Knee Injuries & Overuse Injuries

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Acute Knee Injuries

- MCL Injuries
- ACL Injuries
- PCL Injuries
- Meniscal Injuries
- Osteochondral Defects (OCD’s)
Overuse Injuries

- Patellar Tendon Injuries
- IT Band Syndrome
- Patella Femoral Pain Syndrome (PFPS)
MCL Injuries

- Medial collateral ligament (MCL) sprains should be suspected following valgus strain or twisting with or without contact
- The medial aspect of the knee may show localized swelling and tenderness
- The valgus stress test determines the grade of MCL injury
  - It is performed by placing a valgus stress on the knee over the medial joint line at $0^\circ$ and $30^\circ$ of knee flexion
    - Grade one sprains show local pain and tenderness but no valgus stress testing laxity
    - Grade two sprains have opening laxity on valgus stress testing, but also show a solid end point
    - Grade three sprains, there is no end-point
Physical Exam Tests

- https://www.youtube.com/watch?v=2Gg9e7DtSyc
The Ottawa Knee Rules and Pittsburgh Decision Rules are clinical prediction tools that help guide the decision for x-rays, though the decision is ultimately based on clinical suspicion, history, and physical exam findings.
When To Get Knee X-ray’s

**Ottawa Knee Rules**

- Knee X-rays ordered when patients exhibited any of the following:
  - Age ≥ 55 years
  - Isolated patellar tenderness without other bone tenderness
  - Tenderness of the fibular head
  - Inability to flex knee to 90°
  - Inability to bear weight immediately after injury and in the emergency department
  - Sensitivity 97%, Specificity 27%

When To Get Knee X-ray’s

Pittsburgh Decision Rules

- Blunt trauma or a fall as a mechanism of injury plus either of the following:
  - Age younger than 12 years or older than 50 years
  - Inability to walk four weight-bearing steps in the emergency department
  - Sensitivity 99%, Specificity 60%

MCL Injuries

- When x-rays are necessary, typical orders include weight bearing x-rays of the knee, lateral and bilateral AP, bent knee AP, and sunrise views.
- Negative x-rays do not always exclude a fracture in the knee, especially tibial plateau fractures.
- An MRI may be indicated to rule out other acute knee injuries such as the “terrible triad” of medial meniscus, MCL, and ACL tears.
- X-rays are typically done before MRIs because most insurance company protocols require plain films prior to authorizing an MRI.
MCL Injuries

- Because of the rich vascular supply, most MCL injuries heal with rest, ice, compression, and elevation (RICE) for 1-2 weeks, along with a bilateral hinged knee brace.
- The brace helps prevent re-injury and provides stability to the knee.
- Knee rehabilitation with range of motion (ROM) and strengthening exercises can be advanced as tolerated.
- Sports can generally be resumed after 2-6 weeks depending on sprain severity.
- The brace may be needed during activity for 4-8 weeks while recovering from an MCL injury.
- Isolated grade 1-3 MCL sprains should be treated non-operatively.
  - Subacute isolated grade 3 MCL sprains should be treated operatively if patients have persistent functional instability.

ACL Injuries

- ACL is the primary static intra-articular knee stabilizer
- Most often injured in a non-contact sports injury
  - Common mechanisms include forcefully landing on the heel with knee flexed, and pivoting during acceleration or deceleration
  - Contact-induced injuries often involve valgus loading of a fixed and fully straightened knee
  - Patients often hear or feel a “pop”, and may experience sudden pain and instability in the center of the knee
  - An effusion develops within 1-2 hours
ACL Injuries

- Immediate evaluation is ideal as the hamstrings often contract soon after injury preventing anterior tibial movement on physical exam.
- This hamstring contraction may be mistaken for an ACL endpoint on stress testing when the ACL is actually completely torn.
- The anterior drawer test and Lachman test are common tests to evaluate the ACL.
ACL Injuries

- The anterior drawer test is performed by flexing the patient’s knee between 60° - 90° with the foot anchored on the examination table while the examiner draws the tibia anteriorly to check for laxity.

