International Journal of Physiotherapy Research and Clinical Practice

CASE REPORT

Therapeutic Exercise for the Treatment of Meniscal Lesions in a Young Adult: A Case Report

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ARTICLE INFO

Article history:
Received 23.03.2025
Accepted 29.05.2025
Published 07.07.2025

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https://doi.org/10.54839/ijprcp.v4i2.25.21

ABSTRACT

Meniscal lesions, especially in young individuals, can negatively affect long-term knee health. Hence, the importance of identifying and adequately treating these lesions to improve joint function and reduce the risk of arthritic complications. Although recent and not yet supported by robust literature, non-surgical treatment with therapeutic exercise has been indicated, in the recent Europe-USA Consensus on meniscus rehabilitation, as a valid option for traumatic meniscal lesions. We present the case of a 35-year-old competitive soccer player in lower leagues, diagnosed with a traumatic meniscal lesion. Patient underwent a structured rehabilitation treatment with therapeutic exercise and education for a period of 12 weeks. At the 12-month follow-up, a significant improvement was observed in all patient-reported outcomes, as well as satisfactory levels of safety in physical performance tests for return to sport. Therapeutic exercise had a positive effect in the treatment of traumatic meniscal lesions, allowing the patient to return to pre-injury sport levels. Future, higher-level studies should confirm these findings and focus on identifying ideal candidates for therapeutic exercise treatment.

Keywords: Conservative treatment; Exercise therapy; Knee injuries; Menisci

1 INTRODUCTION

Menisci, thanks to their unique composition, structure, and morphology, play a fundamental role in the knee, absorbing shocks, distributing loads, and contributing to joint stability[1–6]. Their function is crucial for maintaining joint integrity and preventing the onset of osteoarthritis. Therefore, a meniscal lesion, especially at a young age, can have significant consequences on long-term knee health[7–9]. It is therefore extremely important to identify these lesions early and establish appropriate treatment to optimize functional outcomes and reduce the risk of degenerative complications.

Like other knee structures, menisci can also suffer structural lesions. Clinically, these lesions can be classified as acute, usually caused by trauma, or degenerative, associated with aging and joint wear. Acute lesions mainly affect the lateral meniscus and are predominantly found in young people, often following a sufficiently violent knee trauma (sports or work-related), and are characterized by an immediate onset of pain[10]. These lesions activate meniscal and synovial membrane nociceptors, increasing intra-articular cytokine levels, and causing the onset of joint pain[10]. The incidence of these lesions is 15-18% when they occur in isolation, but they are more frequent in conjunction with other knee ligament injuries[10,11]. The prevalence of acute lesions rises to 31% if minor asymptomatic lesions are also included[12]. Conversely, degenerative lesions mainly affect the adult population and are not attributable to violent trauma, but to bone-marrow lesions and synovitis, which appear to be the cause of pain[13,14].

Histologically, unlike what is observed clinically, there does not seem to be a clear demarcation between acutely injured and degenerative tissue. In fact, analysis of acute lesions has shown the presence of initial signs of degeneration, suggesting that tissue quality may play an important role in the risk of injury during a traumatic event[15]. This picture has also been confirmed by analysis of meniscal tissue samples taken from athletes with asymptomatic meniscopathy[12].

The gold standard for the treatment of acute meniscal lesions is surgery, particularly reparative surgery, which allows for better short- and long-term results, including

faster return to sports activity with maintenance of the same level, lower incidence of osteoarthritis, and greater patient satisfaction [10,16,17]. To our knowledge, only one high-level study has compared surgery with rehabilitation treatments, suggesting that structured therapeutic exercise may be a valid option for relieving mechanical symptoms [18,19]. A similar approach has yielded positive results when compared to meniscal surgery in other age groups and in the management of other knee ligament injuries [18,20–23].

2 CASE DESCRIPTION

We present the case of a 35-year-old male soccer player diagnosed with a meniscal lesion in the right knee. He presented to our rehabilitation clinic in September 2022, reporting an impact trauma to the knee that occurred during a match in January of the same year. Following this event, joint symptoms developed, including persistent pain in the anterior region, localized at the tibial plateaus, and, occasionally, a sensation of locking. He was seen by an orthopedic surgeon who initially prescribed an MRI and subsequently deemed him a candidate for conservative treatment with possible secondary surgical treatment not further specified. The MRI, performed with multiplanar DP and T1 sequences, revealed meniscopathy of the posterior horn of the medial meniscus and a tangential lesion of the anterior horn of the lateral meniscus. Recommended diagnostic tests for assessing the menisci (Thessaly test, McMurray test, and Joint line tenderness) were performed and found to be positive [10].

