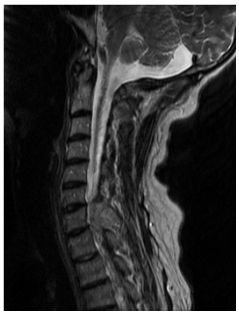
Imaging

- Computed Tomography (CT)
  - Excellent for bone
  - Canal/ foramen (esp with myelography)
  - Less optimal for soft tissue



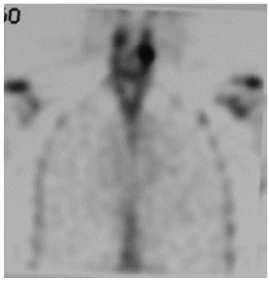
Imaging

- Magnetic Resonance Imaging (MRI)
  - Excellent for soft tissue
    - Disc
    - Nerve root
    - Tumor
    - Infection
  - Not predictive of who will have pain



Imaging

- Nuclear Imaging (bone scan/ SPECT)
  - Very sensitive for bony pathology
    - Fracture
    - Tumor
    - Degenerative change
  - Specificity lower



Treatment

- Rest, activity modification
- Oral medications
- Manual therapy
- Modalities
- Bracing
- Exercise
- Injections
- Manipulation, acupuncture, somatic therapies
- Psychological eval, pain clinic
- Surgery

Treatment

- Acute pain
  - Control inflammation
  - Pain control
  - Activity within tolerance
  - Restore mechanics & function
  - Education
  - Avoid iatrogenic disability
- Chronic pain
  - Encourage appropriate activity
  - Address mood, psychosocial barriers
  - Direct away from passive modalities
  - Restore function
  - Education

There is little evidence that a non-specific treatment applied to a non-specific problem does much of anything!

Medications

- NSAID's
- Corticosteroids
- "Muscle relaxants"
  - Centrally acting
- Narcotics
- Anti-convulsants
- Tricyclic antidepressants
- SSRI's, SNRI's

Medications

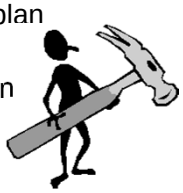
- Management tools
- Not without their problems
- Use for particular goals
  - Pain relief
  - Decrease inflammation
  - Limit neuropathic pain
  - Restore sleep
- Allow for increased function

Modalities

- Heat, ice, E-stim, U/S, others
- Generally short-term effects
- Little proof of efficacy in spinal pain
- Acute pain, inflammation
- Facilitate additional treatment effects
- Can be counter-productive in chronic pain

Interventional Care

- Cervical facet RFN best studied
- Interventional techniques are tools
- Should rarely be used in isolation
- Part of comprehensive care plan
- Over-emphasis contrary to biopsychosocial model of pain



Core stabilization

- Different patterns of cervical motor function in patients with neck pain
- Decreased activity in deep cervical flexors associated with cranio-cervical flexion test for individuals with neck pain compared with controls
  - Falla, Jull, Hodges, Spine, 2004

Rehabilitation

- Remember
  - Pain is complicated
  - Listen to your patient
  - Empowerment is critical
  - Don't lose the forest for the trees

Case

- 37 yo female with right axial neck pain
- MVA 4 weeks ago
- Decreased motion
- Not focally tender over spine
- Xrays negative

Case

- Whiplash
- Things to consider
  - Bad injury?
  - Source of pain?
    - Can this be done?
    - Does it matter?
  - Is it really just pain?
    - PTSD, anxiety, etc
  - Is this going to go well?

Case

- Predictors of poor outcome w/ whiplash
  - High levels of pain & disability
  - Multiple areas of pain
  - PTSD & Depression
  - Catastrophizing & Fear avoidance
  - Passive coping style
  - Low level of education

Sterling et al 2011, Walton et al 2013, Carroll et al 2009

Case

- Prognosis
  - At 1 year, about 50% of those with whiplash associated disorder (WAD) will report neck pain
    - Carroll et al, 2009

Treatment

"Clearly effective treatments are not supported at this time for the treatment of acute, sub-acute, or chronic symptoms of whiplash associated disorders."

Verhagen et al, Cochrane Database Syst Rev, 2007

Treatment

- Manipulation
  - Low level of evidence (clinical consensus)
  - ?Improves ROM and pain
    - Shaw et al 2010
- PT
  - Inconclusive evidence
  - ?Improve ROM and pain with active PT
    - Rushton et al 2011

Treatment

- Exercise
  - Supervised QiGong, Iyengar yoga, combined strength/ ROM/ flexibility programs effective in managing pain
    - Small effect size
  - No evidence that one supervised exercise program is superior to another
    - Southerst D et al, 2014, Syst Review

Case

- Treatment
- Goal is to get her moving, decrease fear and anxiety, resume activities
  - Take a good history
    - PTSD, anxiety, fear, yellow flags
  - Steps to restore ROM
  - Start her moving

Case

- Specific choices depend upon her
  - PT, manipulation, ?massage, others
    - Reduce pain
    - Restore ROM
  - Movement is good
    - What works?
    - Access
    - Baseline/ goals
  - Encouragement

Case

- Medications
  - Goals
    - Inflammation
    - Pain
    - Sleep
    - Mood
- Counseling/ CBT
  - Fear
  - PTSD

It is much more important to know which patient has the disease than which disease the patient has.

- Osler (1849-1919)

Conclusions

- You have to know your anatomy
- You have to know what you are looking for on history, exam & imaging
- “Who” is more important than “What”
- Care should be directed towards empowering the patient and overcoming barriers to improvement

The Lumbar Spine

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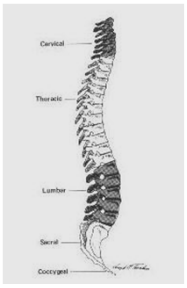
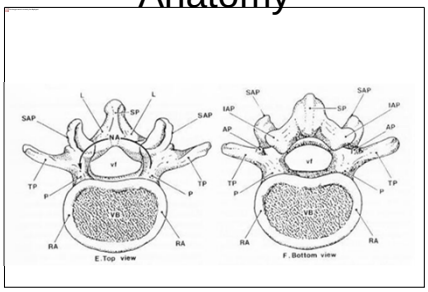
Anatomy



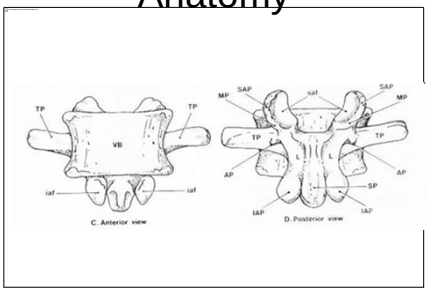
- 5 lumbar vertebra
  - 85% of people
- Intervertebral discs
- Ligaments
- Neural elements
- Musculature

Anatomy



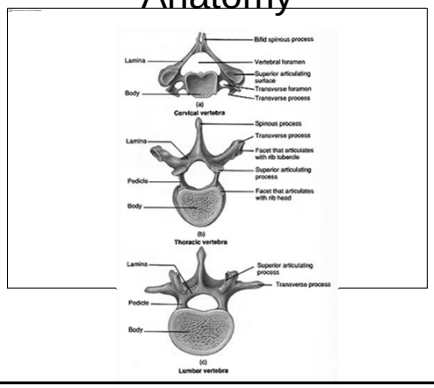
Lumbar vertebra

Anatomy



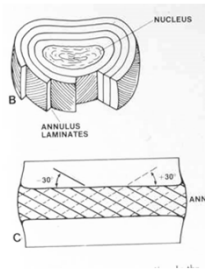
Lumbar vertebra

Anatomy



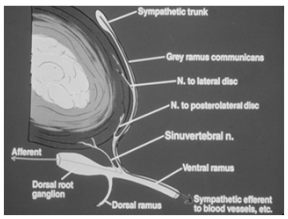
Anatomy

- Lumbar Disc
  - Nucleus
    - Proteoglycan (Pg)
    - Fluid
  - Anulus fibrosis
    - High collagen content
    - Lamellar organization



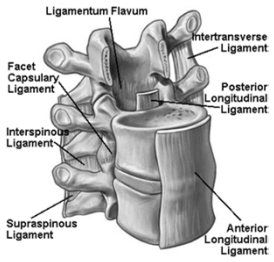
Anatomy

- Outer 1/3 anulus innervated
  - Sinuvertebral nerve
- Anulus vulnerable posterolaterally
- Pg/ collagen ratio decreases with age



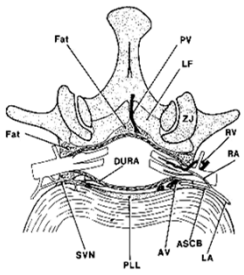
Anatomy

- Ligaments
  - Anterior long lig
  - Posterior long lig
  - Ligamentum flavum
  - Interspinous lig
  - Supraspinous lig
  - Intertransverse
  - Facet capsule



Anatomy

- Neural elements
  - Spinal cord ends T12-L2
  - Cauda equina
  - Nerve roots

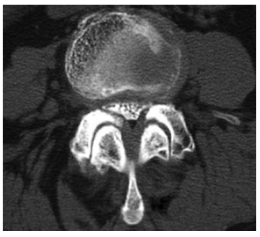


Anatomy

- Neural elements
  - Spinal cord ends T12-L2
  - Cauda equina
  - Nerve roots
- Lateral recess

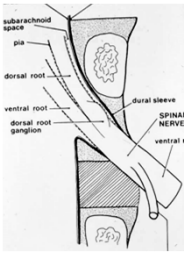
Anatomy

- Neural elements
  - Spinal cord ends T12-L2
  - Cauda equina
  - Nerve roots
- Lateral recess
- Spinal canal

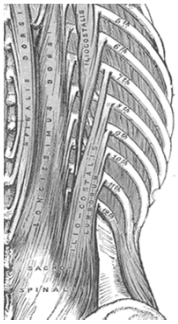


Anatomy

- Neural elements
  - Spinal cord ends T12-L2
  - Cauda equina
  - Nerve roots
- Lateral recess
- Spinal canal
- Neural foramen



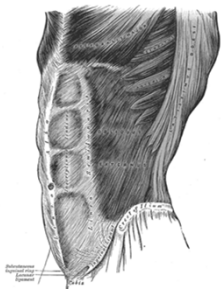
Anatomy



- Lumbar musculature
  - Intersegmental
    - Interspinales and intertransverarii mediales
  - Polysegmental
    - Multifidi and portions of the erector spinae
    - Thoracic erector spinae

Anatomy

- Abdominal muscles
  - Rectus abdominis
  - Int obliques
  - Ext obliques
  - Transversus abdominis

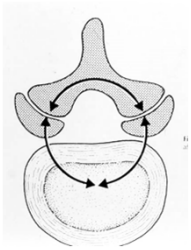


Anatomy

- Global stabilizers/ prime movers
  - Erector spinae
  - Quadratus lumborum
  - Rectus abdominis
  - Ext> int obliques
- Local stabilizers
  - Transversus abdominis
  - Multifidi
  - Internal obliques
  - Quadratus lumborum

Bergmark 1989

Biomechanics



- 3 joint complex
  - Disc
  - Facets
    - 16-33% of weight bearing
    - Protects disc from shear force

Biomechanics- Flexion

- Disc
  - Nucleus moves posteriorly
- Facets
  - Inf process up/anterior
- Neural canal widens
- Ligaments limit flexion

Biomechanics- Extension

- Disc
  - Nucleus moves anteriorly
- Facets
  - More interlocked
- Neural canal narrows
- Bone/ joint limits extension

Biomechanics

- Axial rotation
- Lateral flexion
  - Coupled motion

Assessment

- Rule out bad things
- Establish diagnosis
- Understand scope of the problem
  - Pain
  - Disability
  - Psychosocial barriers
- Initiate treatment plan

Assessment

- Red Flags
  - Fracture
  - Tumor or infection
  - Significant neurologic injury
    - Cauda equina injury
    - Radiculopathy
    - Myelopathy
- AHCPR guidelines

Assessment

- Provocative manuevers
  - Straight leg raise – supine and seated
    - Positive if reproduces leg pain at 30-70º
    - Bragard's, Lasegue's, bowstring
    - Good sensitivity (72-97%), poor specificity (11-66%)
  - Crossed straight leg raise
    - Better specificity, poor sensitivity
  - Slump test
    - Flip sign
  - Femoral nerve stretch test
    - Solomon et al, in Malanga & Nadler (eds), 2005, Hanley & Belfus

Assessment

- Inconsistencies - "Waddell signs"
  - Tenderness - superficial, non-anatomic
  - Simulation - axial load, rotation
  - Distraction - seated vs. supine SLR
  - Regional disturbance
    - give-way weakness, non-anatomic sensory loss
  - Overreaction
    - Waddell, et al, Spine, 1980

Assessment
Yellow Flags

- Belief systems
- Affective factors
- Occupational factors

Assessment
Patterns

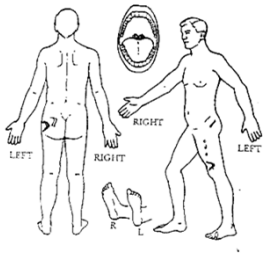
- Age
  - Adolescent
    - Bone relatively weak compared to disc/ soft tissues
    - Fractures/ spondylolysis, Scheuermann's, inflammatory, other pathology
  - 20-50
    - Bone strong, annulus aging, nucleus hydrated
    - Disc, soft tissue injury, inflammatory
  - >50
    - Bone aging, joints degenerative, nucleus desiccating
    - Fracture, degenerative, tumor, lateral disc

Assessment
Patterns

- Back or buttock pain
  - Disc
  - Vertebral body
  - Facet joint
  - Musculo-tendinous
  - Ligamentous
  - Sacro-iliac
  - Hip/ pelvis
- Leg pain
  - Nerve root
    - Disc, stenosis, other
  - Vascular
  - Peripheral structures
    - Nerve, muscle, etc.

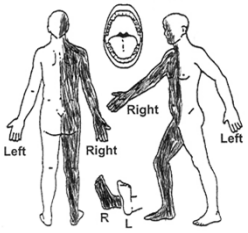
Assessment

- Patterns
  - Acute
  - Recurrent
  - Chronic



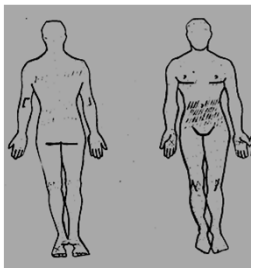
Assessment

- Patterns
  - Acute
  - Recurrent
  - Chronic



Assessment

- Patterns
  - Acute
  - Recurrent
  - Chronic



Assessment

- Establish a diagnosis
  - Difficult to do
- Pain is often non-specific
- PE is often non-specific
- Imaging largely not predictive of who has/ will have LBP
- Chronic pain is often disproportionate

Assessment

- 1 part nociception
- 3 parts anxiety

Questions to Ask Yourself

- Do the findings match the symptoms?
- Do they match the mechanism of injury?
- Is the degree of disability proportional to the injury?
- How does the patient make you feel?

Treatment

- Rest, activity modification
- Oral medications
- Manual therapy
- Modalities
- Bracing
- Exercise
- Injections
- Manipulation, acupuncture, somatic therapies
- Psychological eval, pain clinic
- Surgery

Rehabilitation

- For acute LBP, brief course of mobilization or manipulation is moderately recommended by multiple guidelines when no radicular signs are present.
- Less clear role with chronic pain
- ACOEM, ACP/APS

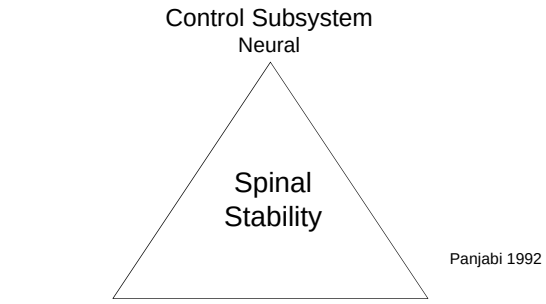
Rehabilitation

- Essential to restore/ optimize function
- Address local and global effects of injury
- Return to activity
- Minimize chance of re-injury

Rehabilitation

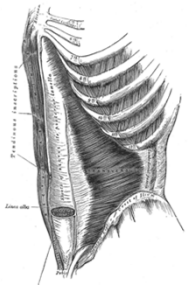
- Numerous conceptual models
  - Flexion (Williams)
  - Extension (McKenzie)
  - Dynamic “core” stabilization
  - Functional restoration
  - Multidisciplinary pain approach
  - General reconditioning

Core stabilization



Panjabi 1992

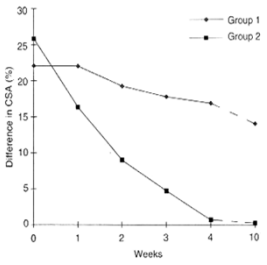
Core stabilization



- Multifidi
- Transversus abdominis
  - Critical in stabilization
  - Postural control
  - Recruited before limb motion in normals, after in those with LBP
- Hodges & Richardson 1998

Core stabilization

- Multifidi
  - Decrease in cross-sectional area with LBP[1]
  - Recover better with training[2]
- [1]Hides et al 1994
- [2]Hides et al 1996



Core stabilization

- Richardson and Jull, Muscle control-pain control. What exercises would you prescribe. Manual Therapy 1995.
  - Described specific exercise program to address the deep trunk muscles
    - Transversus abdominis
    - Lumbar multifidus
  - "The mechanism for pain relief … is believed to be through enhanced stability of the lumbar spine"
  - No data on efficacy

Core stabilization

Efficacy

- Moderate evidence
  - Effective at improving pain and function in chronic or recurrent LBP.
- Strong evidence
  - No more effective than less specific, general exercise program administered within an activating treatment structure
  - Standaert, Weinstein & Rumpeltes, Spine Journal, 2009; Cairns et al, Spine, 2006; Ferreira et al, Pain, 2007

Pain & Rehabilitation

- Wessels et al, Eur Spine J, 2006
- Systematic review on which changes in treatment variables predict outcomes with non-op care
  - Exercise
  - Behavioral treatment
  - Multimodal care

Pain & Rehabilitation

- Wessels et al, Eur Spine J, 2006
  - Coping mechanisms and pain reduction
    - decrease in disability
    - increase in RTW
  - Physical performance factors were not

Pain & Rehabilitation

- Steiger et al, Eur Spine J, 2012
  - Systematic review on correlation of physiologic response to exercise and outcomes in treating chronic LBP
  - 16 studies, 1500 patients
  - Little correlation between changes in pain/ function and changes in physical performance

Pain & Rehabilitation

- Steiger et al, Eur Spine J, 2012
  "The findings do not support the notion that the treatment effects of exercise therapy in chronic LBP are directly attributable to changes in the musculoskeletal system."

Pain & Rehabilitation

Case 1

- 35 yo male with 1 week of LBP
  - No radiation
  - No acute injury
  - Slowly improving
  - Otherwise healthy

Case 1

- 75-85% lifetime prevalence of LBP
- 6-7% of patients/ year in primary care practice
  - Andersson 1998
  - Croft 1998
  - Vanharanta 1989

Case 1

- 40-50% of patients better w/in 1 week
- 75% of patients with sciatica symptom free at 6 months
- 90% of episodes resolve w/o treatment
  - Berquist-Ullman 1977
  - Dixon 1976
  - Vanharanta 1989

Case 1

- Acute LBP
  - Recurrence rate up to 80% at one year
  - Only 25% fully recovered at one year
- Subacute LBP
  - 72% had pain at one year
  - 14% markedly disabled at one year
    - Croft 1998
    - Hides 2000
    - Wahlgren 1997

Rest

- Relative rest generally helpful for acute pain
- Limit absolute rest (bed ret)
  - 2 days better than 7 days (Deyo, et al)
  - Activity as tolerated better than bed rest (Malmivaara, et al)

Case 1

- Encourage activity within tolerance
- Treat acute inflammation/ pain
- Multiple potential acute modalities
- ?Rehabilitation/ exercise program
- Situation different if:
  - Red flags
  - Yellow flags
  - Multiple recurrences

Case 2

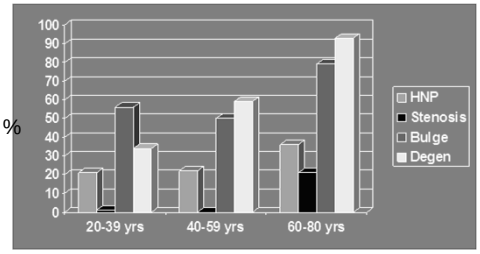
- 44 yo female with 3 weeks of LBP and pain into posterior left leg
  - Feels faintly weak and numb, not progressing, bowel and bladder normal
  - No injury, no constitutional symptoms
  - Having trouble with basic functioning

Case 2

- Sciatica
  - Pain from back radiating past knee
- Radiculopathy
  - Nerve root process/ injury
- Imaging?

