

# Muscle lesions in athletes: case comparison between Hilterapia<sup>®</sup> and traditional therapy.

**Valent A.**

Modena Calcio Team Doctor

## ABSTRACT

Muscle pathologies during sport activities are very frequent. The most serious event is the muscle strain that needs specific treatment based upon functional rehabilitation associated with physiotherapeutic medical equipments. This clinical study compared the results obtained in two groups of 15 patients, homogeneous for pathology (1st degree strain), sex and age, treated with either Hilterapia<sup>®</sup> or with traditional therapy (CO<sub>2</sub> laser therapy and ultrasound therapy). Results have been evaluated by using VAS pain score, ultrasound scan, number of therapy sessions, time before sport activity can be resumed and satisfaction index of patients. Based on this study, Hilterapia<sup>®</sup> proved to be effective in reducing pain and time before sport activity can be resumed, with statistically better results when compared to conventional therapy, according to all evaluation parameters.

## INTRODUCTION

Muscle pathologies are very frequent events during sport activities, with variable incidences of between 10 % and 40 %, depending on the type of sport [1,2,3,4]. Muscular pathologies can be caused by direct or indirect traumas:

- Direct trauma: contusion and lacerated and contused injury
- Indirect trauma: cramp, contracture, stretch, strain and Delayed onset muscle soreness (Doms) (delayed onset muscle soreness).

Muscle strain, caused by indirect trauma is the most feared event. This is the rupture of a variable number of muscle fibres, always associated with haematic extravasation consistent with the severity and localisation of the lesion. Rupture can be partial or complete with the consequent separation of the two fragments. Following a specific technical movement, acute and serious pain occurs, preventing the athlete to continue his performance. Recovery to sport activity takes between 15 days to 2 months, depending on the muscle involved and on the lesion severity. The strain is classified in 3 degrees, depending on the amount of muscular tissue that has been torn:

- 1st degree: rupture of few muscle fibres but not of the entire bundle
- 2nd degree: rupture of one or more muscle bundles that involves less than  $\frac{3}{4}$  of the section of the muscle.
- 3rd degree: rupture that involves more than  $\frac{3}{4}$  of the section of the muscle in a particular area and can be divided in partial or total.

The most frequent muscle strain is the 1st degree one (~ 58%). Biarticular muscles, those with type 2 predominant fibres and those working eccentrically or in presence of muscle flexibility deficit, are prone to pathology.

Diagnosis is based upon anamnestic and symptomatology criteria, supported by objective examination and ultrasound scan, performed at least 48 hours after the trauma in order to evaluate the possible presence of haematic extravasation.

Muscle strain treatment is different depending on the clinical phase, classified as acute (lasting 3-7 days), sub-acute and recovery.

During the first hours of the acute phase (24-72 hours) the RICE protocol is advised. This protocol suggests the use of a compressive bandage, the unload of the involved limb, cryotherapy and rest. Later, massotherapy, the use of physiotherapeutic medical equipment and stretching are gradually introduced.

Only in the sub-acute phase (4-8 days after the trauma) thermotherapy is applied, as this could cause complications if introduced too early.

The recovery phase is aimed to muscle strengthening and to cardio-pulmonary reconditioning, so that sport activity can rapidly be resumed.

The most used physiotherapeutical tools in the treatment of muscle strain are laser therapy, ultrasound, endogenous thermotherapy and electrotherapy. Amongst physiotherapeutical tools, Hilterapia<sup>®</sup> [5, 6, 7, 8] has been demonstrated to be safe, practical and effective, thanks to the possibility of modulating its parameters, to its bio-stimulating effect and to the high energy driven in dept.

Moreover, due to the variability in the parameters and methods of treatment, Hilterapia<sup>®</sup> can be used in all clinical stages, allowing a "cold" treatment in the acute phase and a "thermo" treatment in the following phases.

The objective of the present study was the comparison of the efficacy of Hilterapia<sup>®</sup> versus traditional therapies (ultrasound and CO<sub>2</sub> laser therapy), in speeding up and optimizing recovery from 1st degree muscle strain.

## MATERIALS AND METHODS

**Patients.** Thirty patients (26 males and 4 females, mean age 34.3 years, range 19-39 years) suffering from 1st degree muscle strain, randomly divided in two groups of 15 patients homogenous for age, sex and pathology, have been selected at the Riacef Private Outpatient Clinic of Modena [9].

Group H patients have been treated with Hilterapia®, while group C patients have been treated with ultrasound and CO<sub>2</sub> laser therapy, between September 2007 and October 2008. All patients have undergone a specific rehabilitation program aimed at resuming sport activity.

