Chapter 7

# The Treatment of Muscle Hematomas

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Additional information is available at the end of the chapter

http://dx.doi.org/10.5772/56903

## 1. Introduction

Muscle injuries with hematomas are one of the most common events occurring in sport traumatology and require careful clinical and instrumental evaluation and timely treatment in order to restore a good functional outcome. The consequences of a failed treatment can be very serious, postponing an athlete's return to sports for weeks or months because of possible recurrences and complications (Gabbett, 2000).

## 2. Epidemiology

Muscle contusion is one the most common cause of morbidity from sports-related injuries, together with sprains and strains. Muscle trauma mainly results from sporting activities and accounts for 15 to 50% of sports injuries. Muscle injuries are the most common injuries in sports, with hamstring injuries accounting for 29% of all injuries in athletes. The playing style, refereeing, extent and intensity of match play might influence changes in the incidence of injuries in top-level tournaments. Strict application of the Laws of the Games is an important means of injury prevention (Junge and Dvorak, 2013). A good training and a good warming-up are suggested to reduce muscle injuries.

## 3. Etiology

The muscle hematoma can be the consequence of an impact against an external blunt or against a bone (direct trauma) or of a excessive or uncoordinated contraction (indirect trauma ) (Fig 1). In a direct trauma, when the muscle is contracted, the contusion will impact more superficial tissues while, in a relaxed muscle, the structural damage and the consequent hematoma, generally occur in depth, nearest the bone. The severity of the lesion depends on the site of impact, the activation status of the muscles involved, the age of the patient, and the presence of fatigue.


**Figure 1.** Hamstring subcutaneous hematoma occurred in consequence to a muscle rupture after a sudden eccentric contraction

The size of the effusion can be more or less conspicuous depending on the athlete's muscle status of contraction and on the athlete's characteristics of vascularization and coagulation. Very influent in the severity of hematoma are inherited abnormalities of coagulation like Antitrombine III or C protein or S protein deficit, or quantitative abnormalities in Leiden V or VIII or IX factors or anti-coagulants therapies or massive anti-inflammatory drugs use. External condition like a delayed or insufficient compression is important as well.

## 4. Classification

Many classifications of muscle injuries have been performed in according with anatomical location, pathophysiological characteristics, clinical and radiological features (Tol et al., 2013) (Chan, N. Maffulli et al classification 2012) (The Munich Consensus Statement ). Depending on the muscular structures involved, muscle injuries are distinguished in intramuscular, myofascial, myofascial/perifascial and musculo-tendinous.

The **intramuscular** hematoma is characterized by the integrity of epimysium and by blood extravasation into the body of the muscle affected by the trauma. This causes an increasing of the intramuscular pressure with consequent compression of the capillary bed, which contrasts the bleeding; therefore clinical signs and symptoms remain localized. Since the presence of blood flow may cause an increase in the osmotic gradient, the swelling may increase more than 48 hours after the traumatic event. This change of the osmotic gradient causes a passage of the

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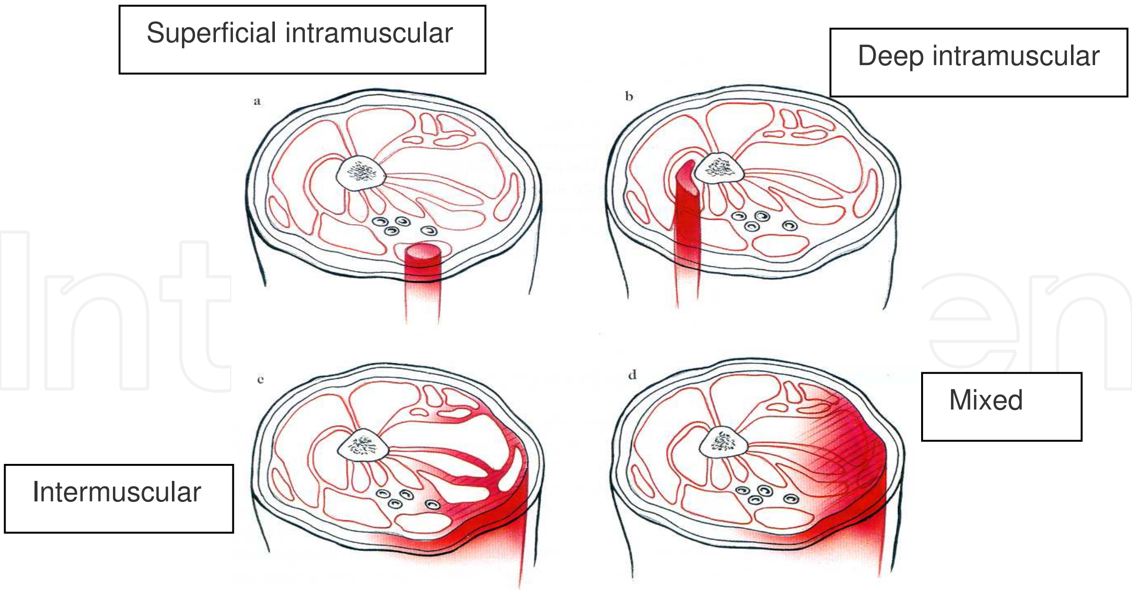