- The Lachman test is performed by placing the patient supine with 20° - 30° of knee flexion and stabilizing the femur with one hand. With the other hand, the examiner moves the tibia anteriorly to evaluate for laxity.

- The Lachman test is more sensitive than the anterior drawer.
ACL Injuries

- If an ACL tear is suspected, X-rays should be obtained followed by an MRI with dedicated ACL sequences.
- Obtain an MRI to confirm ACL injury in patients with suspected ACL injury and to assist in identifying concomitant knee pathology, such as other ligament, meniscal, or articular cartilage injury.
ACL Injuries

MRI Right Knee without contrast. Sagittal Proton Density Fat Saturation image that demonstrates an ACL tear with edema and tear of the proximal ACL.
ACL Injuries

- The ACL has a limited blood supply and has no intrinsic capability for self-repair
- ACL reconstructive surgery is most often needed to restore knee stability
- Pre-surgery rehabilitation focuses on ROM and knee strengthening to avoid quadriceps weakness and atrophy
- Three to four weeks post-injury, swelling and inflammation may have decreased sufficiently to allow for ACL reconstruction
- Common ACL reconstruction surgeries include autograft’s from hamstring, patella, or quadriceps tendons, or allografts
PCL Injuries

- Approximately half of PCL injuries are associated with multi-ligamentous knee injuries
- Isolated PCL injury is subtle and accounts for only 3.5% of ligamentous knee sports injuries
- Symptoms include stiffness, pain with deep flexion, mild effusion, and posterior knee pain
PCL Injuries

- The usual mechanism of injury is external force (e.g., a soccer player sliding into a goal post, sliding into the dashboard in a motor vehicle accident (MVA))
- As the main function of the PCL is to resist posterior tibial translation, posterior drawer testing and a sag sign test are the most useful physical examination tests
PCL Injuries

- The posterior drawer test is performed by placing the patient’s knee in 90° of flexion and applying a posterior force to the tibia in relation to the femur to evaluate for laxity.
- The sag sign test is performed by placing the patient supine with knees and hips flexed 90° and viewing the tibial condyles from the side.
  - A posterior sag of the tibia indicates PCL injury.
- If a PCL tear is suspected, x-rays are indicated to evaluate for fracture, followed by MRI to assess for damage to the PCL and other possible injuries, such as an osteochondral defect or subchondral impaction fracture.
PCL Injuries

MRI Left Knee without contrast. Sagittal Proton Density Fat Saturation image that demonstrates a PCL tear with edema in the PCL and tear of the proximal PCL.
PCL Injuries

- Isolated PCL injuries with tearing of up to 50% of fibers (grades 1 and 2) are treated conservatively, using protected weight-bearing in an extension brace followed by quadriceps rehabilitation and ROM exercises.
- Return to play is generally possible 4 to 6 weeks after injury.
- Surgical intervention is recommended for complete ligament tears (grade 3 PCL injuries), tears in the posterior lateral corner, which often occur with ACL injuries, and PCL injuries associated with generalized knee damage.
Meniscal Injuries

- Acute meniscus injuries often result from a forceful twisting or valgus/varus force on a knee with a planted foot.
- Patients often describe acute joint line pain at the torn meniscus. An effusion may develop within a few hours of injury.
- Mechanical symptoms such as locking, catching, crepitus or instability are common.
- Examination may demonstrate a positive McMurray’s or Thessaly’s test.
Meniscal Injuries

- McMurray’s is performed as the knee is passively flexed, externally rotated, and axially loaded while the knee is brought into extension
  - The test is repeated in internal rotation
  - It is positive if there is a palpable or audible click or pain occurs during rotation
Meniscal Injuries

- Thessaly’s is performed as the patient stands on symptomatic leg while holding the examiner’s hands
  - The patient then rotates his or her body and leg internally and externally with the knee flexed 20°
  - The test is positive test when the patient feels pain or clicking in the joint line
Meniscal Injuries