After treatment, each patient has been evaluated by VAS pain score [10], ultrasound scan to establish the extent of the lesion, number of sessions (carried out during the acute and sub-acute phase respectively), and time before sport activity (partial or complete) could be resumed. VAS is a visual-analogical test that evaluates the subjective pain symptomatology. The score ranges between 0 (absence of pain) and 10 (maximal conceivable pain). Ultrasound scans have always been carried out by the same operator with a linear 10-5 MHz probe. VAS and ultrasound scan evaluation have been performed before therapy (T0), after 7 days (T1) and after 10 therapy sessions (T2).

The number of sessions has been divided into total, acute phase, and sub-acute phase. The time before sport activity could be resumed has been expressed in days, and it has been subdivided in partial or complete, depending on whether the athlete was just training or also competing. Results have been expressed as mean values, according to the above discussed indexes of evaluation.

The satisfaction index has also been evaluated at the end of therapy. Each patient has been asked if he was very satisfied, satisfied, a little satisfied or not satisfied of the therapy employed.

### Methodology. Hilterapia® protocol

In the present study, each patient in group H has been treated with the Hiro 3.0 device (ASA S.r.l., Vicenza, Italy) (peak

power 3000 W) supplied with standard handpiece and parameters chosen according to the clinical phase [6, 7, 8].

During the acute phase, 3 scans at high speed with increasing fluence (360-610 mJ/cm<sup>2</sup>), decreasing frequencies (18-10 Hz) and total energy per session of 900-1200 J have been performed.

During the sub-acute phase, 3 scans at low speed, with increasing fluence (810-1070 mJ/cm<sup>2</sup>), decreasing frequencies (30-20 Hz) and total energy per session of 1500 J have been performed.

### Traditional therapy protocol

Each group C patient has been treated with CO<sub>2</sub> laser therapy followed by ultrasound therapy. CO<sub>2</sub> laser therapy parameters were 10 W of mean power in pulse mode, for a total of 10 minutes per session. Ultrasounds were set at 2 W/cm<sup>2</sup> of power, and 3 MHz of frequency for 10 minutes.

**Data analysis.** Data obtained from the two groups have been compared using the t-test with  $p < 0.05$  considered as significant. Data have been analysed using Office 2007 Excel software.

## RESULTS

The statistical analysis of the VAS score mean values (Figure 1) showed comparable scores at T0 ( $5.7 \pm 1.16$  in group H vs.  $5.72 \pm 0.98$  in group C). T1 and T2 VAS scores resulted lower in group H when compared to group C, with statistically significant differences ( $P < 0.001$  and  $P < 0.01$  respectively). In particular, T1 scores were  $1.52 \pm 0.48$  for group H and  $2.44 \pm 0.7$  for group C; and T2 scores were  $0.26 \pm 0.24$  for group H and  $0.5 \pm 0.48$  for group C, respectively.

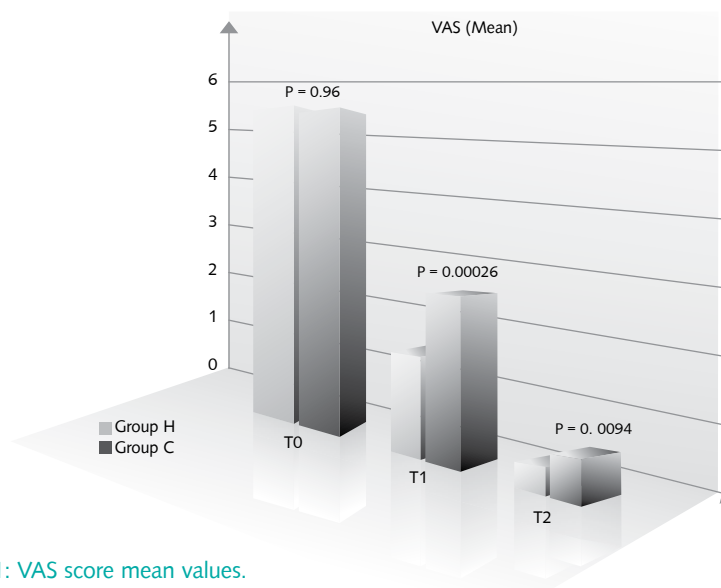


Figure 1: VAS score mean values.

Ultrasound scan evaluation (Figure 2a and 2b) at time T1 shows 1 case of persistent lesion, 10 cases of edema and 4 cases of full recovery in group H. Four cases of persistent lesion, 10 cases of edema and only 1 case of full recovery was shown in group C. Analysis at time T2 has pointed out the presence of residual edema only in 1 case and full recovery in 14 cases in group H. In group C the presence of residual edema was shown in 6 cases and full recovery in 9.