**Figure 2.** From Orthopaedic Sports Medicine: Principles and Practice Delee, Jesse C. M.D.; Drez, David Jr. Saunders Company, 1994

interstitial fluid through the muscle fascia, in order to balance the same osmotic gradient. This fact causes a further increase in the swelling of the injured muscle up to the limits of extensibility of the muscle fascia or the muscle itself. The main symptoms related to the onset of an intramuscular hematoma consists of pain, especially during the first 72 hours after the trauma and, after a few days, involve a decreased contractility and muscle functionality and extensibility. The prognosis for intramuscular hematomas is worse than for intermuscular hematomas, and experts' opinions suggest treating these with drainage in order to avoid potential post-traumatic myositis ossificans or fibrosis.

Although **intermuscular** hematomas appear initially more dramatic due to the resultant bruising and swelling, intramuscular hematomas are considered a more serious condition because the intact fascia creates an increasing of muscle pressure.

In intermuscular hematoma the muscle fascia looks damaged thereby allowing the extravasation of blood flow between muscles and fascia. This causes the formation of a more or less wide livid and swelling area. Contrary to the intramuscular hematoma, the intermuscular hematoma causes a painful symptoms limited to the first 24 hours post-trauma.

Finally in case of a **mixed** hematoma, after a first stage characterized by a temporary pressure increasing due to an extravasation, a rapid decrease in blood pressure can be observed. The swelling due to a blood extravasation appears usually after 24-48 hours, but after a sudden increase in pressure and swelling, the symptoms decrease and functional recovery is fairly rapid with an usually complete healing.

The knowledge of skeletal muscle regeneration principles and healing processes can help in respecting the timing for return to competitions (Klein, 1990).

Muscle repair is a multistep process which includes myofibers degeneration, regeneration and remodeling by acute inflammatory response (Clever JL, Sakai Y, Wang RA, Schneider DB 2010).

The phases of **inflammation** are, in order: organization of the hematoma, necrosis and finally, degeneration of muscle fibers with diapedesis[1] of macrophages and phagocytosis of necrotic material Anti-inflammatory drugs which target cyclooxygenase-2 are found able of hindering the skeletal muscle repair process. Muscle regeneration phase can be aided by growth factors, including insulin-like growth factor-1 and nerve growth factor, but these factors are typically short-lived, and thus more effective methods of healing are needed. Skeletal muscle injuries are repaired by muscle cells, myoblasts in condition of oxygenation. The stem cells repair the tissue with paracrine effects, leading to neovascularization of injured site. The *Gharaibeh B'*Group of University of Pittsburgh has found that factor invoked in paracrine action is Angiotensin II, the hormone of blood pressure control.The "LOSARTAN", a drug receptor blocker, in fact reduces fibrotic tissue formation and improves repair of murine injured muscle( Gharaibeh et al. 2012)Other authors hypothesized that a combination of platelet-rich plasma (PRP) injection and oral administration of LOSARTAN, as antifibrotic agent, could enhance muscle healing by stimulating muscle regeneration and angiogenesis and by preventing fibrosis in contusion-injured skeletal muscle Terada et al., 2013.

The stage of **regeneration** includes all final phases of the healing process: the production of connective tissue scar and neoangiogenesis, phases very important for the restoration of the muscle visco-elastic properties. The low neovascularization would cause fibrosis, due to local ischemia and low O2 tension. So, in this phase, it's important the utilization of physical therapies which cause vasodilatation and neovascularization.

The regeneration process requires the activation of a myogenic stem cells population,, which give rise to proliferating myoblasts. Today we know that repair of muscle takes place with the increase of protein synthesis and activation of satellite cells (stem cells) The satellite cells are quiescent myogenic precursor cells located between the basal membrane and the sarcolemma of myofiber. The adaptation of skeletal muscles to altered use is governed by three major processes: satellite (stem) cell activity, gene transcription, and protein translation. A defect in any of these processes could interfere with muscle maintenance and regeneration. (Shefer G 2012).