- Most meniscus tears heal poorly as the blood supply is limited except to the outer (red) portion of the meniscus.
- Acute meniscus tears need surgical repair if refractory mechanical symptoms are present and activities are significantly limited.
  - Meniscal tears on the outer portion are more amenable to surgical repair, as preservation of the meniscus is preferred when possible.
    - Surgical repairs require a non-weight-bearing period after the surgery.
  - Tears on the innermost (white) portion require shaving or partial meniscectomy.
    - Patients do not require a non-weight-bearing period after partial meniscectomy.
- Most patients return to normal activity in 4 to 6 weeks.
Meniscal Injuries

- Chronic degenerative meniscal tears, as opposed to acute tears, should initially be treated with NSAIDs plus physical therapy focusing on knee ROM, hip and hamstring flexibility, quadriceps and hip strength, and knee proprioception as they may provide pain relief and improvement in knee function.

- For patients with refractory symptoms, arthroscopic partial meniscectomy with physical therapy can provide short term pain relief.
Osteochondral Injuries

- Localized areas of osteonecrosis can result in separation of cartilage and subchondral bone from underlying well-vascularized bone
- These areas of injury are historically known as Osteochondritis Dessicans
  - There is limited evidence for an inflammatory component to the injury so these lesions are better known as Osteochondral Lesions or Osteochondral Defects (OCDs)
  - OCDs are most common on weight-bearing articular surfaces. In patients with open growth plates they are found at the articular epiphyses and are known as “juvenile OCDs”
Osteochondral Injuries

- Osteochondral knee injuries are often associated with repeated trauma or overuse.
- They are most common on the posterolateral aspect of the medial femoral condyle (70%) but can occur along the inferior central aspect of the lateral femoral condyle (15%), inferior medial patella (10-15%), or trochlea (<1%).
- Patients describe localized knee pain on flexion, with or without swelling, and mechanical symptoms such as catching, locking, and instability.
- Pain may be associated with a specific injury or develop over several months.
- Patients often have localized tenderness on palpation of the medial femoral condyle at the joint line.
- Crepitus may be present.
Osteochondral Injuries

- X-rays should be obtained and should include a notch view or tunnel view to allow the best view of the femoral condyles.
- If the diagnosis of OCD is confirmed, an MRI is indicated (figure 4) to grade the severity.
- CT Scan can also delineate an OCD in a post-traumatic setting.
Osteochondral Injuries

- Because of good blood supply to the cartilage and subchondral bone, grade 1-3 juvenile knee OCDs can be initially treated conservatively.
- Grade 1-2 adult knee OCDs can be treated conservatively but do not heal as well as juvenile lesions.
- Grade 4 juvenile OCDs, grade 3-4 adult lesions and all OCDs that have failed conservative treatment require surgery.
Osteochondral Injuries

X-ray of the weight-bearing right knee, Bent Knee AP View that demonstrates a Grade 1 Osteochondral Defect (OCD) along the right knee lateral femoral condyle.
Osteochondral Injuries

MRI Right Knee without contrast. Coronal T2 Fat Saturation image that demonstrates a grade 4 Osteochondral Defect (OCD) of the medial femoral condyle demonstrating edema around the OCD and detachment of the OCD from the femoral condyle.
## Osteochondral Defects Classification

<table>
<thead>
<tr>
<th>Stage</th>
<th>Plain X-ray findings</th>
<th>MRI Findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Depressed osteochondral fragment</td>
<td>Articular cartilage thickening &amp; low signal changes in subchondral bone</td>
</tr>
<tr>
<td>2</td>
<td>Osteochondral fragment attached by bone</td>
<td>Articular cartilage breached, No synovial fluid around fragment</td>
</tr>
<tr>
<td>3</td>
<td>Detached non-displaced fragment</td>
<td>Articular cartilage breached, synovial fluid around fragment</td>
</tr>
<tr>
<td>4</td>
<td>Displaced fragment</td>
<td>Loose foreign body</td>
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</tbody>
</table>

