Quick recovery from acute muscular injuries in athletes: our experience

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Acute muscular injuries are frequently suffered in various sports (between 10 and 30 %). When practicing a sport, the muscle must have the quality, strength, resistance, responsiveness, speed and elasticity which are all gained on the field through training sessions which are often intense and to the limit of the elastic resistance of the muscles.

These intrinsic qualities of the muscles depend on the anatomic-functional characteristics responsible for the visco-elastic and contractile properties, on the different metabolic and constitutional activity of the fibres which condition strength, power and endurance of muscular activity and of the neuro-muscular system which regulates the voluntary activity, reflex or automatic, characteristic of a certain type of sport.

The perfect integration of these three systems condition the level of performance. The most frequent causes of muscular injury depend on:

– Over exertion
– Muscular unbalance
– Excessive muscle tension
– Insufficient warming up
– Limited muscular coordination
– Insufficient recovery
– Climate factors
– Turfs

There are different criteria in classifying muscular injuries. The classification which is generally the most adopted distinguishes between muscular injuries from direct and indirect trauma.

The indirect traumas are classified according to the American Medical Association in elongations and lesions of 1st and 3rd degree depending on the number of muscle fibres injured, on the degree of these lesions, on the connective tissue and vascular structure intimately connected to the lesion. Elongations do not highlight anatomic lesions.

In muscular injuries of the 1st degree due to spraining of the muscle-tendon unit, approximately 5% of the myofibres will break within the muscle fascicle.

In injuries of the 2nd degree with complete interruption of the muscle-tendon unit, one can observe the involvement of one or more muscle fascicles (less than 3/4 of the anatomic section of the muscle) which will break completely in injuries of the third degree.

It is important to stress that, on a clinical level, the boundary between stretching (elongation) and 1st degree muscle injury is very blurred, especially in the initial phase when the blood effusion is not yet evident. Furthermore, the distinction in three degrees of seriousness of the muscle injuries is arbitrary because it is impossible, from a practical point of view, to quantify the entity of the lesion.

The injured part shows the typical signs: flushed skin, heat, impeded function. Recovery of the injured part occurs through the replacement of the destroyed or lost tissue with live tissue in two stages which entail the contraction of the lesion and the mechanical

reduction of mass loss. The replacement of the lost tissue occurs through the migration of cells (repair) or division of the adjacent cells (regeneration) with subsequent formation of granulation which evolves into scar tissue.

Since this process is hindered by the formation of the haematoma on the injured part, it is fundamental to prevent its formation and expansion as it is a delaying element in the complete recovery and healing time of the lesion.

Therefore it is important to reduce the pain and the haematoma on the injured part, improve capillary and lymphatic micro-circulation, exercise a haemostatic action and at the same time colliquative action to eliminate the necrotic tissues and favour the tissue repair processes.

All this can be obtained using the therapeutic effects of cryotherapy associated with ultrasound therapy. Cryotherapy in the first 24-48 hours reduces the spasm, pain, local vascularization with contraction of fibrin and reduction of the bleeding and extension of the lesion; it also produces an anti-inflammatory effect due to its metabolic action with slowing down of the cell reaction and an anti-edema effect due to the systemic vasoconstrictor action.

Ultrasound therapy exercises a mechanic effect stimulating the cells of the connective and muscle tissues and producing higher quantities of collagenous fibres and proteoglycans (scarring process) and determines an initial dermic vasoconstriction followed by a strong superficial vasodilation with reduction of the circulation at a muscular level (haemostasis).

The association of the two methods as in Cryoultrasound therapy enables the reduction to a minimum of the heating effects of ultrasound therapy and increases the mechanical effect so that treatment can be started at a very early stage.

For the recovery of the injured athletes, besides treatment with cryoultrasound we also used hydrotherapy, a consolidated method used in all those cases in which it is necessary to exploit the characteristics of water such as floating and resistance.

Figure 1. – Evolution of the repair process in 1st degree sprain of the leg biceps.

Floating enables minimal stimulation of the articulations, reduces the compression forces and enables the patient to carry out exercises which would be limited and painful if done out of the water.

The opposing resistance of the water is easily adaptable to exercising in that it varies with every variation of movement and can be modified by changing the lever arm, the movement speed, water turbulence or using special equipment[1].

In water the movements which are done in the same direction as the floating direction are facilitated by this push and require less strength to win over its resistance, on the contrary movements developing towards the bottom are hindered by both resistance and floating and require a greater muscular effort[2].

Water also has a considerable proprioceptive effect in that in order to maintain an adequate posture it is necessary to activate a reflex muscular contraction to maintain a balance.

Scope of this study is to evaluate the capacity of Cryoultrasound (an association of cryotherapy and ultrasound therapy) and of e hydrotherapy to reduce recovery time in athletes with muscular injury.

Materials and methods

In the period between January and September 2004, 48 athletes were treated (37 males and 11 females) of between 17 and 26 years of age (32 footballers, 4 volleyball players, 12 basketball players).

