

THE ATHLETE & COMPARTMENT SYNDROME

Text: L, Liebenberg & R, Malan (Biokineticists, ISR)

What is compartment syndrome?

Compartment syndrome is a condition that occurs when injury causes generalized painful swelling and increased pressure within a compartment to the point that blood cannot supply the muscles and nerves with oxygen and nutrients. Compartment syndrome may be acute due to swelling that arises from injury, or it may be chronic because of exertion usually from athletic exertion.

What causes compartment syndrome?

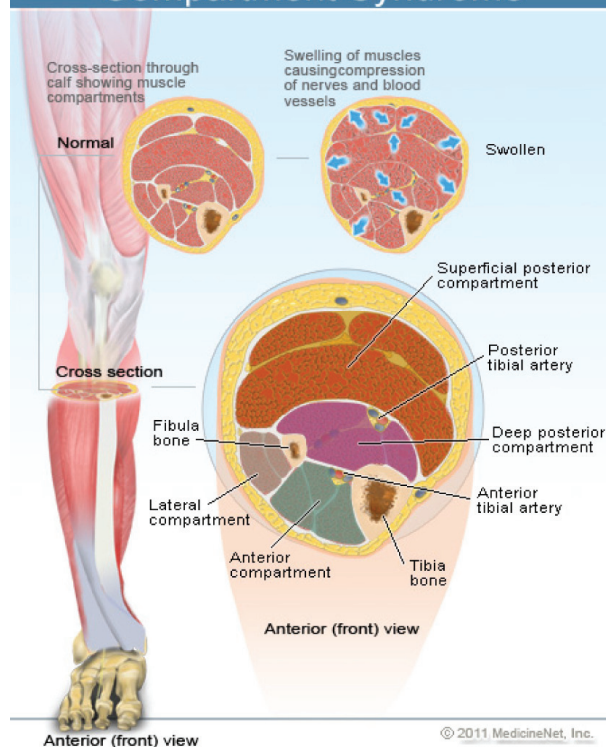
Muscles are contained in compartments or thick fibrous bands of tissue or fascia. Because of injury, pressure can increase within the compartment to swelling (fluid accumulation) or bleeding. In non-contracting muscle, the compartment pressure is normally about 0-15 mmHg of pressure. If the pressure within the compartment increases (usually greater than about 30 mmHg), blood cannot circulate to the muscles and nerves to supply them with oxygen and nutrients.

What are the risk factors for compartment syndrome?

Acute compartment syndrome occurs as a complication of an injury. Often it is due to a fracture of the radius or ulna in the forearm or the tibia and fibula in the lower leg that causes significant bleeding in one or more of the compartments. Bleeding can also be due to a badly bruised muscle. Crush injuries may cause both bleeding and swelling of a muscle.

Chronic compartment syndrome occurs because of excessive exercise, where repetitive motion and muscle use cause localized swelling and irritation. Most often, symptoms in the legs are seen with runners and bicyclists and in the arms of swimmers. Symptoms resolve with rest and very rarely progress to an acute limb threatening situation.

Compartment Syndrome



What are the symptoms and signs of compartment syndrome?

- Pain out of proportion to the injury.
- Loss of blood supply and nerve inflammation. This causes significant pain and numbness (usually resolve within a few minutes of discontinuing exercise).
- Tense and shiny skin that may be significantly bruised.
- Pain occurs with minimal range of motion of the foot, hand, or any of the extremity with compartment syndrome.
- In chronic compartment syndrome, there may be pain with range of motion of the extremity and muscle bulging may be noticed.

Bucholz RW, et.al. (2006)



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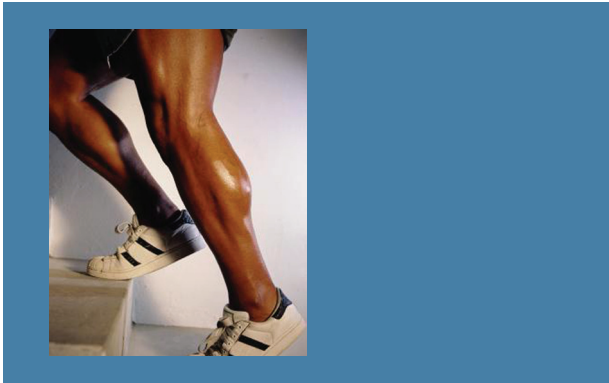
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Treatment of compartment syndrome

Prevention is always better than treating any condition. For compartment syndrome, prevention is the first step in treatment. Therefore any significant injury to the arms or legs should always be treated with the "PRICE" method which stands for prevention, rest, ice, compression and elevation. PRICE is used to minimise the potential for swelling which may lead to acute compartment syndrome (Peterson & Renstrom, 2001).