Case 2

- CT & MRI "Abnormalities" common
  - Boden et al 1990 (MRI)

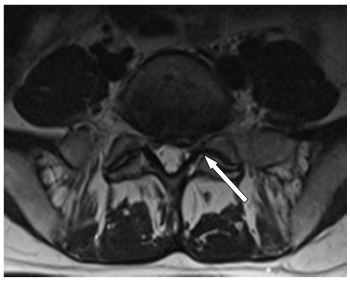


Case 2

- Disc Herniations/ Sciatica
  - 40% lifetime prevalence of sciatica
  - 75% have relief within 6 months
  - Up to 86% w/ HNP improve w/ conservative care
  - 50-80% of disc herniations show ≥50% reduction in size on f/u imaging (1-2yrs)

Frymoyer 1988, Vanharanta 1989, Bush et al 1992, Saal et al 1990, Bazzao 1992

Case 2



Case 2

- Treatment options
  - Relative rest, time
  - Oral medication – data?
  - PT, mobilization/ manipulation – data?
  - Epidural steroids
    - Evidence for short term relief of pain for radicular pain

Case 2

- Surgery
  - Cauda equina
  - **Progressive** neurologic loss
  - Intractable pain
- Microdiscectomy?
  - Evidence for better short term outcomes, similar long term outcomes c/w non-op care
  - Potential complications

Case 3

- 16 yo male with LBP x 2 mos.
- Pain began acutely after fell onto left side playing baseball
- Improved with rest, worsened with play
- Left sided LBP without radiation
- Worsened with extension and flexion
- Chiropractic and PT of limited benefit

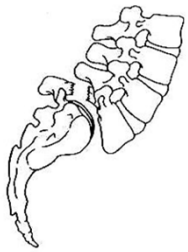
Spondylolysis

- Most common identifiable cause of LBP in adolescent athletes
- 3 - 6% of adults with isthmic spondylolysis
  - 4.4% by age 6 - all asymptomatic
- 80 - 95% at L5
- 8-15% in adolescent athletes

Rossi & Dragoni 2001, Soler & Calderon 2000
Fredrickson et al 1984, Micheli and Wood 1995

Case 3

- Spondylolysis
  - defect in the pars interarticularis of the vertebral arch
- Spondylolisthesis
  - anterior displacement of one vertebral body on the one below it



Classification
Spondylolisthesis and Spondylolysis

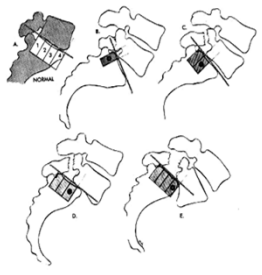
- Type I - Dysplastic
- **Type II - Isthmic**
- Type III - Degenerative
- Type IV - Traumatic
- Type V - Pathological

- Wiltse, Newman, & Macnab, 1976

Classification
Spondylolisthesis

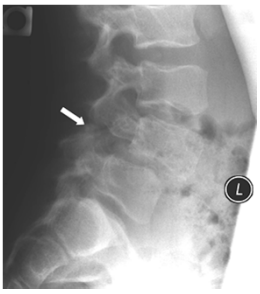
- Grade I - ≤25%
- Grade II - 25-50%
- Grade III - 50-75%
- Grade IV - >75%
- Grade V
  - spondyloptosis

- Meyerding, 1932



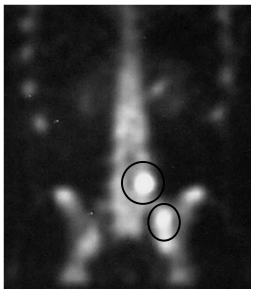
Case 3

- Plain radiographs



Case 3

- Plain radiographs
- Bone scan/ SPECT



Case 3

- Plain radiographs
- Bone scan/ SPECT
- CT

Case 3

- Plain radiographs
- Bone scan/ SPECT
- CT
- ?MRI
  - Pedicle edema
  - Less sensitive than SPECT/ CT

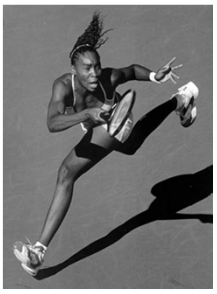
Case 3

- Treatment
  - Relative rest
    - Nothing beyond routine daily activity
    - 3 mos for early/ progressive lesion
  - ?Brace
    - With brace, 89% clinical success
    - Without brace, 86% clinical success
    - Data imply bracing not responsible for clinical improvement

Klein et al, J Pediatr Orthop, 2009

Case 3

- Rehabilitation
  - Aerobic conditioning
  - Spinal stabilization
  - ROM
  - Entire kinetic chain
  - Sport specific tasks
- Make them move like they will have to in life

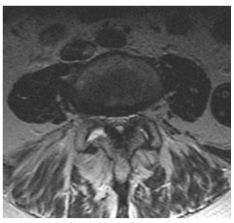


Case 4

- 72 yo female
- 6 mos LBP/ right leg pain
- Insidious onset
- Worsened by standing/ walking, better with sitting
  - Neurogenic claudication
- No weakness or numbness

Case 4

- Spinal stenosis
  - Narrowing of spinal canal
  - Cause not specified
- Degenerative LSS
  - hypertrophy ligamentum flavum
  - Facet degeneration
  - Disc bulge
- Cause of leg pain unclear



Rationale

- Lumbar spinal stenosis
  - 20% of those >60 on MRI
  - Johnsson et al 1993
    - 70% unchanged
    - 15% improved
    - 15% worse at 49 months
  - Periodic exacerbations/ remissions
  - Majority managed non-op do not worsen
  - Boden 1990, Johnsson 1993,Herno 1996, Atlas 1996

Case 4

- Treatment
  - Very little data on exercise, multi-modal rehab programs
    - Flexion bias typically advocated
  - ESI's commonly used but no good data on this
    - Dr. Friedly is working on it
  - Surgery has been shown to be helpful
    - Particularly in more severe presentations
    - Effects wane over 10 yrs

Genevay et al, Best Practice & Research Clinical Rheumatology, 2010

Case 5

- 63 yo university teacher
- Generally healthy
- History of LBP, multiple "tendon injuries" in high school, college
- Active most of adulthood, runner
- 6-7 years progressive LBP

Case 5

- Treatment to date includes:
  - Acupuncture
  - Chiropractic
  - PT (4-5 courses, core work)
  - Massage
  - Pregabalin, gabapentin, nortryptilline, etc
  - Multiple opiods
    - 100 mg Kadian, 90 mg oxycodone per day now

Case 5

- Treatment to date includes:
  - Multiple epidurals
  - Discograms
  - Intradiscal steroids
  - IDET
  - RFN bilaterally L1-L5

Case 5

- Treatment to date includes:
  - Multiple exercise programs
    - Gym
    - Bike
    - Yoga
    - Pool
      - 30 minutes at a time, increased pain
      - "I like to get my money's worth"
    - Rather sedentary over last few years

Case 5

- Imaging
- Xrays, C-T-L spine MRI's
  - Multilevel DDD
  - Numerous Schmorl's nodes, endplate changes in L and lower T Spines
  - Kyphoscoliosis
    - Increased over last 3 years

Case 5

- Primary MD requested consultation at multiple hospitals, including Mayo
- All declined
  - "There was nothing else to do"

Case 5

- "There was nothing else to do"
  - How about a history?
  - Why has everything failed?
    - Fatigue, frustration, pacing, goals, beliefs
  - How about those pictures?
    - Scheuermann's?
  - Are opiates a good thing here?
  - Fix?
  - Cover up?
  - How about adapt?

Conclusions

- Back pain is challenging to treat
- Know the data
- Understand the nature of the problem
- Understand your patient
- Rehabilitate for function
- Be flexible in your approach

It ain't what you don't know that gets you into trouble. It's what you know for sure that just ain't so.

- Mark Twain

Review of the Upper Limb

Brian Liem, MD
Barry Goldstein, MD, PhD (barry.goldstein@va.gov)

1

Objectives

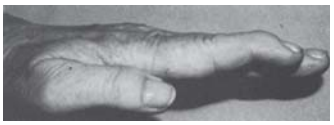
- Review general principles of clinical anatomy and biomechanics as they apply to problems of the upper limb
- Review pertinent anatomy of musculoskeletal and peripheral nervous systems
- Identify pathomechanics of common upper limb problems

2

The Biomechanics of Deformity

- Deformity as a result of musculoskeletal and neurologic problems
- Pull to the strong side

3



Name that deformity

1. Hammer finger
2. Jammed finger
3. Turf finger
4. Mallet finger
5. Swan neck finger
6. Sprained finger

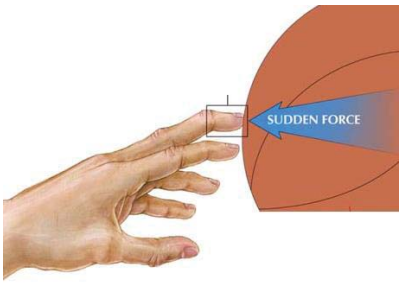
4

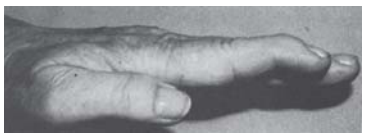
Injury to which structure?

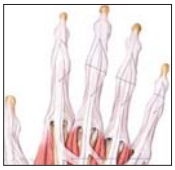
1. Extensor digitorum
2. Central slip
3. Terminal slip
4. Lateral slip
5. FDP
6. Palmar plate

Sudden flexion injury

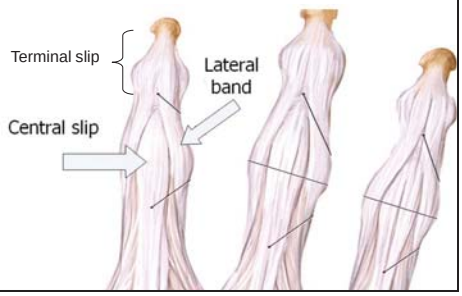
playing basketball. There was a forced flexion injury to the left index finger.

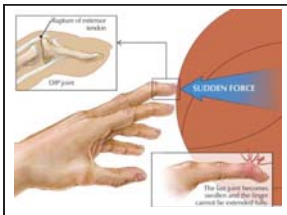






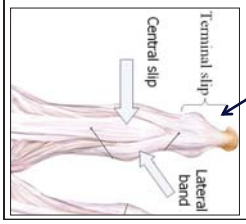
Anatomy of the extensor hood

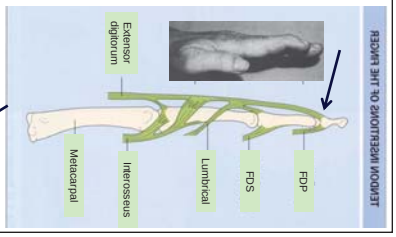




_____

Avulsion of the _____





9

What happened?

1. Disrupted EDC
2. Disrupted lateral bands
3. Disrupted FDS
4. Disrupted FDP
5. Disrupted central slip
6. Disrupted palmar plate

10

What happened?

1. Disrupted EDC
2. Disrupted lateral bands
3. Disrupted FDS
4. Disrupted FDP
5. Disrupted central slip
6. Disrupted palmar plate

11

What happened?

1. Ruptured EDC
2. Ruptured extensor hood
3. Ruptured FDS
4. Ruptured FDP
5. Weak lumbricals
6. Weak interossei

12

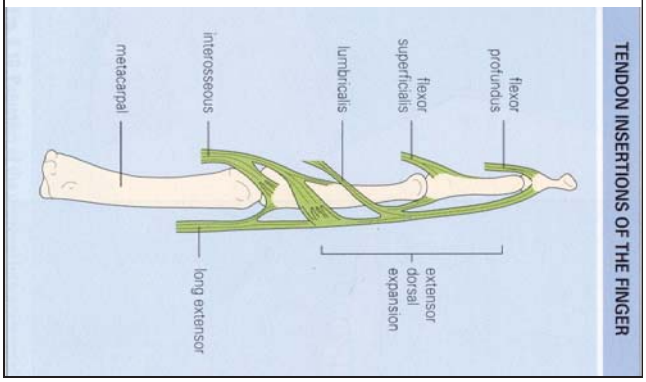
16 year old football player. The ring finger was forced out while grasping firmly

Use movement to identify the weak/ non-functional muscle/tendon

Could not flex the _____

____ is in an extended position

16 year old football player. The ring finger was forced out while grasping firmly

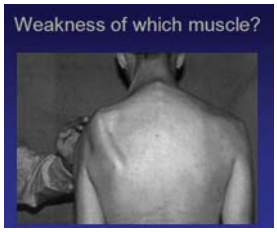


4 musculoskeletal problems that lead to deformities of the fingers

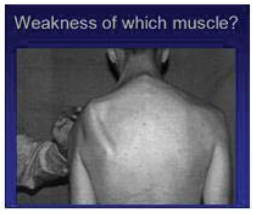
- Mallet finger
- Boutonniere deformity
- Swan neck deformity
- Rupture of FDP/FDS

What is the problem?

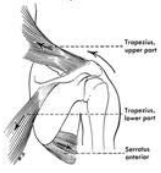
1. Weak rhomboids
2. Weak trapezius
3. Weak serratus anterior
4. Weak rotator cuff
5. Weak levator scapulae
6. Weak deltoid



How would you characterize the winging?



Rotation (upward):
trapezius and serratus anterior



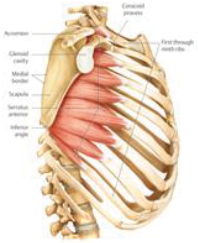
Trapezius innervation

1. Cranial nerve XI
2. Cell bodies are in the brain stem
3. Cell bodies are in the cervical cord
4. Cervical plexus
5. Spinal accessory n.
6. 1, 2, 5
7. 1, 3, 5

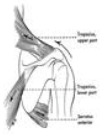
What is the problem?

1. Weak rhomboids
2. Weak levator scapulae
3. Weak trapezius
4. Weak serratus anterior
5. Weak rotator cuff
6. Weak deltoid

Serratus anterior



Protraction
Strong scapular protractor



Prime mover for upward rotation of the scapula

Weak serratus anterior

The scapula is retracted (unopposed trapezius and rhomboid action) and downwardly rotated (unopposed rhomboid action).

at rest

Medial winging

Serratus anterior innervation

1. Dorsal scapular n.
2. Ventral scapular n.
3. Long thoracic n.
4. Short thoracic n.
5. Medium thoracic n.
6. Subscapular n.

Further study

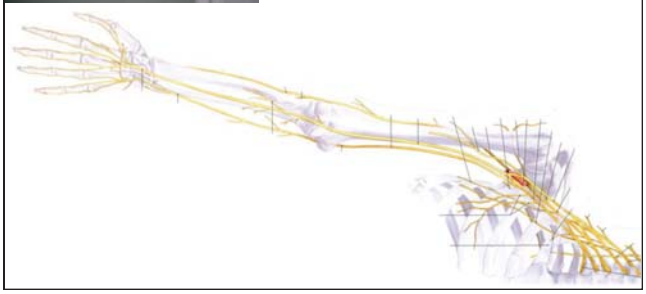
JOINTS	MUSCLE	MAJOR ACTIONS	NERVES	CORDS	DIVISIONS	TRUNKS	ROOTS
Shoulder	rhomboids	girdle retraction	dorsal scapular				C5
	serratus anterior	girdle protraction, upward rotation	long thoracic				C5,6,7
	supraspinatus	glenohumeral abduction	suprascapular			upper	C5,6
	infraspinatus	glenohumeral external rotation	suprascapular			upper	C5,6
	pectoralis major (clavicular head)	glenohumeral flexion	lateral pectoral	lateral	anterior	upper	C5,6
	pectoralis major (sternal head)	glenohumeral adduction	medial pectoral	medial	anterior	middle and lower	C7,8
	latissimus dorsi	glenohumeral adduction	thoracodorsal	posterior	posterior	middle and lower	C7,8
	deltoid	glenohumeral abduction	axillary	posterior	posterior	upper	C5,6
	teres minor	glenohumeral ER	axillary	posterior	posterior	upper	C5,6
Elbow	flexor compartment of arm	elbow flexion	musculocutaneus	lateral	anterior	upper	C5,6
	extensor compartment of arm	elbow extension	radial	posterior	posterior	middle and lower	C7,8
Wrist	flexor compartment of forearm: FCR	wrist flexion	median	lateral	anterior	upper and middle	C6,7
	flexor compartment of forearm: FCU	wrist flexion	ulnar	medial and lateral	anterior	middle and lower	C7,8

Weakness of these three muscles leads to scapular winging

What is the diagnosis?

1. Upper root plexopathy
2. Lower root plexopathy
3. Musculoskeletal n. palsy
4. Axillary n. palsy
5. Radial n. palsy
6. Median n. palsy

Where is the injury?



29

Explain the position of the fingers.

30

Diagnosis?

31

What's wrong?

1. Upper root plexopathy
2. Lower root plexopathy
3. Musculoskeletal n. palsy
4. Ulnar n. palsy
5. Radial n. palsy
6. Median n. palsy

32



Explain the position of the fingers.

Key points: the ulnar claw

- Prime movers for PIP/DIP extension are the _____ and _____.....
  - Ulnar nerve palsy leads to weakness of all the _____ and the 4th/5th digit _____
  - Which leads to the unopposed pull of 4th and 5th FDS/FDP
- Why are the 4th and 5th MCPs in hyperextension?
  - _____ and _____ also flex the MCP joint.
  - Weakness leads to the unopposed pull of 4th and 5th _____ which is the prime mover for MCP extension
- Why are the 2nd and 3rd fingers relatively unaffected?
  - Because the 2nd and 3rd _____ are innervated by the median nerve. These _____ are able to balance forces across the MCP and IPs

The paradox…….

- Deformity of the hand is less pronounced with an ulnar nerve lesion at the elbow. Why?

Diagnosis?

Diagnosis?

