CHRONIC COMPARTMENT SYNDROME OF LOWER LEG. AN UNUSUAL CASE IN NONATHLETIC PATIENT

Andrea Schiavone*, Michele Bisaccia*, Luigi Meccariello, Giuseppe Rinonapoli*, Mattia Manni*, Cristina Ibáñez Vicente*, Olga Bisaccia◊ and Auro Caraffa***

*Division of Orthopedics and Trauma Surgery, University of Perugia, Santa Maria della Misericordia Hospital, Perugia, Italy., **Department of Medical and Surgical Sciences and Neuroscience, Section of Orthopedics and Traumatology, University of Siena, University Hospital "Santa Maria alle Scotte", Siena, Italy., ◊Department of Diagnostic Imaging, "Niguarda Ca' Granda" Hospital, Milano Italy.

ABSTRACT

Chronic exertional anterior compartment syndrome is debilitating disease of the lower limb. Limited symptomology characterises the clinical picture at rest, pain during sporting activities, tumefaction, and contractures of the limb as well impotency by the pain of the entire forefoot and hypoesthesia. Usually, the most affected patients are athletes. We analyse a case of chronic post-traumatic compartment syndrome of the anterior tibial muscle in an unsportsmanlike patient.

KEYWORDS: chronic compartment syndrome; fasciotomy; nonathletic patient; post-traumatic

Introduction

Chronic compartment syndrome can be considered a type of Shin Splints. That is, attenuated compartment syndromes, which are due to increased pressure inside the anterior tibia compartment following prolonged exercise [1-2]. This increase in pressure induces ischemia of the involved muscles of the anterior tibial muscles. Symptomology consists of cramps, excruciating pain at the level of the tibia along with a sensation of swelling.

The physiopathological mechanism underlying chronic exertional anterior compartment syndrome (CEACS) has yet to be fully elucidated. According to some authors, an increase in the interstitial liquids caused by an edema and acute inflammation in an afflicted compartment can lead to an acute transitory obliteration of the tibial artery [2]. While other authors describe this syndrome as being the consequence of hypertrophy of the anterior tibial muscles and a shared extensor to the toes. When there is an increased muscle volume, the muscles set against the anelastic fascial structures therein causing an increase in the inter-compartment pressure [3]. These two hypotheses share the idea that the syndrome determines a reduction in the arterial intramuscular haematic and capillary flows, therein triggering pain of an ischaemic nature. It is also likely that the nerve compression may play a role in the pain mechanism and paraesthesia [4-5].

Mavor made the first ever description of anterior chronic compartment syndrome(CEACS) [6] in 1956, reporting on a professional footballer who presented with bilateral pain at the anterior of a leg: this was resolved with surgery.

The subjects most afflicted are young athletes who have recently undergone strenuous training. Among the predisposing factors, these include irregular posturing of the legs and feet (valgismcalcanear), athletic movements along with exaggerated workloads; this hypertrophy can lead to a considerable increase in the pressure of an internal compartment.

Alterations in arterial and venal flows slowly reduce muscle efficiency. Several studies have described the incidence syndrome to be between 14% and 27% in the general population [5-7-8].

Limited symptomology characterises the clinical picture at rest, pain during sporting activities that afflicts the anterior leg which results being ligneous at a touch; plantar flexing of both the ankle and feet cause pain as does supination and a sense

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[1]Luigi Meccariello, MD, Department of Medical and Surgical Science, and Neuroscience, Section of Orthopoedics and Traumatology, University of Siena, University Hospital "Santa Maria alle Scotte", Viale Bracci 1, 53100 Siena, Italy. E-mail: drlordmec@gmail.com