Overuse Injuries

- Patellar Tendon Injuries
- IT Band Syndrome
- Patella Femoral Pain Syndrome (PFPS)
Patellar Tendon Injuries

- Patellar tendonitis and tendinosis are common knee overuse injuries with very different pathophysiology and recommended treatments.
- Patellar tendonitis generally refers to a painful overuse inflammatory condition of the tendon and is often the initial presentation of patellar tendon injury.
- Patients commonly present with acute patellar tendon pain and they often respond to treatment with a short course of NSAIDs, activity modification and rehabilitation or home exercise program.
Patellar Tendon Injuries

- If patellar tendon pain and symptoms persist longer than 6 weeks, the diagnosis of patellar tendinosis is likely
- Chronic overuse tendinosis results from intratendinious degeneration due to scar formation, disorganization of tendon fibers and eventual degeneration of the patellar tendon from repetitive injuries
- In contrast to patellar tendonitis, patellar tendinosis is treated by stimulating an inflammatory response
Patellar Tendon Injuries

- Eccentric strengthening should be utilized initially
- For patients with refractory symptoms, ultrasound guided percutaneous needle tenotomy can be considered
- Other treatments with limited evidence that can be considered in patients who want to avoid surgery are:
  - Deep soft tissue friction massage, e.g., ASTYM
  - Injections of autologous blood, prolotherapy, or platelet rich plasma (PRP)
- Patients should be advised to avoid NSAIDs during treatment to avoid inhibiting the inflammatory response
ASTYM Tools
Patella Tendinosis Treatment

<table>
<thead>
<tr>
<th>Treatment Modality</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Deep soft tissue massage with tools</td>
<td>1-3 times per week for 4-6 weeks most common with athletic trainer certified or physical therapist</td>
</tr>
<tr>
<td>Eccentric Strengthening</td>
<td>3 sets of 15 exercises, twice daily, for 12 weeks</td>
</tr>
<tr>
<td>Musculoskeletal ultrasound guided percutaneous needle tenotomy with or without autologous blood injection, prolotherapy, or platelet rich plasma</td>
<td>Referral to primary care sports medicine physician</td>
</tr>
</tbody>
</table>

IT Band Syndrome

- The iliotibial (IT) band is composed of dense fibrous connective tissue originating on the iliac crest and attaching to the lateral tibia distal to the knee joint line.
- IT band syndrome is an overuse tendonitis due to compression of the bursa between the IT band and the lateral femoral condyle.
- It is common in runners and is the most common cause of lateral knee pain in long distance runners.
IT Band Syndrome

- Patients present with sharp lateral knee pain often after foot strike in the mid-range of knee flexion from 20 to 70 degrees when the IT band rubs over the lateral femoral condyle.
- Repetitive compression of the IT band progresses to inflammation of the IT band and underlying connective tissue, bursa, and fat pad between the band and the epicondyle.
IT Band Syndrome

- Physical examination findings include tenderness, crepitus, and localized edema where the IT band crosses the lateral femoral condyle.
- Ober’s and Noble’s tests should be performed and are typically positive in this condition:
  - Ober’s test, the patient lies supine, and the examiner flexes the knee 90° and abducts and extends the hip until the hip is in line with the trunk.
  - The hip is allowed to drop with gravity, and if it does not adduct to a horizontal position, the test is considered positive.
  - Noble’s test is performed by having the patient lay supine with knee flexed and compressing the distal IT band against the lateral femoral condyle and extending the knee between 70° - 30°.
  - Pain and/or snapping along the IT band is a positive test.
IT Band Syndrome

