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Research article

MUSCULAR LESIONS IN ATHLETES: THE STATE OF ART.

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Abstract

Muscle injuries are extremely common in athletes and often produce pain, dysfunction, and the inability to return to practice or competition. Appropriate diagnosis and management can optimize recovery and minimize time to return to play. We report in this paper an update review and the state of art of this diseases.

Key Words: Muscular Lesions Athletes, Diagnosis, Management, Therapy.

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INTRODUCTION

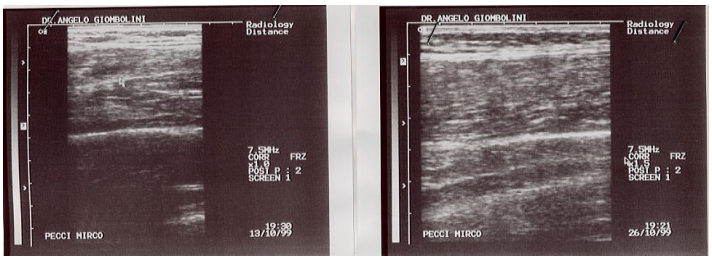
Muscular lesions are problematic for both amateur and professional athletes.
The human body is composed of four types of tissue :epithelial, connective, muscular and nervous.
Among these, the tissue that generally regards muscular lesions is the muscular type.
Muscular tissue is divided into three types: smooth muscle skeletal, smooth muscle striated and cardiac.
Muscles are organs entrusted with the movement of the body. Muscular contraction derives from the capacity to convert chemical energy, made possible from the hydrolysis of ATP, into mechanical energy.
Skeletal muscle is formed of a group of cells that are rather long, cylindrical with extremities fusiform called muscle fibers. These are not isolated, but are grouped together in bundles and wrapped in connective tissue. Muscular fibers are classified into type I, IIa, and IIx. Skeletal muscles are organs by a flesh part, venter muscle and a shiny white part defined as tendon that inserts into bone.Specifically, skeletal muscle inserts into bone through two different points: the termination point closest to the skeleton and therein less mobile and the insertion point which is the point of termination most distant from the skeleton and more mobile. Muscles in the human body can have diverse forms and diverse numbers of both entry /exit points and venter muscles.

Regarding incidence, muscular lesions are due to sporting traumas(90%), with 88% of these afflicting lower limbs: hamstrings (60%), femoral quadriceps (16.7%) with most in the rectus femoris, sural triceps (14.3%) and the adductor muscles (9%). Events that can lead to muscle lesions are of two types: mechanisms of a physical nature and mechanisms of a metabolic nature.The former type is divided into factors of natural mechanisms where the insults attributable to a greater production of force during an eccentric contraction compared to other types of contractions and into temperature dependent factors where the event occurs during an eccentric contraction causes a transitory and intermittent vasoconstriction mechanism which limits the transport of heat.Whereas the metabolic mechanism occurs during intense and repeated eccentric contractions that trigger vasoconstriction and consequently anoxia in the venter muscle. A decrease in the efficacy of mitochondrial respiration with a subsequent lowering of ATP also occurs. These two mechanisms together with thermoregulatory mechanisms cause an increase in temperature and a decrease in Ph, therein increasing the fragility of myofibrils and predisposing the muscle to a damaging event. Muscular lesions are classified into direct and indirect types.
Direct muscular lesions are recognizable by the presence of contusions, while indirect lesions are distinguished by : contracture , elongation, and distraction, of which the latter is divided into grades: first, second, third and break.

