

angle. The knee should be straight with the body as upright as possible. Try and resist the temptation to bend at the hips with the backside sticking out as this reduces the effectiveness of the stretch. Keep the foot in alignment, with the lower leg in neutral rotation. As with all stretches, the move into the stretch should be performed gently and slowly to the point of tension but never pain, and the position should be held for approximately 30 seconds without bouncing.

Muscle endurance

Adequate shock-absorption via the control of the muscles of the lower limbs during running is extremely important. For triathletes, the endurance nature of training and racing requires high levels of calf, quadriceps and gluteal muscle endurance to limit the impact on the bones of the lower limbs. 60% of landing forces during running are absorbed by the ankle / calf complex and 40% of the landing forces are transmitted proximally (Cook et al, 2000). Once calf endurance – and the shock absorbed by the eccentric contractions – fails, the bones of the leg become vulnerable to excessive impact. This process may be amplified as the athlete tires.

Calf muscle endurance can be easily measured by the number of single leg calf raises off the floor that an athlete can perform. There have been no studies to gather normative data on the expected number of calf raises but, anecdotally, adequate calf endurance would be indicated when the athlete can do 30 to 40 repetitions on each leg. To date there is no research that can confirm whether poor calf endurance is the cause or effect of stress fracture, but whichever way around, if the athlete demonstrates asymmetry, then intervention is indicated. If 30 to 40 reps cannot be performed, the athlete should do 3 sets of single-leg calf raises daily, each set performed to failure (ie, the calf muscle is fatigued to the point where another rep is not possible). Calf raises should never be performed before running, as this is likely to pre-fatigue the muscles.

Other causes

It is also important to rule out extrinsic factors in bone stress injury such as training errors or poor footwear. If, for instance, the athlete increases their running training by too much, too soon, and/or potentially runs in shoes that are too old and have lost their supportive structure, they are increasing their risk of developing lower limb bone stress injuries.

IN BOX CASE STUDY

A 20-year-old male triathlete presents to the clinic with a three-month history of right medial shin pain felt with running, which is getting worse. His training has remained constant over the last six months, running 30 to 40km a week, cycling 150 to 175km and swimming 15km. He has reasonable running shoes and wears orthotics that are six months old and feel comfortable. The only subjective point of note is that he suffered a severe right ankle sprain four months ago. Despite undergoing physiotherapy treatment on the ankle, he still feels weak and stiff in the ankle joint. He has been reviewed by a sports physician, who ordered bone scans that showed a focal point of moderate uptake in the lower third of his tibia, suggesting a stress reaction.

His physical assessment highlighted the following:

- Good lower limb biomechanics with walking and running
- Ankle dorsiflexion right slightly reduced as compared to left
- Tender on palpation of the distal third medial tibial border. Oedema was present on the periosteum, which is generally felt with stress reactions / fractures

- Reduced calf endurance on the right side. Maximum calf raises: Right = 17; Left = 29.

The potential factors leading to the stress reaction are reduced ankle dorsiflexion and poor calf endurance on his right side because of the previous ankle sprain, which has led to reduced shock absorption.

Daily treatment included:

- Calf endurance training on his right side
- Gastrocnemius / soleus stretching

Training modification consisted of:

- No running for six weeks
- Cycling and swimming mileage was maintained
- After six weeks, he resumed running every third day, increasing 1km each session from a 2km starting point, ensuring that he remained symptom-free
- After eight weeks he was back to full intensity training with no symptoms
- He still had reduced calf endurance on the right leg (R = 25), compared to the left (L = 29), but the deficit had significantly reduced. His dorsiflexion was equal on both sides. He was encouraged to continue his endurance and stretching programme to prevent a likely recurrence of injury.

Brukner P and Khan K (1993): Clinical Sports Medicine. Sydney: McGraw-Hill Book Company.

Cook J et al (2000): Patellar Tendinopathy – new approaches to a chronic problem. Phys. SportsMed. 28(6): 31-46