- Other risk factors include reduced flexibility of the gastrocnemius and soleus muscles, weakness of the core musculature, and an anatomic malalignment such as pelvic asymmetry, pes planus, leg length discrepancies, knee valgus, hindfoot valgus, femoral anteversion or tibial torsion
- Examination of the tread wear on running shoes provides insight on the foot strike pattern
- Runners should change running shoes every 300-500 miles
- If knee symptoms have been present for four weeks or longer, it is reasonable to obtain x-rays to assess for conditions such as a fracture or bone tumor
IT Band Syndrome

- Treatment includes activity modification to reduce exacerbating activities, rest, NSAIDs, local ice treatment, phonophoresis and iontophoresis
- Muscle imbalances, core weakness, pelvic stabilization, pronation, footwear, and leg length discrepancy should be addressed
- Rehabilitation should involve stretching and strengthening of the IT band and hip abductors, plus core strengthening and pelvic stabilization
IT Band Syndrome

- Local steroid injections have been found to be most helpful within 2 weeks of onset of symptoms.
- If IT band syndrome persists for more than 6 weeks, treatment should target tendinosis with eccentric strengthening of the hip abductors and deep soft tissue massage.
- Referral for surgery should only be considered after conservative options have been exhausted.
Patellofemoral Pain Syndrome (PFPS) is an overuse injury that accounts for 25-40% of knee pain in active individuals and is associated with a recent change in activity or increase in intensity or frequency of training.

- Patellar instability, subluxation, or dislocation can predispose patients to PFPS.
- Patients report insidious onset of pain around and posterior to the patella associated with prolonged sitting in knee flexion, squatting, stair climbing, running, kneeling, or jumping.
PFPS

- The sensation of knee instability due to pain is common.
- Crepitus without pain is common in healthy adults and is not necessarily indicative of knee pathology; however, painful crepitus may indicate PFPS.
- Physical examination should assess vastus medialis oblique (VMO) strength, gluteus medius weakness (with side lying resisted hip abduction strength testing), hip flexor flexibility, vastus lateralis oblique (VLO) and IT band flexibility (Ober’s), patellar mobility, hamstring tightness, and patellar tracking.
PFPS

- Assessments include J-sign (abrupt lateral motion of the patella with full knee extension) during passive flexion and extension of the knee, lateral retinaculum pain to palpation, and Clark’s compression test.
- Clark’s test is performed by laying the patient supine with knee extended and having him/her contract the quadriceps muscles while proximal pressure is maintained on the patella.
  - A positive test is signified by patellar femoral pain.
PFPS

- Imaging is often not indicated to diagnose PFPS
- X-rays should be performed if symptoms persist after a trial of conservative therapy (1-2 months)
PFPS Tx

- Patients may use acetaminophen or NSAIDs for pain control. Treatment targets the biomechanical factors that cause PFPS. Most patients improve with activity modification, footwear evaluation, ice after activity, and rehabilitation therapy.
- VMO strengthening, VLO and IT band flexibility, core strengthening, pelvic stabilization, gluteus medius strengthening, hamstring stretching, shoe orthotics for those with pes planus and footwear replacement are commonly indicated.
PFPS Tx

