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## Return to Sport After Isolated Meniscal repair in Amateur Athletes – Factors Influencing Successful Recovery: Narrative Review

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**Abstract**

**Background.** Meniscal injuries are common among physically active individuals and amateur athletes, particularly in sports involving pivoting movements and rapid changes of direction. Preservation of the meniscus has become increasingly important due to its biomechanical role and the risk of degenerative joint changes after meniscectomy. Return to sport (RTS) is one of the primary goals of treatment.

**Aim.** To analyse current evidence regarding factors influencing RTS after isolated meniscal repair in amateur athletes.

**Material and methods.** This narrative review was based on literature available in PubMed, Scopus, and Google Scholar databases published between 2015 and 2025. Original studies, systematic reviews, retrospective studies, and narrative reviews concerning isolated meniscal repair, rehabilitation, and RTS were included.

**Results.** Successful RTS after isolated meniscal repair depends on multiple factors. Younger age, peripheral tears located in vascularised zones, and longitudinal tear patterns are associated

with better healing and improved functional outcomes. Rehabilitation, restoration of quadriceps strength, proprioception, and dynamic knee stability play a crucial role in recovery. Psychological factors, including fear of reinjury and confidence, may also affect RTS outcomes. Most studies report high RTS rates, although not all patients return to their preinjury level of activity.

**Conclusions.** Isolated meniscal repair enables successful RTS in most amateur athletes while preserving knee biomechanics. Rehabilitation and patient-related factors remain key determinants of postoperative outcomes. Further prospective studies with standardised RTS criteria are needed.

**Key words:** meniscal repair; return to sport; rehabilitation; amateur athletes; sports medicine; knee injuries

## INTRODUCTION

Meniscal injuries are among the most common knee injuries in physically active individuals and athletes. It is estimated that meniscal injuries account for a significant proportion of knee injuries observed in both professional and amateur athletes [1,2]. Those particularly at risk are people who participate in sports requiring sudden changes in direction, rotation and dynamic loading of the lower limb, such as football, basketball, skiing or other pivoting sports [3,4]. The mechanism of injury most commonly involves a twisting movement combined with axial loading of the knee joint. With the growing popularity of physical activity and recreational sport, there has been an increase in the number of knee injuries, including meniscal tears, among amateur athletes [1,5].

The menisci play a key role in the proper functioning of the knee joint. Their primary functions include shock absorption, joint stabilisation, improving the congruence of the articular surfaces, and helping to distribute the forces acting on the articular cartilage [6]. In addition, the menisci contribute to proprioception and influence the biomechanics of knee movement, particularly during activities requiring dynamic changes of direction [7]. Loss of meniscal integrity leads to increased pressure on the articular cartilage, impaired knee biomechanics, and accelerated development of degenerative changes [6,8].

For many years, partial meniscectomy was the most commonly used method of treating meniscal injuries, mainly due to its ability to rapidly alleviate pain and enable patients to return to activity sooner [3]. However, recent studies have shown that removing a fragment of the meniscus is associated with an increased risk of developing osteoarthritis of the knee later on [8]. For this reason, repair techniques aimed at preserving meniscal tissue and restoring normal joint biomechanics are becoming increasingly important. Meniscal suturing allows for better protection of the articular cartilage and potentially more favourable long-term outcomes, but requires a longer rehabilitation process and more cautious postoperative management [4,7]. Currently, the ‘save the meniscus’ concept dominates in sports orthopaedics, aiming to preserve as much meniscal tissue as technically possible [6].

Return to sport (RTS) is one of the most important treatment goals for physically active patients. For many amateur athletes, the ability to resume training and competition is a key factor in their quality of life and in maintaining their physical fitness [3,9]. Despite advances in surgical and rehabilitation techniques, a full return to pre-injury activity levels is not always possible. Some patients return to sport at a lower intensity or limit their activity due to pain, fear of re-injury, or persistent functional deficits [4,9].

In the available scientific literature, considerable attention has been devoted to the issue of return to sport following anterior cruciate ligament (ACL) reconstruction, whilst the number of studies concerning isolated meniscal suturing remains limited [4]. An additional problem is the lack of uniform criteria for assessing return to sport (RTS) and the high heterogeneity of the rehabilitation protocols used. Differences relate to the duration of limb unloading, the range of postoperative motion, and the timing of the introduction of sports training, which makes it difficult to compare the results of individual studies [3,4].

The aim of this study was to analyse current reports on factors influencing return to sport following isolated meniscal suturing in amateur athletes.

