



MUSCLE STRAINS

by Richard Beauchamp, MD

Runners, like any other machine, require a device to provide the power. In the case of an auto mobile it is an engine; for us runners, our muscles provide the power.

Muscle is a living organ. The body has hundreds of muscles of various types. Slow twitch, fast twitch, skeletal, smooth, cardiac to name a few. Muscles provide their power by contracting and relaxing, thereby generating a force that causes movement. Running muscles require a strong anchor, where one end of the muscle attaches to a bone or strong tissue. The other end of the muscle connects to the flexible part of the limb, and when that muscle contracts or shortens, movement of that joint is produced. The science behind this muscle contraction and relaxation is very complex. It involves proteins called actin and myosin, as well as various other substances and elements, including calcium, potassium, sodium and water. This is why it is so important to supply the fuel for the muscles to work—water, electrolytes, etc. when you are training and running.

When muscles contract or tighten harder and faster, the leg moves more quickly and running speed increases. This is called concentric contraction: the muscle is shortening and tightening and generating movement. However, not all muscle contractions are associated with the generation of movement. When you run down a hill, for instance, some muscles are contracting to a degree to generate movement, but at the same time the elongated muscles are also contracting to slow you down and decelerate your legs to prevent you from losing control and falling. This is called eccentric contraction. Injuries to the muscles have been shown to occur more frequently in the eccentric phase than the concentric phase in the long distance runner. Sprinters, on the other hand, may be more prone to suffer injuries to their muscles from a sudden muscle contraction, as seen in concentric phases.

Your muscles are prone to being injured through the usual mechanisms: training errors, improper shoe wear, running on dangerous terrain, anatomical factors, such as weak or stiff muscles, and fatigue. Muscles are injured when they sustain small tears in their fibres—so called micro-tears. This causes a small hemorrhage or bleeding into the muscle belly. This is usually self contained (doesn't last long). Any extra fluid added to a



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muscle belly is painful (for example, the pain felt after an intramuscular injection of an antibiotic or an immunization). The repair process, or inflammation, then takes over to heal the injury; this also prolongs the pain until healing is complete. A strain refers to a muscle injury whereas a sprain usually refers to a ligament injury. Some specific muscles that are more prone than others to be strained are those muscles that control the movement of two adjacent joints, such as the psoas flexing both the spine and the hip or the rectus femoris (quadriceps) bending or flexing the hip and straightening or extending the knee simultaneously. It seems the body can't always stabilize one of these joints thereby allowing the muscle contracting or tightening without the necessary anchor. This can result in a tear of the muscle fibre. An actual muscle strain (stretch or tear) can be felt following a sudden forceful tightening of the muscle as seen in a quick sprint. It can also follow a more slowly elongated pull of the muscle from running downhill. Following a muscle pull, you may actually feel the muscle as a tight "knot" that can be very tender to the touch. It will become sore to run as you stretch out the muscle. This may cause you to limp. Strains are usually classified into three types (see table 1).

The location of the pain in a muscle after an injury will help identify which muscle has been injured. A strain of the hip adductor muscle, for instance, will be felt along the upper inside of the thigh. A quadriceps or rectus femoris muscle strain will be felt over the front surface of the thigh. The gastrocnemius (also possible with its partner the soleus muscle) will give you pain in the back of your calf if it is strained. Hamstring injuries can be quite serious and recovery is often prolonged. They may occur from over-striding causing pain, which is usually felt in the pack of the thigh and lower buttock.

The initial management of these injuries doesn't differ according to their location. The affected muscle should be rested and any strenuous movement of that muscle minimized. This means that when you suffer an acute strain, you

should walk rather than run. Gentle stretches of the muscles, as one regularly should be doing, can be resumed early to prevent tightening of the injured muscle; however, the stretches should NOT be vigorous enough to cause pain in the area as more damage to the muscle can occur. Applying ice to the area is probably the most important early therapy that you can do. Place an ice pack, covered with a towel, over the area for 20 minutes four times a day. Some runners get more pain relief by applying a compressive tensor bandage (not too tight, for it may work like a tourniquet and cause swelling) removing and rewrapping it every few hours. During this acute phase, using pain medications, analgesics, such as Tylenol, are helpful.

The healing phase of a muscle strain begins very soon after the injury. Once the pain and swelling diminish, usually after two to three days for a mild strain, you can gently increase the intensity of the stretches and advance from there to full activity level accordingly. Generally, let pain be your guide.

For the more severe strains, however, longer recovery will be required. Self-treatment lasting for more than one week should not be continued if no improvement is occurring. At this stage you must seek a medical practitioner who can confirm the diagnosis of a muscle strain and hopefully begin a more professionally and scientifically based treatment plan directed at both the muscle strain and possibly at some underlying muscle weakness or imbalance that may have caused the actual strain.

Physiotherapists, massage therapists, chiropractors and trainers with a solid knowledge of the musculoskeletal system are able to assist in your recovery following a muscle strain. They can guide you on your particular program, which may involve specific stretching regimes for contracted or tight muscles. Some areas of weakness may have to be addressed through muscle strengthen-

ing programs such as isometric weight lifting and core strengthening and stabilization. More specific attention to the actual area of the muscle through cross fibre massage is sometimes needed, as is active release therapy (ART).

Muscles have a very rich or abundant blood supply. This allows the generation of an early reparative process and should also allow eventual resolution of the muscle strain and a return to your pre-injury level of running. At times, however, a Grade III muscle strain may lead to a permanent impairment. Fortunately, this grade of injury is rare and most other strains should be healed in six weeks. After a severe strain, your therapist should guide your return to full, unrestricted running as re-injury can easily occur leading to a much more prolonged recovery phase. ❖

table 1

GRADE I

Partial, minor fibre tear
Walking possible
Recovery one to two days

Grade II

Major tear but not whole muscle
Limping
Recovery three to six weeks

Grade III

Major, complete tear of whole muscle
Unable to walk
May require surgery; recovery 6 to 12 weeks (or longer)



About Richard Richard Beauchamp is a runner as well as an orthopedic surgeon. His running career has spanned about 10 years and involved seven marathons. His orthopedic surgery career extends over 25 years. He is the medical director of the Shriner's Gait Lab at the Sunny Hill Health Centre in Vancouver and a clinical professor in the Department of Orthopaedics at the University of British Columbia. He runs out of the Alma Running Room along with his wife and "cookie maker," Dorothy