



Cleaning up your old compartments...

An overview of compartment syndrome

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I am quite certain that the name *compartment syndrome* sounds familiar. And I am also quite positive that in your mind it rhymes with pain too! But what is it exactly? And what do compartments have to do with our running?

The lower leg anatomy

I have mentioned the *fascia* before in previous columns, but let's quickly refresh your brains: the fascia is a very thick and strong tissue that runs throughout your entire body. There is very little blood supply to the fascia, hence its whitish colour (you can sometimes see it in red meat – it is very strong and difficult to cut and chew!). Its main purpose is to support muscles and organs by wrapping around them strong layers of its very resistant material. Fascia is not very elastic and wraps around all the muscles in your body, all of your organs and even all of your brains. Without fascia, our muscles would not have the same shape and our viscera would bulge out of our bodies (although for some people this process has already started!!). There is also something very particular about fascia: it is all in one piece. For example: muscles run from one bone to the other and then stop. Ligaments attach bones together, but they also have a starting point and an end. Fascia on the other hand is like nerves, skin and blood vessels: there is no beginning, and no end. It is all in one piece throughout your entire body.

This particularity makes fascia very important but also tricky because anything happening to it in one area of your body could very well affect another completely remote area. Example: tight fascia on the chest from an old blunt trauma could pull the fascia wrapped around the stomach and create heartburn and reflux problems. Not uncommon.

Fascia of the lower leg though is the one that interests us at the moment. It not only wraps around each muscle individually but also separates the leg into 3 distinct muscle compartments: the anterior compartment, the lateral compartment, and the posterior compartment (which some authors sometimes separate into a deep and a superficial compartment). In other words, on top of wrapping around each muscle individually, it also wraps around groups of muscles and creates those compartments.

The compartment syndrome

A compartment syndrome is thought to de-

velop when there is increased pressure within the compartment, a closed limited space. The compartments described above make for very limited spaces as fascia is not very elastic. A compartment syndrome can happen in any closed space of the body (arm, shoulder, buttock... as a lot of our muscles are regrouped into compartments), but with runners the lower leg is so often a target that by *compartment syndrome* we usually refer to the leg specific problem. *Compartmental syndrome* seems to be the term used to refer to the ones affecting other areas of the body.

The initial cause of a compartment syndrome is usually an abnormally tight compartment. This could be the result of fast growing in the teenage years (the muscles growing faster than their envelope), or could also be the result of quick development of the muscle bulk (very often associated with the intake of steroids), damage to the envelope (bone fracture, direct blunt, muscle tear...), repeated use of drugs (usually affects more the upper extremity) and repeated trauma (chronic type of injury where the leg muscles never are given a chance to recover fully).

What happens is that during exercise our muscles swell up a bit (that is why you see body builders quickly lift weights before they get up on the stage in a competition – they literally inflate their muscles). Muscles get bigger mainly because of all the extra blood we pump into them to bring extra nutrients and energy – you have heard of the expression *pumping iron*! That increase in size/girth creates more pressure inside the compartment since the envelope (the fascia) remains the same size throughout the exercise session due to its lack of elasticity. That extra pressure cannot escape since the compartment is a closed space, so the pressure inside the muscle keeps increasing.

Normally this is not a problem since our fascia is usually built to allow for that increase in girth, especially if you have begun training slowly and gradually. But in some unfortunate cases, the pressure gets so high that it starts limiting the circulation. Blood vessels and nerves can no longer function normally because they collapse under the pressure. The muscles involved then become

painful and weak. This is normally when runners would slow down their pace due to the pain and walk. It is sometimes enough to control the pressure and make the running bearable again. But if the runner does not slow down, then a vicious cycle can take place: the decreased circulation causes more tissues to swell up as there is no longer a way for the muscle to evacuate used blood, making the muscle even bigger and then the compartment even tighter. It only gets worse from there (see figure 1).

Signs and symptoms

The symptoms are very vague and make the diagnosis fairly difficult. Mainly the runner complains of increased pain in the lower leg with exercise. The pain is rarely in a specific point but more in a diffuse area. The pain is usually so intense that the runner has to start walking or even sit down. The pain increases as the workout progresses (unlike most soft tissue injuries that tend to get better as we warm up) and the only relief comes with a complete break from the activity. If the runner tries to *run it out* the pain usually becomes unbearable.

