PHYSICIAN ASSISTANTS ADDRESSING COMMON INJURIES INCURRED WITH RUNNING

Rebecca Goertzen, PA-S

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LEARNING OBJECTIVES

- Comprehend the incidence and magnitude of injuries related to running
- Discuss the unique presentation of injuries that occur with running activities
- Identify the appropriate diagnostics utilizes to adequately assess the different injuries incurred with running
- Review the PA's interprofessional approach to treatment options and prevention strategies applied to injuries sustained with running activities

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MAGNITUDE

- 50 million Americans (15% of the U.S. population) participate in running or jogging according to the 2020 report from the Sports and Fitness Industry Association
- Why run?
  - Easily accessible
  - Can be done nearly anywhere
  - Inexpensive
  - Can fit it into a busy schedule
  - Efficient way to achieve physical fitness
  - Mentally therapeutic
- Disadvantage?
  - Injuries – at least 50% of regular runners get hurt each year

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COMMON INJURIES INCURRED WITH RUNNING

- Patellofemoral Syndrome (Runner's Knee)
- Achilles Tendinopathy
- Plantar Fasciitis
- Iliotibial Band Syndrome
- Medial Tibial Stress Syndrome (Shin Splints)

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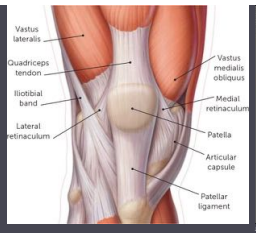
PATELLOFEMORAL SYNDROME

- Condition that is characterized by anterior knee pain involving the patella and retinaculum
- Epidemiology
  - 25-40% of all knee problems seen in sports medicine clinic
  - Women > Men
    - Previously was thought it was due to a wider Q angle, but more recent research has shown it is not a contributing factor



Galtonde DY, Ericksen A, Robbins RC. Patellofemoral Pain Syndrome. *Am Fam Physician*. 2010;39(2):88-94.

John MS. Patellofemoral pain syndrome: a review and guidelines for treatment [published correction appears in Am Fam Physician 2000 Feb 15;61(4):966, 967]. *Am Fam Physician*. 1999;60(7):2012-2022.

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PATELLOFEMORAL SYNDROME

- Etiology
  - Overload – BMI > 25
  - Overuse
  - Malalignment causing abnormal patellar tracking
    - Static abnormalities – leg length discrepancy, abnormal foot morphology, abnormal patellar mobility, angular and rotational deformities of the lower extremity
    - Dynamic abnormalities – muscle weakness or imbalance, excessive or insufficient foot pronation, hip weakness and adduction
  - Trauma

John MS. Patellofemoral pain syndrome: a review and guidelines for treatment [published correction appears in Am Fam Physician 2000 Feb 15;61(4):966, 967]. *Am Fam Physician*. 1999;60(7):2012-2022.

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PATELLOFEMORAL SYNDROME

- Symptoms
  - Dull, achy anterior knee pain that is poorly localized as "under" or "around" patella
  - Worse with squatting, running, prolonged sitting, or using steps
  - Rubbing, grinding, clicking sound when bending/straightening knee
- Physical Exam
  - Pain with squatting
  - Special exams
    - Patellar tilt test
    - Patellar apprehension test
    - Clarke test – no longer recommended, not very specific nor sensitive

Test	Sensitivity	Specificity
Pain During Squatting	91%	50%
Patellar Tilt Test	43%	92%
Patellar Apprehension Test	7-32%	86-92%
Clarke Test	39-48%	67-75%

Adapted table from Gaitonde DY, Ericksen A, Robbins RC. Patellofemoral Pain Syndrome. *Am Fam Physician*. 2019;99(2):88-94.

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PATELLOFEMORAL SYNDROME

Patellar Tilt Test

https://www.youtube.com/watch?v=DlHoesKkvTM

Patellar Apprehension Test

https://www.youtube.com/watch?v=xXmjYVDkmVg

Clarke Test

https://www.youtube.com/watch?v=Y3mKHgg6IoU

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PATELLOFEMORAL SYNDROME

- Diagnosis – clinical
  - Plain films are unnecessary if there is no trauma, instability, prior surgery, or pain at rest
    - Warranted if no improvement in 1-2 months
- Treatment
  - Acute phase
    - Activity modification and NSAIDs
  - Recovery phase
    - PT, stretching, strengthening – hamstrings, hip abductors, quadriceps
  - Adjunctive
    - Bracing and patellar taping

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Jones BQ, Covey CJ, Sineath MH Jr. Nonsurgical Management of Knee Pain in Adults. *Am Fam Physician.* 2015;92(10):875-883.