A. Cerebral palsy
B. Quadriparesis
C. Brachial plexus injury to upper roots
D. Brachial plexus injury to lower roots
E. Radial nerve palsy

Pull to the strong side

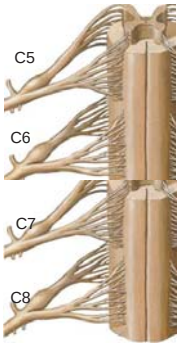
- Shoulder:
- Elbow:
- Wrist:

Shoulder and elbow myotomes

C5,6 — Flexors, abductors, ER

C7,8 — Extensors, adductors, IR

Wrist myotomes



Flexors

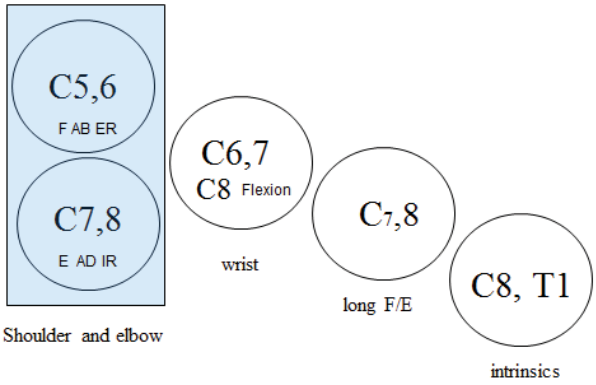
C6, C7
C8

Extensors

C6, C7

Erb-Duchenne brachial plexopathy

Neonatal, traction injuries,
burner, vasculitis, heroin



4 neurologic problems that lead to deformities

- Winging scapula
- Radial nerve palsy
- Ulnar claw
- Erb-Duchenne palsy

Tendons making turns and going around pulleys

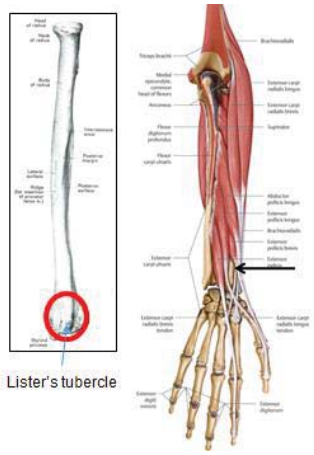
Mechanical problems with tendons and tenosynovial sheaths

What is the problem?

Instructed to extend both thumbs (IP joint)

What is the problem?

1. Weakness of APL
2. Rupture of EPB
3. Rupture of EPL
4. Spasticity of FPL
5. Radial n. palsy
6. DeQuervain's tenosynovitis



_____rupture

Flexor hallucis longus

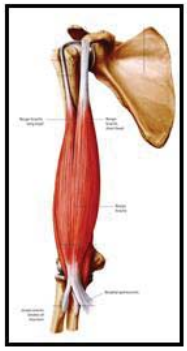
Tibialis posterior

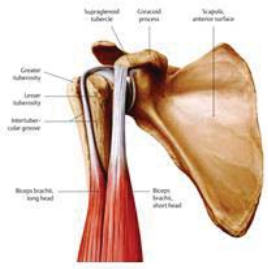
Peroneus (fibularis) tertius

Sign?

1. Superman
2. Olive Oyl
3. Batman
4. Popeye
5. Bluto
6. Wimpy
7. Bugs Bunny

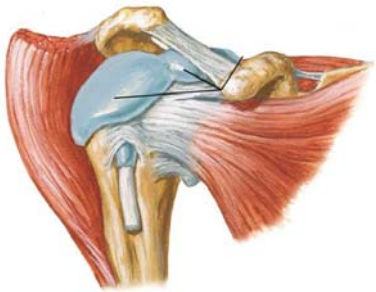
Biceps tendinitis





Biceps tendon (long head)

- Beware of tendons that go through tight spaces or turn corners



Long head of the biceps rupture may result in weakness of these two actions

53

These two physical examination tests for biceps tendinitis include resisted forearm supination and resisted shoulder flexion

54

DeQuervain's Tenosynovitis: which tendon(s) are involved?

1. Extensor indicis
2. APL
3. EPB
4. EPL
5. APB
6. 1 and 2
7. 2 and 3
8. 3 and 4

55

DeQuervain's Tenosynovitis:

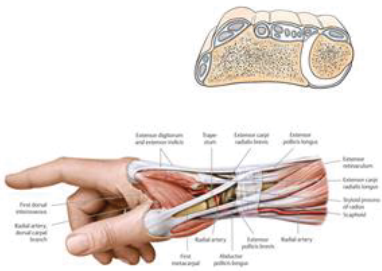
Snuffbox: 3 muscles

Which two are involved in DeQuervain's tenosynovaitis?

Provocative test?

56

De Quervain's Tenosynovitis



in the same sheath

57

Physical examination:

Stretch it!

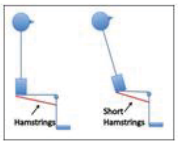
58

Tendons and synovial sheaths:
important pathophysiologic principle

- Go through tight tunnel
- Change directions, angulations, go around a pulley

59

Treat mechanical problems with biomechanical interventions



60

These four mechanical attributes are associated with major joint impairments

Mechanical impairments

- Stiff shoulder
  - Adhesive capsulitis
- Unstable shoulder
  - Traumatic instability
  - Atraumatic instability
- Weak shoulder
  - Rotator cuff tear
- Roughness
  - Arthritis

Upper Limb Review
PM&R Review Course 2015

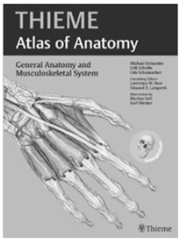
Brian C. Liem, MD
Clinical Assistant Professor
Sports and Spine Division
Department of Rehabilitation Medicine
University of Washington

Objectives

- A lot to cover!
- Review by region anatomy, pathology, and treatment of common upper limb disorders
- Additional slides for self-review

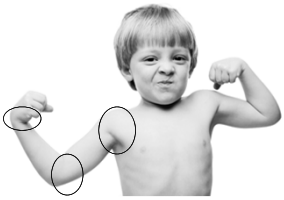
Reminders for study

- Review your bony, muscle-tendon, and liagmentous anatomy
- Pain generators
- Mechanism of injury



Today's Outline

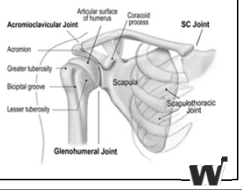
- Shoulder
- Elbow
- Wrist



DEPARTMENT OF REHABILITATION MEDICINE

Shoulder

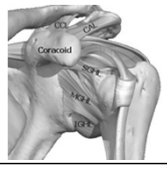
- Instability
- Rotator cuff disease
  - Impingement/Tendinosis
  - Tears
- Glenohumeral Disorders
  - Adhesive capsulitis
  - Labral tears
  - Osteoarthritis
- AC joint Disorders



DEPARTMENT OF REHABILITATION MEDICINE

Instability

- Static stabilizers
  - Role at **End** ROM
  - Bone and Cartilage
  - Shoulder capsule
  - **Labrum:** Deepens shallow glenoid
  - Ligament: IGHL
- Dynamic stabilizers
  - Role at **Mid** ROM
  - Rotator Cuff Muscles
  - LH Biceps
  - Scapular stabilizers (rhomboids, serratus anterior, trapezius, levator scapulae)



DEPARTMENT OF REHABILITATION MEDICINE

Instability

- Laxity ≠ instability
- Instability : ***symptomatic*** laxity of the shoulder
- Subluxation: shoulder popping out and back into place - partial loss of articulation
- Dislocation: total loss of GH articulation
- Classification
  - Etiology: Traumatic vs. Atraumatic
  - Direction: Anterior, Posterior, Multi-directional

DEPARTMENT OF REHABILITATION MEDICINE

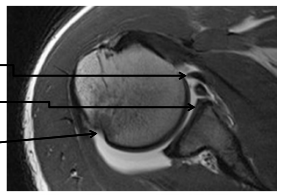
Traumatic Dislocation

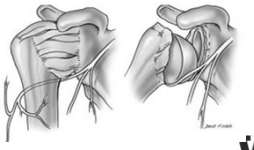
- Unidirectional
  - **Anterior (95%)** >>> Posterior
- Mech: Fall on arm abducted, ER
- Risk factors:
  - Prior dislocation
  - Younger
  - Overhead sports (throwers)

DEPARTMENT OF REHABILITATION MEDICINE

Associated Injury

- RTC– 15%, < 40 y/o
- Bankart
- Bony Bankart
- Hill Sach's
- Axillary Nerve
  - Weakness: Deltoid, Teres Minor
  - Sensory Loss: Lateral shoul
  - 3-6 mo recovery

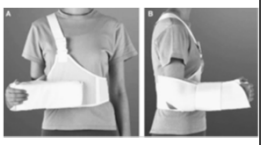




DEPARTMENT OF REHABILITATION MEDICINE

Treatment

- Non-op
- Biggest risk factor for recurrent dislocation: AGE: 60-95% in < 20 y/o
- Surgical indications
  - 3 dislocations /yr
  - Failed non-op tx
  - High level athletes
  - Relative: 1st time dislocation < 30 yr old with high phys demands



DEPARTMENT OF REHABILITATION MEDICINE

Atraumatic Instability

- Most often ***Multidirectional***
- 20's-30's, Frequently **bilateral**
- Variable symptoms
  - Lateral deltoid pain
  - Weakness with pushing, carrying
- Exam:
  - Signs of general hypermobility
  - Apprehension /Relocation Test
  - Anterior Release (anterior instability)
    - (Sensitivity 87%, Specificity 88%
  - Sulcus sign (inferior instability)
    - *(Specificity 89%, Sensitivity 31%)*

DEPARTMENT OF REHABILITATION MEDICINE

Atraumatic Instability Treatment

- "AMBRI"
  - **A**traumatic **M**ultidirecitonal **B**ilateral **R**ehabilitation **I**nferior Capsular Shift
- Non-op
  - Prolonged: 3-6 months to 1 year
  - Start with Closed kinetic chain– co-contraction RTC and scap stabilizers
- Operative
  - Inferior Capsular Shift
    - Post op:
      - 4-6 weeks in sling
      - > 10 months return to contact sport

DEPARTMENT OF REHABILITATION MEDICINE

Practice Question

An 18 yr-old hockey player comes to your office for intermittent right shoulder pain. He reports having a shoulder dislocation during a hockey game one year earlier. This was reduced in the ED. X-rays at that time were normal and he was placed in a shoulder sling. He returned to play hockey 3 weeks later. Your exam reveals normal ROM and strength of the R shoulder. He has a positive apprehension sign in a supine position. Negative sulcus sign. Neurovascular exam is normal. Which is true?

A. The likely position of his shoulder during dislocation was his shoulder forward flexed and internally rotated.

B. Bankart lesions are not associated with chronic instability and repeat dislocation.

C. Age of the athlete, at time of first traumatic dislocation, is the best predictor of future instability.

D. The suprascapular nerve is commonly affected in this type of injury

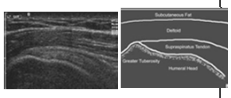
E. He is at low risk for repeat dislocation

DEPARTMENT OF REHABILITATION MEDICINE

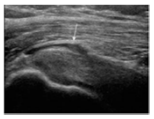
Rotator Cuff Disease

- **Muscles**
  - Supraspinatous
  - Infraspinatous
  - Teres Minor
  - Subscapularis
  - "Honorary": LH Biceps
- **Think continuum of disease**
  - Impingement
  - Tendinosis
  - Partial Thickness tear
  - Full thickness

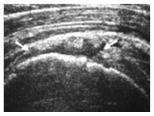
normal



impingement



tendinosis



tear

DEPARTMENT OF REHABILITATION MEDICINE

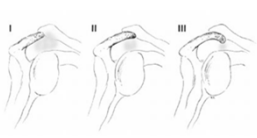
Impingement

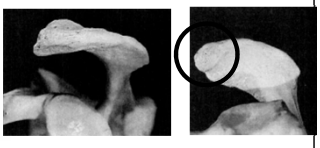
- External
  - Primary
  - Secondary
- Internal (posterior-superior)

DEPARTMENT OF REHABILITATION MEDICINE

Primary Impingement (Neer 1972)

- Due to structural narrowing of the coracoacromial arch space
- Cuff tissue impinges under anterior undersurface of acromion.
- Association between Type 3 "hooked" acromion and RC tear and impingement. (Bigliani 1986)
- Hooking may be an acquired condition related to ossification of the coracohumeral ligament origin. (Edelson 1995)





DEPARTMENT OF REHABILITATION MEDICINE

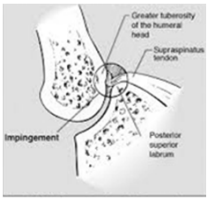
Secondary Impingement

- ***Dynamic*** narrowing coracoacromial space but no frank structural compromise
- Humeral head not controlled in glenoid
- Young individuals, athletes
- Factors
  - GH Instability
  - RTC dysfunction(tendinosis/tear, suprascap neuropathy)
  - Scapulothoraic instability

DEPARTMENT OF REHABILITATION MEDICINE

Internal Impingement

- Pathologic contact between undersurface supraspinatous-infraspinatous junction and posteiror-superior labrum
- Throwers late cocking and acceleration throwing
  - Repetitive ER and ABD
- Posterior-superior shoulder pain
- Pain with apprehension test (but no apprehension)



DEPARTMENT OF REHABILITATION MEDICINE

Rotator Cuff Tears

- Rare in younger patients and athletes
- Etiology multifactorial
  - Degenerative changes, microtrauma, smoking , HLD, family hx
- Partial Tears
  - Only 10% of symptomatic partial-thickness tears progress to FT tears
- Full Tears
  - 50% of **asymptomatic** FT become ***symptomatic*** in 2-3 yrs
  - 50% of symptomatic FT progress in tear size at average of 2 yrs

DEPARTMENT OF REHABILITATION MEDICINE

RC: History and Exam

History

Overuse

Pain (achy and deep)
Location over anterolateral deltoid, can be as far as elbow

Internal impingement = posterior pain

Pain side-sleeping on shoulder

Overhead activities, reaching behind (seatbelt)

Exam

Mid range painful arc
(max pressure in subacromial space in mid ROM)

Pain with or without weakness

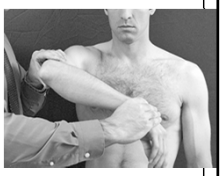
Empty can test in scaption for supraspinatus

ER emphasizes infraspinatus, teres minor

Positive lift off test suggests subscapularis tear

DEPARTMENT OF REHABILITATION MEDICINE

Physical Exam for RC Pathology



Best combination for any RC pathology:

1) + Hawkins-Kennedy

2) + Painful Arc (pain between 60° and 120° in scapular plane)

3) + Weakness in ER with arms at side

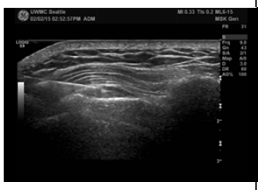
- **Post test probability 95% if all 3 positive**
- **Post test probability 24% if all 3 negative**

Park et al, JBJS Am, 2005

DEPARTMENT OF REHABILITATION MEDICINE

Treatment

- **Rehab**
  - -Scapular stabilizers initially, progress to infraspinatous/teres minor then subscap and eventually supraspinatous
  - -Sleeper stretch—posterior capsule tightness
- **Injections**
  - Steroids
    - Short term benefit
    - High recurrence rate if used in isolation
  - Tenotomy, PRP
- **Surgery**
  - **Post op course is 4-6 months (counsel patients)**



DEPARTMENT OF REHABILITATION MEDICINE

Treatment Algorithm

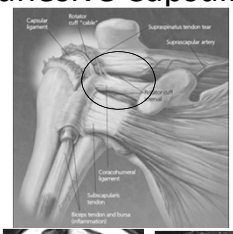
- Tendinosis/Partial Thickness Tears
  - Initial Non-op treatment
- Acute Full thickness tear or Chronic FT Tear in < 65
  - Consider early surgical repair
- Chronic FT Tear (> 65) or irreversible changes (significant muscle atrophy, retraction)
  - Initial Non-op treatment

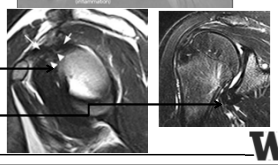
Tashjian 2012

DEPARTMENT OF REHABILITATION MEDICINE

Glenohumeral– Adhesive Capsulitis

- Painful Multidirectional ROM Loss
  - Early External rotation
- Women 40-60's
- Risk factors: DM2, Thyroid disorders, immobilization
- Inflammation → Soft tissue scarring rotator cuff interval and coracohumeral ligament
- MRI: Thickening CHL & Axillary pouch/recess





DEPARTMENT OF REHABILITATION MEDICINE

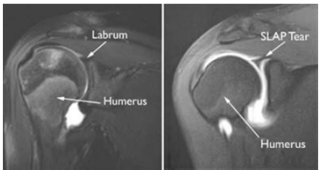
Treatment

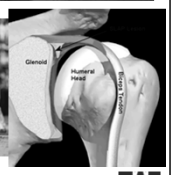
- Natural hx: 3 stages
  - Stage1: "Freezing" (1-3months)
    - Pain, slight motion loss
  - Stage 2: "Frozen" (3-9 months)
    - Reduced pain, increased ROM loss
  - Stage 3: "Thawing" (9-15 months)
    - Gradual improvement ROM
- Surgery if not better 12-18 months
  - Manipulation under anesthesias
  - Arthroscopic capsular release

DEPARTMENT OF REHABILITATION MEDICINE

Glenohumeral– Labral

- Alphabet soup
  - SLAP
  - HAGL
  - ALPSA
- SLAP = Superior Labral Anterior-Posterior Tear
- Seen in
  - Throwers with repetitive stress
  - Degenerative
- MR arthrogram





DEPARTMENT OF REHABILITATION MEDICINE

Treatment

- Most non-surgically with rehab
- ***High level athletes*** consider surgery
- Surgery is **not** 100%
- May take 3-6 months RTP
- Biggest limitation to RTP is presence of supraspinatous tear.

DEPARTMENT OF REHABILITATION MEDICINE

Practice Question

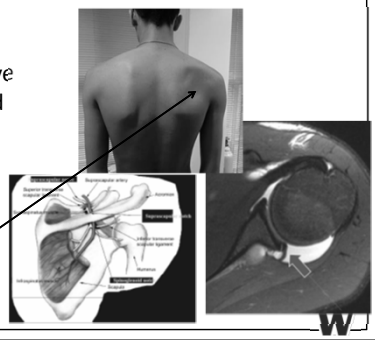
Superior labral cysts associated with posterior glenoid labral tears can dissect to the spinoglenoid notch. If the nerve traversing this notch is impinged by the cyst then weakness can occur in which of the following muscles?

a) Supraspinatus only.
b) Supraspinatus and infraspinatus.
c) Infraspinatus only.
d) Subscapularis only.

