Musculoskeletal Overuse Injuries

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Disclosures

- None relevant to lecture

Objectives:

- Types of Overuse Injuries
- Treatment of overuse injuries
- Electrodiagnostics
- Use of musculoskeletal ultrasound
Injuries:

- Tendinopathies
- Medial and Lateral Epicondylitis
- IT band syndrome
- Bursitis
- Medial Tibial Stress Syndrome (Shin Splints)
- Carpal and Cubital Tunnel Syndromes
- Stress fracture (not included in lecture)

Tendinopathies:

- Repetitive microtrauma due to overuse leading to local tissue damage in the form of cellular and extracellular degeneration
- Most likely to occur with change in mode, intensity or duration of an activity or training
- Misnomer in naming—previously termed tendonitis, but changed to tendinopathy, as degeneration is more common than inflammation on histologic examination
Rotator cuff disorders:

- Most common cause of shoulder pain in older adults
- Most common location for rotator cuff tendinopathies is the supraspinatus—about 2 cm from distal insertion
- Important to distinguish between tendinopathy and full tear, as treatment course will markedly differ

Symptoms: shoulder pain at rest or with certain movements, may have stiffness or crepitus, pain when laying on affected side, loss of mobility

Physical examination: Range of Motion, Palpation, Strength of abduction/IR/ER, Special testing
Special Tests:

- **Diagnostics:** X-ray (generally normal but may see avulsion), MRI, Ultrasound (operator dependent)
- **Treatment:**
  - Physical therapy and rehabilitation
  - Acute phase: maintain ROM, isometric exercises, Modalities (TENS and Cryotherapy)
  - Continue ROM and strengthening with scapulothoracic strengthening as well, start return to activities
  - NSAIDs—oral or topical, ice
  - Injection—with anesthetic only or with corticosteroid, can use ultrasound guidance
  - Rarely surgical management required

Adhesive Capsulitis:

- **Inflammation** in rotator cuff capsule leading to capsule tightening
- **Stage 1** (1-3 months): pain with little ROM loss
- **Stage 2** (3-9 months): pain improved, significant loss ROM (especially with ER)
- **Stage 3** (9-12 months): gradual improvement of ROM
- Increased incidence in diabetes
- Early glenohumeral joint injection may be helpful
- **Tx:** Rehabilitation program, injection (hydrodilation)
De Quervain tendinitis:

- Tenosynovitis of the first dorsal compartment at the wrist
- Most common wrist tendinopathy
- Affecting the APL (abductor pollicis longus) and EPB (extensor pollicis brevis)
- Predisposed with activities requiring forceful grabbing with ulnar deviation or repetitive use of the thumb
- Physical exam: tenderness over first dorsal compartment, positive Finkelstein test
- Diagnostic: X-ray, can also utilize ultrasound
- Treatment: rest and immobilization (cure rate of 25-72%), injection (generally with ultrasound), oral or topical NSAID
- Rarely surgical release of the 1st compartment

Lateral Epicondylitis:
- Tennis elbow, but would be better named wrist extensor tendinosis
- The ECRL, ECRB, EDC and ECU originate at the lateral epicondyle
- The ECR brevis is the most commonly involved (greatest muscle activity with backstroke)
- Generally occurs in 4th and 5th decades (but range 12-80+ y/o)
- Equal male: female
- 75% occur in dominant hand

- Pathology: microtears, collagen fibers disrupted by invasion of fibroblasts and granulation tissue
- Differential Dx: cervical radiculopathy, PIN/radial nerve syndrome, elbow joint or ligament pathology (OCD v. UCL)
- 5-15% recurrence (but generally not fully treated initially)
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Physical Exam:
- Maximal tenderness to palpation over ECRB 1-2cm distal and anterior to the lateral epicondyle
- Positive Cozen and Maudsley's test
- Sensory exam and Spurling's should be normal

Diagnostics: X-ray (generally normal but may show calcifications) vs possible electrodiagnostic testing

Treatment:
- Nonoperative
  - Cessation of offending activity initially but care taken not to completely immobilize
  - Ice as local vasoconstrictor, oral/topical NSAID
  - Possible injection (use USG)
  - Counterforce brace
  - Physical therapy/rehabilitation: stretching, progressive isometric exercises with flexed elbow
- Surgical indications only if failed conservative management for 6-12 months
  - Include excision of tissue and/or lengthening vs TENEX
Medial Epicondylitis:

- Golfer’s elbow
- Due to increased overhead activity and valgus stress
- Musculotendinous structures at the medial epicondyle: FCR, pronator teres, palmaris longus, FDS and the FCU
- Much less common than lateral epicondylitis (which is 7-20 times more frequent)
- 4th and 5th decade
- Male: female essentially equal

Differential Dx: ligamentous instability, ulnar neuropathy

Physical Exam:

- Pain along medial elbow worsened with forearm pronation or wrist flexion
- Tenderness increased distal and lateral to medial epicondyle at FCR or PT
- Normal strength and sensation

Treatment:

- Conservative: Phase 1 (rest, NSAID, possible injection), Phase 2 (activity/equipment modification, rehabilitation with stretching and progressive isometrics), can add eccentric and concentric exercises
- Surgical: persistent medial elbow pain unresponsive to nonoperative program for 6-12 months
- Can perform traditional surgery vs TENEX
Patellar Tendinopathy:
- Results from repeated loading of the knee extensor mechanism
- Prevalent in jumping activities/sports
- Similar to other tendinopathies, histologic studies show abnormal collagen, tenocytes and abundant small vessel growth (neovascularization)
- Degenerative rather than inflammatory condition
- Classic site is at the low pole of the patella
- If located at insertion onto tibial tuberosity = jumper's knee
- Worse with strenuous activity
- Complaints of pain after sitting for prolonged periods and with use of stairs

IT Band Syndrome:
- Friction between IT band and lateral femoral condyle
- IT band originates from confluence of fascia of the TFL and gluteal musculature
- Inserts onto Gerdy's tubercle
- Pain/burning of the lateral aspect of the knee (about 3 cm proximal to the jointline)
- More frequent in runners and military recruits
- Increased tension of IT band with genu varum, excessive pronation of tibia, leg length discrepancy

Physical exam:
- Tenderness of the inferior pole of patella or tibial tuberosity
- Pain improved with knee flexion

Diagnostics:
- MRI or ultrasound

Treatment:
- Relative or absolute rest (4-12 weeks)
- Ice and NSAID, rarely injection
- Begin eccentric exercises and stretching and progress
- Surgical if no improvement after 3-6 months (drilling, excision, repair)
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Physical Exam:
- Tenderness of lateral femoral condyle (worse with knee flexed at 30°)
- Positive Ober test indicates IT band tightness
- Diagnostics: X-ray (generally normal), MRI if consider surgery
- Differential Dx: tendinopathy, hamstring, lateral meniscus pathology, stress fx, early DJD
- Treatment:
  - Nonoperative (gen improve in 3-6 weeks): activity modification, NSAIDs, gluteal stretching and strengthening, possible orthotics
  - Rarely surgical (fail >6 months tx)

Trochanteric Bursitis:
- Can occur in many patient, most commonly female runners
- Lateral hip pain
- Physical exam: Tenderness to palpate over greater trochanter of femur, may also see gluteal weakness
- Diagnostics: X-ray generally unremarkable, MRI with increased signal in bursa due to inflammation (often seen as incidental finding)
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- Diagnostics: X-ray generally unremarkable, MRI with increased signal in bursa due to inflammation (often seen as incidental finding)
- Treatment:
  - Non-operative: NSAID, relative rest, stretching, rehabilitation (include gluteal strengthening)
  - Surgical treatment is rare
    - Trochanteric bursectomy can be performed
Achilles Tendon Disorders:

- Often seen with running sports
- Incidence 7-9%
- Combination of inflammatory and degenerative condition
- Intrinsic factors: hyperpronation of foot, limited mobility of sub-talar joint, leg length discrepancy
- Extrinsic factors: change in training pattern, poor technique, prior foot injury, footwear, training surface (hard, slanting, slippery)

Physical exam: pain 2-6 cm proximal to the insertion of Achilles tendon on calcaneus, inspection of malalignment/deformity, palpation of tendon

Diagnostics: ultrasound and MRI

Treatment:
- Correct training errors, malalignment, footwear and equipment
- Oral NSAID—AVOID STEROID INJECTION
- Good success with PRP

Olecranon Bursitis:

- Often traumatic
- Also called student’s elbow
- Can see with gout, RA and infection
- Swelling of olecranon with discomfort