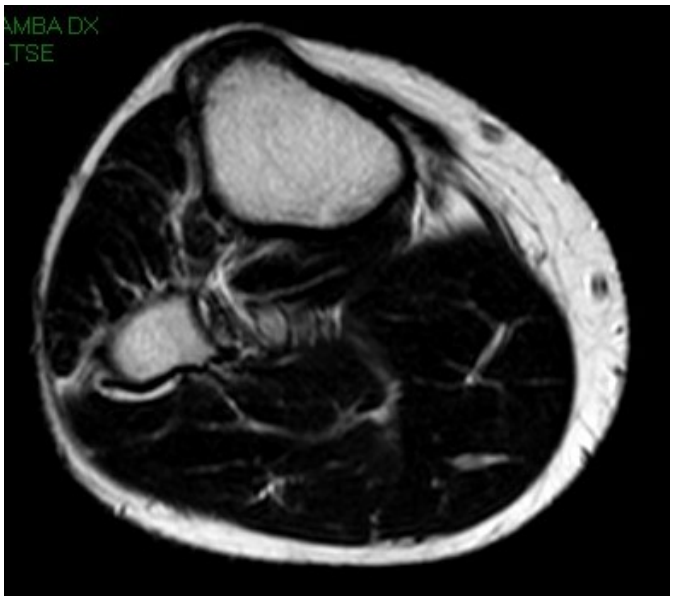

Fig. 1. Axial MRI shows in TSE T2 pesate the fibro- cicatrizant degeneration on the III medial-superior of the antero-lateral fascial compartment with streaks of insertional fibrotic degeneration at the anterior tibia.

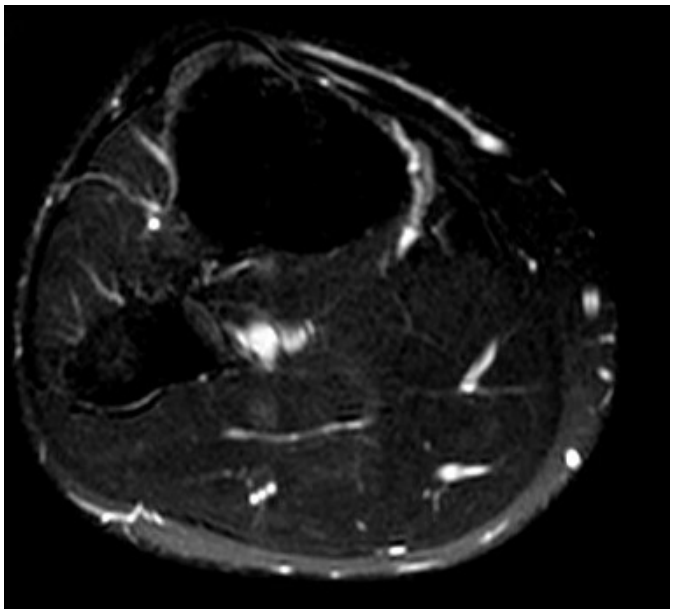

Fig. 2. Axial MRI shows in T1 pesate the fibro- cicatrizant degeneration on the III medial-superior of the antero-lateral fascial compartment with streaks of insertional fibrotic degeneration at the anterior tibia.

of oppression, cramps, weakness and a reduction in sensitivity. Diagnosis is most often clinical and relies upon the following tests: Ratschow –test, measuring of the intramuscular pressure before during and after intense physical activity, X-rays, nuclear magnetic resonance (MRI), neuro-electric exams and bone scintigraphy. Differentiation in diagnosis is performed with periostitis, fracture stress of the anterior cortical of the tibia, tendosynovitis, nervous syndromes or vascular canaliculus, central nervous system disorders, myopathy, infections and tumors. Finally, acute compartment syndromes are differentiated as they are the result of a violent event either osteoarticular or soft tissue. For most cases, good results are obtained from a conservative treatment including "active rest", FKT(U.S. therapy, stretching), oral NSAIDs, functional bandaging of the tibiotarsus and orthesis for the feet. In the case that this treatment fails, surgery is necessary which consists of performing a longitudinal sectioning the fascia of the anterior tibia [9-10-11-12]. The decision to carry out surgery often depends on upon both the subjective symptomology and the functional expectations of the patient, as well as objective diagnostic results.

