Running Injuries

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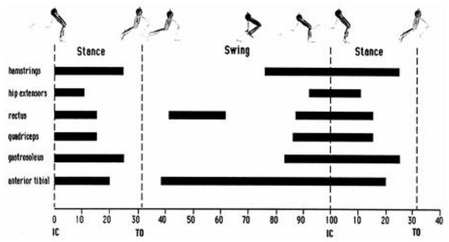
Epidemiology

- Gender: Higher risk of ITBS in females due to greater Q-angle due to the increased stretch on the ITB during the stance phase.[1]
- Skill level: Higher risk of injury in **novice** runners than in **recreational** and **elite** runners.[2]
- Frequency of training: sudden increases in training intensity can increase risk of injury.[2]

Biomechanics

- **Stance phase**: starting from initial contact to push off, stance phase incorporates shock absorption as well as forward propulsion.
  - Initial contact and foot strike: In general, most distance runners will benefit from a **midfoot** strike. This is the most efficient way for the foot to strike the ground because it allows the foot to absorb force without stopping the body thereby preventing excess load on the knee (heel strike). This foot strike will also help keep the runner's torso aligned slightly behind their foot, which is an efficient way to land to prepare for propulsion. A **Forefoot** strike is usually reserved for running at faster speeds or for elite runners, and can sometimes cause overuse of the calf muscles if done improperly. The hamstrings, quadriceps, and hip extensors all begin to fire just before this stage (see graph).
  - Midstance: This is the section of running gait that the gluteus medius is most active. This provides the hip with stable positioning to prepare it for extension. Hamstrings are contracting in an almost isometric fashion keep the knee in a position that allows the hip extensors and quadriceps to work
  - Propulsion or toe-off: Hip extension and slight plantarflexion occur, knee and hip begin to flex to prepare for swing phase.
- **Swing phase**: starting from toe-off and ending at initial contact, this is the section of running where the leg is put back into a cocked position in order to make initial contact and propulsion more efficient. The hip and knee are flexed while the contralateral limb is extended. Good mechanics have the lower legs parallel with each other.



Types of Injuries

- Hip or Groin Pathology
  - Groin and/or pelvic pain commonly caused by muscle imbalances resulting in anteriorly rotated pelvis.
  - Patient presentation:
    - Anterior pelvic tilt
    - Tight psoas, and/or rectus femoris
    - Weak lower abdominals
    - Tight low back extensors
    - Osteitis pubis pain presentation- pubis pain, worse with acceleration
    - Low back pain
- Iliotibial Band Syndrome (ITBS)
  - Occurs due to friction between the lateral femoral epicondyle and the ITB.
  - Patient presentation:[3]
    - Recent increase in running mileage
    - Running with weak hip abductors
    - ITB tightness/positive Ober's test
    - Other possible findings: Decreased hip extension, poor muscle quality or increased pain to palpation of TFL
- Patellofemoral Pain Syndrome
  - Anterior knee pain that is usually linked to malalignment
  - Patient presentation:[4]
    - Abnormal bony alignment such as external tibial torsion, femoral anteversion, genu valgus, or genu recurvatum
    - Muscle imbalances (weak VMO) causing abnormal patellar tracking
    - Increased pain with closed chain loading activities such as squats
- Pes Anserine Bursitis
  - Patient presentation:[5]
    - Medial knee joint line pain mimicking the symptoms of a medial meniscus tear
    - May be more painful with flexing/extending
    - Tendinous attachment may be tender to palpation
    - May have slight swelling over tendinous attachment
    - Will likely have medial hamstring, gracilis, and/or sartorious tightness or congestion
- Stress fracture[6]
  - Medial tibial stress syndrome: inflammation of the periosteum surrounding the medial tibia due to repetitive stresses
  - Patient presentation:
    - Medial tibial soreness, point tenderness
    - Recent change in training routine
    - Decreased dorsiflexion ROM
    - Muscle weakness/imbalance
    - Pes planus, genu varum, tibial torsion, external femoral rotation

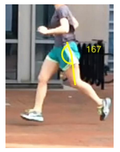
Treatment

- **Activity Modification**
  - Errors in running frequency, duration, and intensity may be responsible for 60-70% of running injuries.[7] Increases in distance or speed of greater than 10% has been a guideline employed in the past, but current research suggests that it has limitations, and that training guidelines should be individualized.[7]

- **Neuromuscular Re-education**
  - Assess natural bony alignment
    - External tibial torsion?
    - Pes planus?
    - Genu valgus/varus?
    - Femoral retro/anteversion?
  - Ergonomics education
    - Make sure that the patient is not compensating for their abnormal bony alignment with constant muscle activation. This can cause muscle imbalances to occur that can cause the aforementioned syndromes as well as other pain syndromes.
  - Running gait assessment examples:

Excessive heel strike

Over-striding



Decreased hip extension

- **Manual**
  - Soft tissue mobilization
    - ITB syndrome: TFL, internal hamstrings, vastus lateralis
    - PFPS: vastus lateralis-improve patellar tracking
    - Pes anserine bursitis: internal hamstrings, Sartorius, gracilis
    - Decreased ankle dorsiflexion: anterior tibialis, gastric/soleus
    - Excessive pronation/eversion: peroneals
- **Therapeutic Exercise**
  - ITBS
    - Strengthen: glutes, hamstrings
    - Stretch: TFL, quads, psoas
  - PFPS
    - Strengthen: VMO,
    - Stretch: Address any muscle imbalances
  - Pes Anserine Bursitis
    - Strengthen: lateral hamstrings
    - Stretch: medial hamstrings, adductors
  - Exercises
    - Hamstring stretch
    - Warrior 2, side lunge stretch
    - Kneeling Hip flexor stretch
    - Quad stretch (from neutral hip extension and PPT)
    - Reverse lunge
    - Toe curls
    - Heel raises
    - Calf stretch
    - Peroneal stretch

Conclusion

There are many factors that can contribute to running injuries and their treatment. Intrinsic factors, such as bony alignment and muscular strength imbalances, can predispose certain runners to specific injuries, while spikes in training frequency and intensity can yield a more diverse list of injuries. The variability in how people run and the diversity of runner anatomies yield equally variable strategies for training and treatment of runners. Two vital treatment strategies are frequency and intensity pacing principles, and strength training, and by including treatments that target mobility improvement, coordination, form, footwear, and nutrition, we can provide the injured runner with the individualized approach necessary to achieve the most effective treatment.

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