We implemented a land-based exercise program, available online, consisting of neuromuscular and strengthening exercises with gradual progression, divided into various levels of difficulty. This program was developed through a feasibility study and subsequently used in a randomized controlled trial in the treatment of meniscal lesions in young adults [20,24,25]. The original program also included several educational sessions on meniscal pathologies.

In our case, the program was guided and supervised by a physiotherapist experienced in the rehabilitation of meniscal pathologies (GP) for a period of 12 weeks, with twice-weekly sessions. Each session, lasting 60-90 minutes, included a warm-up phase on a cycle ergometer, muscle strengthening exercises, and neuromuscular exercises, performed with both lower limbs using external resistance or body weight (Figures 1 and 2).

Each exercise had various levels of difficulty, chosen by the physiotherapist based on the assessment of sensorimotor control of movement and quality of execution, as well as patient feedback on ease of execution with good control and minimal effort [26]. The progression of neuromuscular exercises included increasing external resistance and/or varying support surfaces, with the aim of completing 3 sets of 8-15 repetitions for each exercise [20]. The progression of muscle strengthening exercises involved increasing external resistance and reducing the number of repetitions per set, following the "+2" principle, previously described [27].

Fig. 1: Lateral axis exercise, utilizing body weight as resistance

Fig. 2: Posterior diagonal movements, utilizing external resistance

During the sessions, the same physiotherapist provided the patient with information on meniscal pathologies and possible long-term consequences, as well as on pain and the importance of therapeutic exercise, to develop a therapeutic alliance and encourage strong motivation to continue the exercises even after the conclusion of the rehabilitation program [28,29].

3 RESULTS

The rehabilitation intervention was evaluated using self-administered questionnaires and functional tests specific to meniscal lesions[19]. Questionnaires were used to specifically assess tissue injury, knee condition, level of sports activity, and joint pain, while functional tests were employed to measure muscle strength and physical performance[19].

Questionnaires were administered at baseline, 3 months after the start of treatment, and finally at 12 months. The Western Ontario Meniscal Evaluation Tool (WOMET) was used to assess meniscal lesions[30–32]. This meniscus-specific self-administered questionnaire consists of 16 items that assess physical symptoms, sports, recreational and work activities, lifestyle, and patient emotions. All items are rated on a visual analog scale, and the total score is converted to a percentage value, where lower values indicate worse symptoms[31].

For subjective knee assessment, the Italian version of the Knee Injury and Osteoarthritis Outcome Score (KOOS-I) was used, developed as an extension of the osteoarthritis index (Western Ontario and McMaster Universities Arthritis Index), with the aim of assessing symptoms and function of the injured or osteoarthritic knee, both in the short and long term, in young and physically active subjects[33,34]. This knee-specific questionnaire, also in the Italian version, has demonstrated satisfactory levels of reliability, validity, and responsiveness[34,35]. It is self-administered and has 5 dimensions (pain, symptoms, activities of daily living, sports and recreational activity, and knee-related quality of life), from which scores ranging from 0 to 100 can be obtained, where lower values indicate worse symptoms[35,36].

To assess sports activity, the Italian version of the Tegner Activity Scale (I-TAS) was used, a reliable, valid, and responsive self-administered questionnaire, consisting of a single item that allows choosing between various levels of sports engagement: from 0 (disability caused by the knee) to 10 (high-level athlete)[37,38].

To assess pain, the Visual Analog Scale (VAS) was used, a one-dimensional scale from 0 to 100 mm, where 0 mm represents the absence of pain and 100 mm represents maximum pain[39,40]. The intervals considered are: no pain (0-4mm), mild pain (5-44 mm), moderate pain (45-74 mm), severe pain (75-100 mm)[41].

All functional tests were performed on both lower limbs to compare results with the contralateral limb. Muscle strength of the flexor and extensor muscles was assessed using a standardized and previously validated procedure[42]. A manual dynamometer (ActiveForce 2; Activbody Inc, San Diego, USA) was used, with which the patient performed two maximum voluntary isometric contractions (MVIC), recording the best expressed in kilograms[43].

To assess physical performance, a recommended battery of tests was performed, following procedures previously described: the 30" knee bending test (measuring the number of flexions in 30 seconds), One-leg hop for distance (measuring the jump length in centimeters), and 6-meter timed hop (measuring the time in seconds)[19,44]. The One-leg hop for distance and 6-meter timed hop tests were performed exclusively at the last follow-up, to avoid possible joint damage and to assess return to sports activity[25].