In the **remodeling** phase we can observe the "restitutio funtio lesa".

Myoblasts differentiate and unite together into regenerated myofibers. During the final stages of muscle repair, myofibers remodel to produce mature muscle fibers and recover the contractile capacity of the injured muscle (Mayssa et al 2012)

In response to stimuli such as injury or exercise, satellite cells become activated and express myogenic regulatory factors (MRFs, transcription factors of the myogenic lineage including Myf5, MyoD, myogenin, and Mrf4) that proliferate and differentiate into myofibers. The MRF

1 Passage of corpuscular elements of the blood through the capillary walls, typical of inflammatory states.

family of proteins controls the transcription of important muscle-specific proteins such as myosin heavy chain and muscle creatine kinase.

The MGF mechano-growth factor isoform appears to work by activating satellite cells MGF expresses the level of mechanical stress in muscles and other tissues and could have a important role in muscle growth and repair.

## 5. Clinical examination and prognosis

We extend these new findings to clinical practice to propose an evidence-based approach for the diagnosis and optimal treatment of skeletal muscle hematomas. Optimal treatment of skeletal muscle injuries start with the right diagnosis (Jarvinen et al., 2005). The clinical diagnosis of a surface hematoma is rather easy thanks to the detection of a bruised area of variable extension depending on the extent of the trauma, contextual to swelling and loss of muscle function. On the other hand, the clinical diagnosis of a deep hematoma may be much more complicated. In this case, the clinical diagnosis must necessarily be supported by the imaging consisting of ultrasonography and / or MR. However, the formulation of a precise and definitive diagnosis in case of an intramuscular hematoma, becomes possible only after 12-72 hours from the detrimental event, since the formation of the hematoma may also appear over three days after the trauma, thereby preventing a possible early diagnosis. A more detailed characterization of the injury can be made using imaging (ultrasound or MRI) repeated at second, seventh and fifteenth day, and certainly at the time of going back to aerobic and anaerobic work (Nanni and Roi, 2013).

A decrease in swelling, a reduction in pain, in the appearance of an area in the first 24 hours post-traumatic and a recovery of muscle function, are indicators of a favorable prognosis. On the contrary, an increase or a persistent swelling after 48-72 hours, an increase in pain, a decrease of peripheral pulses, a prolonged or progressive limitation of joint caused by pain or muscle weakness, a numbness and a sense of / or paresthesia below the area of injury, are all negative prognostic factors.

In any case, there is a better prognosis in the case of intermuscular compared intramuscular hematoma In case of intermuscular hematoma is possible an early mobilization and the patient returns to the sport activity between 1 and 10 weeks. On the contrary, the intramuscular hematoma, especially if is extended, requires greater caution in order to avoid the worrying complications, the myositis ossificans or the fibrosis. For this reason, in the case of intramuscular hematoma, return to sport activity is generally not possible before a period of 10-20 weeks (Ryan, 1999).

## 6. Imaging

The evaluation of the longitudinal size (measured in mm) is a more important severity predictor than the cross section of the lesion and the entity of the hematoma. Ultrasonography, with panoramic vision, performed after 24-48 hour is useful in localizing the hematoma and in characterizing its different types. Findings can include the following: circumscribed lesion, anechoic lesion compatible with a liquefied hematoma, circumscribed lesion of mixed echogenicity compatible with areas of liquefied hematoma, coagulated blood, and edema. Considerations could also be made on investigation methods: Ultrasound (Fig. 3 and Fig. 4) is considered an operator-dependent method while MRI (Fig. 5 and Fig. 6) appears to be more sensitive to follow the evolution and to well evaluate extensive lesions.