## **MATERIALS AND METHODS**

This paper is a narrative review of the literature, the aim of which was to analyse current scientific reports on the return to sporting activity following isolated meniscal suturing in amateur athletes [10]. The literature search was conducted using the PubMed, Scopus and Google Scholar databases. Publications released between 2015 and 2025 were analysed [11]. The following keywords were used in the search: ‘meniscal repair’, ‘return to sport’, ‘return to play’, ‘rehabilitation’, ‘athletes’ and ‘sports medicine’ [12]. The analysis included studies on

athletes following isolated meniscal suturing, full-text articles published in English, and publications assessing functional outcomes and return to sport [13]. Studies concerning concomitant anterior cruciate ligament (ACL) reconstruction, animal studies, case reports, and studies involving exclusively paediatric populations were excluded from the analysis [14]. The analysis primarily included systematic reviews, cohort studies, retrospective studies, and narrative reviews of the literature concerning treatment and rehabilitation following meniscal suturing [15].

## **EPIDEMIOLOGY OF MENISCAL INJURIES IN ATHLETES**

Meniscal injuries are particularly common in sports that involve dynamic twisting movements, sudden changes of direction and abrupt deceleration. The sports carrying the highest risk include, above all, football, basketball, handball, skiing and other pivoting sports [16,17]. Repetitive rotational movements of the knee joint, performed whilst the lower limb is under load, significantly increase the risk of overloading intra-articular structures, including the menisci [18]. Epidemiological studies have shown that athletes participating in contact sports and those requiring high-intensity movement experience acute injuries more frequently than physically inactive individuals [19].

The most common mechanism of meniscus injury involves a twisting movement combined with axial loading of the knee joint. The injury usually occurs during a sudden change of direction, landing after a jump, or trunk rotation with the foot fixed [17]. Contact injuries also play a significant role, particularly in team sports, where direct force applied to the knee joint can lead to damage to intra-articular structures [20]. In addition to acute injuries, microtraumas and overuse resulting from repetitive training loads are also significant, as they can lead to gradual degeneration of meniscal tissue [18].

The most commonly observed types of injury include longitudinal tears, bucket-handle tears, radial tears and complex tears [21]. The type of injury is of significant clinical importance, as it affects both the options for surgical treatment and the potential for healing following meniscal suturing. The best prognosis is usually observed in the case of fresh longitudinal tears located in the well-vascularised peripheral zone [22].

Amateur athletes constitute a specific group of patients in whom the treatment and rehabilitation process may differ from that of professionals. People who participate in recreational sport often have limited access to comprehensive rehabilitation and less frequent physiotherapy follow-ups [23]. Furthermore, issues related to adherence to postoperative recommendations (compliance),

the need for a rapid return to work, and the lack of individually tailored training programmes can negatively impact the recovery process and delay a return to sporting activity [24].

## **MENISCAL SUTURING AND MENISCECTOMY**

Meniscal suturing is currently regarded as the preferred treatment for many meniscal injuries, particularly in physically active patients and athletes. The main advantage of this procedure is the preservation of native meniscal tissue, which allows the normal biomechanics of the knee joint to be maintained [25]. The menisci play a key role in load distribution and in protecting the articular cartilage from excessive overload. Preserving their integrity may limit the progression of degenerative changes and reduce the risk of developing osteoarthritis of the knee in the future [26]. Long-term studies have shown that patients who undergo meniscal suturing achieve better functional outcomes and greater cartilage protection compared with patients who undergo partial meniscectomy [27].

Despite its numerous advantages, meniscal suturing is also associated with certain limitations. The post-operative rehabilitation process is usually longer and more restrictive than following a partial meniscectomy [28]. In the early post-operative period, it is often necessary to restrict the range of motion and gradually reintroduce weight-bearing on the operated limb in order to protect the repair site [29]. Additionally, there is a risk of failed healing and re-injury to the meniscus, particularly in cases of extensive or poorly vascularised tears [30]. These factors may prolong the time required to return to full sporting activity.

Modern sports orthopaedics is increasingly focusing on a 'save the meniscus' strategy. The development of arthroscopic techniques, including modern all-inside methods, has enabled less invasive and more stable repairs [31]. Methods of biological healing support, such as the use of platelet-rich plasma (PRP), stem cells or biological augmentation, are also becoming increasingly important [32]. Technological advances and growing awareness of the importance of preserving meniscal function mean that meniscal suturing is now the preferred treatment method in young and active patients, whenever technically feasible [25].

## **FACTORS AFFECTING A RETURN TO SPORT**

The patient's age is one of the most significant factors influencing the healing process following meniscus suturing and the possibility of returning to sporting activity. Younger patients are characterised by greater regenerative potential, better tissue perfusion and a higher capacity for restoring knee joint function [33]. Studies have shown that younger individuals are more likely

to achieve a full return to sport and obtain better functional outcomes following surgical treatment of meniscal injuries [34]. Additionally, younger athletes typically demonstrate greater motivation for rehabilitation and a faster return to muscular fitness.