For the evaluation of questionnaire results, we relied on the search for the minimal clinically important difference (MCID), perceived by the patient in terms of benefit[45].

In the WOMET questionnaire for the evaluation of meniscal lesions, the following values were recorded: 29.6% at baseline, 13.1% after 3 months, and 1% at the last follow-up. The observed change was 28.6 points, considered clinically relevant[30,46].

In the KOOS-I questionnaire for the subjective evaluation of the knee, a score of 85% was recorded at baseline, which became 96% after 3 months and 100% at the 12-month follow-up. We considered the result obtained a clinically relevant improvement, considering as a reference a variation of at least 10 percentage points[33].

In the I-TAS, the level of sports activity before the injury was 9 (competitive soccer player in lower leagues), and the patient reported returning to the same pre-injury performance 12 months after the start of the rehabilitation treatment. This milestone was also considered a clinically relevant improvement[38].

The level of pain reported by the patient was 3 at baseline, then 1 after 3 months, and 0 after 12. We judged this change clinically important, comparing it with that identified for other knee pathologies[47–49].

Table 1: Functional test results and physical performance

Test	Baseline	3 Months	12 Months
MVIC Extensors Healthy	3.5 kg	21.6 kg	24.9 kg
MVIC Extensors Injured	2.5 kg	17.9 kg	22.9 kg
MVIC Flexors Healthy	9.6 kg	13.6 kg	15.8 kg
MVIC Flexors Injured	8 kg	12.5 kg	14.9 kg
30" Knee Bend Test Healthy	16	20	24 reps
30" Knee Bend Test Injured	13	17	22 reps
One-Leg Hop for Distance Healthy	\	\	182 cm
One-Leg Hop for Distance Injured	\	\	168 cm
6-Meter Timed Hop Healthy	\	\	2"12
6-Meter Timed Hop Injured	\	\	2"18

- MVIC: Maximum Voluntary Isometric Contraction
- Reps: Repetitions

Table 2: Results of Limb Symmetry Indes (LSI)

Test	Baseline	3 Months	12 Months
Quadriceps Strength (Q)	72%	83%	92%
Hamstring Strength (H)	84%	92%	94%
30" Knee Bends	81%	85%	91%
One-Leg Hop for Distance	/	/	92%
6-Meter Timed Hop	/	/	95%

The results of functional and physical performance of the two limbs are summarized in Table 1 and, to evaluate them, were compared with the Limb Symmetry Index (LSI) (19,50). The LSI results are summarized in Table 2. Usually, a gap of less than 10% between the two limbs is considered safe for returning to sports activity[50,51].

4 CONCLUSIONS

The analysis of the outcomes of this clinical case seems to confirm what has already been highlighted by the literature, namely that therapy with therapeutic exercise, combined with an educational program, would have positive effects on pain, knee function, and patient quality of life[20]. Furthermore, the results of the limb symmetry index of the injured limb, compared with the healthy one, demonstrated excellent recovery of physical performance, allowing the patient to return to playing at pre-injury levels.

A closer analysis of the clinical case raises the doubt that the meniscal lesions were acute rather than degenerative. On the one hand, the age and onset of symptoms would suggest a traumatic classification, on the other hand, the type of lesions would suggest a degenerative nature[10,14]. This leads us to agree with those who believe that treatment with therapeutic exercise can give overlapping results in both young patients with traumatic lesions and degenerative ones[21]. Not only that, we also agree with those who argue that there is a gray area in which some acute and degenerative lesions represent different moments of the same problem: that is, that some menisci are more prone to injury during trauma because degenerative lesions already exist[15]. Therefore, further studies should establish which patients would benefit most from this treatment, without relying solely on the classification of the onset of symptoms[19].

In conclusion, knee health can be compromised by meniscal lesions, making appropriate treatment essential to avoid further future problems, such as the risk of early osteoarthritis. In this context, therapy with physical exercise could constitute a valid tool, in addition to reparative surgery, in the treatment of lesions in young age.

Future high-level studies should confirm this hypothesis, as well as classify patients in such a way as to identify ideal candidates for treatment with therapeutic exercise among those with an acute onset of symptoms.

DISCLOSURES

The author declares no conflict of interest and that he has not received funding and financial support.

ETHICAL DECLARATION

The content complies with current legislation on research ethics.

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