- In a randomized controlled trial, a combination of daily patellar taping and exercise was superior to exercise alone.
- A patellar stabilizing brace may be useful, although bracing has not been shown to be significantly superior to non-bracing treatment.
- If symptoms persist after at least 6-12 months of adequate conservative therapy, surgery may be considered.
- Surgical treatments include lateral retinaculum release, VMO advancement, and realignment procedures.
<table>
<thead>
<tr>
<th>Condition</th>
<th>History Pain &amp; Limitations</th>
<th>Physical Exam Findings</th>
<th>Imaging</th>
<th>Initial Management</th>
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</thead>
<tbody>
<tr>
<td>MCL Injury</td>
<td>- Valgus knee strain or twisting with or without contact</td>
<td>- Swelling &amp; tenderness over medial knee</td>
<td>- X-rays typically unremarkable</td>
<td>- RICE</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Valgus stress test pain +/- laxity depending on grade of sprain</td>
<td>- MRI to further define &amp; rule out other acute injuries</td>
<td>- Bilateral hinged knee brace 4-8 weeks</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td>- Physical therapy</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td>- Pre-surgery rehabilitation</td>
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<td></td>
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<td>- Surgical re-construction</td>
</tr>
<tr>
<td>ACL Injury</td>
<td>- Forcefully landing on heel with knee flexed &amp; pivoting during acceleration or deceleration</td>
<td>- Knee effusion</td>
<td>- X-rays typically unremarkable</td>
<td>- Grade 1-2 treated with protected weight bearing in extension brace followed by PT</td>
</tr>
<tr>
<td></td>
<td>- Contact injury with valgus loading of fixed &amp; fully straightened knee</td>
<td>- Lachman’s, Anterior Drawer, &amp; Lelli can demonstrate laxity</td>
<td>- MRI to further define &amp; rule out other acute injuries</td>
<td>- Grade 3 require surgery</td>
</tr>
<tr>
<td>PCL Injury</td>
<td>- External force onto knee (e.g., sliding into dashboard in MVA)</td>
<td>- Knee effusion</td>
<td>- X-rays typically unremarkable</td>
<td>- Grade 1-3 juvenile OCD &amp; Grade 1-2 adult OCD treat conservatively</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Posterior drawer &amp; sag test can demonstrate laxity</td>
<td></td>
<td>- Grade 4 juvenile OCD &amp; Grade 2-4 adult OCD treat with surgery</td>
</tr>
<tr>
<td>Osteochondral Defect (OCD)</td>
<td>- Repeated trauma or overuse</td>
<td>- Localized knee pain +/- effusion</td>
<td>- X-rays with notch or tunnel view</td>
<td>- Acute tears need surgery if refractory mechanical symptoms &amp; activities limited</td>
</tr>
<tr>
<td></td>
<td>- Mechanical symptoms</td>
<td>- Pain with deep knee flexion</td>
<td>- MRI to further define &amp; rule out other acute injuries</td>
<td>- Chronic tears need</td>
</tr>
<tr>
<td>Meniscal Injury</td>
<td>- Forceful twisting or valgus/varus force on knee with planted foot</td>
<td>- Joint line tenderness</td>
<td>- X-rays typically unremarkable</td>
<td>- Acute tears need surgery if refractory mechanical symptoms &amp; activities limited</td>
</tr>
<tr>
<td></td>
<td>- Mechanical symptoms</td>
<td>- McMurray’s &amp; Thessaly’s test may be positive</td>
<td></td>
<td>- Chronic tears need</td>
</tr>
<tr>
<td>Patellar Tendinosis</td>
<td>Overuse injury</td>
<td>Pain along patella tendon</td>
<td>Not usually necessary</td>
<td>Activity modification</td>
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<tr>
<td>Chronic (&gt;6 weeks) patella tendon pain</td>
<td>Pain along patella tendon</td>
<td>MSK US or MRI for refractory cases may show tendinosis</td>
<td>Avoid NSAIDs</td>
<td>Percutaneous needle tenotomy for refractory cases</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>IT band Syndrome</th>
<th>Overuse injury</th>
<th>Tenderness over IT band</th>
<th>Not usually necessary initially</th>
<th>Activity modification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lateral knee pain</td>
<td>Crepitus &amp; edema over distal IT band</td>
<td>X-rays if symptoms do not improve with treatment</td>
<td>Physical therapy</td>
<td>Local corticosteroid injection</td>
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<tr>
<td>Distal IT band pain</td>
<td>Ober's &amp; Noble's compression test may be positive</td>
<td></td>
<td>Physical therapy</td>
<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Patellofemoral Pain Syndrome</th>
<th>Overuse injury</th>
<th>VMO weakness</th>
<th>Not usually necessary initially</th>
<th>Activity modification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Associated with recent change in activity or increase in frequency or intensity of training</td>
<td>Gluteus medius weakness</td>
<td>X-rays if symptoms do not improve with treatment</td>
<td>Physical therapy</td>
<td></td>
</tr>
<tr>
<td>Pain around &amp; posterior to patella worse</td>
<td>VLO &amp; IT band tightness</td>
<td>Acetaminophen or NSAIDs</td>
<td>Physical therapy</td>
<td></td>
</tr>
<tr>
<td>Patellar hypermobility</td>
<td>J-sign</td>
<td>Footwear evaluation</td>
<td></td>
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<tr>
<td>Hamstring tightness</td>
<td>Clark’s compression test may be positive</td>
<td>May consider patella taping or stabilizing brace</td>
<td></td>
<td></td>
</tr>
<tr>
<td>J-sign</td>
<td>Hamstring tightness</td>
<td>Surgical referral for refractory cases (&gt; 6 months of adequate conservative treatment)</td>
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</tr>
</tbody>
</table>
Overuse Injuries