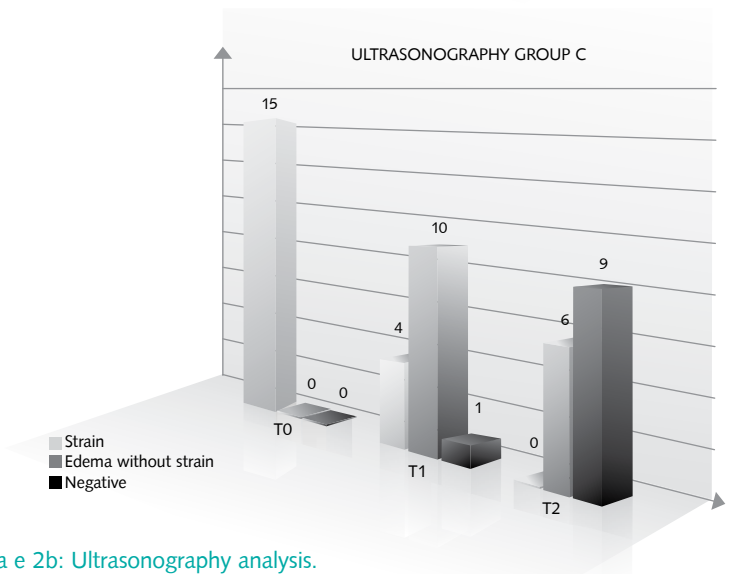
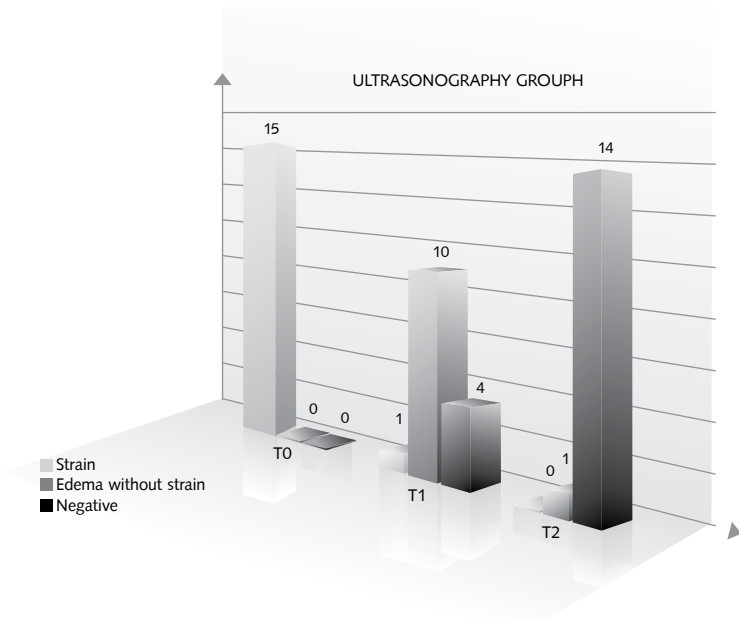


Figure 2a e 2b: Ultrasonography analysis.

The statistical analysis of the mean scores of the total physiotherapy sessions, acute and sub-acute phases (Figure 3), has shown highly significant differences ( $p < 0.001$ ) in favour of group H compared to group C. In particular, the mean number of total physiotherapy sessions was  $12.2 \pm 0.77$  for group H and of  $14.9 \pm 0.74$  for group C. The average time until sport activity could be resumed (Figure 4) has shown values of  $13.7 \pm 0.72$  (partial) and  $18.9 \pm 0.99$  (complete) days in group H and of  $17 \pm 0.65$  (partial) and  $22.9 \pm 0.8$  (complete) days in group C. These differences were highly significant ( $P < 0.001$ ).

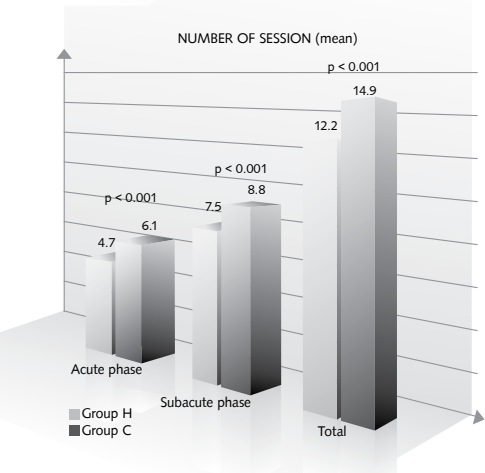


Figure 3: Average number of sessions sport activity.