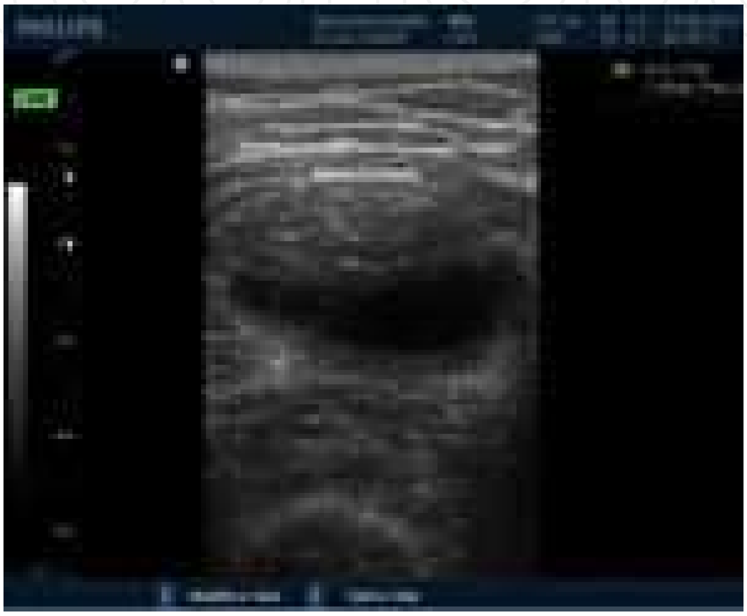

**Figure 3.** Transversal section: 4,6 x 2 cm lesion in Rectus femoris at day 6, before drainage


**Figure 4.** After drainage at day 6

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**Figure 5.** Axial and Coronal MR of hematoma in the hamstring muscle group at day 10.

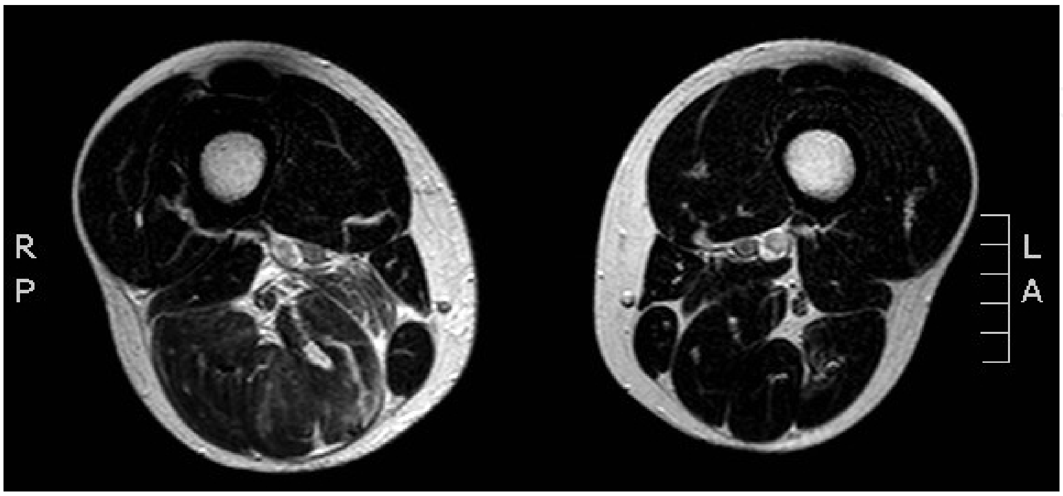


**Figure 6.** Axial and Coronal MR of hematoma in the hamstring muscle group at day 10.

Aside from the different degrees of seriousness in muscle damages, it is necessary to consider the anatomical location where the damage occurred in order to plan the most proper rehabilitation treatment.

## 7. Treatment

The first aid for any kind of muscle injury is the **RICE** (Rest, Ice, Compression and Elevation) principle or **PRICE** (Protection, Rest, Ice, Compression and Elevation) principle. The aim of RICE is to stop the injury-induced bleeding into the muscle tissue and thereby to reduce the extent of the injury (Thorsson et al., 1997).

### 7.1. Rest

Rest is recommended during the first 24-72 hours following the traumatic event (Reström and Peterson, 2001), in order to prevent further bleeding and exacerbation of fibrillar necrosis at the site of the lesion, thus allowing a better scar (Reström, 2003). Some authors recommend, in case of important hematoma in the lower limb, the total abstention from the load for 48 hours (Lachmann and Jenner, 1994; Reström, 2003). The duration of the rest period depends on the extent of the trauma and the pain symptoms of the patient.

### 7.2. Elevation

The elevation of the injured limb may contribute to the resolution of the hematoma reducing blood pressure and increasing venous return (Gray, 1977; Williams, 1980; Peterson and Reström, 2001; Reström, 2003;).