PATELLOFEMORAL SYNDROME

Hamstring stretch

A) Knee of the affected leg bent and hold thigh steady

B) Extend the leg at the knee, hold for 30-60 seconds

2 repetitions twice daily

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PATELLOFEMORAL SYNDROME

Jones BQ, Covey CJ, Sineath MH Jr. Nonsurgical Management of Knee Pain in Adults. *Am Fam Physician.* 2015;92(10):875-883.

Hip abductor strengthening

a) Unaffected leg off the platform, keep pelvis parallel with the floor

b) Lower leg slowly while supported knee remain in extension

c) Contract gluteal muscles to elevate leg

3 sets of 10 repetitions

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PATELLOFEMORAL SYNDROME

Jones BQ, Covey CJ, Sineath MH Jr. Nonsurgical Management of Knee Pain in Adults. *Am Fam Physician.* 2015;92(10):875-883.

Quadriceps straight leg raise

- Affected leg outstretched and unaffected leg flexed
- Lift the affected leg 8 inches off the surface and slowly lower the leg to the ground over 2-4 seconds

3 sets of 10 repetitions

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PATELLOFEMORAL SYNDROME

https://www.youtube.com/watch?v=D3F8c6Mm9O8

https://www.amazon.com/Mueller-Jumpers-Knee-Strap-Black/dp/B01EUPDXEK?th=1

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PATELLOFEMORAL SYNDROME

- Weight loss
- Stretching before runs
- Gradually increasing activities
- Running with slight lean forward and knees bent
- Running barefoot or in minimalist running shoes may lower the rates
  - Recommend running their cool down runs barefoot in grassy area

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ACHILLES TENDINOPATHY

- Overuse injury of the Achilles tendon, the largest tendon in the body which connects calcaneus to gastrocnemius and soleus muscles
- Epidemiology
  - Lifetime incidence in competitive runners is 40-50%
- Tendon susceptible to injury because of its limited blood supply and the large forces it is subjected to
  - Running produces forces up to 8x the body's weight
- Risk Factors
  - Cold weather training
  - Prior history of tendinopathy
  - Foot misalignment
  - Males > 30
  - Obesity
  - Increasing age
  - Fluroquinolone use
  - Oral glucocorticoids

https://westcoastsci.com/blog/soleus-the-forgotten-muscle-for-runners/

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ACHILLES TENDINOPATHY

- Etiologies
  - Abruptly increasing activity
    - Common in middle-aged individuals who play weekend sports
  - Sustained stress
  - Poor running mechanics
  - Improper footwear
- Symptoms
  - Pain or stiffness 2-6 cm above the posterior calcaneus
  - "burning" that is worse with activity and relieved after period of rest

Maughan KL, Boggess BR. In: Post TW, ed. *UpToDate*. UpToDate; 2022. Accessed February 10, 2022. https://www.uptodate.com/contents/achilles-tendinopathy-and-tendon-rupture?search=achilles%20tendonitis&source=search_result&selectedTitle=1~44&usage_type=default&display_rank=1

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ACHILLES TENDINOPATHY

- Physical Exam
  - Have patient lie prone with feet hanging off table
    - Inspection – bruising, swelling, foot misalignment
    - Palpation –
      - Often elicits tenderness, especially when rubbing tendon between the fingers
      - Assess the thickness and consistency for differences between legs
      - Perform range of motion
      - Crepitation common
  - Thompson Test to evaluate for rupture
    - Squeeze gastrocnemius and watch for plantar flexion, if there is not then considered a positive test indicating tendon rupture
    - If unclear test, place sphygmomanometer on calf and inflate to 100mmHg. Dorsiflex foot, if pressure rises to 140 mmHg then tendon intact. If only a flicker of movement, then likely ruptured

Maughan KL, Boggess BR. In: Post TW, ed. *UpToDate*. UpToDate; 2022. Accessed February 10, 2022. https://www.uptodate.com/contents/achilles-tendinopathy-and-tendon-rupture?search=achilles%20tendonitis&source=search_result&selectedTitle=1~44&usage_type=default&display_rank=1

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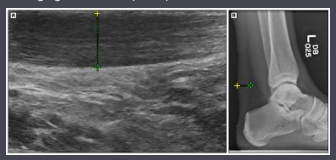
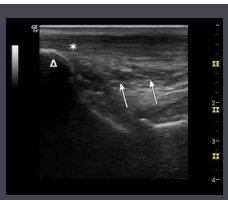
ACHILLES TENDINOPATHY