All the athletes came to our attention from the E.R. in the immediate post trauma phase. The ultrasound scan carried out within the following 72 hours showed that 39 athletes had 1st degree muscle sprain and 9 athletes second degree sprain; localized in the following muscles: leg biceps (20), medial twin(6), lateral twin (5), femoral rectum (12), large thigh adductor (5).

All patients had an ultrasound scan on arrival, another after 12 days (Fig. 1) and in those cases which had not resolved, further ultrasound scans until the completion of the scarring process.

For every patient an evaluation form was filled in at the beginning and at the end of the treatment containing data regarding pain /on digital pressure or active mobilization) and regarding function (articulation comparative goniometric assessment)

Pain was measured with the Scott- Huskisson analogical-visual scale indicting absence of pain with 0 and intolerable pain with 10.

Furthermore the efficacy index was measured (difference between the initial and final VAS initial VAS X 100) and the degree of satisfaction of the patient.

The efficacy index enabled us to classify the results obtained in:

– Slight improvement (score between 1 and 30)
– Improvement (score between 31 and 55)
– Great improvement (between 56 and 80)
– Cured (between 81 and 100)

The patient's satisfaction was classified in:

– Dissatisfied
– mildly satisfied
– Satisfied
– Very satisfied

All the athletes were treated immediately with 12 sessions of cryoultrasound treatment on a daily basis with the following protocol:

– 2,2 watt power per square centimetre
– continuous mode with mobile head
– temperature of -2 degrees centigrade.
– patients with a diagnosis of 1st degree lesion started hydrotherapy on the 7th day, those with 2nd degree lesions on the 14th day with specific exercises aimed at a progressive recovery of the articulation and muscular strength.

Results

The V.A.S scores obtained were subjected to statistical evaluation with analysis of the one way variance for repeated measures considering as significant a P<0,005 reading.

The analysis of the results obtained with the analogical-visual pain scale before and after treatment, highlighted a statistically significant variation (P< 0.005) (Fig. 2).

The therapy proved valid because it reached an efficacy index of 87,8 which enabled us to classify the patients as cured. Furthermore, the patients were satisfied in 39% of cases and very satisfied in the remaining 61%.

The post treatment ultrasound scan showed a complete recovery of the edema, of the effusion of blood and an excellent tissue repair without fibrous phenomena in the 1st degree lesions.

The resumption of sports activities in athletes with 1st degree sprains occurred with complete recovery of the R.O.M. and the muscular coordination in average after 13,6 days.

In athletes with 2nd degree lesions the ultrasound scan highlighted a complete recovery in 2 cases, in 16 and 18 days respectively, and partial recovery in 7 cases. The latter underwent a further cycle of cryoultrasound therapy until complete resolution of the lesion.

The seven athletes with 2nd degree sprains resumed their sports activities within an average time of 24,6 days.

All patients treated were reassessed after 6 months and no relapse was observed.

Conclusions

Ultrasound therapy is one of the most common physiotherapy instruments used in treating muscoloskeletric pathologies[3].

Previous studies have proved that low intermittent doses of ultrasound therapy favour tissue repair[4-6].; even if the efficacy of the ultrasound therapy is still under discussion[7-10].

Cryoultrasound is able to exploit the positive effects of cryotherapy and ultrasound therapy and we can therefore define it a san excellent therapeutic instrument in terms of efficacy, easy to handle, absence of undesired side effects, resolution of pain and consequent satisfaction of the patient. As well as proprioceptive stimulation, Hydrotherapy offers the possibility to act on the articulations and muscles minimally stimulating these and reducing the compression forces in the initial phases; while subsequently to the treatment it favours the healing process by exploiting its characteristic

In light of the results obtained, we can therefore state that the association of Cryoultrasound and Hydro-kinesitherapy shortens recovery time and guarantees a precocious resumption of sports activities thereby representing an effective treatment for muscle spraining in the athlete.

Summary

The scope of this study was to evaluate the capacity of Cryoultrasound therapy (an association of cryotherapy and ultrasound therapy) and of Hydrotherapy in reducing recovery time in athletes with muscle injury.

Materials and methods. In the period between January and September 2004 48 athletes were treated (37 males and 11 females) of between 17 and 26 years of age (32 footballers, 4 volleyball players, 12 basketball players). All the athletes came to our attention from the orthopaedic E.R. in the immediate post trauma phase. The ultrasound scan carried out within the following 72 hours showed that 39 athletes had 1st degree muscle strain and 9 athletes second degree sprain; localized in the following muscles: leg biceps (20), medial twin (6), lateral twin (5), femoral rectum (12), large thigh adductor (5). All patients had an ultrasound scan on arrival, another after 10 days to asses the healing process and tissue repair and certain clinical parameters were assessed such as pain (VAS), functional limitation (R.O.M.) at the beginning and at the end of the treatment. Since the athletes treated had not reached the complete tissue repair, we carried out further ultrasound scans until the completion of the scarring process. All athletes are….

Figure 2. – Average V.A.S. readings before and after treatment with Cryoultrasound.

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