### 7.3. Compression

The aim for applying a compression bandage on the injured area is to limit a further haemorrhage (O'Donoghe, 1984; Klein, 1990; Peterson and Reström, 2001). The compression bandage should be maintained for a period of 2 -7 days, but not neglected until a substantial decrease in the swelling and a fluctuation reduction of the palpable mass is obtained (Thorsson et al., 1987; Thorsson et al., 1997). The amount of compression due to the different types of bandage causes different responses at the site of the lesion: high compression, approximately 85 mmHg, obtain an immediate stop of intramuscular blood flow, while a low compression, in the order of 40-45 mmHg, reduces blood flow about 50%. In the bibliography there are not studies on the optimal compression intensity in the case of intra-or intermuscular hematoma. Certainly the patient should not feel pain or have ischemia symptoms.

### 7.4. Ice

The cooling of a body area involves a complex of physiological responses that Fu et al. (2007) summarized in: Vasoconstriction-Analgesia-Reduction of edema - Muscle contracture. This initial response induces respectively:

- A decrease in capillary blood flow
- An improvement of lymphatic drainage.
- A reduction in the local metabolism
- A reduction in the enzymatic liberation
- A decrease in histamine liberation
- A decrease in nerve conduction velocity and a change in sympathetic activity

The lowering of the temperature causes an increase in blood viscosity with a reduction of blood flow and a reduction of vascular permeability in the cooling area. This physiological effect induced by cold is the key mechanisms in the reduction of edema due to the increasing of venous diameter and of the inflammatory reaction (Smith et al., 1993; Low and Reed, 2000).

A crucial point in cryotherapy application is the duration of cooling. The cooling of a healthy body area initially causes a reflex vasoconstriction, for a period between 9 to16 minutes, followed by a vasodilatation phase between 4 and 6 minutes, after which vasoconstriction reappears. For this reason the application of cold pack on a hematoma should have a duration between 12 and 15 minutes, with interruption of about 10 minutes. The total duration of treatment cryotherapy, however, must be appropriate to the level of the lesion (Lindsey, 1990), because unfortunately is based on empiricism (Bleakeley et al., 2004). We recommend ice bag for 20 minutes (Meaney et al., 1979) or airjet cryotherapy at -3°C for 5 minutes applied several times in a day. The muscle becomes tenser, stiffer, and less elastic as a result of cooling, and the mechanical properties are not fully recovered even after 15 min. So, in results of muscle injuries, warming-up is suggested after cooling to enable normalization of mechanical properties of the muscle.In any case cryotherapy appears particularly indicated in the first 24 hours post-trauma (Gray, 1977; Williams, 1980; Klein, 1990; Lachmann and Jenner, 1994; Renström and Peterson, 2001; Prentice, 2004).

Cryotherapy is used to prevent muscle damage, ( Bailey et al 2007) either separate or associated to stretching in the stretching -spray technique (Taylor et al., 1995). Cryoultrasound (cryotherapy with ultrasound) therapy has more scientific evidence in treatment of tendonitis thank in muscle injury (Costantino et al., 2005).

### 7.5. Mobilisation

In the treatment of injured skeletal muscle, an immobilization should immediately be carried out or, at least, an avoidance of muscle contractions should be encouraged. The key to a right therapy consists in the appropriate timing between immobilization and mobilization. However, the duration of immobilization should be limited to a short period, sufficient to produce a scar able to bear the forces induced by re-mobilization, thus avoiding to mobilize a lesion healed with type I collagen fibers that would facilitate re-injury. The muscle activity (mobilization) should be started gradually respecting the physiological phases of wound healing and with the limits of not pain. On the other hand, early return to activity is desirable to optimize the regeneration of healing muscle and recovery of the flexibility, elasticity and strength of the injured skeletal muscle to pre-injury levels.

The interval to muscle repair might be shortened by certain adjuvant therapies which induce higher metabolic turnover.

In case of a not yet organized blood mass, it may be appropriate, from the seventh to twelfth day, to drain the hematoma, under ultrasound guidance. This is possible when blood is melted (Sofka et al., 2001; Del Cura et al., 2010; Zabale and Corta 2010 ).

Ultrasound is the most appropriate tool for interventional procedures on the hematoma when the lesion is visible with this methodology. The target area is easily identified with ultrasound and needle or catheter position is easily and efficacy documented (fig 7). Advantages of US-guided procedures include the absence of ionizing radiation, real-time monitoring during needle placement, decreased risk of injury to vessels and nerves, real time confirmation of procedure success of complete fluid aspiration. Complications are rare and can be avoided by using proper sterile technique and evaluate for potential contra-indications to the procedure.