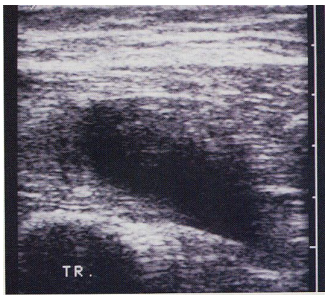
DIAGNOSIS OF MUSCULAR LESIONS

A diagnosis of muscular lesions begins with a thorough investigation of the trauma mechanics, followed by a clinical examination which includes an inspection and a palpitation of the interested muscles along with test of functionality with and without external resistance.
Diagnosis results being easier when or muscular contusion or distraction is accompanied by evidence of swelling and/or distal ecchymosis present at the lesion zone.Diagnosis is reached through echography or magnetic resonance. The former being the best choice for the first evaluation thanks to its ease of execution and its great reliability. Muscular echography is a non-invasive diagnostic exam that utilizes ultrasound waves to produce images that are projected on a screen. Ultrasound waves are not able to bypass obstacle such as air, bone, bandages or clothing.
Whereas magnetic resonance is a diagnostic exam that utilizes a magnetic field having an elevated intensity and radiofrequency waves. This diagnostic instrument produces images in transversal sections permitting to obtain three dimensional images of an anatomical structures without the utilization of ionized radiation; necessary for the study of lower limb articulation and muscles.
Magnetic resonance creates an electromagnetic field around the subject and sends waves to the examined area. These waves of different frequencies bounce off the tissues.
A computer registers the level of tissue vibration which is translated into bi-dimensional images that provide a precise picture of the studied area.Magnetic resonance allows to better view calcium deposits and fibrosis and distinguish between solids and liquids. A limitation of magnetic resonance is it does not produce a well-defined definition of muscle fibers.

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First grade lesion First grade lesion in the healing phase



Second grade lesion

TYPES OF THERAPY

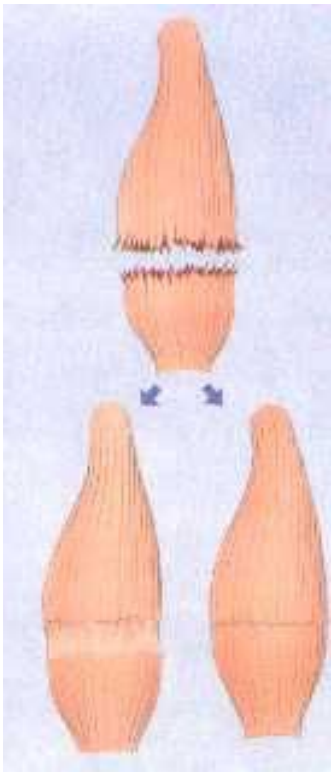
The regeneration process of a muscular fiber occurs in diverse phases: the inflammatory phase with the appearance of heat, pain and swelling.
The objective of this phase is to reduce inflammation needs to a minimum.The second phase consists of regeneration where the phagocytosis of the necrotized tissue and the regeneration of the myofibrils occur with the formation of scarred tissue which is less elastic and can easier lead to recurrence.
Finally, the re-modelling phase is characterized by a reorganization of the scarred tissue and a recovery of the functional capacity of the muscle.
Rehabilitation is very important in this phase as it permits a correct realigning of the muscle fibers.
The principle types of treatment are included in the acronym R.I.C.E. which stands for: rest, ice, compression and elevation. These treatments must be applied as soon as possible. The first of these interrupts any activity to prevent ulterior damage to the tissues, while the application of ice on the interested areas (as long as it as not lost its sensitivity) has the aim of cooling the interested area and reducing the flow of blood.
The compression phase has the objective of reducing any bleeding. While the elevation phase where it is necessary to bring the damaged area higher than the chest aims to foster draining and minimize swelling.
Tecar therapy is a rehabilitation technique that takes advantage of energy within the biological tissue by activating the natural repairing and anti-inflammatory processes.
Tecar provokes increases in circulation and lymphatic drainage. Furthermore, thanks to the heat it produces, tecar leads to increased oxygenation and a rise in metabolism with a greater production of ATP.
Its laser is a source of light that propagates through electromagnetic waves. These waves can be either continuous, where the emission of light has the same potency for the entire treatment, or delivered in impulses, where the emissions of light are brief in duration but at a higher potency. Their effects on damaged tissue are analgesic, ant-inflammatory and regenerative. Ultrasound is a therapy that utilizes high-frequency acoustic vibrations produced by an electric vibration generator.
The passage from the luminous ultrasonic phase to the delivery of the ultrasound waves to the various biological tissues is painless and determines variations in pressure that (depending on the modality and dosage of application) produces mechanical, thermal, physical-chemical and analgesic effects. This provokes at a tissue level, increases in microcirculation and temperature, a local chemical stimulation and a disintegration of cell binding of the structures reached.
Hyperthermia therapy consists of the induction into biological tissue i slightly superior to physiological: the warming of tissue is realized by electromagnetic fields has the advantage of reaching a greater depth compared to other types of therapy.
Oxygentherapy aims to improve the repair capacity of lesioned skeletal muscles. Cryotherapy is a rehabilitation technique that cools a body zone leading to a complex physiological response that includes: vasoconstriction, analgesia, and reductions in both the edema and muscle contracture.