- Diagnosis – clinical
  - Imaging not necessary except to r/o other conditions



Achilles tendinopathy – increased thickness, no fiber disarray



Tendon rupture – disarrayed tendon fibers

Maughan KL, Boggess BR. In: Post TW, ed. *UpToDate*. UpToDate; 2022. Accessed February 10, 2022. https://www.uptodate.com/contents/achilles-tendinopathy-and-tendon-rupture?search=achilles%20tendonitis&source=search_result&selectedTitle=1~44&usage_type=default&display_rank=1

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ACHILLES TENDINOPATHY

- Acute treatment
  - Avoid aggravating activities
  - Ice when symptomatic
  - NSAIDs for 7-10 days
  - Topical nitroglycerin
  - Heel lift or cushion
- Rehabilitation
  - Eccentric exercise and resistance training – Alfredson protocol
    - Eccentric = muscle and tendon contract as you are lengthening the muscle
- Other options
  - Low-level laser therapy
  - Dry needling
  - Kinesiotape
  - Extracorporeal shockwave therapy
  - Platelet rich plasma injection
  - Autologous blood injection
  - Multiple other newer injections with limited studies

Do not give glucocorticoid injection – rupture risk

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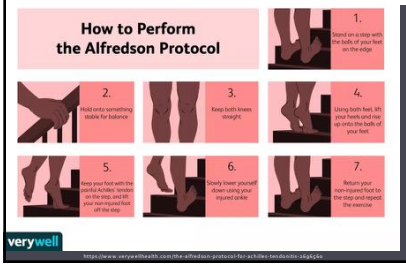
ACHILLES TENDINOPATHY



https://www.verywellhealth.com/the-alfredson-protocol-for-achilles-tendonitis-2645464

- 3 sets of 15 repetitions with knees straight to stress the gastrocnemius
- Repeat with knees slightly bent to stress the soleus
- Do both exercises twice daily
- Total of 180 repetitions daily
- Continue for 12 weeks

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ACHILLES TENDINOPATHY

- Prevention
  - Increase activity gradually
  - Pick shoes with heel cushions
  - Stretch daily
  - Strengthen calves
  - Alternate high impact with low impact activities
  - Additional support with taping

Maughan KL, Boggess BR. In: Post TW, ed. *UpToDate*. UpToDate; 2022. Accessed February 16, 2022. https://www.uptodate.com/contents/achilles-tendinopathy-and-tendon-rupture?search=achilles%20tendonitis&source=search_result&selectedTitle=1~44&usage_type=default&display_rank=1

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ACHILLES TENDINOPATHY

- Fluroquinolone therapy precautions in athletes or highly active patients
  - Athletes (football, basketball, baseball, etc.)
    - Reduce their training volume and intensity from the first dose to 2-4weeks after last dose
  - Runners
    - Decrease their total mileage to 60% of normal training volume & avoid hill and speed training
    - If symptom free for 2 weeks after therapy completion, increase milage by 10% each week
      - Avoid hill and speed training for 2 more weeks

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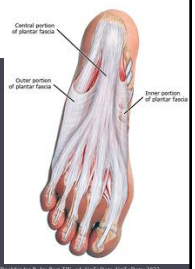
PLANTAR FASCIITIS

- Degeneration of the plantar aponeurosis (plantar fasciopathy more accurate descriptor)
- Plantar fascia is a thick, pearly-white tissue that attaches to medial process of the calcaneal tuberosity and distally divides into 5 segments
- Epidemiology
  - Estimated to be responsible for about 1 million patient visits to the doctor per year in the U.S.
  - 1 in 10 people experience this in their lifetime
  - Peak incidence 40-60 y/o in general population, younger peak in runners
- Etiology – poorly understood, multifactorial most likely
  - Risk factors – obesity, prolonged standing/jumping, flat feet, reduced ankle dorsiflexion



Buckhinder R. In: Post TW, ed. *UpToDate*. UpToDate; 2022. Accessed February 10, 2022. https://www.uptodate.com/contents/plantar-fasciitis?search=plantar%20fasciitis&source=search_result&selectedTitle=1~404&usage_type=default&display_rank=1

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PLANTAR FASCIITIS

- Symptoms
  - "stabbing" pain in the anteromedial heel + worse when initiating walking + local point tenderness
  - Heel pain worse with first steps of activity, lessens with activity, then worsens toward the end of the day with prolonged weight bearing

Trojian T, Tucker AK. Plantar Fasciitis. *Am Fam Physician*. 2019;99(12):744-750.

