

Research Article,

Incipient acute phase in compartment syndrome of the lower limb, behavior and discussion.

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Abstract

Introduction. Compartment syndrome is described as a pathological entity that owes its origin to several causes, where all of them lead to an increase in internal pressure of an injured limb that has muscle groups divided by septa and facial that are less compliant than by increasing pressure due to above 30 mmHg leads to deep nerve and vessel compression. Presentation of the patient. We present a case of incipient acute compartment syndrome of the lower limb in a patient who ruptured the gastrocnemius muscles at the knee after practicing sports. With the aim of testing the validity of preventive follow-up and conservative treatment through a protocol in four stages, lasting one week, it was possible to verify that as the treatment progressed in stages, the symptoms and signs disappeared until a total solution was reached. .after completion of the treatment, surgical intervention not being necessary in said patient. **Conclusions.** Acute compartment syndrome in the incipient phase can be resolved with conservative treatment, avoiding surgical intervention, provided that an adequate treatment protocol is applied.

Keywords: Acute compartment syndrome; lower limbs; calf muscles.

Introduction

Compartment syndrome is a condition described by Richard Von Volkman, although the first to refer to it and describe it in detail was Hamilton 1850. With two forms of presentation, one severe acute, which often requires fasciotomy and the other chronic. Compartment syndrome is defined as an elevation of interstitial pressure, above the capillary perfusion pressure within an osteo-fascial compartment, with compromised blood flow in muscles and nerves, which conditions tissue damage. It can manifest itself in any region with little capacity for expansion such as: the leg, forearm or hand. 1

Compartment syndrome is described as a pathological entity that owes its origin to several causes, where all lead to an increase in internal pressure of an injured limb, which has muscle groups divided by septa and facia that are not very compliant, which when increasing pressure above 30 mmHg leads to compression of deep vessels and nerves that, if prolonged over time, produces ischemia and fatal necrosis, which may require amputation in severe cases. 2

The decrease in the size of the compartment causes a drop in capillary perfusion until it becomes

incompatible with the viability of the tissue. The interstitial pressure exceeds the intravascular pressure in vessels and capillaries, the walls collapse and leads to local blood flow obstruction, produces tissue ischemia, local edema. If the intracompartmental pressure continues to increase for 12 to 24 hours, it would lead to an irreversible loss of blood flow and fasciotomy would be indicated.2

The main objective of the article is for the general surgeon to have an updated knowledge of the diagnosis and management of Compartment Syndrome and the necessary bases to establish a timely treatment.

Clinical case

Information of the patient. 42-year-old mestizo male patient, weight 90 kg, height 1.90 cm, who suffers injury while playing sports. It is brought to the body of guard in May 2020.

Clinical findings. The patient arrives on stretchers with flexion of the limb and visible edema. On examining him, we found calf tension and

ecchymosis in the popliteal fossa savanna, hyperesthesia of the knee area and hyperesthesia of the lower limb area, exaggerated patellar reflex and decreased achillian reflex. , pulses present, tachycardia, BP -150/90.Diagnostic evaluation. Admission is decided and several laboratory and radiological examinations are performed, a team is formed made up of an emergency nurse, a physiotherapist and a specialist in Orthopedics and Traumatology, to follow up and treat the patient.



Figure 1. Photo of the lesion in the study patient. Note ecchymosis.

Maladaptive pattern of internet use leading to clinically significant impairment or distress [3, 5]. Admission is decided and laboratory and radiological examinations are carried out, a team made up of an emergency nurse, a physiotherapist and a specialist in Orthopedics and Traumatology is formed to treat the patient. Intra-compartmental pressure was measured and it was 27 mm / Hg at the time of admission. Due to the above, in consensus with the medical team, it is interpreted as incipient compartment syndrome.

Therapeutic intervention. Continuous clinical monitoring is performed for each stage, such as pain, paresthesia, paleness, pulses, pressure, and discrimination between two points.

Therapeutic management and monitoring of the patient.

The first week.

- Rest lying supine, limb at heart level.
- Cold water promotion.
- Medicines.
 - Diuretic (Furosemide (40mg ampule) one ampule / intravenous every / 12h)
 - Broad spectrum antibiotic. (Rocephin bulb / 1gr dose IV / 12h)
 - Analgesics (Dipyron (600mg ampoule) 2 intramuscular ampoules every / 8h)

- Anti-inflammatories (Ibuprofen (400mg tablets) orally every 12h)

- An emergency echo-soma was performed.

The second week.

- Physiotherapy (therapeutic ultrasound)
- Assisted passive exercises
- The same medication from the previous stage.
- Echo-soma was performed.

The third week.

- Laser therapy began to be applied.
- Assisted passive exercises were maintained.
- Medications were discontinued.
- Echo-soma was performed.

The fourth week.

- Active exercises were started by the patient himself.
- The laser therapy treatment was maintained.
- Echo-soma was performed.

Stages	Symptoms and signs at the beginning of treatment.		Symptoms and signs at the beginning of treatment.	
	No.	%	No.	%
First stage	5	83	1	17
Second stage	2	33,3	4	66,7
Third stage	1	16,6	5	83,4
Fourth stage	0	100	0	100
Total	6	100	0	100



Figure 2. Emergency echo-soma showing muscle rupture and significant hematoma. Echo-soma week 2 where a very slight decrease in the hematoma is observed. Eco-soma week 3 where organization of the hematoma is observed. Eco-soma week 4 marked improvement in structure

Monitoring and results.

