OrthoInfo

DISEASES & CONDITIONS

Compartment Syndrome

Compartment syndrome is a painful condition that occurs when pressure within the muscles builds to dangerous levels. This pressure can decrease blood flow, which prevents nourishment and oxygen from reaching nerve and muscle cells.

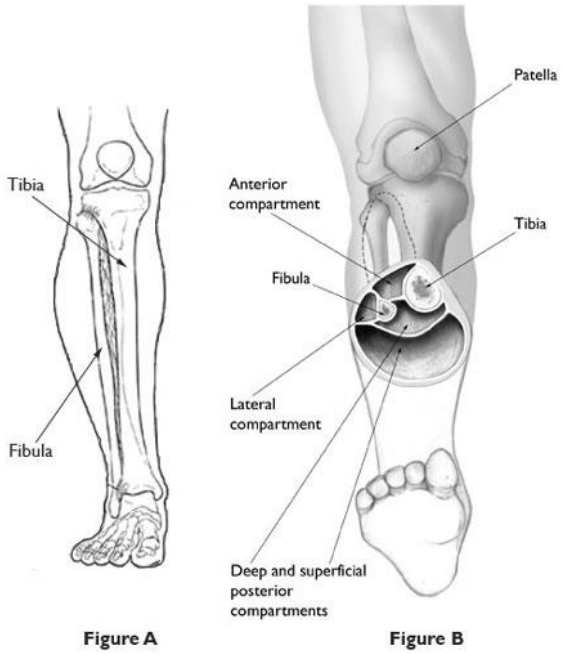
Compartment syndrome can be either acute or chronic.

Acute compartment syndrome is a medical emergency. It is usually caused by a severe injury. Without treatment, it can lead to permanent muscle damage.

Chronic compartment syndrome, also known as exertional compartment syndrome, is usually not a medical emergency. It is most often caused by athletic exertion.

Anatomy

Compartments are groupings of muscles, nerves, and blood vessels in your arms and legs. Covering these tissues is a tough membrane called a fascia. The role of the fascia is to keep the tissues in place, and, therefore, the fascia does not stretch or expand easily.



The area between the knee and ankle has four major muscle compartments: anterior, lateral, superficial posterior, deep posterior.

Figure A: Reproduced and adapted with permission from Gruel CR: Lower Leg, in Sullivan JA, Anderson SJ (eds): Care of the Young Athlete. Rosemont, IL, American Academy of Orthopaedic Surgeons, 2000. Figure B: Reproduced and adapted from The Body Almanac. © American Academy of Orthopaedic Surgeons, 2003.

Description

Compartment syndrome develops when swelling or bleeding occurs within a compartment. Because the fascia does not stretch, this can cause increased pressure on the capillaries, nerves, and muscles in the compartment. Blood flow to muscle and nerve cells is disrupted. Without a steady supply of oxygen and nutrients, nerve and muscle cells can be damaged.

In acute compartment syndrome, unless the pressure is relieved quickly, permanent disability and tissue death may result. This does not usually happen in chronic (exertional) compartment syndrome.

Compartment syndrome most often occurs in the anterior (front) compartment of the lower leg (calf). It can also occur in other compartments in the leg, as well as in the arms, hands, feet, and buttocks.

Cause

Acute Compartment Syndrome

Acute compartment syndrome usually develops after a severe injury, such as a car accident or a broken bone. Rarely, it develops after a relatively minor injury.

Conditions that may bring on acute compartment syndrome include:

- **A fracture.**
- **A badly bruised muscle.** This type of injury can occur when a motorcycle falls on the leg of the rider, or a football player is hit in the leg with another player's helmet.
- **Reestablished blood flow after blocked circulation.** This may occur after a surgeon repairs a damaged blood vessel that has been blocked for several hours. A blood vessel can also be blocked during sleep. Lying for too long in a position that blocks a blood vessel, then moving or waking up can cause this condition. Most healthy people will naturally move when blood flow to a limb is blocked during sleep. The development of compartment syndrome in this manner usually occurs in people who are neurologically compromised. This can happen after severe intoxication with alcohol or other drugs.
- **Crush injuries.**
- **Anabolic steroid use.** Taking steroids is a possible factor in compartment syndrome.
- **Constricting bandages.** Casts and tight bandages may lead to compartment syndrome. If

symptoms of compartment syndrome develop, remove or loosen any constricting bandages. If you have a cast, contact your doctor immediately.

Chronic (Exertional) Compartment Syndrome

The pain and swelling of chronic compartment syndrome is caused by exercise. Athletes who participate in activities with repetitive motions, such as running, biking, or swimming, are more likely to develop chronic compartment syndrome. This is usually relieved by discontinuing the exercise, and is usually not dangerous.

Symptoms

Acute Compartment Syndrome

The classic sign of acute compartment syndrome is pain, especially when the muscle within the compartment is stretched.

- The pain is more intense than what would be expected from the injury itself. Using or stretching the involved muscles increases the pain.
- There may also be tingling or burning sensations (paresthesias) in the skin.
- The muscle may feel tight or full.
- Numbness or paralysis are late signs of compartment syndrome. They usually indicate permanent tissue injury.

Chronic (Exertional) Compartment Syndrome

Chronic compartment syndrome causes pain or cramping during exercise. This pain subsides when activity stops. It most often occurs in the leg.

Symptoms may also include:

- Numbness
- Difficulty moving the foot
- Visible muscle bulging

Doctor Examination

Acute Compartment Syndrome

Go to an emergency room immediately if there is concern about acute compartment syndrome. This is a medical emergency. Your doctor will measure the compartment pressure to determine whether you have acute compartment syndrome.

Chronic (Exertional) Compartment Syndrome

To diagnose chronic compartment syndrome, your doctor must rule out other conditions that could also cause pain in the lower leg. For example, your doctor may press on your tendons to make sure you do not have tendonitis. He or she may order an X-ray to make sure your shinbone (tibia) does not have a stress fracture.

To confirm chronic compartment syndrome, your doctor will measure the pressures in your compartment before and after exercise. If pressures remain high after exercise, you have chronic compartment syndrome.

Treatment

Acute Compartment Syndrome

Acute compartment syndrome is a surgical emergency. There is no effective nonsurgical treatment.

Your doctor will make an incision and cut open the skin and fascia covering the affected compartment. This procedure is called a fasciotomy.

Sometimes, the swelling can be severe enough that the skin incision cannot be closed immediately. The incision is surgically repaired when swelling subsides. Sometimes a skin graft is used.

Chronic (Exertional) Compartment Syndrome

Nonsurgical treatment. Physical therapy, orthotics (inserts for shoes), and anti-inflammatory medicines are sometimes suggested. They have had questionable results for relieving symptoms.

Your symptoms may subside if you avoid the activity that caused the condition. Cross-training with low-impact activities may be an option. Some athletes have symptoms that are worse on certain surfaces (concrete vs. running track, or artficial turf vs. grass). Symptoms may be relieved by switching surfaces.

Surgical treatment. If conservative measures fail, surgery may be an option. Similar to the surgery for acute compartment syndrome, the operation is designed to open the fascia so that there is more room for the muscles to swell.

Usually, the skin incision for chronic compartment syndrome is shorter than the incision for acute compartment syndrome. Also, this surgery is typically an elective procedure -- not an emergency.

Last Reviewed

October 2009