The location of the meniscal tear is also of significant importance for the healing process. The best biological conditions for regeneration occur in the red-red zone, characterised by good blood supply to the peripheral part of the meniscus [35]. Injuries located in the red-white zone show moderate healing potential, whereas lesions involving the white-white zone—an area virtually devoid of blood supply—are associated with a significantly poorer prognosis [36]. Consequently, better blood supply to the damaged tissue is associated with a higher likelihood of successful healing and a successful return to sport.

The type of meniscal tear also has a significant impact on treatment outcomes. The most favourable prognosis is usually observed in the case of fresh longitudinal tears, which respond relatively well to suturing [37]. Bucket-handle tears, despite a higher degree of instability, can also yield good results following appropriately performed surgical repair [38]. Radial tears and complex tears, however, are much more challenging to treat and are more frequently associated with poorer healing potential and a higher risk of treatment failure [39].

The rehabilitation process following meniscal suturing plays a key role in achieving a full return to sporting activity. In the early postoperative period, range of motion (ROM) restriction and partial weight-bearing on the operated limb are often employed to protect the repair site [40]. The literature describes both more conservative rehabilitation protocols and accelerated rehabilitation programmes, which allow for the earlier introduction of functional exercises [41]. Properly planned rehabilitation influences the restoration of muscle strength, dynamic stability and proprioception, which has a direct impact on the safety and effectiveness of RTS [42].

One of the most commonly observed problems following knee surgery is quadriceps weakness. Deficits in muscle strength may persist for many months after surgery and adversely affect knee joint stability during sporting activities [43]. The restoration of proprioception and neuromuscular control, which are responsible for the proper dynamic stabilisation of the lower limb, is also of significant importance [44]. Inadequate functional recovery increases the risk of re-injury and may delay a return to sport.

Increasing attention is also being paid to the importance of psychological factors in the process of returning to sporting activity. Fear of reinjury, reduced self-confidence and a lack of psychological readiness to return to training can significantly limit treatment outcomes despite

the proper healing of anatomical structures [45]. A high level of motivation, a positive attitude and appropriate mental preparation are associated with a greater likelihood of a successful return to sport [46].

Treatment outcomes are also influenced by the level of sport practised. Professional athletes usually have access to more comprehensive rehabilitation, regular physiotherapy monitoring and individually tailored training programmes [47]. In the case of amateur athletes, the treatment process is often less closely monitored, and limited access to specialist rehabilitation care can lead to poorer adherence to post-operative instructions and a longer recovery period [48].

## **REHABILITATION FOLLOWING MENISCUS SURGERY**

The rehabilitation process following meniscus suturing is crucial for achieving proper healing and a safe return to sporting activity. In the early postoperative phase, the main objective is to alleviate pain, reduce swelling and gradually restore the range of motion of the knee joint [49]. During this period, particular attention is paid to protecting the repair site through controlled weight-bearing on the limb and limiting excessive flexion of the knee joint [50]. Early mobilisation, appropriately selected range-of-motion exercises and anti-oedema therapy can have a beneficial effect on the regeneration process and reduce the risk of joint stiffness [51].

The intermediate phase of rehabilitation focuses primarily on rebuilding muscle strength and improving neuromuscular control. Of particular importance is strengthening the quadriceps femoris and the hamstring group, which are responsible for stabilising the knee joint during functional activities [52]. An important element of therapy is also proprioceptive training and balance exercises aimed at improving dynamic stability of the lower limb [53]. Gradual normalisation of the gait pattern and increasing load tolerance form the basis for preparing the patient for more advanced physical activities.

In the advanced phase of rehabilitation, higher-intensity exercises are introduced, aimed at preparing the patient for a return to sport. The rehabilitation programme includes the gradual introduction of running, plyometric exercises and sport-specific training [54]. The aim of this stage is to restore speed, motor coordination and the ability to perform dynamic rotational movements and changes of direction without symptoms of pain or instability [55]. Properly planned functional training can reduce the risk of re-injury and improve the athlete's readiness for a full return to sport (RTS).

The assessment of readiness to return to sport should be based on both clinical and functional criteria. The basic conditions for RTS are considered to be the absence of pain and swelling, full range of motion of the knee joint, and adequate muscle strength in the operated limb [56]. In clinical practice, functional tests such as hop tests or symmetry tests are frequently used to assess dynamic stability, neuromuscular control and compare the function of both lower limbs [57]. The importance of psychological assessment of the patient's readiness to return to sporting activity is also increasingly emphasised [58].

## **CURRENT RESEARCH FINDINGS ON RTS**

Available studies indicate that the majority of patients following isolated meniscal suturing are able to return to sporting activity at a satisfactory level [59]. In systematic reviews, the rate of RTS following meniscal suturing in athletes often exceeds 80%, particularly in the group of young and physically active patients [60]. It should be emphasised, however, that a return to sport does not always mean regaining the full level of fitness prior to the injury. Some athletes limit the intensity of their training or adjust their activity level due to persistent pain, fear of re-injury, or functional deficits [61].