Another symptom is the weakness that accompanies a compartment syndrome: the muscles involved become not only very painful but also weak and uncoordinated due to the

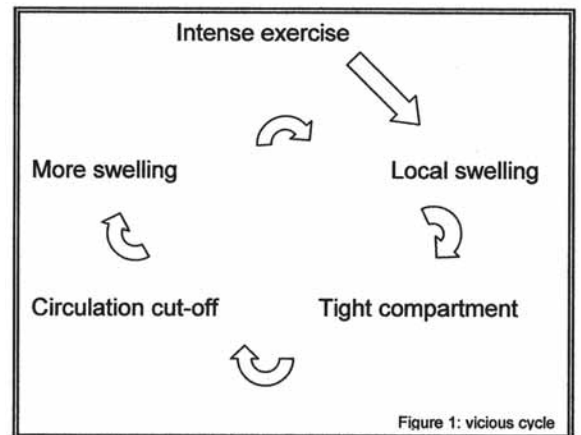


Figure 1: vicious cycle





lack of blood and decreased nervous supply. The doctor may sometimes find areas of the leg or foot where the skin is numb and insensitive, depending on which nerve branch is affected.

Establishing a first diagnosis is often more of a clinical impression than a formal diagnosis. The doctor can use the description of the symptoms from the patient and the signs found to suspect a compartment syndrome but no formal diagnosis is possible as of yet. Some physicians may choose to insert pressure gauges inside the painful compartment while the patient is running (not very pleasant by the way) to measure any abnormal increase in pressure during exercise, but again, this is not a formal diagnosis as many other pathologies could also increase the pressure. Also the pulses taken at the ankle are usually normal.

Treatment

The first thing you want to do is make sure your lower body (from your hips down to your toes) is well aligned. Any biomechanical defect could contribute to muscle overuse or repeated trauma.

Then if you do pass the above test, try some intensive soft tissue therapy (with a registered massage therapist – RMT) to release the fascia and get rid of old scars. The best massage technique to improve the flexibility of the compartments is

called *Myofascial release* (MFR). This is a mildly painful technique with results that tend to last (because fascia is not like muscle – once it has been released, it will not contract back to what it was before the treatment). This type of treatment may take a while before results show, depending on how many compartments are affected and in what kind of state they were in. One way to measure improvement once you are allowed back to running is to see how much time it takes before the pain starts kicking in. As you get better it should take more and more time before you experience pain during your run. Also, the pain may be less intense and go away faster when you rest.

If all fails, then surgery is in order. The surgeon opens up the leg and cuts slits in the tight fascia to force it to decompress. They usually have to leave the wound open for a few days following the surgery to ensure that the internal pressure is minimal. This surgery is a rather drastic solution and it leaves scars in the fascia and the skin which may cause other problems later on in life. Not my favourite solution to say the least...

So, if your legs feel awfully tight and they hurt deeply when you run, you may want to clean up and make some more room in your compartments...

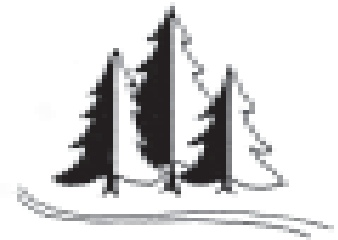
Distance Judgment

Do you find yourself overrunning controls or attack points? Try the following:

Draw a straight line on a map. Pass through as many different types of terrain and features as possible. Have someone hang streamers at varying intervals (from 50m to 1500m) on features on the line and mark them on your map. Then run the course at race pace and find the streamers along the way. The course should be designed so that navigation only requires holding a bearing. The terrain should allow running close to the line. Pace count if you wish, but try to develop a sense of distance without actually counting. Try not to read the map too much, either, just focus on how far you have run.

This drill also serves as a good interval workout to develop race speed. Since navigation isn't the objective, you can run the same course many times. Time and record your intervals and keep track of your improvement over the season.

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