- Tendinosis
- Musculoskeletal Ultrasound (MSK US)
DEGENERATIVE RESPONSE

- Most common in tendon

**THE REAL DEAL**

**TENDINOSIS (NOT TENDINITIS)**

Collagen fiber disorientation occurs with dense populations of fibroblasts, scattered vascular hyperplasia, & occasionally necrosis & calcification (angiofibroblastic hyperplasia)
NORMAL TENDON

Type-I collagen bundles packed tightly along the tendon axis with sparse fibroblasts between the collagen rows
DEGENERATIVE RESPONSE

Collagen fiber disorientation occurs with dense populations of fibroblasts & scattered vascular hyperplasia (angiofibroblastic hyperplasia)
A NEW WAY OF THINKING?

The inflammatory process may be the only way to remove necrotic muscle fibers & disrupted connective tissue.

It clears injured tissues to permit new muscle fibers & scar tissue to heal the injury.

MSK US

Indications

- Example
  - Achilles Tendinopathy
  - Achilles Tendon Chronic Pain with associated tendinosis on MSK US
left achilles tendinosis
Percutaneous Needle Tenotomy

- MSK ultrasound guided percutaneous needle tenotomy can stimulate a healing response in chronic tendonosis
- 18 gauge to 22 gauge needle (1.5 inch to 5 inch in length depending on the area of interest)
- Multiple tendon fenestrations & needling
  - Create good inflammation & allow for healing to occur
Percutaneous Needle Tenotomy (PNT)

- Most commonly perform the PNT followed by injection with Autologous Blood, Prolotherapy or PRP
- Eccentric strengthening after procedure during recovery phase
  - Help induce appropriate healing in the tendon in an organized fashion
Autologous Blood Injection

- In refractory cases another treatment option is to take a sample of the patient's own blood & inject this into the area of tendonosis under MSK U/S guidance.
- For example:
  - Lateral epicondylosis: 5-10 ml of Autologous Blood
  - Hamstring Tendinosis: 10-20 ml of Autologous Blood
  - Achilles Tendinosis: 5-10 ml of Autologous Blood
Achilles Tendonois
S/P PNT with ABI

LEFT ACHILLES TENDON TRANSVERSESE AT SITE OF AHI
PRE

left achilles tendonosis

POST

LEFT ACHILLES TENDON TRANSVERSE AT SITE OF AHI
Studies?

- Limited
- Some small controlled & observational studies of patients with refractory medial & lateral epicondylosis who received MSK ultrasound-guided PNT with ABI reported improvement in symptoms & in MSK U/S appearance of tendons
Elbow Lateral Epicondyle Tendonosis

- Needleling into hypoechoic areas
- Lat Epicondyle
- Needle tip
- Radial head

Left elbow longitudinal view
Elbow Lateral Epicondyle Tendonosis
Elbow Lateral Epicondyle Tendinosis

NEEDLING PARATENON OF EXTENSOR TENDON

NEEDLE

LATERAL EPICONDYLE

RADIUS

LEFT ELBOW LONGITUDINAL VIEW