## 8. Kinesiotaping

Kinesiotaping (KTT) is no more clinically effective than the usual care tape/elastic bandage. There was limited evidence that KTT in conjunction with physiotherapy was clinically beneficial for plantar fasciitis related pain in the short term; however, there are serious questions around the internal validity of this treatment. (Fig. 8 and 9) It currently exists insufficient evidence to support the use of KTT over other modalities in clinical practice but, in reality, it is largely used in practice by physiotherapists and masseurs (Morris et al., 2012).

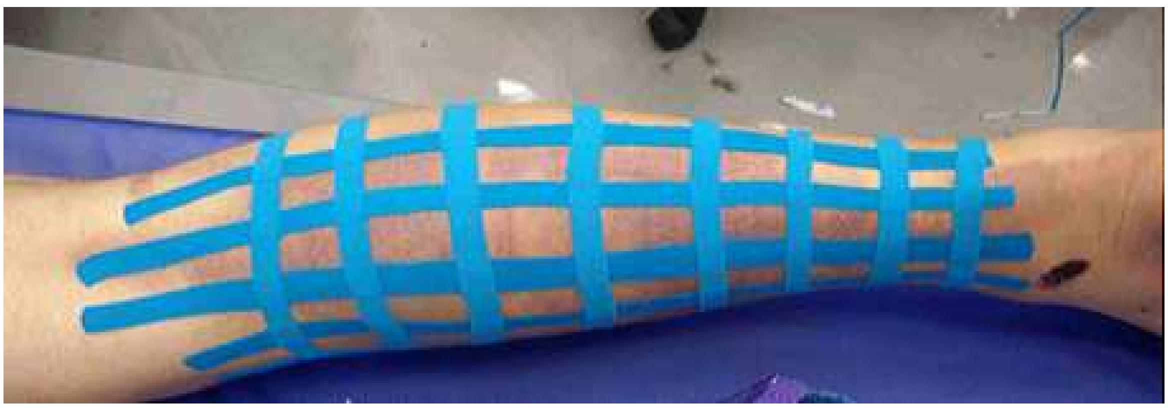

**Figure 7.** Kinesiotaping in medialis gastrocnemious in “tennis leg” injury

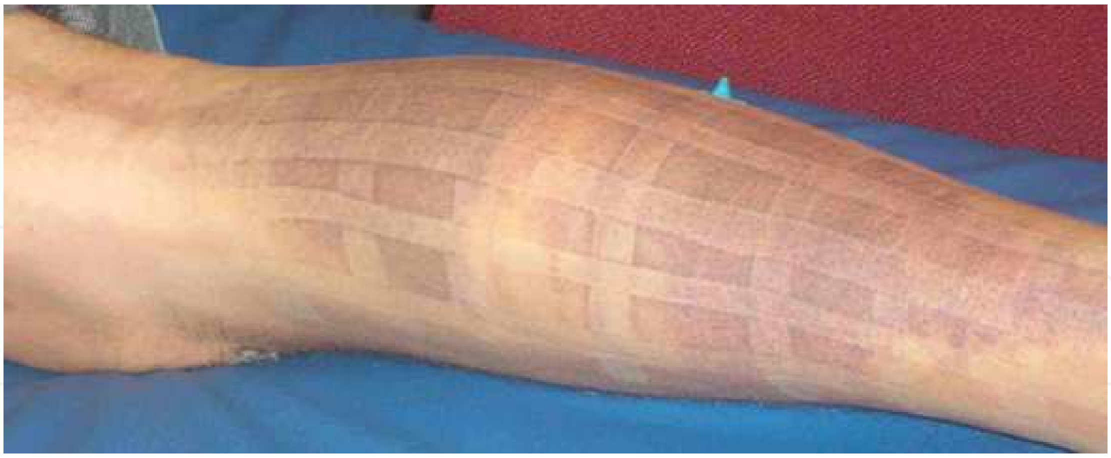

**Figure 8.** Evolution of the lesion after 3days

## 9. T.E.CA.R. THERAPY (Transfer Energetic Capacitive and Resistive)

The diathermy is based on application of electromagnetic waves; those oscillations induce a transfer of kinetic energy which is readily converted into heat. This effect of heat production in the tissues is called "Joule effect". The diathermy and every other exogenous form of application of heat is indicated only in the resolution phase of the hematoma and never in the immediate post-traumatic period. The rational application of various forms of diathermy is based on accelerating the rate of absorption of the residual hematoma, due to increased blood circulation induced by the temperature (Costantino et al., 2005).

### 9.1. Hyperthermia

Notoriously, heat in depth may be very helpful instrumental in hematomas re-absorption.