Treatment:
- Ice, compression, NSAID, elbow pad, may aspirate (high risk of recurrence) and controversial use of steroids (risk of infection)
- Surgical excision is rare
Pes anserine bursitis:
- Common tendinous insertion of the sartorius, gracilis, and semitendinosus
- About 6 cm below medial jointline on the medial tibia
- Differentiate from stress fracture of tibia
- Tx: NSAID, rest, steroid injection

Medial Tibial Stress Syndrome:
- Shin Splints
- 12-18% of runners/running athletes, more frequent in women
- Pain at the posteromedial aspect of the mid-distal 1/3 of the tibia (generally exacerbated with exercise)
- May be related to periostitis at the origin of the posterior tibialis muscle
- Differentiate from stress fracture or exertional compartment syndrome
Physical exam: tenderness of posteromedial tibia (4-12cm proximal to medial malleoli), pain with resisted planar flexion and inversion, pes planus

Diagnostics: X-ray negative, may get bone scan to evaluate for stress fracture, compartment pressure testing if suspect ECS

Treatment:
- Generally conservative
- Ice and NSAIDs
- Activity modification (decrease running distance, intensity, time and change in surface), shoe modification, strengthen ankle invertors and evertors
- Rarely operative treatment—deep fasciotomy with release of painful portion of periosteum

Carpal Tunnel Syndrome:
- Median mononeuropathy at the wrist
- 0.1-10% population, female dominant
- Can be precipitated by repetitive overuse/ vibration (but conflicting studies)
- Carpal tunnel: scaphoid/trapezium, hamate/pisiform, transverse carpal ligament, proximal row carpal bones
- Paresthesias (1st-4th digits), weakness of median innervated muscles
- Positive Tinel at wrist, Phalen
Electrodiagnostic testing:
- Nerve conduction studies (NCS) and needle study (EMG)
- Mild (sensory)—generally conservative treatment (bracing, injection)
- Moderate (sensory and motor)—surgical candidate
- Severe (axonal involvement)—surgical candidate

Cubital Tunnel Syndrome:
- Ulnar nerve compression (generally at medial elbow)
- Can be due to aponeurosis or muscular septum
- May see with medial epicondylitis
- Cubital tunnel formed by: FCU fascia, Osborne’s ligament, MCL, joint capsule, medial epicondyle and olecranon
- Paresthesia (4th/5th digits), intrinsic hand weakness, positive Froment, Wartenburg, Tinel’s at elbow
Treatment:
- Conservative with elbow extension splint/NSAIDs
- Surgical decompression and transposition if needed

Ultrasound basics

Benefits of Ultrasound:
- Diagnostic and image guidance (also utilized for EMG)
- Good soft tissue imaging
- No radiation
- Dynamic testing
- Portable
- Able to compare to contralateral side
Therapeutic Benefits:
- Can visualize response to treatment: effusion side, pathology/improvement of muscle, tendons, nerve
- Image guidance for diagnostic and therapeutic injections

Limitations of Ultrasound:
- Operator dependent
- Unable to penetrate bone (tumors, stress fracture, intra-articular pathologies)
- Cost of machine
- Coverage/billing, lack of universal certification/organization
- If sound wave is reflected, it produces a bright echo with a brighter “white” image (bone)
- If sound absorbed, a lighter/fainter white color (muscle, tendon, nerve) or black (effusion, blood)
Ultrasound “lingo”

- Echogenicity: Capacity of a structure in the path of an ultrasound beam to reflect back sound waves.
- Anechoic: no internal echoes (black); fluid, artery, vein.
- Hyperechoic: High reflective pattern, appears brighter than the surrounding tissue.
- Hypoechoic: Low reflective pattern, manifesting as an area where the echoes are not as bright as the surrounding tissue.
- Anisotropy: artifact that occurs when the beams exiting the transducer are not 90° to the target.

Tendinosis

- Thickening
- Focal hypoechoegenicity
- Calcification
- Partial tears
- May see “inflammation” due to neovascularization with Doppler
Doppler Neovascularization

AC Joint with fluid
Muscle atrophy:
- Thinner in appearance
- Hyperechoic and fibrotic
- Able to compare to contralateral side

Nerve:
- Less densely packed architecture but regular and fascicular
- Less echogenic than tendons and ligaments
- Longitudinal: Train track
- Transverse: Honeycomb, still can get anisotropy
Carpal Tunnel injection:

Platelet Rich Plasma (PRP):

- Multiple techniques
- Not covered by insurance
- High concentration of growth factor and cytokines with goal to cause inflammation and regeneration/healing of tissue
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Questions?

References:
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