For chronic exercise induced compartment syndrome the athlete should rest, stretch the involved compartment, apply local heat, and analyse running surfaces, running technique, training, and type of shoes etc. A doctor may treat an injured athlete with diuretics and anti-inflammatory medications or even operate on the athlete (Peterson & Renstrom, 2001). The surgery performed is called a fasciotomy, which involves cutting the fibrous bands that line the muscle, allowing the muscle to swell and relieve the pressure within the compartment.



Rehabilitation of compartment syndrome

The rehabilitation of this condition is dependent on what caused it, therefore identifying the underlying etiology is important. Acute compartment syndrome therapy begins with gentle active range of motion exercise of the surrounding joints. During this stage, exercise must be taught and progressed gradually so as not to compromise the healing of the soft tissue. When soft tissue healing is complete therapy is continued with range of motion exercise and advances to strengthening programmes.

Compartment syndrome can be rehabilitated conservatively when it is a chronic condition. This method involves 6-8 weeks of: reduced or modified activity, massage, and other specific soft tissue mobilization and manipulation techniques. These techniques include myofascial stretching, taping, orthotic inserts, foot ware modification, stretching, and non-steroidal anti-inflammatory medications (Schubert, 2011).

Schubert (2011) states that there are four phases of rehabilitation after surgery to release compartment syndrome. These phases are as follows:

Phase 1:

Protection and mobility (\pm 2-3 weeks post-operatively).

Phase 2:

Light strengthening (\pm 3-4 weeks following surgery).

Phase 3:

Progression of strengthening (\pm 4-6 weeks following surgery)

Phase 4:

Impact/Sport Training (\pm 8-12 weeks following surgery)

The suggested therapeutic exercises for each of the phases are as follows (Schubert, 2011):

Phase 1:

Plantar flexion, dorsiflexion, version, eversion, knee flexion, knee extension, isometric quadriceps strengthening and supine leg lifts.

Phase 2:

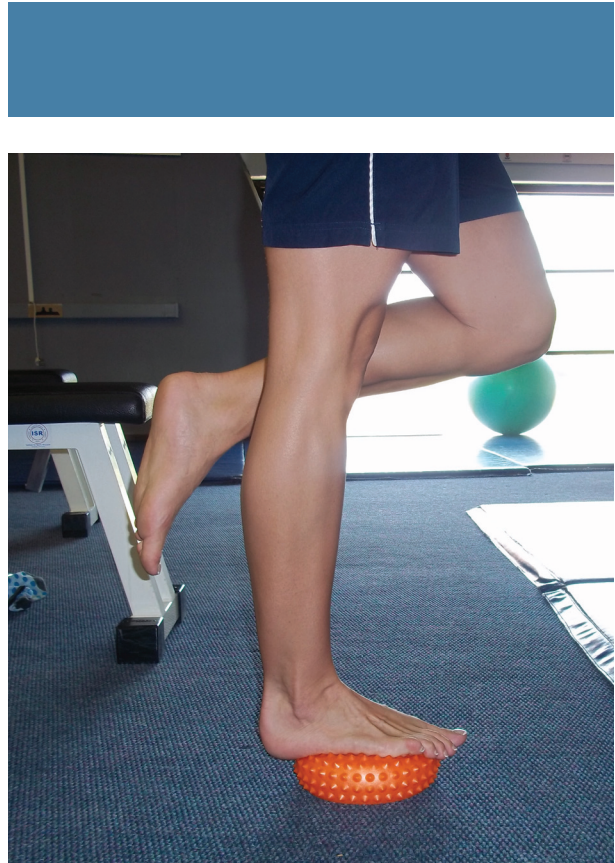
Stretches (held for 30-60 seconds 2-3 times a day), open kinetic chain ankle strengthening, balance and proprioceptive exercises, and gait drills.

Phase 3:

Lower extremity myofascial stretching/ massage, lower extremity closed chain functional strengthening, and basic plyometric exercises.

Phase 4:

Biomechanical assessment of sport specific activity, progressive strengthening exercises using higher stability and neuromuscular control, integrate movements and positions into exercises that stimulate functional activities, and sport specific training 🏃



Conclusion

Compartment syndrome when left untreated can become a devastating condition to any athlete. Quick recognition of the condition along with prompt surgical fasciotomy and proper rehabilitative techniques is essential for return to normal function and minimal injury

References:

- Bucholz RW, et.al, (2006). *Rockwood and Green's Fracture in Adults*. 6th ed. United States; Lippincott, Williams and Wilkins.
- eMedicine.com. Compartment Syndrome, Exremity; Multimedia.
- National Institutes of Health. Compartment Syndrome.
- Peterson, L. and Renstrom, P. 2001. *Sports Injuries their prevention and treatment*. 3rd ed. Singapore; Kyodo Printing Pte. Ltd.
- Schubert, A.G. 2011. Exertional compartment syndrome: review of the literature and proposed rehabilitation guidelines following surgical release. *The International Journal of Sports Physical Therapy*. 6(2):126-139