Case report

The patient was a 25-year-old male who practiced sports occasionally, like jogging for few hours in the weekend. Anamnesis resulted negative for comorbidities and pharmacological use. Familial anamnesis was negative for rheumatoid, cardiovascular, neurodegenerative and autoimmune diseases.

The parents of the patient were, at the first visit, in perfect health, while the paternal grandfather had died a few years prior of a carcinoma of the hepatobiliary tracts. The patient referred it during anamnesis that he had suffered a minor trauma, about a decade prior afflicting his right lower limb. No bone lesions were resulting from this injury, but there was a hematoma measuring 5cm in diameter. Treatment for this consisted of bland analgetics and cryotherapy. The patient returned to full mobility almost immediately.

The patient also referred a chronic worsening of his health over the preceding 4-5 years, specifying the onset of painful cramps located at the interior of his right leg after walking 400-500 meters, but such pain was not present while at rest. At clinical exam, the right limb resulted normal; there was no vascular or nerve deficits underway, and all of the leg muscles were seen to be functioning normally including the anterior tibial muscle.

After stretching and test of strength, the patient was re-examined, upon which he complained of pain when the area proximal the anterior tibialmuscle was palpated. Tumefaction and contractures of the limb were evident as well as impotence by pain of the entire forefoot and hypoesthesia. Deep palpation of the anterior section resulted being extremely painful. An extension of the first toe was not possible, and a dorsal flexion of the first toe followed by a maximal plantar flexion occurred being often impossible and extremely painful. Being so, an echography and MRI were performed on the anterior section which confirmed a fibro- cicatrizant degeneration on the III medial-superior of the antero-lateral fascial compartment with streaks of insertional fibrotic degeneration at the anterior tibia. (Fig.1,2,3,4) Comparing the echography with one taken in the same area 6 years prior, it showed a progression of degeneration. (Fig.5) A conservative therapy of stretching and FKT were prescribed to regain functionality. After five months of conservative therapy, which lead to no regression in symptomology, the patient underwent a fasciotomy of the anterior section. (Fig.6-7) The patient was discharged the day after surgery with without a limited load and prescribed a prophylactic dose of enoxaparin (4000 U.I. s.c./die) for five days, along with a mild analgetic therapy. A week later, medication was performed, while on day 14 the patient was desutured.

Follow-up was carried out at 1, 2,4 and 12 months from surgery. At day 20, the patient returned to the sporting activities of both running on a regular surface and swimming. By day 45, the patient had fully returned to his sporting activities,

Fig. 3. Sagittal MRI shows in T1 the same of Figure 2.