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PLANTAR FASCIITIS

- Diagnosis
  - Dorsiflex patient's toes with one hand to pull plantar fascia taut and palpate along fascia from heels to toes
  - Windlass Test
  - Labs – not helpful
    - CRP and ESR will be normal unless coexistent inflammatory disease
  - XRAY – not indicated, can order to r/o other causes if atypical or persistent symptoms
  - Ultrasound – not recommended routinely, but > 4mm thick and hypoechogenicity support the diagnosis

Buchbinder R. In: Post TW, ed. *UpToDate*. Waltham, MA: UpToDate; 2022. Accessed February 10, 2022. https://www.uptodate.com/contents/plantar-fasciitis?search=plantar%20fasciitis&source=search_result&selectedTitle=1~40&usage_type=default&display_rank=1

https://www.youtube.com/watch?v=52tvH54_o2c

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PLANTAR FASCIITIS

- Treatment – limited supporting evidence on effectiveness
  - Stretching
    - Foot ankle circles
    - Toe towel curls
    - Unilateral heel raises with toe dorsiflexion
  - Avoid flat shoes and walking barefoot
  - Silicone heel shoe inserts
  - 2-3 weeks of NSAIDs
  - Night splint – conflicting evidence
  - Taping
  - Injections

Buchbinder R. In: Post TW, ed. *UpToDate*. Waltham, MA: UpToDate; 2022. Accessed February 10, 2022. https://www.uptodate.com/contents/plantar-fasciitis?search=plantar%20fasciitis&source=search_result&selectedTitle=1~40&usage_type=default&display_rank=1

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PLANTAR FASCIITIS

- Panel 1 – Place metatarsal strip circumferentially
- Panel 2 – Place tape at lateral aspect of the plantar surface of metatarsal strip and apply diagonally across the sole, around the heel, and along lateral border of foot ending on metatarsal strip
- Panel 3 and 4 – Begin like previous piece of tape. Once around the heel bring diagonally to metatarsal strip near base of great toe.

Buchbinder R. In: Post TW, ed. *UpToDate*. Waltham, MA: UpToDate; 2022. Accessed February 10, 2022. https://www.uptodate.com/contents/plantar-fasciitis?search=plantar%20fasciitis&source=search_result&selectedTitle=1~40&usage_type=default&display_rank=1

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PLANTAR FASCIITIS

- Glucocorticoid Injection – significant pain and disability > 3-4 weeks
  - Supplies
    - 5 mL syringe
    - 25-gauge, 1.5 inch needle
    - 2 mL of 1% lidocaine or 0.25% or 0.5% bupivacaine
    - 1 mL of 40mg/mL methylprednisolone
  - Approach
    - Identify the medial aspect of the foot and palpate the soft tissue just distal to calcaneus and locate point of maximal tenderness
    - Insert medially and perpendicular to skin reaching down past the midline of the width of the foot
    - Inject slowly and evenly in the middle 1/3 of the foot
    - Do not inject into fat pad - atrophy

Tatila AF, Cardone DA. Diagnostic and therapeutic injection of the ankle and foot. *Am Fam Physician*. 2003;68(7):1356-1362.

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PLANTAR FASCIITIS

- Last line treatment is surgical
  - Indicated if no improvement in 6-12 months
  - Standard procedure is an endoscopic plantar fasciotomy without inferior calcaneal exosetectomy
  - Majority of patients have seen improvement post surgically
- Unproven and expensive options that may be beneficial
  - Extracorporeal shock wave therapy
  - Autologous whole blood or platelet-rich plasma injections
  - Botulinum toxin
  - Topical corticosteroids
  - Cryosurgery
  - Electric dry needling
- Prevention is unknown, shock absorbing footwear may help

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ILIOTIBIAL BAND SYNDROME

- IT band is thick band of fascia originating at iliac crest and runs longitudinally along lateral aspect of the thigh coursing over the lateral femoral epicondyle and inserting at Gerdy's tubercle
- ITBS = overuse injury of lateral knee that causes inflammation to distal portion of IT band, specifically where the IT band passes over the lateral femoral epicondyle
- Epidemiology
  - 2nd MC cause of knee pain due to overuse
  - Commonly in runners and cyclists

