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RECOVERY OF QUASI-TOTAL RUPTURE OF THE MEDIAL COLLATERAL LIGAMENT AT A HANDBALL PLAYER

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Abstract: *The present paper aims to demonstrate whether the proposed operational model helps to improve the functional capacity and quality of life in an athlete who suffered a quasi-total rupture of the medial collateral ligament. The program was structured in 4 phases, for each phase having clear objectives to be achieved. The exercises used took into account the following aspects: reduction of pain and inflammation through physiotherapy, improvement of mobility, strength, balance, stability and coordination at the lower limb through movement therapy, favoring flexion and extension movements, increasing muscle strength, returning to full extension, reducing the risk of recurrence. The tests used showed the evolution of the athlete so that he returned to the competition program and continues the activity after a recovery program of 4 months.*

Key words: *quasi-total rupture, medial collateral ligament, handball player, goalkeeper, recovery.*

1. Introduction

Medial collateral (MCL) and anterior cruciate ligaments (ACL) are, respectively, the primary and secondary ligamentous restraints against knee abduction, which is a component of the valgus collapse often associated with ACL rupture during athletic tasks. Despite this correlation in function, MCL ruptures occur concomitantly in only 20% to 40% of ACL injuries [1].

Different studies have been made regarding the dynamic valgus rotation that has been associated with the principal knee motion restrained by the medial collateral ligament (MCL) [2, 3, 4].

Risk factors can lead to poor control and high mechanical loads during athletic movements like landing, cutting, and pivoting [5, 6].

Studies made by authors Greenwald, Moore, Rachev, Kane & Meister (1997) shown that elastin dominates the

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mechanical response of highly extensible tissues like artery, heart valve, and nuchal ligament, which consist of up to 70% elastin [7].

Elastase degradation decreases stiffness and peak stress, and increases energy dissipation in these tissues [8, 9].

Medial collateral ligament injuries are common in the athletic population. Partial injuries are treated non-operatively with excellent outcomes. Complete ruptures may be treated non-operatively, although some will require surgery. A comprehensive rehabilitation program is critical to outcome, but a standardized program for all injuries does not exist.

Most of the literature regarding non-operative and postoperative rehabilitation includes observational reports and case studies.

Level I studies comparing rehabilitation protocols have not been published. The goal of the injured athlete is to not only return to play with no functional limitations, but to also address risk factors and prevent future injuries. [10]

Research hypotheses:

- if the correct implementation of the physical therapy programs is essential in the post-traumatic recovery of athletes with quasi-total rupture of the medial collateral ligament.
- if the efficient use of general and specific kinetic means, which concern the functional recovery of the knee, ensures the athlete's return to the parameters before injury.

2. Material and Methods

2.1. Participants and procedure

The research was carried out over a period of 4 months and the research subject was a male, aged 22, an athlete who practices performance handball and presented quasi-total rupture of the medial collateral ligament that appeared after a contact with a teammate during training. The subject followed a non-operative treatment of the injury.

The research started with the establishment of the diagnosis by the orthopedist. After that, a series of tests were carried out, following the documentation of the condition by studying the literature on the issues addressed in the research.

The research ended with the final tests and the results obtained at the beginning of the research were compared with those from the final evaluation.

2.2. Research Design

A 22-year-old patient who was physically evaluated by an orthopedic participated in this case study. As a result of the evaluation it was found that the patient undergoes quasi-total medial collateral rupture of the ligament. After the MRI diagnosis, the lesion is clearly visible at the level of the ligament.

The evaluation methods used were the following: articular balance, muscular balance of the knee, measurements of muscular perimeter and measurement of the degree of pain using VAS scale.

The kinetotherapeutic plan extends over a period of 4 months and comprises 4 stages.

In the first stage, physiotherapy was carried out by the following procedures: laser and short waves. The objectives of phase one were pain control and reduction of inflammation.

Phase II referred to static, dynamic exercises that were performed with different equipment and installations,

stretching and isometric exercises. An orthesis with 30°, 45° was used in the exercises.

In phase III the degree of the orthesis was modified (60°, 90°). The objectives of the intervention plan were: strengthening of the muscles; perform symmetrical exercises on both legs to reduce asymmetry; re-education of walking. If the patient is in pain, the exercises are less frequent or decrease in intensity and repetition.

Phase IV (normal orthesis). The objectives of the intervention plan followed to increase muscle strength, improve coordination, resistance, balance and return to daily workouts.

3. Results and Discussions

Results obtained after the application of the movement therapy plan, presented in tables 1, 2, 3, 4 and 5, show that the recovery objectives were achieved, namely: reduction of pain, prevention of muscular atrophy, favoring flexion and extension movements, increasing joint mobility in the knee, increasing muscle strength, returning to full extension.

The recorded data registered at the final evaluation were close to those before the injury, the patient regained his normal values at the muscular balance, the joint balance and the muscular perimeter. After the kinetotherapeutic protocol, the patient returned to daily training and competitions.