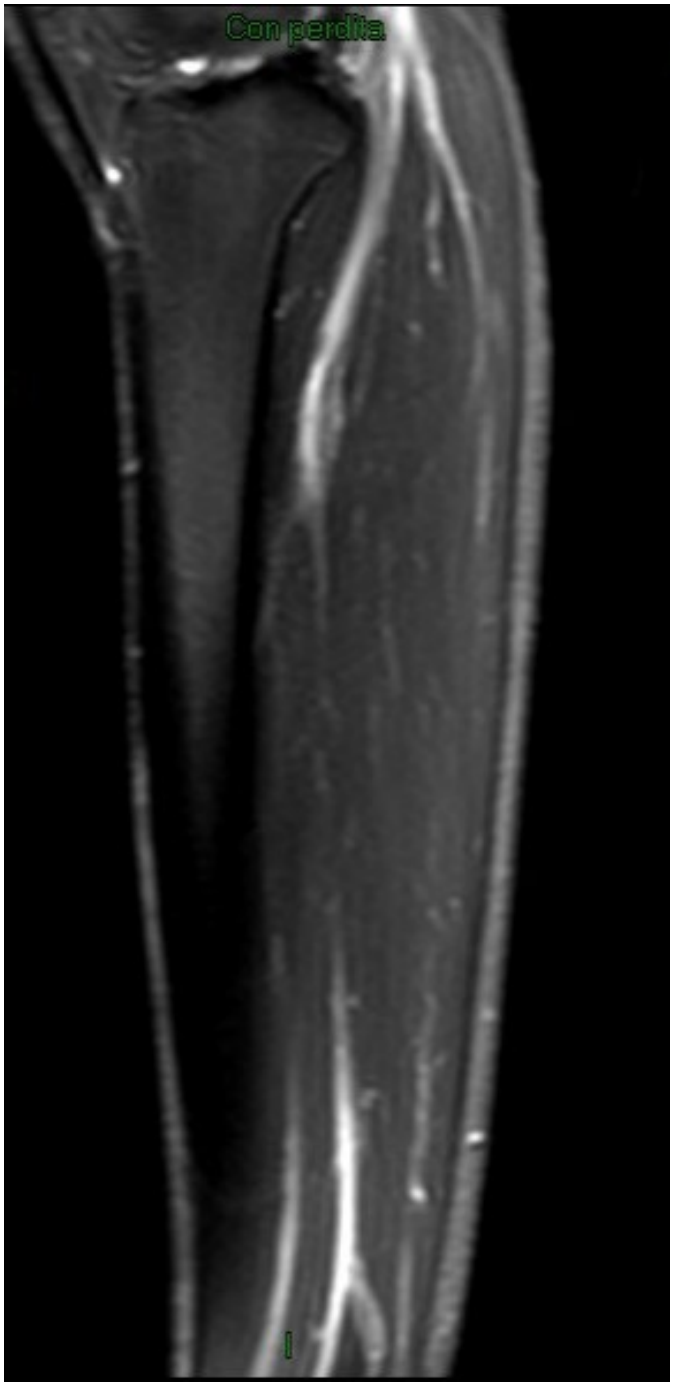

Fig. 4. Sagittal MRI shows in TSE T2 the same of Figure 1.

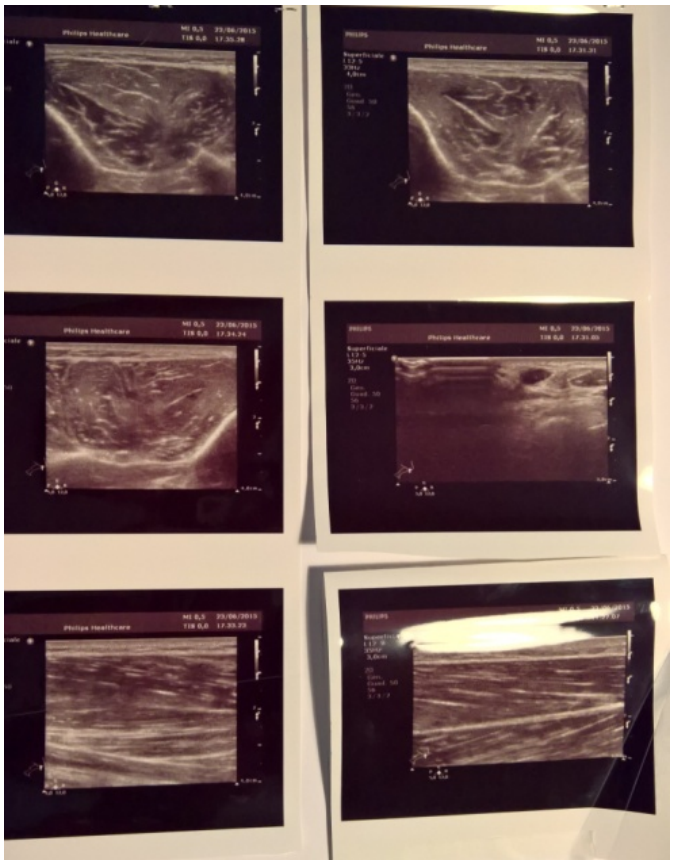

Fig. 5. In all images, the ecography shows the degeneration progression of the anterior tibial tendon.