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Cryotherapy induces a decrease in capillary blood flow, an improvement in lymphatic drainage, a reduction in local metabolism, a reduction enzymatic liberation and a decrease in the velocity of nervous conduction.
The massage consists in the mechanical stimulation of tissues through the rhythmic application of pressure and stretching.
Benefits include an increase in flexibility and coordination, pain threshold and a reduction in neuro-muscular excitability.

COMPLICATIONS OF MUSCULAR LESIONS

A muscular lesion that is not properly treated can lead to complications;these complications can include the formation of fibrotic scars which are scarcely symptomatic. That is, fibrotic tissue is limited in vascularization and elasticity, retracting and with an anarchic fiber orientation, where algic symptomology can be extremely acute.
Another complication is myositis ossificans which is the proliferation of non-neoplastic bone tissue and cartilage inside skeletal muscle situated in the site of a previous trauma or following repeated traumas.
Hernia muscles are rare and paucisymptomatic lesions . Their onset is determined by the herniation of muscle fascia. Generally, these lesions do not require treatment due to their limited symptomology.
Intermuscular blood-serum pseudocystis is a rare consequence of a muscular lesion and can appear when a hematoma is not completely reabsorbed and encapsulated by a fibrotic tissue formed by surrounding tissue that are compressed and ischemic.
In athletes with severe algic symptomatology, the removal of the fibrous wall and a suturing of the venter muscle is necessary through either an eco-guide or surgery.



Scarring from 4°grade muscular lesion

RE-EDUCATION AFTER A MUSCULAR LESION

One of the most important phases in treating muscular lesions is certainly the re-education phase. The principle objectives of re-education include restoring the pre-trauma performance status and reducing to a minimum the risk of recurrence.

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Re-education should not have either time or modality restrictions, as they are both subject to the conditions of the patient.
Re-education is made up of different phases, each having its own specific objectives to reach. It is necessary to successfully complete the objectives defined within a phase, before proceeding to the next phase. Once a scar is formed and has reached a good articular stability, one can proceed to reconstruct the trophism and muscle strength through isometric contractions and restore the motor pattern through coordinated exercises.
The intensity of these exercise must respect the principles outlined in S.A.I.D. regarding the suitability of an imposed load. This principle consists of phases that include; static exercising without load, static exercises with load, dynamic muscle training, dynamic exercising with increasing load, stretching exercised, proprioceptive training, gradual increase in activity load specific to the damaged muscle area and a return to training specific to the sporting activity.
Prevention plays an important as its objective is to reduce stressful events both personal and physical through an appropriate time of return to various competitions, an adequate programming with an equilibrium between intensity and volume of work and finally the necessity to engage in stretching and postural training prior to and after training sessions.
Therefore, it is clear that an appropriately tailored and respected prevention program would reduce the percentage of traumas and avoid any unpleasant pauses in sporting activities.

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