Lateral view

Jackson J. In: Post TW, ed. *UpToDate*. UpToDate; 2022. Accessed February 11, 2022. https://www.uptodate.com/contents/iliotibial-band-syndrome?search=iliotibial%20band%20syndrome&source=search_result&selectedTitle=1~74&usage_type=default&display_rank=1

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ILIOTIBIAL BAND SYNDROME

- Pathophysiology is unclear
  - Previously believed it was due to friction from the ITB sliding over the LFE, but studies have shown the ITB is firmly connected at the LFE by the epicondylo-patellar ligament and patellar retinaculum and does not make significant movements
  - Recent studies show ITB is under greatest tension at 30 degrees of knee flexion
    - Repeated motion at this angle can cause repeating compression of underlying structures and lead to ITBS
- Risk factors
  - Intrinsic
    - Weak hip abductors
    - Increased hip abduction – genu varum "bowlegs"
  - Extrinsic
    - Uneven running surfaces
    - Sudden increase in running mileage
    - Over-striding
    - Excessive running in the same direction on a track
    - Improper running footwear

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ILIOTIBIAL BAND SYNDROME

- Symptoms
  - Initially a diffuse achiness over entire lateral aspect of knee
  - Develops into sharper burning pain over lateral femoral epicondyle occurring just prior to or during foot strike when running
  - Physical exam
    - Focal tenderness at the distal ITB*
    - Positive Noble Compression Test
    - Ober test – previously thought to assess ITB tightness and mobility, but recent studies reveal it is assessing gluteus muscles and hip capsule

Jackson J. In: Post TW, ed. *UpToDate*. UpToDate; 2022. Accessed February 11, 2022. https://www.uptodate.com/contents/iliotibial-band-syndrome?search=iliotibial%20band%20syndrome&source=search_result&selectedTitle=1~74&usage_type=default&display_rank=1

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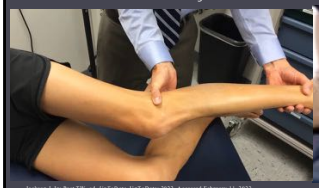
ILIOTIBIAL BAND SYNDROME

- Diagnosis – clinical
  - Ultrasound – ITB thickening at LFE



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https://www.youtube.com/watch?v=68ouuhDyVNI

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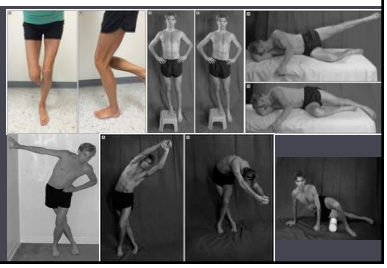
ILIOTIBIAL BAND SYNDROME

- Treatment
  - Acute phase (up to 1 week) – symptom control with rest, ice, NSAIDs
  - Subacute phase (weeks – months) – correct strength and mobility
    - Strength
      - Single shallow knee bend
      - Contralateral pelvic drop
      - Side laying abduction or standing abduction
    - Mobility – ITB stretches
      - Standing stretch
      - Arms overhead stretch
      - Forward lean stretch
      - Foam roller



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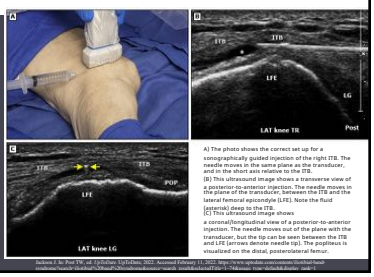
ILIOTIBIAL BAND SYNDROME

- Treatment
  - Chronic phase (months-years)
    - Glucocorticoid injection
      - Patient in lateral recumbent position with knee flexed 20-30 degrees
      - Supplies – 5 mL syringe, 25-gauge 1 inch needle, 1-2mL of 1% lidocaine, and 1 mL of betamethasone sodium phosphate and acetate or 1 mL of methylprednisolone, 40 mg per mL
      - Insert needle with a posterior to anterior approach in same plane as transducer between ITB and LFE at point of maximal tenderness
    - Other controversial options
      - Dry needling
      - Biologic injections
      - Prolotherapy
      - Topical nitroglycerin
    - Symptoms > 6 months despite long term PT with a compliant patient, refer to surgeon with experience on ITB releases



A) The photo shows the correct set up for a sonographically guided injection of the right ITB. The needle moves in the same plane as the transducer, and in the short axis relative to the ITB.
(B) This ultrasound image shows a transverse view of a posterior-to-anterior injection. The needle moves in the plane of the transducer, between the ITB and the lateral femoral epicondyle (LFE). Note the fluid (asterisk) deep to the ITB.
(C) This ultrasound image shows a coronal/longitudinal view of a posterior-to-anterior injection. The needle moves out of the plane with the transducer, but the tip can be seen between the ITB and LFE (arrows denote needle tip). The popliteus is visualized on the distal, posterolateral femur.