Fig. 6. Skin and fascia incision for fasciotomy.

Fig. 7. A mini access allows us to make a long fasciotomy in distal-proximal direction while preserving the subcutaneous tissues and the skin.

which included running on irregular surfaces at both slow and fast speeds, without any disturbance. Symptoms present before surgery were not re-evidenced during a climbing test and cross country running, even over long distances, where the only limitation was the training level of the patient As a consequence of surgery, the patient suffered a muscular hernia of the anterior compartment. At three months there was no evidence of this hernia. The patient expressed a high level of satisfaction regarding the surgery, as well as his physical ability in its aftermath. At 12 months, the patient underwent a strength test which showed a complete absence of symptomology, a full physical recovery and the hypotrophy of the limb undergoing surgery was 0.5cm smaller than the contralateral limb.

Discussion

Trauma is not routinely implicated as a risk factor for chronic compartment syndrome, and therefore literature on this topic is limited. There have been however case reports that suggest an association between traumatic event and the development of chronic compartment syndrome, [13-14-15] of which several have suggested that trauma, may trigger such an event. Therefore, it is possible that chronic inflammation of the anterior compartment is both self-fed over time, rendering the fascia muscle fibrotic, and therein non-extendible, which in turn creates hypoxemia damage to the anterior muscles; particularly during and after physical activity. This process creates a vicious circle of repeated inflammation and fibrosis that over the years can manifests in painful symptomology [7]. Several techniques have been described for a fasciotomy of the anterior compartment. One of the most utilised is that developed by Mubarak [16]: a fasciotomy of the anterior and lateral compartments via a 10cm incision. While newer techniques are mini-invasive either via an endoscopic or cutaneous mini- accesses [9-17]. These more modern approaches produce results similar to those of interventions using more ample accesses[18]. Based upon our experience, we chose to perform a mini- invasive procedure which consisted of performing a 2cm incision at the third media of the leg on the anterior tibial muscle. As reported in the literature, this technique guarantees a rapid recovery with a minimal access. The muscular fascia of the anterior tibial muscle is reached and with

dedicated instrumentation, a subcutaneous tunnel is created in a distoproximal revealing the fascial muscle between the tibial crest and the intramuscular septum. The incision goes along the entire length of the fascia to provide an ample opening of the anterior compartment. An ulterior mini-access centred at the origin of the proximal insertion of the anterior tibial muscle, so to allow for insertional tendon scarification. Finally, elastic bandaging was applied.

Conclusion

Chronic compartment syndrome of the anterior compartment of the leg is infrequent and often difficult to diagnose. It can often be mistaken during a regular clinical visit as its symptomology can be misleading. A claudication having a vascular origin, for either arterial or venous, can proceed toward a differential diagnosing, therein requiring further investigations. For our patient, in light of his young age, an absence of comorbidities both accurate and non, an absence of cardiovascular risks which could have shed doubt on the nature of the symptomology, we decided not to perform any ulterior diagnostic exams. While we did, however, have the vascular surgeon consult the patient. Regarding the surgical technique adopted, it resulted being easy and rapid to execute and did not lead to any particular complications. Moreover, the cutaneous cicatrix was well accepted by the patient. The authors retain our FKT program, in particular, the immediate mobilisation of the patient without limited load and the stretching of the anterior compartment, prevented recurrence.

Authors' Statements

Competing Interests

All authors disclose any financial and personal relationships with other people or organisations that could inappropriately influence (bias) their work. Examples of potential conflicts of interest include employment, consultancies, stock ownership, honoraria, paid expert testimony, patent applications/registrations, and grants or other funding.

Human And Animal Right: For this type of study is not required any statement relating to studies on humans and animals. All patients gave the informed consent prior being included into the study. All procedures involving human participants were by the 1964 Helsinki declaration and its later amendments.

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