Table 1 shows the data gathered after the evaluation of articular balance. It was concluded that the patient recovered much of the articular amplitude, reaching almost normal values in all the movement plans of this joint. The tests were performed both actively and passively in order to provide the most accurate diagnosis regarding muscle deficiency and joint stiffness. In order to raise awareness of the stage where the affected lower limb is found and to design a therapeutic program as efficient as possible, the results obtained in each of the evaluations were compared with the ideal values specific to the movements of the knee joint. Within the active articulation balance the results were as follows:

- the flexion movement had the initial assessment value of 25˚, 125˚ in intermediate evaluation while the final evaluation of the knee flexion reached 140˚.
- the extension of the knee started from a deficit of 15° at the first evaluation, thus generating one of the main objectives of the first two phases of recovery, and more precisely the complete gain of the extension and subsequently its maintenance. In the intermediate and final evaluations the knee reached the full extension (0˚).
- in the case of internal and external rotation of the femoral-tibial joint, the active and passive mobility in the first phase was 0° due to the fact that these movements occur only when the knee flexion is wider, above 60° -70°. At the intermediate and final evaluation of the knee joint the subject reached an application of 10˚ respectively 15˚.

Table 1

Active balance of the knee joint (°)

Movements	I.T.	Int. T.	F.T.
Flexion	25	125	140
Extension	-15	0	0
Internal rotation	0	10	15
External rotation	0	10	15

I.T. – Initial Testing, Int. T. – Intermediate Testing, F.T. – Final Testing

Table 2 presents the results obtained in the case of passive joint balance. Due to the external force exerted on the affected knee by the kinetotherapist, the amplitude increased by approximately 5° - 10˚ compared to the amplitude actively obtained. Thus, comparing the final results with those initially recorded in the knee joint balance, we can observe a positive evolution of the amplitude of both active and passive movement.

Table 2

Passive balance of the knee joint (°)

Movements	I.T.	Int. T.	F.T.
Flexion	35	135	155
Extension	-5	0	0
Internal rotation	0	15	20
External rotation	0	15	25

I I.T. – Initial Testing, Int. T. – Intermediate Testing, F.T. – Final Testing

In table 3 we present the values recorded in the joint balance sheet. At initial evaluation in the flexion movement a F2 force was recorded and in intermediate and final evaluations the values obtained were F4 and F5. At the knee extension movement, the values started from F3 during the initial evaluation and then went up to F5 after the recovery period. Analyzing the data obtained and comparing them with the ideal values in the literature, it appears that the values recorded in the muscle balance followed an upward slope, finally resulting in a total recovery of the muscular strength of the affected muscles.

Table 3

Muscular balance of the affected lower limb

Movements	I.T.	Int. T.	F.T.
Flexion	F2	F4	F5
Extension	F3	F4	F5

I.T. – Initial Testing, Int. T. – Intermediate Testing, F.T. – Final Testing

In order to identify the muscular deficit of the thigh and lower thigh, measurements were made on the affected lower limb. Thus, by determining the degree of muscular hypotrophy, we were able to design a program of specific exercises for the muscular toning of the affected lower limb. An initial value of 48cm. was recorded at the perimeter of the thigh. After the recovery period, at the final evaluation, the muscle mass increased by 4 cm, the result being a positive one. At the initial evaluation of the muscular perimeter of the calf, a value of 38 cm. was recorded, later, at the final evaluation, resulting in an increase of 2 cm. (table 4)

Table 4

Muscular perimeter of the affected lower limb (cm)

	I.T.	Int. T.	F.T.
Thigh	48	50	52
Lower thigh	38	39	40

I.T. – Initial Testing, Int. T. – Intermediate Testing, F.T. – Final Testing

Table 5 presents the data obtained at VAS scale that was applied both at rest and during physical exercises and the results were as follows: in the initial phase the patient accused pain at level 4 at rest

respectively 6 during the activity. In the last phase of recovery, the patient did not accuse pain anymore, the result being 0 on the VAS scale.

Table 5

VAS scale results

Pain level	I.T.	Int. T.	F.T.
At rest	4	0	0
During the activity	6	2	0

I.T. – Initial Testing, Int. T. – Intermediate Testing, F.T. – Final Testing

4. Conclusions

Given the objectives proposed at the beginning of the study and the results obtained at each evaluation of the patient, we can say that by early intervention of a recovery program developed by a kinetotherapist, depending on the needs, age, and condition of the patient in general, the athlete can recover in a high percentage and can successfully return to the activity performed before the accident.

After an accident, the athlete is affected both physically and mentally. For a performance athlete the interruption of activity generates a high stress, due to the uncertainty of the athlete regarding his return to the playing field. The recovery process can be slowed down or accelerated depending on the patient's mental state, but also on the approach of these factors by the physical therapist / sports psychologists.

The degree of amplitude on every movement is on an uphill slope, so the athlete after carrying out the kinetotherapeutic plan returned to the competitive activity.

The communication and the relationship between the patient-physiotherapist-doctor have led to improved recovery results.

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