DEPARTMENT OF REHABILITATION MEDICINE

Associated Injury: Suprascapular Neuropathy

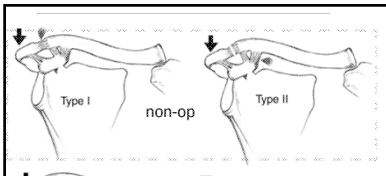
- Paralabral cyst compressing suprascapular nerve in the spinogelnoid notch
- Posterior-superior pain
- Weakness
- Atrophy infraspinatous



DEPARTMENT OF REHABILITATION MEDICINE

AC Joint Separation

- AC ligament is the major stabilizing force in the A-P direction
- CC ligament is the major stabilizing force in **superior-inferior** direction
  - Trapezoid and conoid ligaments
- Male predominance 5:1
- 45% occur in individuals in 20s
- Majority Type I and Type II



Types of ACJ separation

- **Type I:** Sprain of AC ligaments, no damage to CC ligaments. Widended AC joint, no increase in coracoclavicular distance. Non-operative
- **Type II**: Tear AC ligaments, sprain CCL. Wide AC joint, wide CC distance (<25%). Non-op.
- **Type III:** Tear AC and CC ligaments. AC joint wide, CC joint 25-100% displacement. Rx controversial. Initial trial of non-op management.
- **Type IV.** Clavicle displaced posteriorly. Most painful
- **Type V.** 100-300% increase in CC distance, torn deltopectoral fascia. VI= subcoracoid dislocation

DEPARTMENT OF REHABILITATION MEDICINE

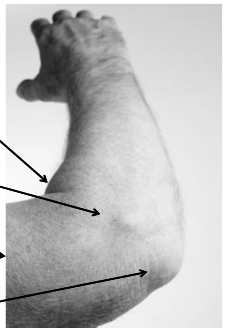
AC Joint Separation

- Second most common joint dislocation (shoulder is #1)
- Acute traumatic separation, distal clavicular osteolysis (weightlifters)
- Painful palpation over ACJ, positive scarf sign, O'Brien's localizes pain to the ACJ
- Workup: standard xrays usually adequate, stress views no longer recommended
  - Stress views usually do not add additional information, and are painful to the patient. Used to differentiate Type II and III, but standard AP xrays and PE usually adequate (marked tenderness over CC ligaments suggests Type III)
- Rx of Type I and II (and usually III) nonoperative
  - Rest, ice, protection (sling for 3-7 days for type II), ROM as soon as tolerated

DEPARTMENT OF REHABILITATION MEDICINE

Elbow Injuries

- **Differential is based on regions**
- Anterior
  - Distal biceps rupture
- Lateral
  - Lateral epicondylosis
  - Radiocapitellar arthritis
  - Radial head fracture
  - PIN lesion
  - C7 radic
- Medial
  - Medial epicondylosis
  - Ulnar collateral ligament injury
  - Cubital tunnel syndrome
- Posterior
  - Olecranon bursiits
  - Triceps tendinosis
  - Valgus Extension Overload
  - Tophus Gout



DEPARTMENT OF REHABILITATION MEDICINE

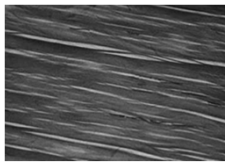
Anterior Elbow: Distal biceps rupture

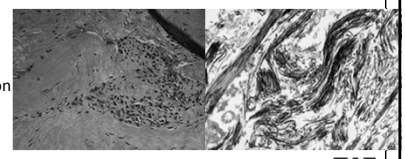
- Eccentric load to a flexed elbow
- Supination weakness by **30-40%** > Flexion weakness
- Hook Test
- Key Tx Decision: Partial vs. Complete tear

DEPARTMENT OF REHABILITATION MEDICINE

Lateral Elbow: Lateral Epicondylosis

- Epicondylitis → Epicondylosis
- Not a true inflammatory response
- Degenerative Injury common extensor tendon (ECRB most affected) with incomplete healing response
- Tendinosis
  - Tendon degeneration
  - Collagen disarray
  - Neovessels
  - Fibroblasts





DEPARTMENT OF REHABILITATION MEDICINE

Lateral Elbow: Lateral Epicondylosis

- Exam
  - Pain with resisted wrist and 3rd digit extension
  - Pain with passive wrist flexion
- Treatments
  - Counterforce bracing
  - PT (Graston, Friction Massage, Forearm stretching)
  - Steroids for short term
  - Potential for non-steroid injections (Tenotomy, PRP, Aut Blood) but still controversy (For: Peerbooms 2010 vs. Against: Krogh 2013)

DEPARTMENT OF REHABILITATION MEDICINE

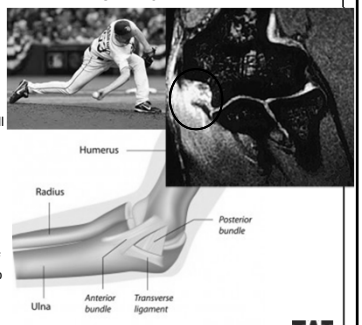
Lateral Elbow: Radial Head Fracture

- Fall on outstretched hand
- TTP radial head
- Pain with rotation forearm
- X-ray:
  - Fat pad displacement (lucency)
- Fracture classification
  - I: Non-displaced
  - II Fracture w/ displacement, depression, angulation
  - III: Commminuted
  - IV: Fracture with dislocation

DEPARTMENT OF REHABILITATION MEDICINE

Medial Elbow: Ulnar Collateral Ligament injury

- UCL = MCL
  - **Anterior bundle** primary restraint to valugs
  - Acute or chronic overstretching in valgus
  - Throwing athletes, especially baseball pitchers. Acceleration phase
  - Treatment
    - Partial ***and*** Complete: Non-op
    - Non-op: **42% return to pre-injury level at 24 weeks (6 mo)**
    - Athlete complete tear: "Tommy John" surgery, reconstruction of UCL, good outcome 90%. Postop rehab 6-12 mo.



DEPARTMENT OF REHABILITATION MEDICINE

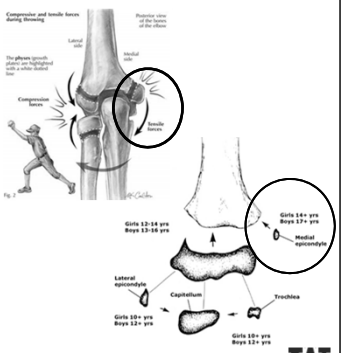
Posterior Elbow: Olecranon Bursitis

- Subcutaneous bursa.
  - **Chronic:** repeated trauma.
  - **Acute:** falls onto hard surface.
  - **Septic:** serious superimposed infection (septic arthritis, osteomyelitis if untreated. Aspirate and abx)
- Treatment: NSAIDs, **compression**, steroid
- Aspiration: Cell cout w/ Diff, Culture

DEPARTMENT OF REHABILITATION MEDICINE

Pediatric Elbow

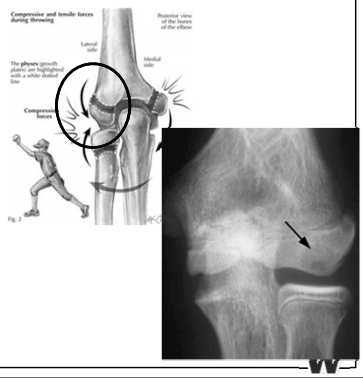
- Common mechanism: **Repetitive valgus stress**
- Medial Elbow
  - **Tensile force** → Stress on medial epicondyle physis (growth plate) (aka "Little Leaguer's elbow")
  - Of all elbow growth plates, medial epicondyle is last to fuse
  - 8-15 y/o
  - Treatment
    - Rest from pitching
    - Age-based pitch counts



DEPARTMENT OF REHABILITATION MEDICINE

Pediatric Elbow

- Common mechanism: **Repetitive valgus stress**
- Lateral Elbow
  - **Compressive force →** Osteochondritis dissecans (OCD) of capitellum
  - 12-16 y/o
- Treatment
  - Restrict throwing
  - Aged-based Pitch count



DEPARTMENT OF REHABILITATION MEDICINE

Age Based Pitch Counts

Age	Pitches/game	Per week	Per Season	Per Year
9-10	50	75	1000	2000
11-12	75	100	1000	3000
13-14	75	152	1000	3000

Based on USA Baseball Medical and Safety Advisory Committee 2006

DEPARTMENT OF REHABILITATION MEDICINE

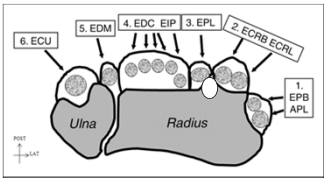
Wrist

- **Differential is based on regions**
- Radial
- Ulnar
- Dorsal

DEPARTMENT OF REHABILITATION MEDICINE

Wrist Landmarks

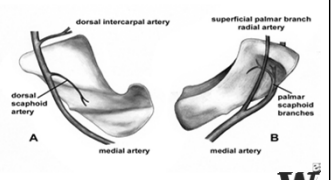
- Snuff box: Scaphoid
- Lister's tubercle
- 6 Dorsal compartments



DEPARTMENT OF REHABILITATION MEDICINE

Radial: Scaphoid Fracture

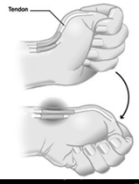
- Most common carpal fracture
- FOOSH injury
- Tender anatomic snuff box
- Proximal end increased risk AVN
- If X-rays NEG
  - Tx Thumb spica, repeat X-rays in 2 weeks or MRI



DEPARTMENT OF REHABILITATION MEDICINE

Radial Side: DeQuervain's tenosynovitis

- Most frequent wrist tendon disorder
- 1st dorsal compartment (EDB, APL)
- Factors: forceful grasp activities with ulnar deviation (golf, bowling, racquet sports, chopping wood), rheumatoid arthritis
- +Finklestein's
- Treatment
  - Thumb spica
  - Steroid injection



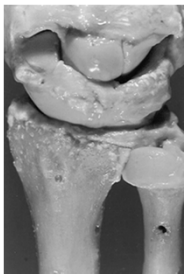
DEPARTMENT OF REHABILITATION MEDICINE

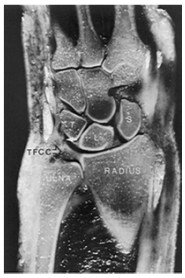
Ulnar: Ulnar Variance

- Normal axial loading: 20% force through ulna, 80% through radius
- Small changes in relative ulnar length (variance) can significantly alter force distribution
- Positive = Ulna > Radius
- Ulnar abutment syndrome

DEPARTMENT OF REHABILITATION MEDICINE

Triangular Fibrocartilage Complex



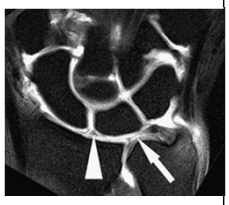


- Cartilaginous disc + ligamentous structures distal to ulna
- Major stabilizer of DRUJ
- Provides continuous gliding surface
- Force transmission from hand to forearm

DEPARTMENT OF REHABILITATION MEDICINE

Ulnar: TFCC Injury

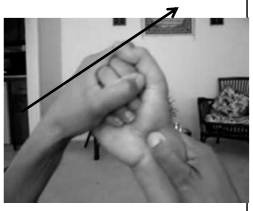
- FOOSH or Insidious
- Pain and swelling dorsal-ulno-carpal area
- Exam
  - Pain resisted wrist ext with ulnar deviation
  - Pain with compression ulnar side
  - Tender over soft spot btw FCU and ulnar styloid
- X-ray to r/o fx, eval ulnar variance
- MR arthrogram
- NSAIDs, rest, neutral wrist splint 4-6 weeks
- Surgery



DEPARTMENT OF REHABILITATION MEDICINE

Dorsal: Scapholunate Dissociation

- **Most common** wrist ***ligament*** injury
- Mech: Trauma/FOOSH
- Ligament injury: Tear of Scapho-Lunate Ligament
- Exam:
  - Dorsal side: TTP
  - May have little or no swelling
  - Watson's Test
- Imaging
  - 3 views
  - Supine clenched fist (next slide)



DEPARTMENT OF REHABILITATION MEDICINE

Supine Clenched Fist X-ray Terry-Thomas Sign

PA view wrist w/ Fist Clenched and Supine
-In this position, Capitate dawn proximally to accentuate S-L interval

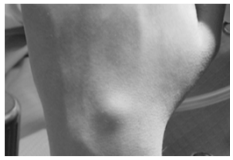
Normal: 1-2 mm

Abnormal: **2-3** mm or above

DEPARTMENT OF REHABILITATION MEDICINE

Ganglion Cyst

- 70% scapholunte joint
- Treatment
  - **Observation** unless symptomatic
  - Bracing
  - Aspiration
    - Viscous: 16 or 18G needle
    - Reaccumulation
  - Steroid Inj (Breidhal Skeletal Radiol 25:635–638, 1996
  - Surgery
    - Post op Bracing/Activity limitations up to 4-6 weeks
    - Risks Stiffness, Scar tissue



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The End

- Thank you!

DEPARTMENT OF REHABILITATION MEDICINE

Additional Slides: Shoulder

DEPARTMENT OF REHABILITATION MEDICINE

Posterior Traumatic Instability

- <5% of shoulder dislocations
- Mechanism: Arm usually forward elevated, internally rotated, adducted (O'Brien testing position)
- If mechanism unwitnessed or unknown
  - Consider electrocution (lightning strike, classically) or seizure
- Sequela of neonatal brachial plexus injury (Erb's palsy)
  - Persistent internal rotation contracture → glenoid dysplasia. Up to 62% posterior subluxation


Case Report

Missed posterior fracture-dislocation of the humeral head following an electrocution injury to the arm

A H C Tan

ABSTRACT

Posterior dislocation of the shoulder is a rare and commonly missed injury. While prompt diagnosis and treatment is important to prevent untoward sequelae, it is often diagnosed and treated too late. The first reported case of a posterior fracture-dislocation of the humeral head following a domestic electrocution accident in Singapore is described in a 53-year-old man. The injury was missed by several doctors before a humeral head replacement was done. The diagnostic pitfalls and management of this injury and ways to avoid a missed or delayed

Intern Emerg Med (2007) 2:63–65

DOI 10.1007/s11739-007-0017-y

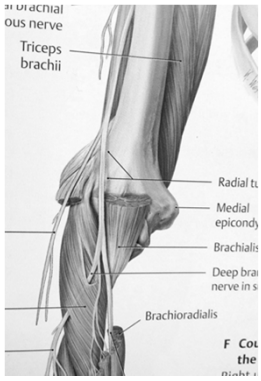
Bilateral posterior shoulder dislocations following seizure

M.E. Betz • S.J. Traub

DEPARTMENT OF REHABILITATION MEDICINE

Additional Slides: Elbow

DEPARTMENT OF REHABILITATION MEDICINE



- PIN neuropathy / Supinator syndrome
  - PIN susceptible to injury at proximal edge of superficial belly of supinator (Arcade of Frohse)
  - Finger drop, not wrist drop. Sparing of ECRB, ECRL
  - Burning pain and tenderness over lateral elbow mimics recalcitrant lateral epicondylitis
  - Following radial fracture, may see scar around nerve; susceptible to stretch injury also

DEPARTMENT OF REHABILITATION MEDICINE

Posterior Elbow: Valgus Extension Overload

DEPARTMENT OF REHABILITATION MEDICINE

Additional Slides: Wrist

DEPARTMENT OF REHABILITATION MEDICINE

Intersection syndrome

- Intersection of APL and EPB (1st compartment) over ECRL and ECRB tendons (2nd compartment)
  - Inflammation/friction syndrome
  - 4-6 cm proximal to Lister's tubercle
  - Rowers, racquet sports, weight lifters
  - Movement of wrist more painful than movement of thumb (de Quervain's)
  - Crepitus on palpation
  - NSAID and relative rest. Consider wrist cockup splint

REVIEW OF THE HIP AND KNEE

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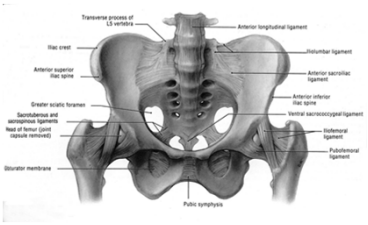
HIP

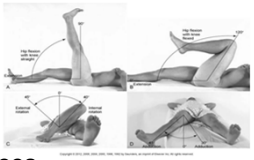
- 3 Joints
  - Acetabular joint
  - Pubic symphysis
  - SI joint
- Review anatomy
  - Muscles/Tendons
  - Ligaments
  - ROM

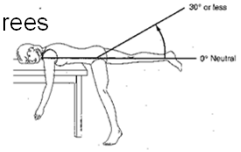


2

HIP PHYSICAL EXAM/SPECIAL TESTS

- Normal range of motion
  - Flexion 120 degrees
  - Extension 30 degrees
  - Abduction 45-50 degrees
  - Adduction 0-30 degrees
  - External rotation 35 degrees
  - Internal rotation 45 degrees
    - *Osteoarthritis first limits IR*

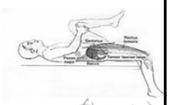


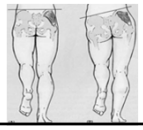


3

HIP PHYSICAL EXAM/SPECIAL TESTS

- Thomas test
  - Assess for hip flexion contracture
- Ober test
  - Assess for contracture of tensor fascia lata or IT band
- FABER (Patrick)
- FADIR
- Trendelenburg
  - Gluteus medius weakness
  - Positive test: pelvis on the unsupported side descends
  - "Sound side sags"

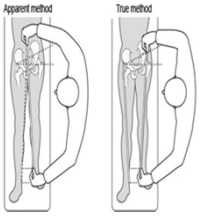




4

HIP PHYSICAL EXAM/SPECIAL TESTS

- Leg length discrepancy
  - True= ASIS to medial malleoli
  - Apparent= Umbilicus to medial malleoli
    - May be caused by pelvic obliquity or flexion/adduction deformity of hip



- Lumbar spine ROM
- Intra-articular pathology
  - FADIR, Scouring

5

HIP PAIN DIFFERENTIAL DIAGNOSIS

Acute

- Muscle strain
- Contusions
- Avulsion
- Labral tear
- Fracture
- Hip dislocation

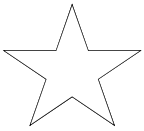
Subacute/Overuse/Insidious

- Bursitis
- Tendinopathy
- Apophysitis
- Labral tear
- Osteoarthritis
- Stress fracture
- AVN
- Athletic pubalgia
- Osteitis pubis
- Pediatric (SCFE, AVN)

6

HIGH YIELD FACT

Proximal ulnar fx with radial head displacement (Monteggia's fx) may injury the posterior interosseous nerve (PIN)



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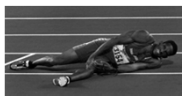
MUSCLE STRAINS

- Predisposing factors
  - Inadequate warm up, poor flexibility, muscle imbalances, early season training
- Injuries often occur during eccentric contractions
- More common in muscles that cross two joints
- Clinical
  - Pain with passive stretch and resisted activation
- Imaging to rule out avulsion
- Treatment
  - Ice, compression, WBAT, NSAIDs, stretching, rest
  - Advance to strengthening when pain improved



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MUSCLE STRAINS: HAMSTRING

Hamstring strain

- Normal strength ratio of hamstrings to quadriceps 3:5
- Most commonly seen in track and gymnastics

- Clinically
  - Pain in hamstring region after forceful contraction/ knee flexion
  - Tenderness over muscle belly, origin (ischial tuberosity) or distally posterior knee region
  - Imaging= Xray to evaluate for ischial tuberosity avulsion
  - Large area of ecchymosis and hematoma likely represents tear

9

MUSCLE STRAINS

Iliopsoas

- Explosive hip flexion and eccentric overload
- Overuse= tendinopathy
- Pain in groin

Adductors

- Most commonly strained= Adductor Longus
- Forceful abduction of hip or during eccentric contraction
- Pain with resisted adduction

Rectus femoris

- Origin= AIIS
- Explosive hip flexion or eccentric overload
- Pain 8-10 cm below ASIS
- Complication= myositis ossificans

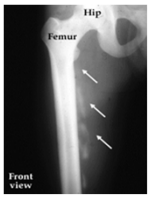
Greater trochanteric pain

- Usually secondary to gluteus medius or minimus tendon abnormalities
- Pain over greater trochanter with side lying, standing, hip abduction

10

MYOSITIS OSSIFICANS

- Formation of heterotopic ossification within muscle
- Often due to direct blow to hip or thigh
- Painful/palpable mass
- XR may initially show soft tissue mass
- Within 14d calcification may develop
- Ossification within 2-3 weeks
- Treatment
  - Gentle ROM, prevent contracture
  - Progressive strengthening
  - Surgery if nerve entrapment, loss of function
  - Wait until bone matures at 10-12 months



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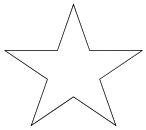
HIGH YIELD FACT

Tendons involved in De Quervain's tenosynovitis:

-APL

-EPB



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SNAPPING HIP SYNDROME

3 types

- Anterior/Internal
  - *Iliopsoas tendon* over iliopectineal eminence, femoral head or lesser trochanter
  - Felt in groin
  - Tendon may be thickened or not at optimal length

- Intra-articular
  - Labral tear, loose body, etc.
- External
  - Most common
  - *ITB, TFL, Gluteus Med or Max tendon over greater trochanter*
  - Felt laterally

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HIP OSTEOARTHRITIS

- Generally pain in groin
  - But can also present in buttock, anterior thigh, posteriorly, even region of knee
- Clinical
  - Loss of internal rotation first
- Imaging hallmarks
  - Joint space narrowing
  - Osteophytes
  - Bony sclerosis
  - Subchondral cyst
- Treatment
  - Activity modification
  - Tylenol/NSAIDs
  - Cane use in contralateral hand
  - Improve biomechanics/PT/Strength
  - Intra articular steroid injections for short term relief
  - Total hip arthroplasty