The patient was followed up by outpatient consultation, he evolved satisfactorily. At the moment he is walking without any accessory means to help him, he reports great satisfaction with the treatment carried out. He resumed sports practice 16 weeks after the injury.

Discussion

Compartment syndrome represents a surgical emergency in all cases in which it occurs. It is an extremely common pathology in our guard corps and requires an accurate and rapid diagnosis for proper management. However, due to the lack of diagnostic methods, intracompartmental pressure monitoring was introduced in 1970, later the use of ultrasonography and more recently nuclear magnetic resonance. 2

Compartment syndrome is a very common pathology, with a higher prevalence in males, associated with trauma, exposed fractures, mainly of the tibia and forearm. Currently, there are many medical reviews, however, it is not possible to reach a consensus about the most accurate diagnosis of this pathology. There are several diagnoses that are under study and it remains in doubt whether intracompartmental measurements are the most accurate method of diagnosis. The reader is presented with an academic compilation of the surgical approaches used, the most up-to-date diagnostic methods, and generalities about this surgical emergency.

Different causes can cause this syndrome eg: from traumatic crush injuries, prolonged external compression, internal bleeding (hemophilia), open or closed fractures, and excessive exercises. Others such as infections, snakebites arteriographies, drugs, toxins, metabolic endocrine, hypothermia, alcohol, anesthesia, CPK enzyme deficiencies, this syndrome can present as acute or chronic, with large ecchymotic savannas, paresthesia, paleness,

paralysis, discrimination between two points, pulse present or absent with a predominance of five of them for what is called the five P syndrome in English.⁴ The most frequent cause of compartment syndrome is fractures (69%), in athletes it is more common to find the chronic compartment syndrome.

The clinical picture can be divided into pre-ischemic and post-ischemic: the first includes pain that increases with movements and paresthesia, the second includes paresthesia that can lead to anesthesia, paralysis and also absence of the pulse. The pain is disproportionate and worsens with flexion of the affected muscle group. The absence of a pulse, paralysis, and paleness are not frequent signs, but there may be a rapid progression of symptoms and signs, a high pressure above its normal value (0 to 8 mm of mercury) is a diagnostic finding. Of the symptoms, paresthesia, which can range from hypoesthesia or anesthesia, are among the first to set in, paralysis is a late symptom due to compression of the nerve or irreversible muscle injury.⁵

The end result of compartment syndrome is ischemic contracture, if not the clinical picture characterized by flexion contracture of the muscles is reversed. Paralysis, cutaneous anesthesia and trophic alterations of the skin. In the diagnosis the physical examination is of great importance as the nervous, vascular and muscular examination.

The proper management and treatment of compartment syndrome requires a high suspicion of this entity. After an injury and before a possible CS, the damage to hypoxic cells must be minimized by means of certain measures.

1. Maintain normal blood pressure
2. Remove any compression bandage
3. Keep the limb at the level of the heart
4. Provide supplemental oxygen to optimize oxygen saturation.

If signs and symptoms do not diminish with these measures, fasciotomy or surgical decompression should be considered as a treatment option.⁶

The treatment we have so far is fasciotomy as an option or prophylactically, depending on the stage of the clinical picture, ⁷ when it is done prophylactically, decompression is not

contemplated. Now, according to different authors, not all high-risk patients have compartment syndrome and not all patients with this syndrome had high-risk lesions. Fasciotomy can bring great complications such as: infections, muscle contractures, sensitivity alterations, recurrent ulcers, muscle herniation, kidney failure, respiratory distress, heart failure, disseminated intravascular coagulation.

The prophylactic surgical treatment of this must be accompanied by the control of the cause of it. Fasciotomy should be done when the probability of damage to which the viability of the limb is high and is at risk, which will be done when it is anticipated that the neuromuscular compromise may be irreversible, if the fasciotomy is prophylactic, no decompression is being performed. Compartment. After acute management of CS, the care of fasciotomies is very important to reduce the risk of infection, sepsis and, in more severe cases, loss of the limb, they should be covered with sterile dressings moistened with saline solution and a padded bandage, the first revision being carried out 48-72 hours after the fasciotomy, taking care to leave fingers or toes, as the case may be, visible to monitor distal neurocirculatory involvement and subsequently periodic healing with debridement of necrotic tissue until tissue is obtained viable and that the muscle edema has subsided.

Conclusions

Compartment syndrome represents a surgical emergency, which requires a precise and rapid approach to avoid the adverse effects it causes on the limb. Despite the fact that there are many studies regarding effective diagnosis, today there is no "gold standard" that can be carried out to determine for sure whether or not the patient presents such a clinical picture. The clinical history and physical examination continue to be used, with the supplementation of intracompartmental pressure measurements. Compartment syndrome in the acute insipient phase can be resolved with conservative treatment avoiding surgical intervention as long as a treatment protocol is applied to the patient through a combination of careful medications, techniques and radiation with well-planned physiotherapy equipment such as therapeutic

ultrasound. Low power laser therapy.

Conflict of interests

The authors of this article declare that they have no conflict of interest whatsoever with the objectives of the research.

Declaration of the personal contribution of each author to the research.

The authors of this article participated in the diagnosis, treatment, study design, and writing of the first version, as well as the final version of the manuscript in equal parts.

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