Jackson E Jr. Post TW, ed. UpToDate. UpToDate; 2022. Accessed February 11, 2022. https://www.uptodate.com/contents/iliotibial-band-syndrome?search=iliotibial%20band%20syndrome&source=search_result&selectedTitle=1~74&usage_type=default&display_rank=1

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ILIOTIBIAL BAND SYNDROME

- Treatment
  - Adaptation phase – return to sport
    - Run at 50% of pre-injury weekly distance or time, increase volume 10-20% of weekly total
- Prevention
  - Increase running pace
    - Increases knee flexion angle at foot strike to keep them out of 30 degree range
  - Assess biomechanics – have them run centered over a straight line on the track and watch where their feet land
    - If they in-toe, advise to increase gait width
  - Avoid running downhill running and uneven roads
  - Continue interventions that were beneficial

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MEDIAL TIBIAL STRESS SYNDROME

- Overuse or repetitive stress injury characterized by exercise-induced pain along the posteromedial border of the distal two-thirds of the tibia
- Epidemiology
  - Occurrence rate 13.2-17.3%
- Risk Factors
  - Overpronation of the subtalar joint*
  - Training errors "too much, too fast"
  - Running on hard or uneven surfaces
  - Previous lower extremity injury
  - Running > 20 miles per week
  - Females > Males
- Pathology unknown
  - Some suggest due to fasciopathy
  - Others propose due to bone overloading or impaired bone remodeling

Galbraith RM, Lavallee ME. Medial tibial stress syndrome: conservative treatment options. *Curr Rev Musculoskelet Med*. 2009;2(3):127-133. Published 2009 Oct 7. doi:10.1007/s12178-009-9055-6

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MEDIAL TIBIAL STRESS SYNDROME

- Symptoms
  - Vague, diffuse pain along the middle-distal tibia associated with exertion
    - Early course – pain worse at beginning of exercise and subsides during training
    - Progressed course – pain with less activity and can occur at rest
  - If there is a cramping, burning pain over posterior compartment or numbness or pins and needles sensation in the foot during exercise then should be suspicious for chronic exertional compartment syndrome
- Diagnosis – H&P usually sufficient
  - Reproducible pain when palpating the posteromedial tibial border for 5+ consecutive centimeters
  - XRAY if failing to improve or underlying pathology suspected, such as pain more localized to specific area then stress fracture should be considered

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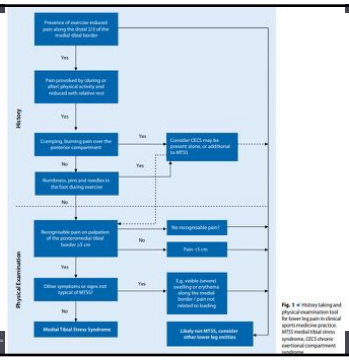

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MEDIAL TIBIAL STRESS SYNDROME

- Treatment
  - Acute – rest, ice massage, NSAIDs
  - Subacute
    - Modify training routine – lessen the impact with a graded tibial loading exercise program
    - Decrease weekly running distance by 50%
    - Avoid hills or uneven surface
    - Stretching and strengthening
    - Proprioceptive training
    - Footwear – new shoes every 250-500 miles
    - Fascial distortion model treatment (targeted manual techniques)
  - Surgery (posterior fasciotomy) – last resort

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MEDIAL TIBIAL STRESS SYNDROME

- Prevention – nothing has been proven
  - Encourage a biomechanical analysis of their running movements to identify their risk factors
  - Useful methods
    - Shock absorbent insoles
    - Pronation control insoles
    - Graduated running programs
    - Increase strength in soleus muscle
  - Stretching does NOT prevent

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CONCLUSION

- All running related conditions discussed are due to overuse and are multifactorial
  - The exact etiologies of each are still largely unknown
- Diagnosis of each is heavily reliant on history and physical exam
  - Utilize imaging only when underlying pathology is suspected
- Numerous treatment options available for each condition, may need to try many of them before results are seen
  - Clinicians should continue to stay up to date with recent research on newer options
- Prevention strategies are vital to prevent recurrence of injuries, but evidence of the efficacy of most is lacking
  - Difficult to provide preventative options when etiologies are not fully understood

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CITATIONS

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