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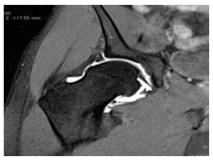
ACETABULAR LABRAL TEARS

- Results from
  - Trauma
  - Twisting or slipping
  - Degenerative joint disease
  - Underlying acetabular dysplasia or FAI
  - Incidental finds
- Symptoms
  - "Catching" pain in groin
  - Audible click
  - Mild decreased ROM
  - Anterior tears= pain with HF, ER, abduction
  - Posterior tears= HF, IR, posterior load
- Imaging
  - MR Arthrogram
- Treatment
  - +/- Protected weight bearing
  - Local anesthetic injection for diagnostic purposes, consider steroid
  - Strengthen hip and pelvic girdle
  - Arthroscopic debridement



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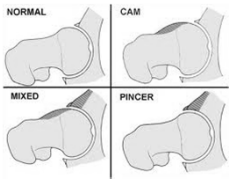
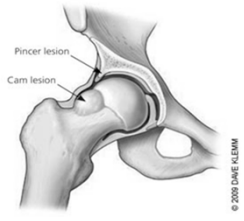
FEMORAL ACETABULAR IMPINGEMENT (FAI)

- Impingement of femoral neck on the acetabulum
- Common cause of secondary OA and labral tears
- 3 Types
  - CAM=excess bone head/neck junction
  - Pincer=acetabular overcoverage
  - Mixed/Combination





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FEMORAL ACETABULAR IMPINGEMENT (FAI)

- Groin and/or anterolateral hip pain
- Reproduction of pain in groin with FADIR
- Scouring hip
- C-sign
- Exacerbation of pain
  - Sitting
  - Hip flexion
  - Kicking maneuvers (ballet, soccer)
- Improved with
  - Hip extension
- Imaging
  - Cam= alpha angle on Dunn view XR or radial/oblique axial view on MRI
  - Pincer= center edge angle on standing AP XR pelvis
- Treatment
  - Hip girdle strengthening
  - Activity modification, avoid prolonged/forceful HF, IR
  - Intra-articular steroid injections
  - Surgery

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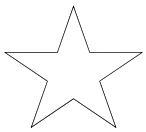
HIGH YIELD FACT

Most common nerve injury with proximal humerus fractures is the axillary nerve



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AVASCULAR NECROSIS OF THE HIP

- Disruption of blood supply to the femoral head
- Can cause severe hip DJD in young patients
- Legg-Calve-Perthes disease
  - Children aged 2-12
- Risk Factors
  - Oral steroids, etoh, tobacco, trauma
- Clinical
  - Pain in groin, anterior thigh, knee (especially in kids)
  - Insidious onset
  - Pain with ROM, especially IR

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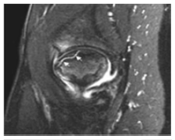
AVASCULAR NECROSIS OF THE HIP

- Imaging
  - Xray= crescent sign (subchondral radiolucency) and subchondral collapse
  - MRI= low signal intensity of T1
- Treatment
  - Conservative if asymptomatic or no subchondral collapse
    - Maintain femoral head within acetabulum
    - Bracing/casting in kids
  - Surgical
    - Osteotomy vs. Total hip arthroplasty



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POSTERIOR HIP DISLOCATION

- 90% of all hip dislocations
- MVC when hip flexed, adducted, and internally rotated
- May have concomitant sciatic nerve injury
- AVN in 10% (risk increased with delayed reduction)
- Clinical
  - Hip flexed, adducted, internally rotated
  - If anterior= extended, abducted, externally rotated. Leg appears shorter
- Imaging
  - Xray
- Treatment
  - Orthopedic emergency due to potential vascular compromise and sciatic nerve injury
  - Closed vs. open reduction

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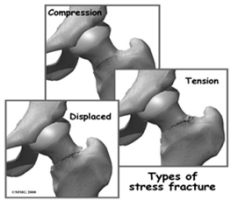
FEMORAL NECK STRESS FRACTURES

- High risk stress fracture
- Compression side
  - Inferior aspect of femoral neck, more stable
- Tension side (transverse)
  - Superior aspect of femoral neck, unstable
- Clinical
  - Groin pain exacerbated by activity, pain with FADIR, hop test
- Imaging
  - Xrays may be negative
  - Bone scan positive after 2-8 days
  - MRI
- Treatment
  - Compression type= NWB
  - Tension/transverse= Surgical ORIF



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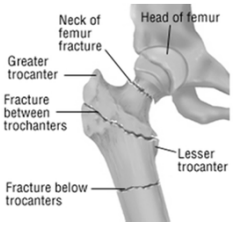
HIP FRACTURES

- Osteoporosis= risk fracture
- Non modifiable risk factors: Age,Sex,Race
- 60% occur in >75 years old
- Females>Male
- <u>3 main types</u>
  - Intracapsular
  - Intertrochanteric (most common)
  - Subtrochanteric

- High morbidity/mortality associated with surgery. Highest risk of PE 2nd-3rd week
- <u>Clinical</u>
  - Externally rotated, shortened limb
- <u>Treatment</u>
  - Often surgical
  - Hip replacement precautions= Avoid flexion past 90 degrees, adduction, and internal rotation



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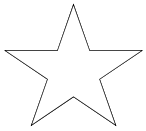
HIGH YIELD FACT

Lateral epicondylalgia most commonly affects the ECRB



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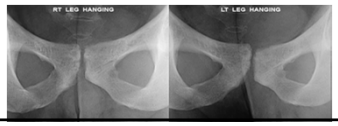
OSTEITIS PUBIS

- Periostitis/inflammation from repetitive use or avulsive trauma at pubic symphysis
- Instability of pubic symphysis
- Clinical
  - Pain over pubic symphysis, exacerbated by hip IR and adduction, "popping" sensation over pubic region while walking
  - Xray= sclerosis/erosive changes, symphyseal widening, instability of pubic symphysis on flamingo view
- Treatment
  - Relative rest
  - NSAIDs
  - Core/pelvic/hip girdle strengthening



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ATHLETIC PUBALGIA

- Chronic, refractory groin/lower abdominal pain in an athlete
- Group of diagnosis fall under term "sports hernia"
- Exact lesion differs
  - Abnormalities in rectus abdominis
  - Torn conjoint tendon
  - Tear of internal oblique
  - Avulsion of internal oblique from pubic tubercle
  - Tear/abnormality in external oblique
- Much more common in males
- Common in twisting sports and cutting at speed
  - Soccer, tennis, football, hockey
- Clinical
  - Pain groin/lower abd with resisted sit up or adduction
  - Exacerbated with valsalva, coughing, exercise

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ATHLETIC PUBALGIA

- Imaging
  - Xray to evaluate for avulsion
  - MRI may show bone marrow edema, thinning of fascial layers, increased signal in adductors or rectus
- Treatment
  - Relative rest
  - Correct biomechanics
  - Core strengthening
  - Stretch hip
  - If no improvement with conservative management= consider surgery

27

SLIPPED CAPITAL FEMORAL EPIPHYSIS

- Injury to epiphyseal growth plate at femoral head causing displacement
- Most common ages of incidence 11-16 years old
- Clinical
  - Groin pain, but may also present as thigh or knee pain
  - Antalgic gait
  - Limited internal rotation
  - Limb externally rotates when hip flexed
- Imaging
  - Xray and/or CT
- Treatment
  - Immediate NWB
  - Surgical stabilization
  - Rule out endocrine abnormalities

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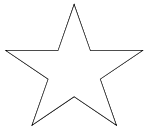
HIGH YIELD FACT

Kienbock's disease is avascular necrosis of the lunate



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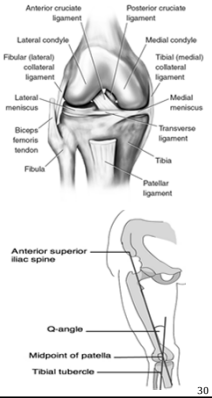
KNEE

- Modified hinge joint
- ROM
  - Extension/flexion: 0-135 degrees
  - Internal rotation: 10 degrees
- Genu varus/valgus/recurvatum
- Q angle
  - Formed by long axes of femur and tibia
  - Reflects valgus attitude of knee
  - Males 13 degrees
  - Female 18 degrees



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KNEE PHYSICAL EXAM/SPECIAL TESTS

- Meniscus: McMurray, Apley grind, Thessaly, Duck walk
- Patella: mobility, grind test, J sign
- Bonce home test
- Noble test
- Anterior/posterior drawer tests
- Lachman's test
  - More sensitive
- Varus/Valgus stress
  - Full extension and 30 degrees of flexion
- Dial test
  - Posterior lateral corner and PCL injuries

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KNEE OSTEOARTHRITIS

- Medial>Patellofemoral>Lateral
- Usually over age 50
- Hx of prior trauma may accelerate process
  - ACL tear
- Imaging
  - Xray: weight bearing, lateral and sunrise view
  - Asymmetric joint space narrowing
  - Osteophytes
  - Subchondral sclerosis
  - Subchondral cysts

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KNEE OSTEOARTHRITIS TREATMENT

Pharmacologic
- Oral
  - Tylenol
  - NSAID's
- Injectable
  - Steroids
  - Hyaluronic Acid
- Topical
  - Capsaicin
  - NSAID's
  - Lidocaine
  - Diclofenac gel

- Rehab
  - Exercises: Quad/hip abductor/core stabilization
  - Aquatic therapy
  - Orthotics
  - Assistive Devices
- Education
  - Activity modification
- Weight Loss
- Surgical referral for TKA

33

ANTERIOR CRUCIATE LIGAMENT (ACL)

- Attaches lateral intercondylar notch of femur to a point lateral to medial tibial eminence
- Prevents anterior translation of tibia relative to femur
- Limits medial rotation of femur when foot is fixed
- Prevents backward sliding of femur and hyperextension of knee
- Tightens with full extension and loosens in flexion
- In flexion, draws femoral condyles anteriorly
- ACL deficient knees= increased pressure on posterior meniscus

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ACL INJURIES

- Most commonly injured knee ligament in athletics
- Mechanism= cutting, deceleration, and hyperextension of knee
- Non-contact injuries more common
- >50% of ACL tears occur with meniscal tears
- O'Donoghue's triad
  - ACL, MCL, MM vs LM (controversial)
  - Medial meniscus has attachment with MCL

35

ACL INJURIES

- Clinical
  - "Pop", instability, effusion
  - Anterior drawer
  - Lachman's= false negative 10% of cases. Examiner dependent, influenced by muscle guarding (hamstrings)

- Imaging
  - Xray may show avulsion fx at lateral tibial plateau (*Segond fracture*)
  - MRI= "kissing contusions"

- Treatment
  - Initially partial wt. bearing, ice, compression
  - Rehab to regain ROM
  - Consider Reconstruction

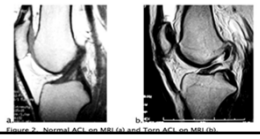

Figure 2. Normal ACL on MRI (a) and Torn ACL on MRI (b).

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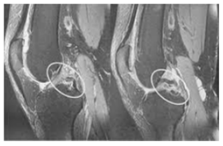
POSTERIOR CRUCIATE LIGAMENT (PCL)

- Most frequent cause= impact anterior tibia with knee flexed (dashboard injury)
  - Also can result from hyperextension injury
- Clinical
  - Posterior drawer, sag test (quad spasm may cause false negative)
- Imaging
  - Xray may show avulsion
  - MRI less accurate than for ACL, arthroscopy more accurate than MRI
- Treatment
  - Surgery if avulsion of tibia present
  - Surgery often not needed in isolated PCL tear
  - Focus on quad strengthening



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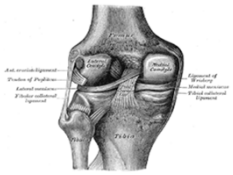
ARCUATE POPLITEAL LIGAMENT COMPLEX (APLC)

- Provides attachment for posterior horn of lateral meniscus
- Reinforces lateral aspect of knee
- Gives posterior lateral rotary stability
- Restraint for posterior tibial subluxation
- Attachment may be mistaken for tear of posterior horn lateral meniscus on MRI



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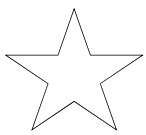
HIGH YIELD FACT

A hip pointer is a contusion of the iliac crest

Ulnar (medial) collateral ligament is the most common elbow ligament injury in baseball pitchers



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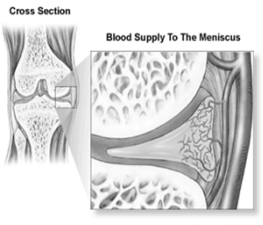
MENISCI OF THE KNEE

- Deepen articular surfaces of tibia to provide stability for femoral condyles
- Fibrocartilage
- Peripheral *outer third well vascularized*
- *Inner two-thirds not well vascularized* and usually cannot be surgically repaired



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MENISCI OF THE KNEE

Lateral
- Nearly circular
- Covers larger area than medial meniscus
- Joined to medial femoral condyle by posterior meniscofemoral ligament

Medial
- Longer
- "C" shaped
- Peripheral border adherent to medial collateral ligament
- Injured more often compared to lateral menisci

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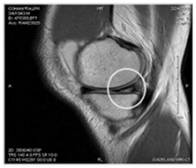
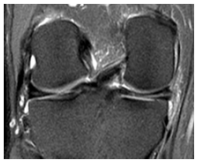
MENISCAL INJURIES

General:
- Medial: cutting injuries, tibial rotation w/ KF during weight bearing (soccer, football)
- Lateral: squatting, full flexion w/ rotation (wrestling)



Clinical:
- Acute: "pop", effusion, locking (bucket handle tear)
- Degenerative: >40yo, minimal trauma
- Duck walk, Thessaly, McMurray, Apley

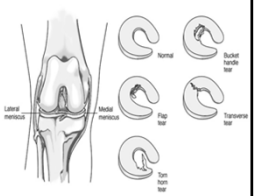


42

MENISCAL INJURIES

Imaging: MRI

Treatment:
- Consider surgery if:
  - Persistent pain, mechanical or recurrent symptoms
- Inner 2/3 of meniscus not well vascularized, may need surgical debridement of damaged tissue (WB in 1-2 days)
- Outer 1/3 can be repaired (WB in 4-6 weeks)
- Rehab: quad strengthening/knee stabilization



43

MEDIAL COLLATERAL LIGAMENT TEARS

General:
- Impact to lateral knee or sustained valgus force
  - Football, skiing
- MCL is extra-articular

Clinical: Medial instability, valgus stress
Imaging:
- X-ray may reveal Pellegrini-Stieda Lesion: post traumatic ossification at origin of med femoral condyle (avulsion or repetitive vs chronic injury)
- MRI to delineate MCL tear and associated injuries

Treatment:
- Brace, rehab to focus on strengthening/stability
- Rarely require surgery

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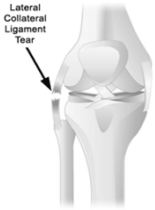
LATERAL COLLATERAL LIGAMENT TEARS

- Varus force to knee
- Can result from knee dislocations
- Evaluate for associated vascular and fibular nerve injuries
- Rare to have isolated LCL tears
- Can be involved in posterolateral corner injuries
  - LCL, popliteus tendon, popliteofibular ligament, lateral capsule, arcuate ligament, biceps femoris, lateral head of gastroc, iliotibial tract, fibular nerve



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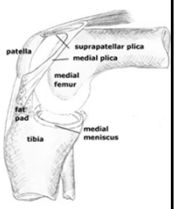
PLICA SYNDROME

- Plica is a normal fold of the synovium
- Medial, suprapatellar, and infrapatellar plica can become inflamed from trauma or malalignment
- Clinical
  - Anterior knee pain
  - Insidious onset
  - Sensation of popping or buckling if plica is trapped
  - Snapping with knee ext/flexion
- Imaging
  - MRI
- Treatment
  - PT
  - Surgical excision if conservative management fails



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OSTEOCHONDRITIS DISSECANS

- Osteonecrosis of subchondral bone
  - +/- articular cartilage involvement
- Can have mechanical symptoms from loose body
- Usually involve <u>medial femoral condyle</u>
- Primarily affects adolescents
- Non-operative
  - If overlying cartilage is intact
  - Not at skeletal maturity yet
  - Activity modification
  - Immobilization
- Operative
  - Debridement, microfracture, autologous chondrocyte implantation, osteochondral graft

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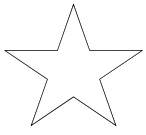
HIGH YIELD FACT

Lateral scapular winging may indicate injury to the spinal accessory nerve (Trapezius innervation)



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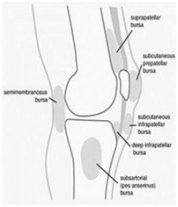
KNEE BURSITIS

- Prepatellar (housemaid's)
  - •Rule out septic bursitis
- Pes anserine
  - Sartorius, Gacilis, Semitendinosis
- No instability on exam
- Normal x-ray
- Rest, rehab to balance forces across the knee
- Consider aspiration/steroid inj



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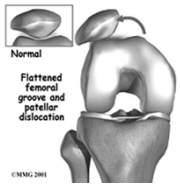
PATELLAR RELATED INJURIES

- Stability of patella depends on
  - Depth of intercondylar groove
  - Proper contour of patella
  - Adequate muscular control
  - Ligamentous stability
- Patellofemoral forces increase with knee flexion
  - Walking= 0.5x body weight
  - Stairs= 3.3x body weight
  - Squatting= 6.0x body weight



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PATELLOFEMORAL PAIN SYNDROME

- AKA runner's knee
- **General:**
  - Insidious onset of diffuse achy anterior knee pain
  - Increases with prolonged sitting, down stairs, jumping, squatting
  - May have patellofemoral malalignment or some degenerative changes
  - Inappropriate patellar tracking
- **Clinical:**
  - Patellar compression tests, J sign
  - Position of patella
  - Q angle
  - Tight lateral retinaculum/ VMO dysplasia/weakness
  - Poor gluteal muscle control: weak hip abductors
- **Imaging:**
  - X-ray to view patellar position
  - Advanced imaging if needed to r/o other etiologies

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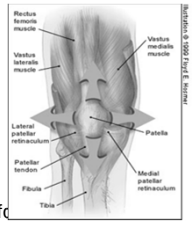
PATELLOFEMORAL PAIN SYNDROME

Treatment

- Reduce pain/ inflammation
  - •NSAIDS, Modalities
- VMO strengthening
- Strengthening hip abductors
- Stretching
- Taping
- Bracing
- Correction of abnormal biomechanics (fo overpronation)
- Surgery rarely required
  - May involve lateral release of knee capsule and retinaculum, patellar realignment, patellar tendon transfer, patellectomy



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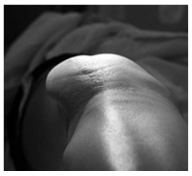
RECURRENT PATELLAR SUBLUXATION

General:

- Less prominent lip or more promient medial lip
- Patella will dislocate laterally
- Increased genu valgum/varum/recurvatum
- VM weakness, tear of medial retinaculum



Clinical:

- Patella may be displaced acutely
- Effusion/hemarthrosis

Imaging:

- X-ray (3 views) to see position of patella
- Consider MRI to further evaluate for loose body or osteochondral defect

Treatment: conservative vs surgical

- Rehab, taping, bracing

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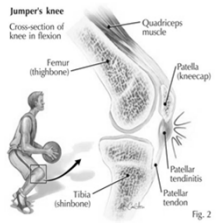
PATELLA AND QUADRICEPS TENDINOPATHY

- "Jumpers knee"
- Overuse syndrome involving the insertion of the tendons into the patella
- Most common site of involvement is the inferior pole of the patella
- Rehab proximal and distal strength
- Patellar tendon strap
  - Counter force brace



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PATELLAR OR QUADRICEPS TENDON RUPTURE

General:

- Forceful quad contraction with foot planted, flexed knee

Clinical:

- Palpable defect
- Hematoma/ecchymosis
- Unable to extend knee
- Evaluate for patellar movement to determine which tendon injured

Treatment:

- Place in knee immobilizer with crutches
- Early surgical repair for best results

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IT BAND FRICTION SYNDROME

- **General:**
  - ITB slides over lateral femoral condyle w/ KF/KE
  - Extends from TFL to insert on Gerdy's tubercle on lateral tibia
  - Tightness of ITB and adductor/abductor imbalance
- **Clinical:**
  - Pain over lateral femoral condyle, worse with running/walking/cycling
  - Ober's, Noble's test
- **Imaging:**
  - Generally not needed
- **Treatment:**
  - Stretching ITB, HF, gluteus max
  - Strengthen hip adductors, gluteus max, TFL
  - Improving dynamic leg stability
  - Orthotics to correct overpronation

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LEG CONDITIONS

- Medial tibial stress syndrome
- Tibial stress fracture
- Acute compartment syndrome
- Chronic exertional compartment syndrome
- Popliteal artery entrapment syndromes

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STRESS FRACTURES

- Stress Fracture
  - Overuse injury to bone
  - Repetitive stresses
  - *Imbalanced* remodelling: osteoclast > osteoblast
  - Torsional and compressive stresses from repetitive loading result in microfracture
  - Microfractures consolidate into a full cortical break

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TIBIAL STRESS FRACTURE

- Most common stress fracture
- 90%+ involve posteromedial aspect
  - Low risk
  - High risk= anterior cortex
- Most common site middle to distal third of tibia
- Local tenderness posteromedially
- Positive single leg hop test
- Imaging
  - Xray may be normal
  - MRI study of choice
- Treatment
  - If medial tibia
    - Rest
    - Walking boot
    - Rehab
  - If anterior tibia
    - Surgery

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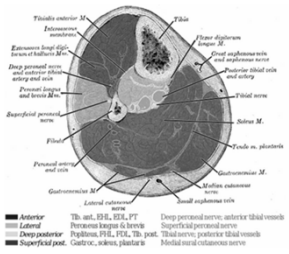
CHRONIC EXERTIONAL COMPARTMENT SYNDROME

- **General:**
  - Most common in distance runners
  - Cramping, tightness, numbness or weakness w/activity
    - Usually after predictable time or distance
  - Anterior compartment most common
- **Clinical:**
  - Compartment pressure to establish dx:
    - Preexercise ≥15 mm Hg
    - 1 minute post ≥30 mm Hg
    - 5 minute post ≥20 mm Hg
- Fasciotomy if no response to conservative management



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MEDIAL TIBIAL STRESS SYNDROME

- Soleus attaches to medial tibia
  - actively inverts the calcaneus and eccentrically contracts to resist pronation
- In excess, muscle induced traction on the periosteum of posteromedial border of the tibia
- Other muscles also involved
  - posterior tibialis, flexor hallicus longus and peroneus longus
- ***Diffuse*** pain along posteromedial border of tibia
- Dull, aching pain
- Usually decreases with warming up in earlier stages
- Athlete usually reports sudden increase in frequency, intensity, duration of activity
- More focal pain should make you think of stress fracture

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MEDIAL TIBIAL STRESS SYNDROME

- Imaging
  - Xrays
    - Routinely negative
    - Careful inspection may reveal periosteal reaction
- Bone Scan
  - Patchy, diffuse areas of increased uptake along medial border of tibia
  - Stress fx will show focal uptake
- MRI
  - Diffuse periosteal edema, marrow involvement
  - Surrounding soft tissue changes
- Treatment
  - Rest
  - Pain control NSAIDs/Tylenol
  - Correct abnormal biomechanics
  - PT
  - Gradual return to play
  - If no improvement, rule out deep posterior CECS

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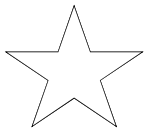
HIGH YIELD FACT

Weight bearing is usually immediate following ACL reconstruction

Dupuytren's contracture is a thickening of the palmar fascia



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PEDIATRIC CONSIDERATIONS

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PEDIATRIC HIP DISORDERS

- Developmental dysplasia of the hip (DDH)
- Legg-Calve-Perthes disease
- Slipped capital femoral epiphysis (SCFE)
- Septic arthritis

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PRESENTATION

- Kid presents with a limp or achy pain
- May complain of knee pain, rather than hip pain
- Septic joints may or may not have a fever
- Internal rotation ROM is lost first

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LEGG CALVE PERTHES VS. SCFE

Legg Calve Perthes

- Idiopathic osteonecrosis
- Disruption of blood flow to femoral head
- 4-10 yo, M>F
- Unilateral
- Treatment= Rest, +/- abduction bracing
- May require surgery

SCFE

- Injury to epiphyseal plate
- Femoral head displacement/slip
- 11-14 yo, overweight males
- Bilateral in 50%
- Leg rests in flexion/ER
- Prompt surgical referral

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APOPHYSEAL INJURIES

- **Apophysis=secondary ossification center**
  - Where muscle-tendon unit attaches
  - Close at varying times depending on location (pelvis last)
  - The weakest link
- **Chronic overuse injury**
  - Bones grow more quickly, but are weaker than the muscles/tendons
  - Starts with inflammation, can lead to microfracture
  - Localized pain, tenderness, swelling
  - Improves with rest, time, PT

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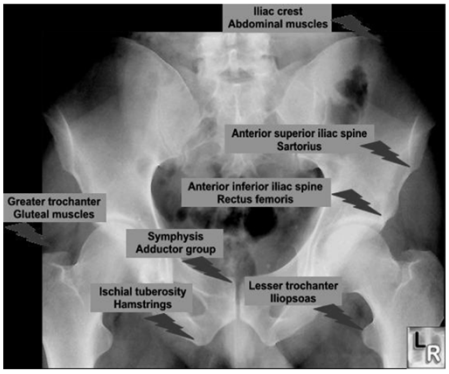
AVULSION/APOPHYSEAL INJURIES



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COMMON APOPHYSEAL INJURIES

- Osgood-Schlatter= Tibial tubercle
- Sinding-Larson-Johansson= Inferior pole of patella
- Abdominals = iliac crest
- Rectus femoris = AIIS
- Sartorius = ASIS
- Hamstrings = ischial tuberosity
- Bilateral films for comparison
- Usually resolve when growth plate closes
- Relative rest and rehab
- Surgery for displaced apophysis greater than 2 cm

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Thanks and Good Luck!!

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Review of Lower Extremity: Foot and Ankle

Elena Jelsing, MD
Clinical Assistant Professor
University of Washington
UW Medicine Sports and Spine

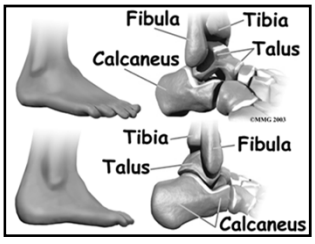
Overview

1. Ankle and foot functional anatomy and biomechanics
2. Anatomic based differential diagnosis
   a. Epidemiology
   b. Clinical presentation
   c. Management strategies

KEY CONCEPT

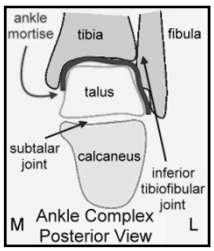
Ankle: Functional Anatomy and Biomechanics

Three joints
1. Talocrural (tibiotalar)
2. Distal tibiofibular
3. Subtalar

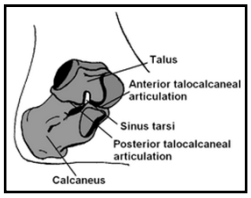


Talocrural Joint

- Dorsiflexion
  - Very stable due to bony articulations
- Plantarflexion
  - Trochlea (of the talus) moves anteriorly in the tibial mortise, lessening bony stability
  - Creates more reliance on ligamentous stability



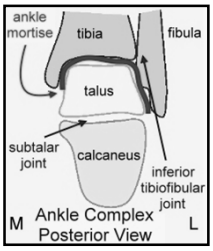
Talus



- Body
  - Three continuous facets for articulations
    - Superior: tibia
    - Lateral and medial: malleoli
  - Trochlea (superior surface)
- Posterior process:
  - Medial and lateral tubercles form a groove for the FHL tendon
  - Os trigonum: un-united lateral tubercle
- Lateral process:
  - Snowboarders fracture

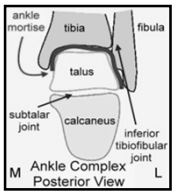
Distal Tib-Fib Joint

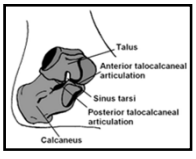
- Small amount of rotation
- Inferior tibio-fibular ligament
  - The syndesmosis
  - "high ankle sprain"



Subtalar Joint

- Between talus and calcaneus
- Anterior & posterior articulations separated by the sinus tarsi
- Inversion and eversion
- Excessive or delayed motion
  - Risk factor for running injuries
- Function:
  - Shock absorption
  - Allows foot to accommodate to uneven ground
  - Transmits forces efficiently

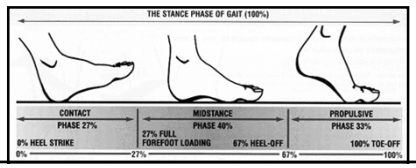




Pronation ✪ Supination

- Triplanar motion
  - Ankle dorsiflexion
  - Subtalar eversion
  - Forefoot abduction
- Assists ankle and knee with impact shock absorption
- Making the foot a relatively mobile, adaptive structure

- Triplanar motion
  - Ankle plantarflexion
  - Subtalar inversion
  - Forefoot adduction
- Locks the hind and midfoot to act as a rigid lever
  - At heelstrike and push-off



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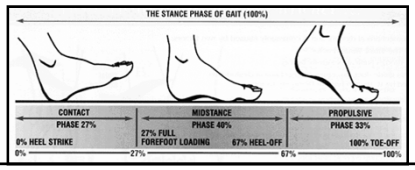
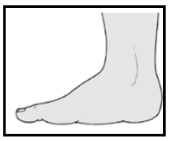


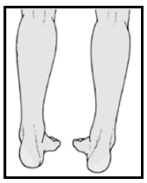
Pronation in the Kinetic Chain

primarily eccentric muscle contractions to provide joint control and shock absorption

- Ankle dorsiflexion ✪
- Tibial internal rotation
- Knee flexion & adduction (valgus)
- Femoral internal rotation
- Hip flexion & adduction
- Pelvis rotates anteriorly



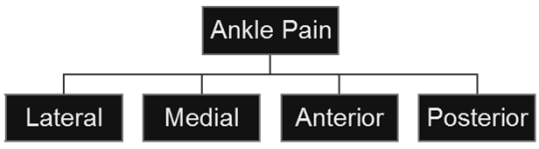
Supination in the Kinetic Chain



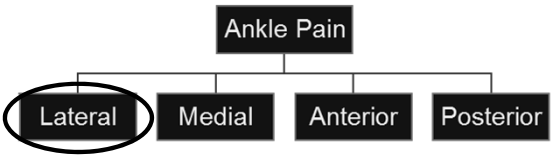
primarily concentric muscle contractions (gluteals!) to provide acceleration and propulsion

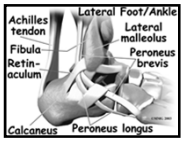
- Ankle plantarflexion ✪
- Tibial external rotation
- Knee extension & abduction (varus)
- Femoral external rotation
- Hip extension & abduction
- Pelvis rotates posteriorly

Differential Diagnosis



Differential Diagnosis

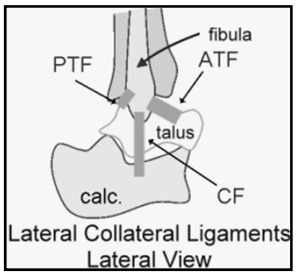




1. Lateral Ankle Sprain
2. Peroneal tendon tendinopathy / subluxation
3. Lateral soft tissue impingement
4. Sinus tarsi syndrome (subtalar ligament sprain)
5. Osteochondral talus injury

Lateral Ligaments

- ATFL
  - Prevents:
    - Anterior talar translation in DF
    - Inversion when in PF
  - Weakest: most commonly torn
- CFL
  - Prevents inversion at talocrural
- PTFL
  - Prevents posterior talar translation
  - Strongest
  - Taut only in extreme dorsiflexion; sprained only in severe ankle sprains



Lateral Ankle Sprain

- Inversion, supination, & plantarflexion
- Grading
  - I - ligamentous stretching, no gross tear
  - II - partial ligamentous tearing
  - III - complete ligamentous rupture
    - ATFL solely - 65%
    - ATFL + CFL - 20%

Provocative maneuvers

Palpate for tenderness:

- Ligaments
- Malleoli
- Talus
- Fibula - distal and proximal
  - Maisonneuve fracture
- Base of the 5th metatarsal
- Peroneal tendons

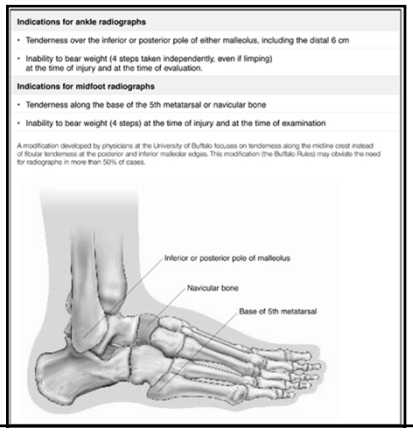
Anterior drawer - ATFL

Talar tilt (inversion test) - CFL

Van Dijk 1996 JBJS Br

delay PxEx 5 days to improve sensitivity and specificity

Ottawa Ankle Rules



Ankle Sprain: treatment

1. Reduce pain and swelling: PRICE
   a. Functional, removable brace (air splint) to control inversion/eversion generally recommended over rigid immobilization (walking boot), except for maybe grade III injuries
   b. WBAT if no associated fractures
2. Rehabilitation
   a. Restore ROM
   b. Restore neuromuscular control - esp. peroneals
   c. Strengthen
   d. Proprioceptive training - for balance and postural control (wobble board)
3. Functional training
   a. Once pain-free, full ROM, strength > 75%, adequate proprioception and balance
   b. To increase power and neuromuscular control in multiple planes
   c. Plyometrics, agility drills, closed chain single leg exercises
4. Return to sport
5. Surgical management: Rare (Modified Brostrom Procedure)
   a. For grade III injuries after rehab has failed and other causes of pain have been ruled out

Ankle Sprain: treatment ✪

KEY CONCEPT

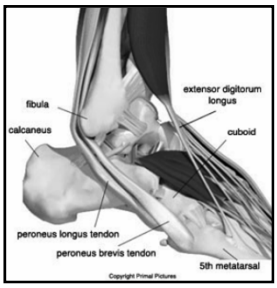
1. Reduce pain and swelling: PRICE
   a. Functional, removable brace (air splint) to control inversion/eversion generally recommended over rigid immobilization (walking boot), except for maybe grade III injuries
   b. WBAT if no associated fractures
2. Rehabilitation
   a. Restore ROM
   b. Restore neuromuscular control - esp. peroneals
   c. Strengthen ECCENTRIC ANKLE EVERTER STRENGTHENING
   d. Proprioceptive training - for balance and postural control (wobble board)
3. Functional training
   a. Once pain-free, full ROM, strength > 75%, adequate proprioception and balance
   b. To increase power and neuromuscular control in multiple planes
   c. Plyometrics, agility drills, closed chain single leg exercises
4. Return to sport
5. Surgical management: Rare (Modified Brostrom Procedure)
   a. For grade III injuries after rehab has failed and other causes of pain have been ruled out

Chronic Pain and Functional Loss after Ankle Sprain

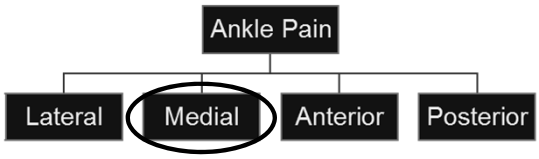
1. Inadequate rehabilitation
2. Other sources?
   a. Talar dome injury
      i. 7-22% of ankle sprains
      ii. Commonly missed on initial evaluation
   b. Other osteochondral injury
   c. Peroneal tendon involvement
   d. Lateral soft tissue impingement
      i. Scarring or synovial hypertrophy from severe sprain or recurrent strains
3. Imaging: MRI

Peroneal tendinopathy

1. Excessive pronation and eversion
2. Pain with resisted eversion
3. Treatment
   a. Rehabilitation
   b. Foot orthoses to limit pronation
4. Subluxation
   a. Can occur after acute dorsiflexion-eversion stress
   b. Peroneal retinaculum tears or incompetence
   c. Tendon subluxes anteriorly to lateral malleolus
   d. Treatment
      i. Injections
      ii. Limit weightbearing
      iii. Surgery



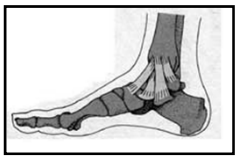
Differential Diagnosis

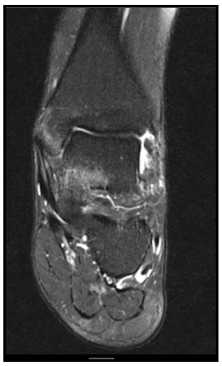


1. Deltoid ligament sprain
2. Posterior tibialis tendinopathy
3. FHL tendinopathy
4. Navicular stress fracture
5. Medial calcaneal nerve entrapment
6. L4 radiculopathy

Medial Ligaments

- Deltoid
  - Tibionavicular
  - Anterior tibiotalar
  - Posterior tibiotalar
  - Tibiocalcaneal
- Attaches medial malleolus to the talus, navicular, and calcaneus





Deltoid Ligament Sprain

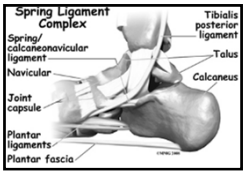
1. Less common injury
2. Eversion stress or forced ER on planted foot
3. Associated fractures common
4. Rehabilitation and return to play course is protracted

Posterior Tibialis Tendinopathy

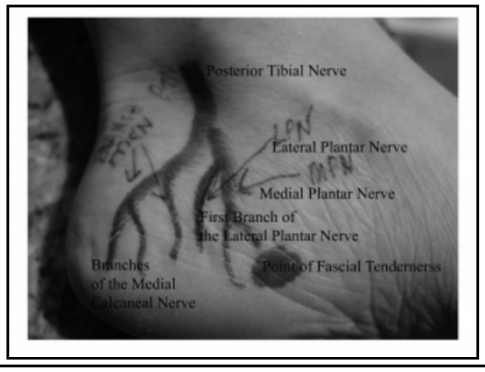
1. Passes behind medial malleolus and inserts on navicular
2. Controls descent of the medial longitudinal arch
3. Worsened by excessive pronation from rapid increase in training intensity or poor footwear
4. Provocative maneuver: resisted inversion
5. Management
   a. Rest, rehabilitation
   b. Proper foot wear +/- orthosis that controls pronation
   c. Surgical if complete tear due to the effect on the arch

Medial Longitudinal Arch

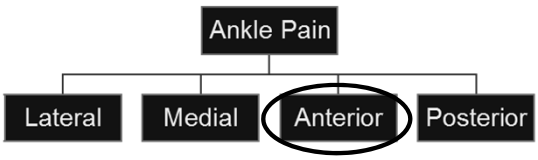
1. Posterior Tibialis
   a) Dynamic stabilizer of MLA
2. Spring Ligament: plantar calcaneo-navicular ligament
   a) Connects calcaneus to navicular along plantar surface
   b) Supports the head of the talus
   c) Static stabilizer of MLA



Medial calcaneal neuropathy & Tarsal tunnel syndrome



Differential Diagnosis



1. Anterior ankle impingement
2. High ankle (syndesmosis) sprain
3. EHL tendinopathy
4. Tibialis anterior tendinopathy
5. Osteochondral talar dome injury
6. L5 radiculopathy