Also microwave diathermy (the old Marconi therapy) induced hyperthermia into the tissues and can stimulate the repair processes, allowing more efficient relief from pain, helping in the removal of toxic metabolites, reducing the muscles and joints stiffness. Moreover, hyperthermia induces hyperemia, which improves local tissue drainage, increases metabolic rate and induces alterations in the cell membrane. The biological mechanism that regulates the relationship between the thermal dose and the healing process of soft tissues with low or high water content or with low or high blood perfusion is still under study. Microwave diathermy treatment at 434 and 915 MHz can be effective in the short-term management of musculoskeletal injuries (Lehmann et al., 1993) also combined with massage therapy.

### 9.2. Massage therapy

Massage therapy and intense eccentric exercise, practical and non-invasive forms of therapy, also seem to have certain usefulness in preventing fibrosis.

Several studies have also shown that vascular endothelial growth factor (VEGF) can increase the efficiency of skeletal muscle repair by increasing angiogenesis and, at the same time, reducing the accumulation of fibrosis. The biological mechanism(s) behind the beneficial effect of massage are still unclear and require further more investigations and randomized human clinical studies (Best et al., 2012).

### 9.3. Lasertherapy

For a correct use of high power laser therapies, a practical classification is based on the precise localization in depth and on presence-absence of hematoma in muscular injuries.

On the basis of this, the following classification can be purposed:

A) Injury to a depth of 0.5 to 2.5 cm, without hematoma

B) Lesion to a depth of 0.5 to 2.5 cm, with hematoma

C) Injury to a depth of more than 2.5 cm, without hematoma

D) Injury to a depth of more than 2.5 cm, with hematoma (Conforti et.al. 2004)

High energy **laser therapy** had developed in the last twenty years and offers today an effective help by acting in all phases of inflammation and regeneration. At the basis of biological reparative processes is a photochemical reaction able to speed up the reabsorption of intramuscular or intermuscular hematoma and repair processes like capillarization and neoangiogenesis (Algeri et al., 2011).

It was demonstrated that laser promotes an increase in collagen IV immunolabeling in skeletal muscle in the first 7 days after acute trauma caused by cryoinjury, but does not modify the duration of the tissue-repair process. Even with LLLT (low-level laser therapy), the injured muscle tissue needs ~21 days to achieve the same state of organization as that in the non-injured muscle (Baptista et al., 2011).

The laser therapy, in the first 48 h, reduces the intensity of inflammation, in a second phase, about two weeks, it accelerates the healing process and in the third stage, about third and fourth week, of proliferative and restorative healing, it helps to avoid fibrosis, scarring or inelastic metaplasia. Distinction in soft, mid and laser power is no longer accepted, it is preferable to classify laser depending on the wavelength, the power density and the density of energy transferred for unity of surface. The choice of treatment is not empirical but based on the study of Laser radiation interaction -tissue.

The Nd-YAG laser, with 1064 nm, continuous emission is, since fifteen years, the most accredited and used method for treatment of muscle injuries due to its penetration ability, not absorption in Hb and low coefficient of water and melanin absorption (Castellacci et al., 2003)

It is known for effective possibility of transferring the right amount of energy to the injured tissue until 4 or 5 cm in depth in a short time (8-50 sec.).

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Validated therapeutic protocols for the treatment of injuries with laser = 1064 nm according to the criteria of Evidence Based Medicine are defined in number of sessions, power density, time of application for spot in function to the depth.

Medical Nd Yag laser devices, without thermal control, can't be used early in presence of intense hematoma, but only after needle drainage and not before third / fifth day from the trauma due to danger of blood clotting.

Today there is a new innovative therapeutic method: laser FP3 SYSTEM. In presence of hematoma and surrounding edema, it is necessary to drain with circular manual scanning with continuous emission at a distance of 10 cm from the skin, draining with high power and low density and many times in a day with breaks of about 30 minutes, divided into mini-sessions (500Joule for session).

The patient should not perceive "heat". The Fp3 System,with Temperature Control System ® detecting T in the first mm deep, respects the absence of heating (T max = 42 ° C).

If the hematoma is over 2,5 cm deep from the skin, laser is set at 4 watt x150-200 joules at mini-session, if it is below 2,5 cm depth from the skin, it is set at 6.5 watt x 150/200 joules at mini-session, giving about a total of 800/1000 joules.

The amount of energy will be a function also of the size of the lesion, but with FP3 it is possible to immediately begin a biostimulating treatment in the first day without fear to clot the hematoma.

Physical therapies must act in the depth of the lesion, neither above nor below, and on that tissue in that precise phase.(M Conforti, 2003).