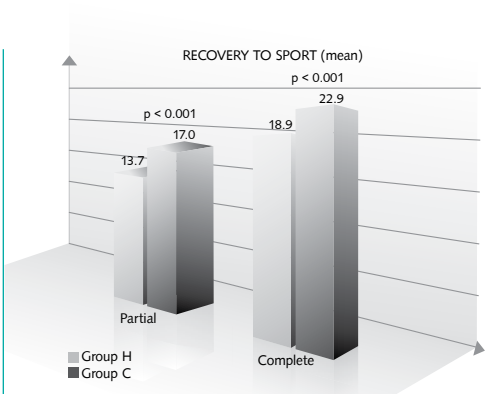


Figure 4: Average time (days) to recovery.

Finally, the patients' satisfaction index is shown in Figure 5. Better results were achieved in group H, compared to group C also for this parameter. In group H, 9 patients were very satisfied (60%) and 6 satisfied (40%). In group C, 6 patients were very satisfied (40%), 7 satisfied (46%), 1 a little satisfied (7%) and 1 not satisfied (7%).

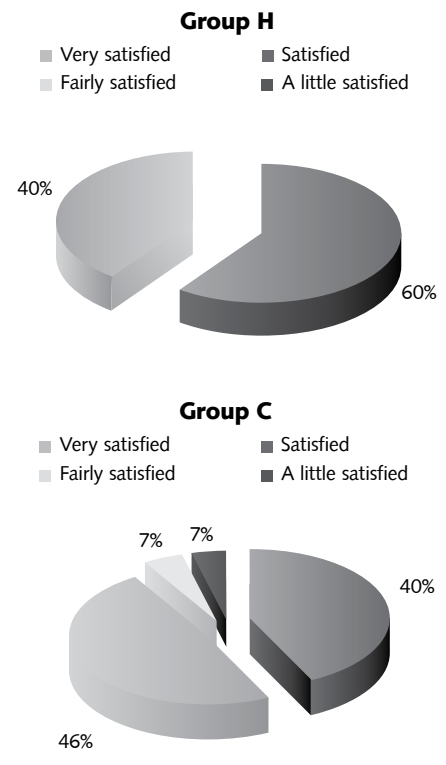


Figure 5: Satisfaction index at the end of treatment.

## DISCUSSION AND CONCLUSIONS

Modern sport, especially at professional level, requires the identification and treatment of sport-associated pathologies in an increasingly specific and effective way. In particular, there is a surging demand to reduce the recovery time, without compromising the patient safety. Physicians, health care providers and coaches have therefore the duty to allow the athlete to go back to competitive activity, whether professionally or not, in optimal conditions and without the risk of relapse. In this apparently difficult task, the physician can count on last generation physiotherapeutic medical equipments. In particular Hilterapia® has demonstrated to be effective in the treatment of several pathologies of the muscle-skeletal systems. In this clinical study we have focalised our attention on the treatment of 1st degree muscle strains, that are very common in sport activities, comparing a group of patients treated with Hilterapia® (group H) with a group of patients treated with well established and commonly used therapies, CO<sub>2</sub> laser and ultrasounds, (group C). Data obtained using the different evaluation parameters, showed that Hilterapia® was, without doubts, effective in speeding up recovery of 1st degree muscle strain but obtained also better scores compared to traditional therapy.

VAS score results have demonstrated a clear improvement from T0 to T1 and even better from T0 and T2 in both groups, with significant better results ( $p < 0.001$  and  $p < 0.01$  at T1 and T2 respectively) in group H compared to group C. Particularly, in group H, not only a greater reduction of pain in time, but also earlier analgesia has been shown.

The clinical parameter of reduction of pain is widely justified by the ultrasound scan, which demonstrates the progressive disappearance of the lesion in time leading to full recovery, through a phase of persisting peri-lesion edema. Ultrasound scan evidence has demonstrated a quicker recovery of the lesion in patients of the Hilterapia® group compared to the group treated with traditional therapy (at the

end of treatment 14 out of 15 patients of group H made a complete recovery, versus 9 out of 15 in group C).

Moreover, group H needed in average less therapy sessions (12.2 vs.14.9), with shorter times before agonistic activity could be resumed compared to group C (18.9 vs. 22.9 days).

In our opinion, the final crucially important parameter is the satisfaction index. Hilterapia® proved to be effective in satisfying the patients needs. In group H all patients declared to be satisfied, while in group C a patient declared to be a little satisfied and another not satisfied because of persistent pain, that required further physiotherapy sessions.

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