

# “Healthy Running”

## Hamstring Strain Injuries

Hamstring strains are common muscle injuries in runners. The hamstrings are a group of 3 muscles in the back of the thigh. They attach by a tendon to the bottom of the pelvis above the hip joint (press deep in the buttock where you sit) and they extend to the lower leg just below the knee joint. You can easily find these 3 muscles. Place a finger behind and just above your knee, move it to the inside, and you will feel the 2 tendons of the semimembranosus and semitendinosus muscles. Move the finger toward the outside and you will feel the thick lower tendon of the biceps femoris muscle. The biceps consists of a short head and long head. The long head of the biceps is the most frequently injured during sprinting and speed work, whereas tears to the upper tendon attachment at the pelvis are more common in middle-aged and endurance runners.

The long head of the biceps may be predisposed to injury due of its action during running. The hamstrings cross both the hip joint and knee joint and act both to bend the knee (knee flexion) and swing the leg behind (hip extension). These are concentric contractions, when the muscle shortens as it contracts (think the “curl” of arm bicep curls). But during running, the hamstrings act to control and decelerate forward leg motion just before foot strike. This occurs when the hip is flexed and knee extended, placing the muscle at maximum stretch. This is eccentric contraction, when the muscle lengthens as it contracts (think the “release” of arm bicep curls) and places the greatest demand on the biceps femoris long head.

Hamstring strains account for up to 60% of upper leg strains. The runner has sudden onset of pain at the back of the thigh, may report a pop, and is unable to continue running. Pain may be pronounced when sitting. Walking may be painful, avoiding straightening of the knee and bending at the hip, and there is more pain when bending forward. Signs and symptoms depend on the amount of muscle torn. Grade I (mild) strains involve a limited tear of muscle fibers. They produce minor swelling and discomfort with minimal or no loss of strength or motion. Running may be possible though not at full speed. Grade II (moderate) strains involve larger amounts of muscle tear and cause pain to touch, mild to moderate swelling, loss of strength, and limitations of motion. Bruising can be seen. A “gap” in the muscle may be felt. All running is painful. Grade III (severe) strains, uncommon in runners, are a tear across the entire muscle, with extensive bruising, significant pain, and full loss of muscle strength and movement. For the more common grade I and II strains, locating the point of maximal tenderness is helpful. The closer this point is to the attachment high at the pelvis, the longer will be the recovery time and the time not running.

Plain x-rays are useful if there is a suspected bone injury (a bone fragment pulled off with tendon), but otherwise are normal. MR imaging is in order if a complete tendon tear or muscle rupture is suspected, as these may require surgical repair. In most cases, MR imaging is

reserved for the evaluation of these more serious hamstring strain injuries. MR can show the extent of swelling and hemorrhage within a muscle in grade I or grade II injuries, but MR may be normal in minor grade I injuries. MR imaging also does not aid in the return-to-run decision, as swelling and hemorrhage on MR can persist beyond the resolution of pain and weakness.

To lower the rate of hamstring strains, we should be able to identify risk factors for injury and reduce them. Fatigue, inadequate warm-up or cool-down, poor hamstring flexibility, inadequate stretching, and concentric hamstring weakness (bending the knee against resistance) are often listed as risk factors. However, studies addressing these have not demonstrated reduced injury rates. Ironically, perhaps the greatest risk factor for a hamstring injury is having a previous hamstring injury! This underscores the importance of seeking prompt evaluation and treatment.

The pain, weakness, and stiffness of a hamstring strain are notoriously slow to improve. Hamstring strains are among the injuries when you have to STOP RUNNING and allow healing. You should not try to run through a hamstring strain! Treatment of hamstring strains begins in the early stages (1 to 5 days) with RICE: rest, ice, compression, and elevation. Stretching within the degree allowed by pain is done to preserve motion. Non-steroidal anti-inflammatory agents (NSAID's) can be used for the first 1 to 2 weeks for pain and swelling, but their use beyond this is discouraged due to their interference with muscle and connective tissue healing. Massage, chiropractic care, ART, and Graston can be used to reduce symptoms but have not been studied for promoting return to run. After the first few days, submaximal strengthening and exercise to improve joint motion are started. Cardiovascular cross training (bike, swimming) is encouraged. Initial concentric strengthening exercises are followed by eccentric strengthening. Physical therapy plays a key role in formulating and monitoring an exercise protocol. Exercises are added to improve muscle length, promote neuromuscular control, and promote trunk stabilization and agility. Running specific exercises are added when light forward and backward jogging is pain-free. Biomechanical risk factors for future injury can be identified and corrected through functional testing and gait analysis.

One can return to unrestricted running once there is full pain-free range of motion and strength (including eccentric strength), symmetry of movements, and neuromuscular control are restored. Running can resume within 1 to 3 weeks of a grade I strain. Longer recovery time is typical of grade II injuries, with the more severe of these resulting in up to 3 to 4 months of time away from running. Drills and functional movement exercises should be continued because mild pain and stiffness may persist for many months beyond these recovery periods. Training for races should balance weekly mileage, the amount of speed work, and adequate recovery days. Many runners report that they do not feel fully recovered for up to 12 months after a hamstring strain. Even with all of these efforts, re-injury rates are as high as 12 to 31%.

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