

5th International Conference EDU-WORLD 2012 - Education Facing Contemporary World
Issues

Study on the functional rehabilitation of the lower limb in professional athletes having undergone meniscal repair

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Abstract

Our research is justified by the following context of ascertained phenomena: the considerable increase in meniscus injuries caused by different types of sports activities; a conclusive casuistry of meniscal repair procedures; the need to promote modern technologies for testing, intervention and treatment. The premise with which we started was that operational strategy oriented toward functional rehabilitation from meniscus injuries should be restructured and re-harmonized. Thus, we designed a kinesic program based on a clear succession of rehabilitation stages, establishing, at the same time, an effective methodology of assessment and monitoring of knee's joint functionality, as well as a kinesic treatment personalized for each patient, depending on their response to the kinesic treatment.

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Selection and/or peer-review under responsibility of the University of Pitesti, Romania

Key words: meniscus injuries, meniscus repair, kinesitherapy, functional rehabilitation, professional athletes, descriptive statistics.

1. Introduction.

Within the traumatic pathology of the knee, meniscus injuries are among the most frequent. They occur most often through an indirect mechanism, marking an alteration of joint mechanics, as the knee is a functional unit, reacting in solidarity if one of its components is injured [1]. Functional, temporary alteration of articular mechanics can produce progressive and irreversible anatomic modifications. In this sense, techniques for meniscal repair have imposed lately and have been developed, namely its repair through the arthroscopic method and kinesic procedures, which reduce the recovery period, having real chances of returning to the activity interrupted by the injury. In our vision, kinesitherapy holds a central place; we think it is necessary to harmonize specific kinesitherapeutic means with modern technologies and procedures for intervention and treatment.

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Although the number of meniscal injuries which can be repaired is reduced – only basal insertion injuries- which is vascularized and offers scarring conditions [2], numerous clinical studies prove that meniscal repair is the optimum solution (when it is possible), meniscus functions of take over and transmitting the load being reset along with the healing [3]. The success of the functional rehabilitation of the lower limb upon meniscal repair depends both on the surgical procedure, and on the rigorous establishment of the kinesic intervention strategy, namely on the choice, dosage and adaptation to the mobilization, toning and loading of the lower limb. It shall be pursued to protect the meniscus from those forces that might determine its damage, by avoiding aggressive rehabilitation protocols due to the mechanical impact on the meniscus [4].

2. Work methodology

2.1. *The purpose of this research* is to carry out a kinesitherapy program based on the harmonization of kinesic intervention methods and means with current methods of surgical intervention, meniscus repairs.

2.2. *The objective of this research* aims at identifying kinesic operational units and means to be used for the rehabilitation of professional athletes by meniscal repair, drawing-up of a kinesic intervention strategy that would lead to a good functional rehabilitation of the knee and establishing methodological prescriptions concerning the effective use of the rehabilitation program applied.

2.3. Work hypotheses

1st Hypothesis: If the kinesic intervention strategies should be observed, a good functional rehabilitation of post-traumatic knee can be achieved, the athlete being able to return to the sports activity at about 12-14 weeks from the meniscal repair under safety conditions.

2nd hypothesis: If a project, based on a good staging and dosing of the entire kinesic program shall be carried out, considerable increase in the quality of the functional rehabilitation of athletes having undergone meniscal repair shall be obtained; kinesic intervention is the cornerstone of the functional rehabilitation within sports injuries.

2.4. *Presentation of the sample of subjects.* Our sample was made-up of 6 subjects, professional athletes with meniscus traumatic injuries. The surgical method by which it was carried out the repair of the injured meniscus was, in all the cases, meniscal repair. We are mentioning that all the athletes are students within faculties from other fields.

2.5. *Establishing the kinesic intervention strategy:* exercises are made in the first 2 weeks with the brace blocked in full extension, in weeks 3-4 with the brace limited between 20-90 degrees of flexion, in weeks 5-6 with the brace limited between 0–90 degrees of flexion; after 6 weeks, the brace is removed and is continued with exercises to gain full range of mobility and muscle strength.

2.6. *Kinesitherapeutic objectives of the rehabilitation program for athletes having undergone meniscal repair:* protecting the knee joint, preventing flexor musculature contraction, reducing pain in the knee joint, preventing articular swelling, maintaining quadriceps' muscle tone, toning abductor and adductor musculature, toning gluteal musculature, toning ischiotibial musculature, increasing muscular control over the injured lower limb, achieving pseudo, coxofemoral and lumbar column co-ordination, achieving knee co-contraction - gluteal muscles, ischiotibial and quadriceps, re-educating the active control of the lower-limb- knee, re-educating knee flexibility and mobility, facilitating quadriceps' stretching by activating the iliopsoas, achieving selective toning: hip and knee extension in unipodal station, increasing the quantum of muscle strength within locomotion, increasing the quantum of muscle strength within running, hypertrophy of the lower limb musculature.

2.7. *Research methods used:* study of the bibliographic material, interview method, observation method, case study method, experiment method statistical-mathematical method.

3. Results obtained and discussions based on the results obtained

3.1. *Evolution of quadriceps hypotrophy, of suprapatellar perimeters.* In respect of the evolution of suprapatellar perimeters both in 5cm , and in 10cm, a positive evolution is ascertained.