The time required to achieve full return to sport (RTS) following meniscus suturing varies and depends on numerous factors, such as the location and type of injury, the surgical technique used, and the course of rehabilitation [62]. In most studies, the average time to return to sport is between 4 and 7 months after surgery [63]. A shorter recovery time is usually observed in patients with simple longitudinal tears located in the well-vascularised peripheral zone, whereas more complex tears may require a longer rehabilitation process [64].

Despite the favourable treatment outcomes, the possibility of complications following meniscal repair must be taken into account. The most commonly reported problem is healing failure, which can lead to a recurrence of pain and the need for further surgical intervention [65]. In some cases, reoperation involving re-suturing or partial meniscectomy is necessary [66]. Additionally, some patients report persistent pain, a feeling of instability or limited knee function despite having completed surgical treatment and rehabilitation [67].

## **DISCUSSION**

An analysis of the available literature indicates that a successful return to sport following isolated meniscal suturing is influenced by a number of interrelated factors. The most significant factors appear to be the patient's age, the location and type of injury, appropriately

managed rehabilitation, restoration of muscle strength, and psychological preparation [68,69]. Better outcomes are observed particularly in young athletes with injuries located in well-vascularised peripheral zones of the meniscus. The quality of postoperative management and the extent to which the patient adheres to rehabilitation recommendations also play a significant role [70].

The results of the analysed studies highlight the crucial importance of rehabilitation in the process of returning to sporting activity. A properly planned rehabilitation programme allows for the gradual restoration of muscle strength, proprioception and dynamic stabilisation of the knee joint [71]. Both overly aggressive and excessively conservative rehabilitation can negatively impact the healing process and delay return to sport (RTS) [72]. Increasing attention is being paid to the need to tailor rehabilitation protocols to the specific type of injury, surgical technique and the patient's level of sporting activity.

Psychological factors are a significant, yet often underestimated, aspect of the return-to-sport process. Fear of re-injury, reduced self-confidence and a lack of psychological readiness can limit the ability to achieve a full return to sport, even when the anatomical structures have healed properly [73]. Studies have shown that patients exhibiting higher levels of motivation and greater self-confidence are more likely to return to sporting activity at the pre-injury level [74]. This highlights the need to take psychological aspects into account in the comprehensive rehabilitation process for athletes following meniscus suturing.

The findings of this study may have significant clinical relevance in everyday orthopaedic and rehabilitation practice. Identifying factors influencing RTS may facilitate treatment planning and the selection of an appropriate rehabilitation protocol [75]. Equally important is patient education regarding the expected duration of recovery, possible limitations, and the risk of re-injury. Establishing realistic expectations regarding the treatment process may improve patient cooperation with the therapeutic team and enhance the effectiveness of rehabilitation [76].

However, the available literature on RTS following isolated meniscal repair has numerous limitations. The studies analysed are characterised by considerable heterogeneity in terms of patient populations, the type of injury, and the rehabilitation protocols used [77]. An additional problem is the variation in definitions of return to sport and the lack of uniform criteria for assessing treatment outcomes [78]. Many studies also involve relatively small patient groups and short follow-up periods, which makes it difficult to interpret the results unequivocally [79].

## **SUMMARY AND CONCLUSIONS**

Isolated meniscal repair is currently the preferred method of treatment for many meniscal injuries in physically active individuals, particularly among amateur athletes. Preserving the meniscal tissue allows for the maintenance of normal knee joint biomechanics, better protection of the articular cartilage, and a reduced risk of developing degenerative changes in the future [80]. An analysis of the available literature indicates that most patients are able to return to sporting activity following meniscal suturing; however, the success of return to sport (RTS) depends on numerous coexisting biological, functional and psychological factors [81].

The patient's age, the location and the type of meniscal injury have a significant impact on treatment outcomes. The best results are observed in cases of fresh injuries located in well-vascularised peripheral zones, which demonstrate greater healing potential [82]. Properly managed postoperative rehabilitation, involving the gradual restoration of range of motion, muscle strength, proprioception and dynamic stabilisation of the knee joint, also plays a key role [83]. Increasing attention is also being paid to the importance of the patient's psychological preparation, as fear of re-injury and a lack of mental readiness may limit the possibility of a full return to sport despite the proper healing of anatomical structures [84].

Despite the growing number of studies on meniscal suturing, there remain significant limitations in the available scientific literature. The lack of uniform criteria for assessing RTS, differences in the rehabilitation protocols used, and the heterogeneity of the patient groups analysed make it difficult to interpret the results unequivocally [81]. Further prospective studies and standardisation of rehabilitation protocols are necessary to optimise treatment and improve functional outcomes in athletes following isolated meniscus suturing.

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No supplementary materials are associated with this article.

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The authors declare no conflicts of interest.

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