### 9.4. Pulsed ultrasound

TPU (Therapeutic Pulsed Ultrasound) presents beneficial effects on the muscular healing process, inducing a reduction in the production of ROS and also the expression of pro-inflammatory molecules (Victor et al., 212). Other authors conclude that, although treatment with pulsed ultrasound can promote the satellite cell proliferation phase of the myoregeneration, it does not seem to have significant effects on the overall morphological manifestations of muscle regeneration (Rantanen et al., 1999).

### 9.5. ESWT

Extracorporeal Shockwave Therapy (ESWT) is an alternative to surgery in calcific shoulder tendinitis when conservative treatments such as non-steroidal anti-inflammatory drugs, steroidal injections, and physiotherapy fail to relieve symptoms. It has been hypothesized that ESWT is effective in the midterm for reducing pain and improving function for patients with chronic calcific myositis or fibrosis and that a dose-response relationship exists in the treatment parameters for effectiveness (Galasso et al., 2110).

### 9.6. Rehabilitation programme

The rehabilitation programme should be built around progressive agility and trunk stabilization exercises, as these exercises seem to yield better outcome for injured skeletal muscle than programs based exclusively on stretching and strengthening of the injured muscle. (Järvinen et al., 2007),

In order to assess joint ROM and muscle strength, we used isokinetic dynamometer with concentric contractions (CIBEX Norm) at proposal speeds of each joint, following International accredited protocols. Very important is the dramatic effect of eccentric strength training on muscle strength, both isotonic and isokinetic. It is known that eccentric training reduces the severity of a possible indirectly occurred muscle damage.

The prognosis, returning to the initial concept, is better if the diagnosis is accurate and protocols adequate

Early active exercise in the rehabilitative process is essential for

- Decreased healing time,
- Increased structural strength and stiffness of ligaments,
- Increased collagen synthesis in tendons,
- Increased proteoglycan content in articular cartilage and periosteal expansion of bone tissue.
- Decrease muscle fibrosis.

### 9.7. Proprioception

Arthrogenic muscle inhibition not only slows strength gains during rehabilitation, it also slows gains in proprioception and increases susceptibility to further injury. Receptors involved in proprioception are located in skin, muscles, and joints. Information about limb position and movement is not generated by individual receptors, but by populations of afferents. Afferent signals generated during a movement are processed to code for endpoint position of a limb. The afferent input is referred to a central body map to determine the location of the limbs in space. A contribution from central feedback mechanisms to the sense of effort is relevant to muscle rehabilitation and prevention re-injuries. Positive feedback is often associated with instability and oscillation, none of which occurs in normal locomotion (Riva, 2013).

## 10. Complications

A possible complication is chronic organized hematoma, well circumscribed, with mass-related symptoms. It is showed by Computed tomography (CT) like a homogeneous mass with capsule formation with a soft cystic center and a fibrous pseudo-capsule, whereas ultrasound shows it to resemble a multi-locular cyst. CT is unable to discriminate the chronic expanding hematoma from other soft tissue masses.

The mass is surrounded by a rim of hyalinized fibrous tissue with a chronic inflammatory infiltrate and granulation tissue (Nakano et al., 2010). Histologically, the mass is composed of necrotic debris, fibrin and blood clots. The lesion can be treated by hyperthermia, ultrasound therapy or shock waves or, finally, by excision (Silveira et al., 2010)

## 11. Conclusions

Sport can be resumed when the extensibility, isotonic and isometric and isokinetic stretch tests are balanced and when the contraction is painless.

The recovery of competitiveness is possible when were recovered in field skills specific sport. We think that prevention is the best thing, but it is often difficult to eliminate the risk of intrinsic and extrinsic damage. We recommend an appropriate warm-up, an appropriate training, balancing agonist-antagonist, to recognize stages pre-lesion as contracture or fatigue and do not underestimate the lesion or his scar, do not administer medications inappropriately, do not perform incomplete or too aggressive rehabilitation and especially to properly use the means at our possession like physical therapy.

Muscle hematomas can have a significant impact on an athlete's performance, ranging from short-term performance impairment, muscle deconditioning and compartmental syndromes, to long-term problems, such as myositis ossificans and possibly muscle re-injuries. We recommend the use of protectors, well tolerated by all people, except in hot conditions, when they were uncomfortable (Mitchell,. 2000).

We conclude by suggesting to the physician to better delineate the depth of the lesion on ultrasound imaging, because all high energy treatments require precise localization in depth in order to provide the right energy level.

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