Anterior Impingement

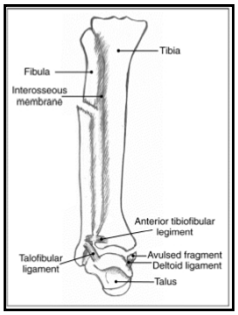
1. Soccer (kicking) and Ballet (plie/lunge)
2. Forced dorsiflexion
3. Bony lip develops on the anterior tibia or the anterior superior talus
4. Impinge on overlying soft tissue or each other
5. Provocative maneuver: extreme DF (lunge)
6. Management:
   a. Rest, rehabilitation, talocrural mobilization
   b. Surgical excision

Syndesmosis Sprain

1. High ankle sprain
2. Associated with fractures
3. Provocative maneuver: External Rotational Stress Test & Squeeze test
4. Grade III tears
   a. Tib-Fib widening on plain films
   b. Associated fracture
5. Management
   a. Grade I-II: rest, protracted rehabilitation
   b. Grade III: cast immobilization or surgical

Maisonneuve Fracture

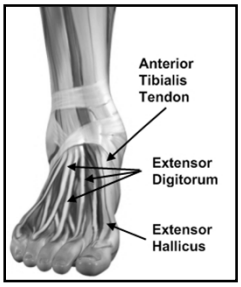
- Rupture of anterior tibiofibular ligament, interosseus membrane, and medial deltoid ligament
- May result in proximal fibular fracture



TA and EHL tendinopathy

Multiple causes:

- dorsiflexion overuse secondary to talocrural joint restriction
- running downhill
- tight shoelaces

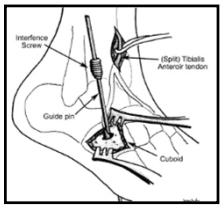


SPLATT

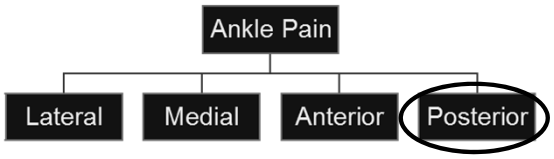
Split Anterior Tibialis Tendon Transfer
(spasticity management)

Surgically divide AT tendon to move the lateral half attachment to cuboid and 3rd cuneiform:

- to correct equino-varus deformity
- spastic gastroc/soleus and AT
- foot is plantarflexed, inverted, and supinated
- creates an eversion force
- in conjunction with achilles lengthening



Differential Diagnosis



1. Achilles tendinopathy / rupture
2. Retrocalcaneal bursitis
3. Haglund's syndrome
4. Posterior ankle impingement
5. Sever's disease
6. S1 radiculopathy

Achilles tendinopathy

1. Common in runners, particularly older age group
2. Most tender area 2-6 cm above the calcaneal insertion
3. Biomechanical factors
   a. Excessive pronation
   b. Subtalar joint restriction
   c. Limited ankle dorsiflexion
   d. Weak gastroc-soleus
4. Clinical diagnosis; MRI and US can evaluate for tear/rupture
5. Thompson's test for rupture

Achilles Rupture: Thompson's Test

Management of Achilles tendinopathy

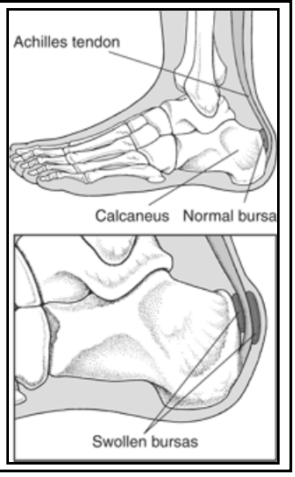
- Rest, immobilization, rehabilitation
- Correct contributing biomechanical faults
- Eccentric calf strengthening
- Percutaneous procedures

Management of Achilles tendinopathy

KEY CONCEPT

- Rest, immobilization, rehabilitation
- Correct contributing biomechanical faults
- Eccentric calf strengthening

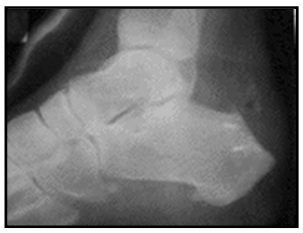
Retrocalcaneal Bursitis



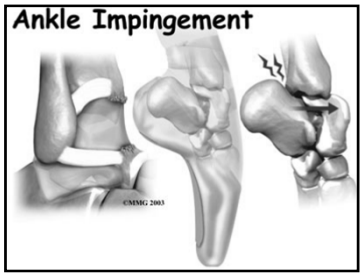
Haglund's syndrome

- Retrocalcaneal bursitis and achilles tendonitis in association with a retrocalcaneal exostosis or prominent posterior superior calcaneus (Haglund's deformity)

Haglund's Syndrome

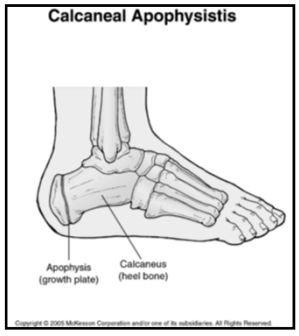


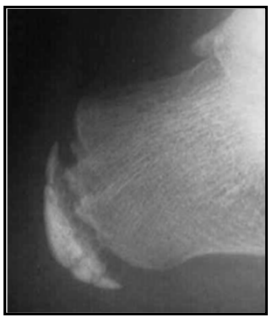
Posterior Impingement



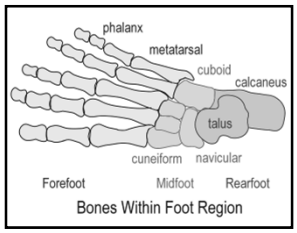
Os Trigonum

Sever's Disease





Foot: Functional Anatomy & Biomechanics



Rearfoot

- calcaneus, talus, soft tissues

Midfoot

- navicular, cuneiforms, cuboid, soft tissues

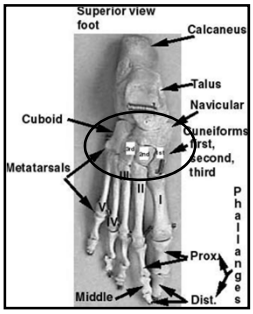
Forefoot

- metatarsals and phalanges

Lisfranc Chopart

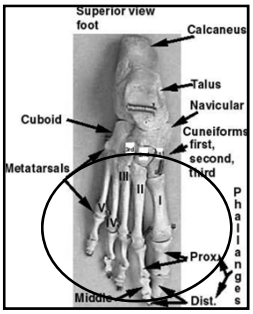
Midfoot

- Navicular, cuneiforms, cuboid
- Very little motion, in isolation
- Working together
  - Accomodation to the ground
- Common injuries
  - Stress fractures
  - Ligamentous injuries



Forefoot

- Metatarsals & phalanges
- Tarsometatarsal joints = Lisfranc's joints
- Base of 2nd metatarsal
  - in a recessed position as it articulates with the 2nd cuneiform
  - Thus, inherently more rigid → ↑susceptibility to stress fractures
- 5th metatarsal
  - More mobile
  - Less common as a site of stress fx
  - When one does occur, healing may be protracted due to mobility



Forefoot

KEY CONCEPT

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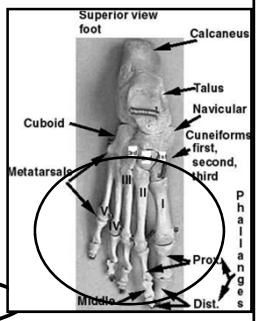
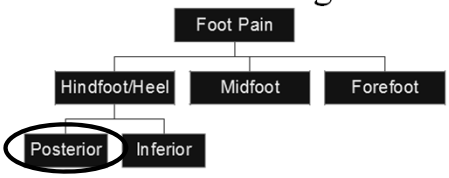


Differential Diagnosis



1. Achilles tendinopathy / rupture
2. Retrocalcaneal bursitis
3. Haglund's syndrome
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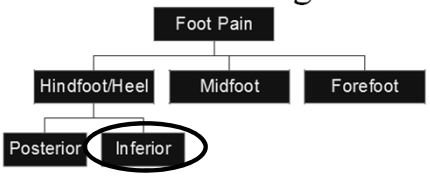
Differential Diagnosis



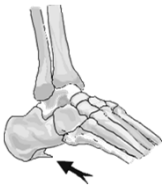
1. Plantar fasciitis
2. Fat pad contusion
3. Calcaneal stress fracture
4. Tarsal tunnel syndrome
5. Medial calcaneal nerve entrapment
6. S1 radiculopathy

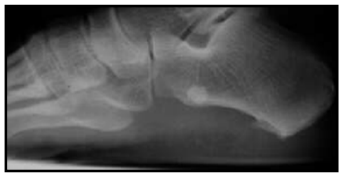
Plantar Fasciitis

- 11-15% of all adult foot symptoms seeking medical care
- 10% of all running injuries
- Bilateral in 15-30%
- Peak incidence: Bimodal
  - General population: 40-60 yo
  - Runners: much younger
- Pain at the anteromedial process of medial calcaneal tubercle
- Worse with first few steps in a.m. and later at end of day
- 80% of resolve within one year

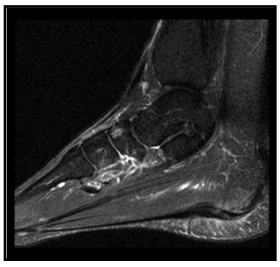
Plain films

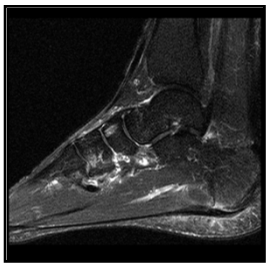
- Rule out calcaneal stress fracture
- Spondyloarthropathy: "fluffy periostitis"
- Can visualize heel spurs
  - Robin 1963
    - of 125 pts with heel spurs, only 10% were symptomatic





MRI



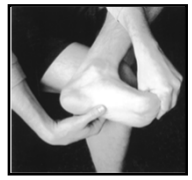


Risk Factors (JBJS 2003)

- Decreased ankle DF (tight calves)
  - < 0º DF has 23x risk of > 10º DF
- Obesity
  - BMI > 30 has 6x risk of < 25
- Occupations requiring prolonged standing
- Repetitive microtrauma
  - In runners

Treatment

- Rest- Limit offending activities
- Shoe modification- Heel cups, gel inserts, orthotics
- Night splints
- Taping
- Immobilization
- PF stretching
- Calf stretching
- Intrinsic foot strengthening
- Manual friction massage
- Corticosteroid injection/PRP



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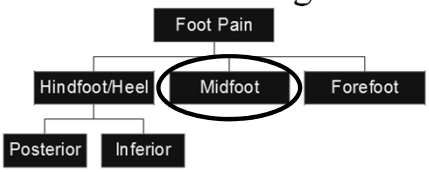
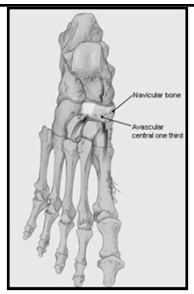


1. Posterior tibialis tendinopathy
2. Peroneal tendinopathy
3. Tarsal fracture (navicular)
4. Cuboid subluxation
5. Anterior tarsal tunnel syndrome

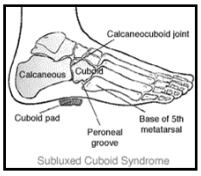
Navicular Stress Fracture

1. Common in runners ✪
2. Vague midfoot pain
3. Tenderness over the proximal, dorsal surface of navicular
4. MRI or Bone Scan + CT
5. Management
   a. NWB (cast) x 6 weeks
   b. Post-immobilization rehab
   c. Worry about non-union central third



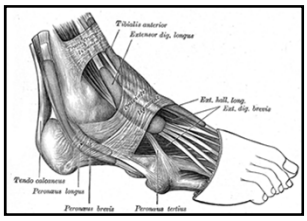
Cuboid Subluxation

1. Associated with peroneal tendinopathy
2. Caused by excessive traction of the peroneus longus
3. Commonly seen in overpronators
4. Cuboid is subluxed medially
5. Treatment
   a. Manipulation of the cuboid in an upward and lateral direction
   b. Treat peroneal tendon issue if present

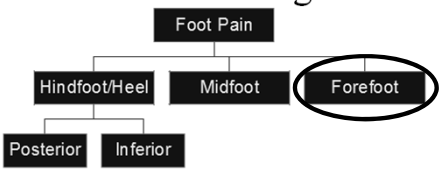


Anterior Tarsal Tunnel Syndrome

- Entrapment of the deep peroneal nerve under the extensor retinaculum
- Aching and numbess of the dorsal midfoot, extending to the first web space
- Cause: poor fitting shoes



Differential Diagnosis



1. Metatarsalgia
2. Metatarsal stress fractures
3. Morton's neuroma
4. Sesamoiditis / stress fracture
5. Turf toe
6. Gout
7. Hallux valgus
8. Hallux rigidus

Metatarsalgia

1. Diagnosis of exclusion
2. Potentially related to excessive pronation and further stress on the 1st and 2nd metatarsal heads
3. Management
   a. Metatarsal pad
   b. Orthosis with a cut-out for the painful metatarsal head

Metatarsal Stress Fractures

1. Common in runners & ballet, females > males
2. Second > third
3. 2nd metatarsal head is relatively immobile as it is tucked between the medial and lateral cuneiforms
4. Treatment
   a. Relative rest until pain free
   b. If walking is painful - NWB
   c. Stiff soled shoe or walking boot
   d. Average return to sport is 8 weeks (variable)

Metatarsal Stress Fracture

1 week after symptom onset

Week 6

5th Metatarsal Fractures

1. Jones fracture
   a. Diaphyseal-metaphyseal jxn fracture
   b. Inversion/plantarflexion injury vs. overuse
   c. NWB cast x 6-8 weeks vs. screw fixation
2. Tuberosity at the base
   a. Peroneus brevis avulsion injury after an acute ankle sprain
   b. Immobilization for pain relief then protect mobilization and rehabilitation
3. Spiral fracture of the distal third
   a. Non-displaced: weight-bearing rest
   b. Displaced: 4-6 weeks of cast immobilization

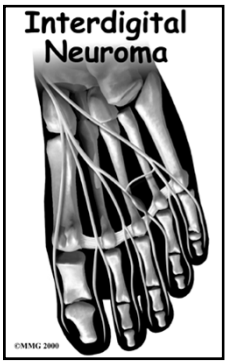
Stress Fractures Summary

High Risk	Low Risk
Medial malleolus	Distal fibula
Navicular	Metatarsal shaft
Proximal 5th metatarsal	
Sesamoids	

Harrast MA, Colonno D. *Stress Fractures in Runners* in Clinics in Sports Medicine 2010, 29(3): 399-416

Morton's Neuroma

1. Swelling of nerve and scar tissue around the interdigital nerves
2. Usually between 3rd-4th MT
3. Toe pain and paresthesias, worsened with weightbearing and narrow fitting shoes
4. Metatarsal hypermobility may contribute
5. Management
   a. Metatarsal pad - to distribute forces more evenly
   b. Intrinsic strengthening to improve transverse arch
   c. Corticosteroid injection
   d. If excessive pronation, orthosis
   e. Surgical excision



Sesmoid injuries

1. Act as pulleys for the FHB tendons and stabilize the first MTP joint
2. Bipartite sesmoid prevalence: 30%
3. Potential injuries
   a. Stress fracture
      i. Difficult to see on plain films
      ii. Prone to non-union
      iii. NWB X 6 weeks
   b. Sesmoiditis
      i. Sprain of bipartite sesmoid
      ii. Sprain of sesmoid-MT articulation

Turf Toe

1. First MTP joint sprain
2. Excessive forced dorsiflexion
3. Incidence increased with the use of non-slip artificial turf
4. Plain film appropriate to r/o fracture
5. Management
   a. Relative rest, protected weightbearing
   b. Taping and stiff-soled shoes

Recognizing Rheumatologic Disease in Adults

Grant Hughes, MD
Assistant Professor
Fellowship Program Director, UW Division of Rheumatology
Rheumatology Section Head, Harborview Medical Center

Topics

- Rheumatoid Arthritis
- Spondyloarthritis (ankylosing spondylitis)
- Osteoarthritis
- SLE
- Gout
- Vasculitis

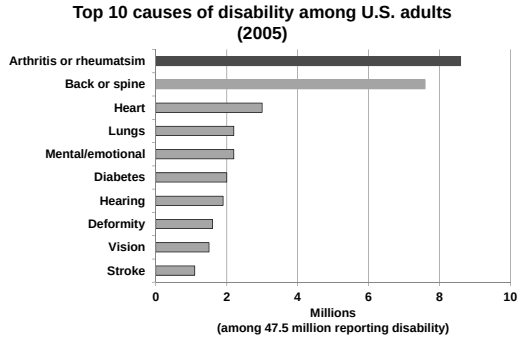
Case – 55 yo woman with knee pain

- A 55-year-old postal worker with a 1-year history of increasing left knee pain and decreasing ability to ambulate arrives at your office. Her history is significant for 15 minutes of morning stiffness and a left medial meniscal tear that was repaired arthroscopically 5 years ago.
- Her exam is significant for a BMI of 35, left knee varus deformity, and mild quadriceps weakness.
- Her radiograph demonstrates medial compartment narrowing and bony sclerosis.

What is the most likely cause of her knee pain?

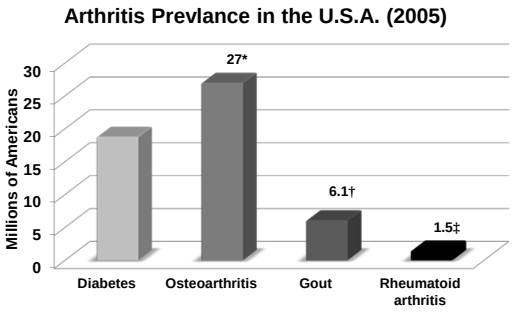
A. Rheumatoid arthritis
B. Osteoarthritis
C. Parvovirus B19 infection
D. Pseudogout (calcium pyrophosphate deposition disease)

Arthritis/Rheumatism Most Common Cause Of Disability IN U.S.



U.S. Census Bureau. *MMWR* 2009;58(16):421-426

The Big 3



* *Arthritis Rheum* 2008;58(1):26–35
† *Arthritis Rheum* 2008;58(1):26–35
‡ *Arthritis Rheum*. 2010 Jun;62(6):1576-82

Diagnosing osteoarthritis (OA)

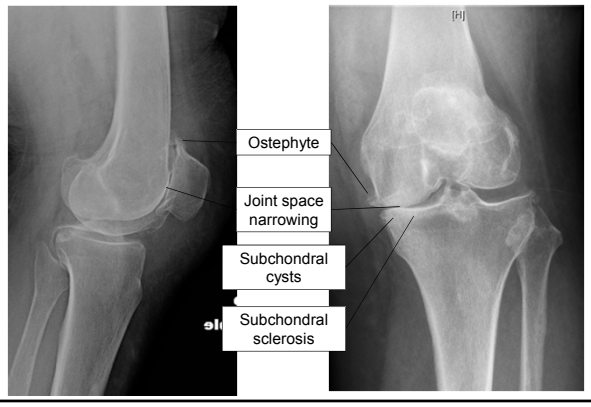
- **History**
  - Persistent pain
  - Brief morning stiffness
  - Limited function
- **Exam**
  - Crepitus
  - Restricted movement
  - Bony enlargement

99% probability of OA when all present

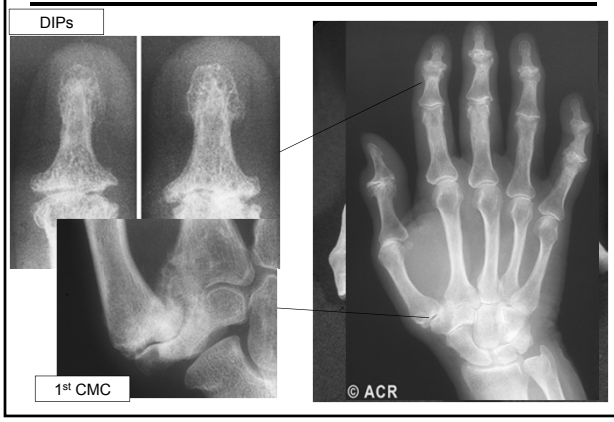
- *Confirm* with radiographs (esp. hips and spine)

Ann Rheum Dis 2010;69:483–489.