In the initial testing, the following values were obtained for the suprapatellar perimeters at 5cm: the mean was of 42,65 and the standard deviation of 2,12 at the injured lower limb and of 44,25, respectively 2,16 at the uninjured lower limb. In the final testing, the following values were obtained: the mean was of 43,91 and the standard deviation of 2,04 in the injured lower limb and the same values as the initial ones in the uninjured lower limb. Calculating the differences between the means of suprapatellar perimeters at 5 cm of the injured limb and the means of the suprapatellar perimeters at 5 cm of the uninjured lower limb it was obtained, in the initial testing, a mean difference of -1,6 and in the final testing, a mean difference of -0,34. From the analysis of the synthetic table of the basic statistical indicators shown below (table 1), it is noticed that the differences obtained between initial and final testing are statistically significant.

Table 1. Table showing basic statistical indicators on the evolution of suprapatellar perimeters at 5 cm.

	Mean	Standard deviation
Initial testing	-1,50	0,23
Final testing	-0,20	0,30

In the initial testing, the following values for suprapatellar perimeters at 10 cm were obtained: the mean was of 46, 42 and the standard deviation of 1, 81 in the injured lower limb and of 44,58 and respectively 1,83 in the uninjured lower limb. In the final testing, the same values were obtained both for the injured lower limb, and for the uninjured lower limb. Calculating the differences between the means of suprapatellar perimeters at 10 cm of the injured lower limb and the means of suprapatellar perimeters at 10 cm of the uninjured lower limb it was obtained, in the initial testing a mean difference of -2,38 , while in the final testing the mean difference was equal to 0. From the analysis of the synthetic table of basic statistical indicators shown below (table 2) it is noticed that the differences obtained between the initial and final testing are statistically significant.

Table 2. Table showing the basic statistical indicators on the evolution of suprapatellar perimeters at 10 cm

	Mean	Standard deviation
Preoperative testing	-2,08	0,33
Final testing	0 differences	

3.2. *Evolution of proprioception.* In respect of proprioception, it is noticed, for all the athletes, the increase of proprioception capacity.

From the analysis of the synthetic table shown below (table 3), it is noticed that proprioception had initially a mean value of 33,67%, and in the end of the rehabilitation period it had a mean value of 97,17%; thus, it indicates a favourable evolution, respectively a significant increase of the proprioception capacity.

Table 3. Table showing basic statistical indicators on proprioception evolution.

	Mean	Standard deviation
Preoperative testing	33,67%	0,82%
Final testing	97,17%	3,13%

3.3. *Evolution of spontaneous pain.* In our casuistry, in respect of the evolution of spontaneous pain, it is ascertained how it was reduced for most of the athletes.

From the analysis of the synthetic table shown below, (table 4), it is noticed that initially, in 83,33% of the cases, pain was on levels 2, 3 and 4 (pain when performing intense, moderate and light activities); only one case, represented by 16,66 % of the total, showed a level 1 pain degree (experienced pains just sometimes). No athlete showed level 5 pain (continuous pain, when walking and in rest period). In the end of the rehabilitation period, for the most cases, 83,33%, pain was of level 0 (no pain) and just one case, representing 1,66% of the total, still experienced pain sometimes (level 1 pain). Calculating the means, it was noticed a decrease in scores from the initial value of 2,33 to 0,33 in the end of the rehabilitation period. It is noticed, thus, a favourable evolution, namely, a significant reduction of spontaneous pain.

Table 4. Synthetic table on the evolution of spontaneous pain.

score	Score frequency	
	initial	final
0	0	5
1	1	1
2	3	0
3	1	0
4	1	0
5	0	0
Mean scores	2,33	0,17
Standard deviation	1,03	0,41

3.4. *Evolution of Lysholm knee- score.* In respect of Lysholm score, it is noticed, for all the athletes, the increase of its level.

From the analysis of the synthetic table shown below (table 5) it is noticed that Lysholm score initially had a mean value of 39,76 %, and in the end of the rehabilitation period, it had a mean value of 98,17%, indicating the favourable evolution, respectively a significant increase of the level of this score.

Table 5. . Table showing the basic statistical indicators on the evolution of Lysholm score.

	Mean	Standard deviation
Initial testing	39,67	6,98
Final testing	98,17	2,23

3.5. *Evolution of Noyes knee-scoring questionnaire.* In respect of Noyes knee-scoring questionnaire, it is noticed, for all the athletes, the increase of the score level in this questionnaire.

From the analysis of the synthetic table shown below (table 6), it is noticed that Noyes knee-scoring questionnaire initially had a mean value of 39, 83%, and in the end of the rehabilitation period, it had a mean value of 98, 33%, indicating a favourable evolution, respectively a significant increase of this score's level.

Table 6. . Table showing the basic statistical indicators on the evolution of Noyes knee-scoring questionnaire.

	Mean	Standard deviation
Preoperative testing	38,80	4,20
Final testing	96,53	4,31

Conclusions

The observance of the intervention strategies by kinesitherapy resulted in a good functional rehabilitation of the knee for all the athletes within our sample; they returned to the sports activity at 3-4 months from the meniscal repair, which verifies hypothesis no. 1

The carry out of a project based on good staging and dosing of the entire kinesic program, associated with assessment methods of the effectiveness of the program covered, applied regularly, resulted in a considerable increase of the quality of functional rehabilitation of athletes having undergone meniscal repair, which verifies hypothesis no. 2.

Non-observance of the kinesic program's stages may compromise the functional rehabilitation of the knee. Choosing a kinesic intervention strategy, based on an aggressive and accelerated rehabilitation, may have harmful consequences on the meniscus.

Good management based on the monitoring of dosage, assessment, and isokinetics is the key to the success of the entire kinesitherapeutic intervention program to the functional rehabilitation of the lower limb in professional athletes having suffered from meniscus injuries.

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