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Chapter 1 - Injury Overview, Relevant Research and Clinical Pearls

It is important to understand what science has to say about running and knee pain. Most runners are keenly aware of the word pronation. In fact, they often believe that it is a bad word when it comes to describing their running pattern.

While overpronation can certainly cause a cascade of issues, I want to clear the air about pronation. Normal gait consist of supination and pronation. Pronation (the rolling of the arch inward or flattening of the foot) is a normal part of the gait cycle and ankle biomechanics with walking and running. It is intended to help with the dissipation of forces and pre-set the foot for propulsion as the foot moves into supination and pushes back off the ground.

It is excessive pronation or even asymmetrical pronation that leads to overuse injuries and issues in runners including but not limited to, shin splints, stress fractures, runner's knee, IT band problems and anterior knee pain. For years, researchers have thought pronation must be corrected in runners. Excessive pronation causes the tibia and femur to internally rotate. In turn, often the knee cap will slide or rotate laterally. Therapy programs often seek to strengthen the quadriceps to better align the knee cap.

Other common interventions include:

- Orthotics
- Over the counter inserts
- Stability running shoes (moderate pronation)
- Motion control shoes (severe pronation or flat foot)
- Knee brace to pull the knee cap more medially

With excessive pronation, the heel becomes everted and the toes will tend to point outward. Adding medial arch support has been considered the frontline defense to prevent further collapse and reduce strain in the entire kinetic chain. Personally, I tend to favor using less expensive over the counter arch supports (such as Superfeet) prior to investing in custom orthotics.

More importantly, I believe it is far more important to address mobility, align the body and strengthen the kinetic chain before defaulting to a passive remedy that further allows the muscles to work less efficiently. That is not to say I am against orthotics. I just prefer to look at them as a last line of defense in my treatment approach.

One of the biggest problems I see as the direct result of unwanted pronation is true "runner's knee" and referred to medically as IT Band friction syndrome. If you have ever felt progressive and debilitating pain along the outside of the knee (perhaps even a locking up sensation), then you know how frustrating IT band problems can be. The IT band directly attaches to the gluteus maximus and tensor fascia lata muscles. Its primary purpose is to help stabilize the knee and increase gait efficiency.

Signs and Symptoms of Runner's Knee:

- Pain almost exclusively along the outer portion of the knee (the lower part of the the IT band inserts on the lateral tibial condyle)
- Pain may be worse with ascending and/or descending stairs
- Tenderness over the lower part of the IT band (see picture at right)
- Marked pain with foam rolling compared to the other knee
- Pain decreases with rest
- No pain with sitting or deep squatting in most cases



What does current research have to say in regard to IT band problems? A study published in 2010 by Ferber et al. in the *Journal of Orthopaedic & Sports Physical Therapy* looked at 35 female runners with a history of ITB problems. The major findings revealed:

- ITB syndrome group exhibited significantly greater peak rearfoot invertor moment, peak knee internal rotation angle, and peak hip adduction angle compared to controls
- Prior ITB issues may increase risk for recurrence due to increased strain and indicate atypical hip and knee kinematics may be present
- The rear-foot position may have a lesser role in causation of ITBS -> takeaway is that pronation may not be as critical as we thought before
- Addressing hip stability, strength and eccentric control is paramount to injury prevention
- Observing knee mechanics with respect to side-to-side and rotational motion is very prudent

The thought process was the ITB group would have higher everter moments and this was not found to be true. Focusing more time on the hip may be more prudent for knee control, and I will cover this in more depth moving forward.

When experiencing knee pain, runners may have trouble determining whether or not the true source of pain is from the IT band or the patellofemoral joint (knee cap and femur). Patellofemoral pain (PFP), also commonly referred to as anterior knee pain and/or chondromalacia, may cause some pain along the outside of the knee, but generally presents with some different symptoms. It is an issue that more commonly impacts women. Contributing factors seem to include a wider pelvis, hypermobility and poor muscle activation.

Tensor fascial lata (TFL) and IT Band



There is much debate as to whether you can impact the mobility of the iliotibial band. However, there is a small muscle, the TFL, that attaches directly to the IT Band. If tight, it can inhibit the gluteus medius muscle and create unwanted internal rotation of the leg during running.

To roll the TFL, position the upper thigh on the roller (pictured above) and angle the bottom foot so the toes point at a 45 degree angle to the floor. Now roll up and down the area just in front of the outside of the hip and below the body portion on the front of your pelvis. To roll the IT band, simply move up and down from the hip to the knee. The foot can be neutral for this technique. [Click here](#) for a video on TFL rolling.

Adductors

There are several muscles running up along the inner thigh. Current research indicates that the adductor muscles over power the glutes pulling the thigh inward which in turn may create poor mechanics for the knee.

The picture at top right demonstrates how to roll the adductor group. Position the roller beneath the inner thigh with the knee bent and body supported by the forearms. Next, slide in and out along the roller from the pelvis to the knee.

The picture at bottom right, demonstrates an advanced progression to work on the lower adductor and vastus medialis as you slowly extend the knee while maintaining pressure for 5-10 repetitions.



Bridges - begin in a supine position with the knees bent to 90 degrees and feet flat on the floor shoulder width apart. Place the arms palm down along the side of the body. They can be at any angle, but the further away from the trunk the more help or stability you will gain. Contract the abdominals and then drive through the heels lifting the body off the floor into a table top position. Hold for 1 second at the top and then slowly lower back down. Perform 10-15 repetitions.

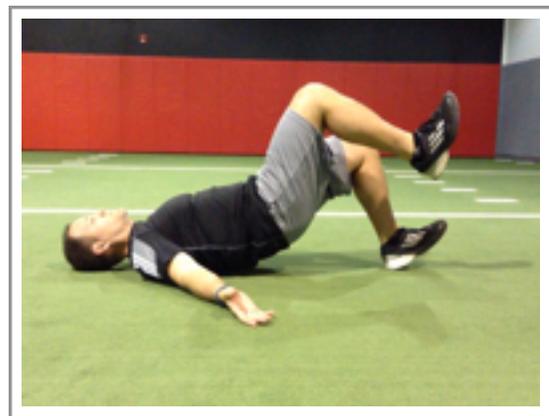


In this particular image, you will also note a small mini-band above the knees. This added resistance forces you to contract the gluteus medius to keep the knees apart. I use this to maximize hip and pelvic stability, but it is optional. Progressing to a stability ball beneath the feet further challenges stability with the double leg bridge.

The double leg bridge can also be advanced by changing arm positions as follows:

1. Arms along the side with palms facing up
2. Arms folded across the chest
3. Hands and arms together pointing away from the chest and toward the ceiling

Bridge with marching - perform a double leg bridge but now hold in the top position and slowly march in place lifting the foot at least 8-10 inches off the floor in an alternating pattern for 10 repetitions on each side.



Single leg sticks - stand and balance on the right leg. Next drive off the right leg and hop forward onto the left foot. Allow the knee and hip to flex (bend) to decelerate the movement and stay in line with the foot. Pause 2-3 seconds at the bottom and then step back to the start position. Perform 5-10 repetitions and then repeat on the other side. Complete 2-3 sets.



The single leg stick is designed to introduce loading to the knee and see how the joint responds as well as challenge the muscles to absorb force and control the body as it decelerates. Observing form and discomfort with this is a critical step in determining how ready you are to hit the ground running again. Avoid medial collapse at all times.