Knee osteoarthritis – radiographs



Hand osteoarthritis

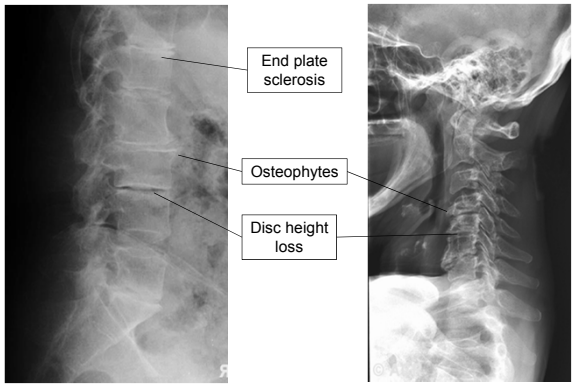


Hip osteoarthritis – radiographs

Osteoarthritis

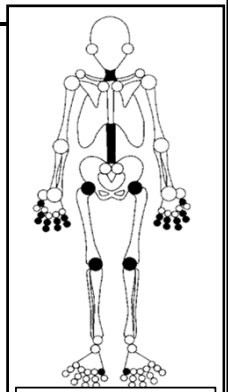
Normal (same patient)

Spine osteoarthritis



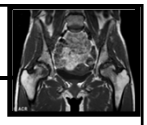
Primary v. Secondary OA

- Primary: symmetric, age 45+, characteristic joints
- Clues to secondary OA:
  - Age < 45
  - Asymmetry
    - Trauma
    - Avascular necrosis
  - Unusual joints (wrist, MCPs)
    - Trauma
    - Rare metabolic conditions
  - Unusual radiographic appearance
    - Global joint space loss only (e.g., RA)
    - Subchondral collapase (avascular necrosis)



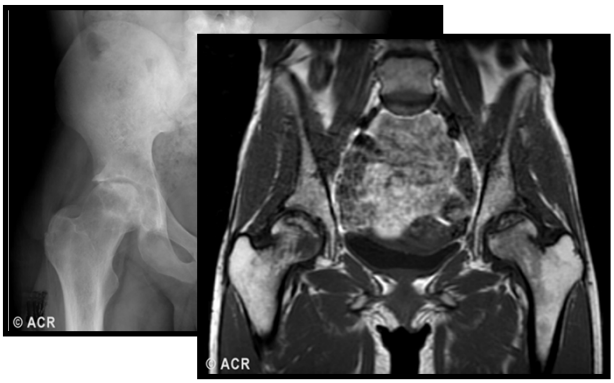
Distribution of Primary OA

Avascular Necrosis



- Risk factors:
  - Glucocorticoid use, current or past
  - Alcoholism
  - Sickle cell disease
  - SCUBA divers
- Weight-bearing joints: hips > knees > ankles
- Pain with use, nocturnal pain
- Bland effusions common
- Radriographs:
  - Early: normal
  - Late: subchondral collapse, OA changes
- MRI most sensitive diagnostic tool
- Treatment largely symptomatic
- Surgical interventions may be helpful in early stages

Avascular Necrosis



Case: 56 yo woman with polyarthralgia

- 6-week history of arthralgia, 45 minutes morning stiffness involving the hands and feet, and severe fatigue.
- History of hypothyroidism, well-controlled with levothyroxine
- Ibuprofen has not helped to relieve her joint pain.
- VS are normal.
- BMI is 32. Cardiopulmonary examination is normal. There is no rash.
- Musculoskeletal examination reveals tenderness and swelling of the second and third metacarpophalangeal joints bilaterally.
- The elbows are stiff but have a full range of motion and are without synovitis. There is squeeze tenderness of the metatarsophalangeal joints bilaterally.

Case: 56 yo woman with polyarthralgia

Laboratory studies:	
Complete blood count	Normal
Rheumatoid factor	Negative
Thyroid-stimulating hormone	1.8 µU/mL (1.8 mU/L)
Anti–cyclic citrullinated peptide antibodies	Positive
IgG antibodies against parvovirus B19	Positive
IgM antibodies against parvovirus B19	Negative

Which of the following is the most likely diagnosis?

A. Hypothyroidsism
B. Parvovirus B19 infection
C. Polymyalgia rheumatica
D. Rheumatoid arthritis
E. Systemic lupus erythematosus

Rheumatoid arthritis

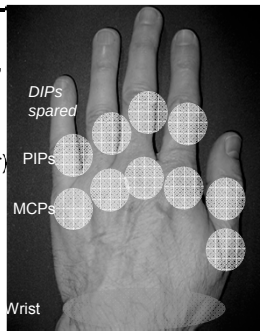
- Not rare (~ 1% of adults in U.S.)
- Insidious onset (weeks – months)
- Articular manifestation predominate
- Fatigue common, fever is unusual
- RA is an <u>inflammatory</u> arthritis syndrome
  - Morning stiffness
    - Usually > 30 minutes
    - Can be dominant symptom
  - Stiffness and pain better with activity
  - Worse with rest (gelling phenomenon)

RA joint involvement

- Symmetric (mirror image)
- Additive
- Polyarthritis (≥5 joints involved)
- Arthritis, not just arthralgia
  - Swelling of joint lining (boggy, rubbery)
  - Tenderness
  - Joint effusions
  - Warmth, not redness

RA joint involvement

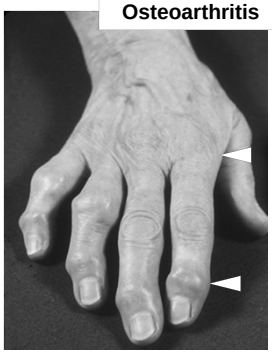
- Typical:
  - **Hands** (>90%): wrists, MCPs, PIPs
  - Feet: MTPs
- Common:
  - Ankles (tibiotalar and subtalar)
  - Knees
  - Elbows
  - Shoulders
- Axial skeleton
  - C-spine (C1/C2)
  - *Spares thoracic and lumbar spine*



RA vs. OA of the hands

Rheumatoid Arthritis

Osteoarthritis



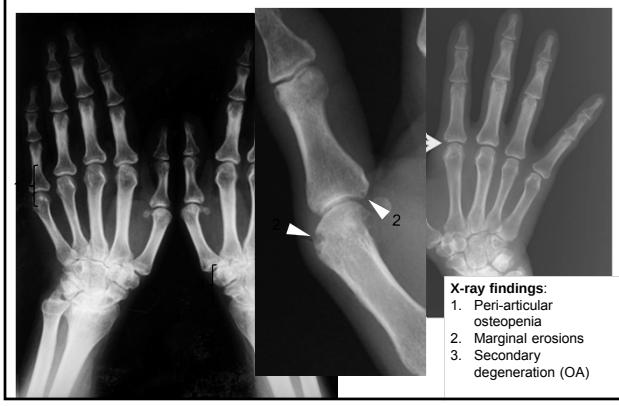
Early RA

Progressive RA

Late RA

RA Feet

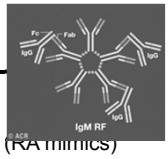
RA - Radiographic findings



X-ray findings:
1. Peri-articular osteopenia
2. Marginal erosions
3. Secondary degeneration (OA)

In rheumatoid arthritis, bony erosions in feet often precede those in hands

RA - autoantibodies



- Rheumatoid factor
  - 75% sensitivity, 75% specificity
  - RF seen in variety of arthritic conditions (RA mimics)
    - SLE, Sjogren's, MCTD
    - Active HCV, HBV, HIV
    - Chronic bacterial infection (SBE, osteomyelitis)
- Anti-citrullinated protein antibodies (anti-CCP)
  - Sensitivity ~ 75%; Specificity ~ 95%
- Order both when suspecting RA
  - ACPA+ and RF+ = RA
  - ACPA+ only = early RA
  - RF only: consider RA mimic
  - Both negative: usually NOT RA

Chronic polyarthritis – differential diagnosis

Polyarthritis	**Clues** ***These should be ACPA negative***
Systemic lupus erythematosus	Serositis Cytopenias
Sjögren's syndrome	Mild arthritis Prominent sicca **RF+**
Systemic vasculitis	Prominent constitutional symptoms Nerve, kidney, lung and skin
Chronic HCV	Mild arthritis **RF+**
Psoriatic arthritis (rheumatoid pattern)	Psoriasis/nail abnormalities DIP involvement Enthesitis/dactylitis
Parvovirus B19	Exposure to kids Viral exanthem
Other autoimmune connective tissues diseases (SSc, MCTD, etc.)	Scleroderma Severe Raynaud's ILD

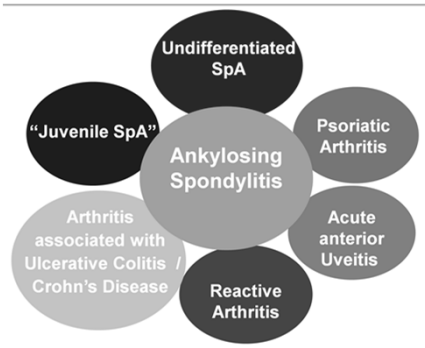
Case: 25 yo man with back pain

A 25-year-old man with a history of plantar fasciitis complains of 6 months' low back and buttock pain. The pain is worse at rest and better with activity. Schober test (signifying restricted lumbar flexion) is positive.

The laboratory or radiology result that would help confirm your most likely diagnosis is a positive

A. Antinuclear antibody (ANA) test
B. Human leukocyte antigen (HLA) B27 genetic test.
C. Discogram
D. Myelogram

Spondyloarthritis (SpA) syndromes

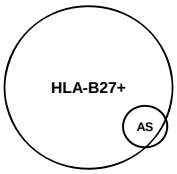


Inflammatory back pain is core feature of ankylosing spondylitis

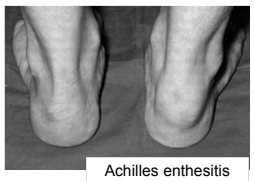
Inflammatory	Mechanical
Onset before age 40	Onset after age 40
Worse in morning (> 30 min. AM stiffness)	Brief AM stiffness
Improves with activity	Worse with activity
Spondyloarthritis (SpA) syndromes • Ankylosing spondylitis (AS) • Psortic arthritis (PsA) • Reactive arthritis (ReA) • Undifferentiated spondylo. (USp)	Lumbar DJD, etc.

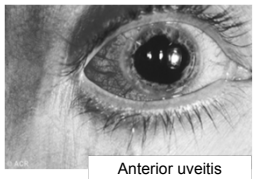
Ankylosing Spondylitis (AS)

- Onset teens – 20s, M ~ F
- Inflammatory back pain
- Sacroiliitis
- Good response to NSAIDs
- May have extra-axial involvement
  - Peripheral arthritis (asymmetric, oligoarthritis)
  - Enthesitis (plantar fasciitis, Achilles enthesitis)
  - Dactylitis (sausage digit)
  - Inflammatory eye disease (iritis)
- Often have family history of SpA
- HLA-B27 greatly increases pre-test probability but has poor negative predictive value



Spondyloarthritis features

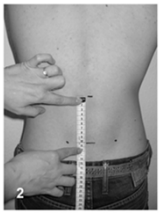

Achilles enthesitis


Anterior uveitis

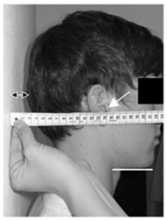

Dactylitis


Scalp psoriasis

Assessing axial involvement on exam



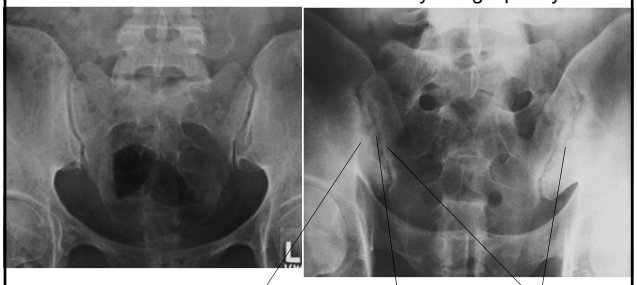
Modified Schober test for lumbar flexion
- Patient erect: mark at level of PSIS and 10 cm above
- Measure change with full flexion
- Normal > 5 cm



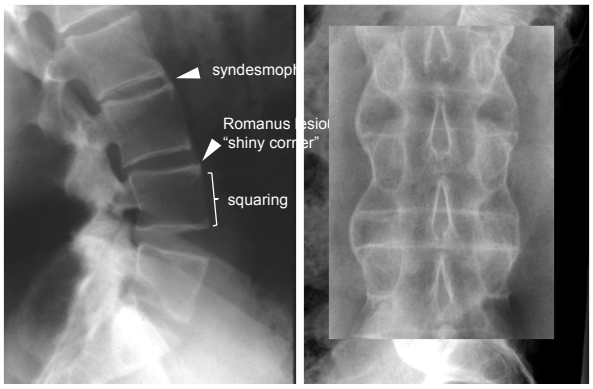
Occiput and tragus to wall test – cervical extension
- Must consider thoracic kyphosis

Sacroiliitis – imaging

Normal | Ankylosing Spondylitis



Ankylosing spondylitis – lumbar spine



Early | Late

Ankylosing spondylitis – cervical spine

Early | Late

MRI sensitive modality for detecting sacroiliitis

Look for *subchondral bone marrow edema*

Case: 52 yo man with acute knee pain

- A 52 yo man with 2 day history of left knee pain and swelling
- No trauma, no sexual activity
- History of well-controlled DM2
- Physical exam: T38.0, BP 144/88, HR 88, R 18.
- Left knee is swollen and warm, has overlying erythema, and is tender to palpation. Range of motion of the left knee elicits pain and is limited.

Laboratory studies:

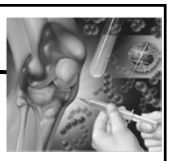
Leukocyte count	11,300/μL
CRP	56 mg/L
Uric acid	6.5 mg/dL
Serum creatinine	2.0 mg/dL

Case: 52 yo man with acute knee pain

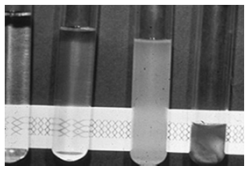
Which of the following is the most appropriate next step in this patient's management?

A. Arthrocentesis
B. Prednisone and allopurinol
C. X-ray of the left knee
D. Blood cultures

Acute Monoarthritis



- Usually one (or more) of three things – think *BBC*
  - Bugs (Staph, Strep, gonococcus)
  - Blood (hemarthrosis)
  - Crystals (gout, pseudogout)
- Tap the joint! (or have someone do it)
  - Stat Gram's stain + culture
  - Crystal analysis
  - Cell count
- Presume bacterial infection



Crystal-induced arthritis

Gout – caused by monosodium urate crystals
- Two clinical forms
  - Acute monoarthritis: LE > UE
  - Erosive polyarthritis (tophaceous gout)
- Serum uric acid level may be normal during attacks
- Diagnosis relies on demonstrating crystals in joint fluid

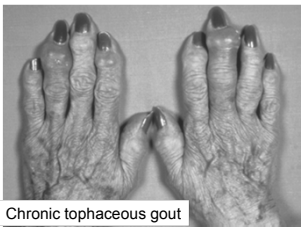
Pseudogout – caused by calcium pyrophosphate crystals
- Acute monoarthritis: knee, wrist most common
- Diagnosis relies on demonstrating CPP crystals in joint fluid

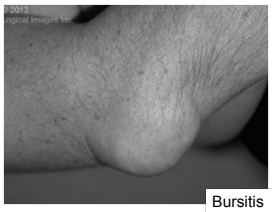
Treatment of acute gout or pseudogout relies on systemic anti-inflammatory drugs or intra-articular steroids

Smith et al., *Best Practice & Research Clinical Rheumatology* 24 (2010) 811–827

Gout images

Chronic tophaceous gout


Chronic tophaceous gout


Bursitis

Case: 28 yo woman with polyarthralgia

- Previously healthy
- Pain in hands, wrists, knees and ankles x 5 months
- Morning stiffness = 1 h, partially improved with NSAIDs
- ROS: fatigue, mild hair loss, depressed mood; right-sided chest pain with deep inspiration.
- PMH – depression, insomnia
- Exam – T 37.8, BP 150/95, HR 90. mild, tender swelling of PIPs, MCPs, wrists; knees normal; 2+ pitting edema of ankles. Mild central alopecia. Faint rash over cheeks. Cardiovascular normal. Neuromuscular exam normal.
- X-rays of hands and wrists do not show erosions or other abnormalities
- Labs: WBC = 3 with lymphopenia, HCT = 29, PLT = 115; creatinine = 0.9; urinalysis = 2+ blood, 2+ leukocytes and 3+ protein.

Case: 28 yo woman with polyarthralgia

A positive result in which of the following blood tests is mostly likely to confirm the cause of this woman's arthritis?

A. Rheumatoid factor
B. Anti-citrullinated cyclic peptide antibodies (Anti-CCP)
C. Anti-nuclear antibody test
D. Parvovirus B19 serology

Systemic lupus erythematosus (SLE)

- Chronic multi-systemic inflammatory disease of women >> men
- Peak onset between 20 and 40
- Arthralgia and fatigue nearly universal
- Specific findings:
  - Inflammatory polyarthritis, non-erosive
  - Serositis (pleurisy, pericarditis)
  - Photosensitivity, butterfly rash
  - Cytopenias
  - Kidney disease
  - Unexplained neurological disease (seizures, stroke, psychosis, neuropathy) – associated with antiphospholipid antibodies
- Patients with active lupus have anti-nuclear antibodies (ANA)
- Thus, negative ANA testing has good negative predictive value)

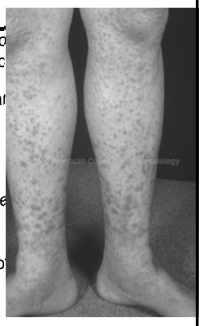
Butterfly rash

Case: 55 yo woman with neuropathy

- 57 yo woman referred to you for evaluation of neuro
- Numbness, burning pain on dorsum her L foot, whic weeks
- Polyarthralgia, myalgia, low-grade fever, malaise a wks
- Progressive dyspnea

Exam: T 37.7 BP 150/100 HR 88 R 18

- Heart exam normal; lungs with coarse rhonchi bilate
- Hypoesthesia dorsum L foot
- 1 out of 4 strength EHL and ankle dorsiflexion on L
- Mild tenderness to palpation of wrists, small joints o ankles
- Rash (shown) is palpable
- Urinalysis shows 2+ blood and 2+ protein
- Your nerve condition study shows evidence of L fibular axonal neuropathy consistent with mononeuritis



Case: 55 yo woman with neuropathy

You are worried that her neuropathy is part of a systemic illness. Which of following is the most likely explanation?

A. Systemic vasculitis
B. Unrecognized diabetes mellitus
C. Tabies dorsalis (neurosyphylis)
D. Compressive neurpathy

Systemic vasculitis syndromes associated with mononeuritis

- ANCA-assocaited vasculitis
  - Sinusitis
  - Severe asthma
  - Rapidly progressive renal failure
- Cryoglobulinemic vasculitis
  - Active HCV infection
- Polyarteritis nodosa
  - Hypertension
  - Bowel angina

When to suspect small-vessel vasculitis syndrome – features common to all

Glomerulonephritis

Sino-pulmonary disease

Constitutional Symptoms Arthralgia

Palpable purpura

Skin ulcers

Deep nodules

Mononeuritis multiplex

Polyneuropathy

Recognizing Rheumatologic Disease in Adults

Grant Hughes, MD
Assistant Professor
Fellowship Program Director, UW Division of Rheumatology
Rheumatology Section Head, Harborview Medical Center