

Meniscal injuries in basketball players

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Abstract

Basketball is a highly competitive sport in which the knee joint is constantly subject to physical stresses. Basketball-related traumatic injuries are the result of specific technical movements. Even though basketball is not considered a contact sport, injuries in basketball players are due both to athletes' handling of the ball and to their intense physical interaction during games. Nowadays, traumatic meniscal injuries are constantly on the increase, especially in young athletes, and they are generally the result of compressive forces together with knee flexion rotation. Recognition of the great importance of meniscal biomechanics and of the functional role of the meniscus has resulted in the adoption of an increasingly preserving approach, also in the light of the effects, in terms of articular degeneration, of removing meniscal tissue.

Even though recent decades have seen considerable developments in arthroscopic meniscectomy techniques, geared at preserving as much meniscal tissue as possible, basketball players undergoing this treatment often present, in the long run, clinical symptomatology severe enough to compromise their participation in competitive sport. Hence the treatment of meniscal injuries in athletes has become more and more preserving in recent years, through recourse to surgical techniques such as meniscal repair, biological replacement implantation and donor meniscus implantation, which allow pain relief, return to competitive activities and stable long-term results, slowing down arthritic progression. Therefore, considering the increasing number of meniscal injuries in basketball players, which can jeopardize their sporting careers, great importance is now attached to early dia-

gnosis and to the correct choice of meniscal injury treatment in these athletes.

Key Words: meniscal, injuries, basketball, athlete, treatment.

Introduction

Basketball is a highly competitive sport in which the knee joint is constantly subject to physical stresses (1). It is currently one of the most popular sports in the world. The International Basketball Federation (FIBA) has estimated that about 11% of the general population plays basketball as amateur or professional level.

Basketball-related traumatic injuries are the result of specific technical movements. Even though basketball is not considered a contact sport, injuries in basketball players are due both to athletes' handling of the ball and to their intense physical interaction during games (2).

Nowadays, traumatic meniscal injuries are constantly on the increase, especially in young athletes and they are generally the result of compressive forces together with knee flexion rotation (3). Meniscal injuries manifest themselves clinically with pain, swelling and often articular block, reducing performance and, in some cases, even leading the athlete suspend his/her sporting activity. Basketball is associated with an increased risk of meniscal injuries, due to the physical movements involved in the sport: quick and frequent running movements, pull-ups, shooting, direction changes and jumps. Recognition of the great importance of meniscal biomechanics and of the functional role of the meniscus has resulted in the adoption of an increasingly preserving approach, also in the light of the effects, in terms of articular degeneration, of removing meniscal tissue (4-7). The risk of developing degenerative changes has remarkably increased in athletes owing to greater functional requests and to the earlier age at which

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their injuries occur and are therefore treated surgically. Considering the increasing number of meniscal injuries in basketball players, which can jeopardize their sporting careers, great importance is now attached to early diagnosis and to the correct choice of meniscal injury treatment in these athletes.

Epidemiology

Meniscal injuries are among the most common injuries found in the young sporting population. In research concerning on a population of about 17,000 athletes, Majewski et al. (8) remarked that meniscal injuries occur much more commonly in sports such as football, skiing, handball and basketball due to the movements, involving a combination of axial compression and rotation, associated with these sports.

Drakos et al. (2), in their descriptive epidemiological study of National Basketball Association (NBA) athletes, highlighted that injuries sustained in 17 championship seasons involved the lower limbs in 62.4% of cases and the upper limbs in 15.4% of cases. The most commonly injured site was the ankle (14.7%), followed by the spine and the knee respectively.

Yeh et al. (1), searching a database, identified 129 isolated meniscal injuries occurring in 21 NBA championship seasons; of these, 77 (59.7%) involved the lateral meniscus and 52 (40.3%) the medial meniscus, with a higher occurrence recorded in athletes under 30 years of age and in those with a body mass index (BMI) higher than 25. The study showed a slightly greater involvement of the right knee (53.5%) compared with the left knee (46.5%), and thus conflicted with the research by Baker et al. (9), who found right knee involvement in 80% of cases. Furthermore, this analysis showed substantially the same results as regards return to competitive activity for medial and lateral injuries, while 25 athletes (19.4%) failed to return to sporting activities.

Conservative treatment

Conservative treatment of meniscal injuries in the general population represents a valid option for stable, incomplete, circumferential tears inferior to 10 mm and loca-

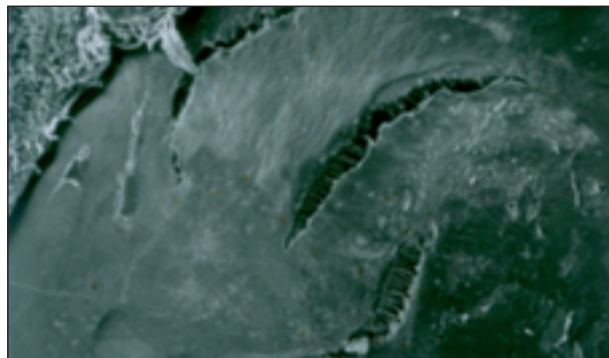


Fig 1. Incomplete meniscal tears of the red-red zone observed under scanning electron microscopy can be treated with conservative treatment.

ted at less than 3mm from the meniscocapsular junction (Fig. 1). In basketball players, as in the entire sporting population, a conservative approach to the treatment of meniscal injuries is less indicated owing to the greater functional demands on these individuals and their need to return rapidly to competitive activities.

Conservative treatment could nevertheless represent a valid temporary solution in asymptomatic athletes, i.e. until the end of the season, pending a subsequent surgical treatment (10).

Surgical treatment

Meniscectomy

For decades meniscectomy has been considered the gold standard for the treatment of meniscal injuries, both in the general population and in athletes. Over the years, prospective studies have documented that joints undergoing meniscectomy develop degenerative alterations more quickly than healthy contralateral joints (5, 11). Furthermore, clinical and radiographic studies have shown that these degenerative phenomena have a 4-7 times higher occurrence in the treated knee than in the contralateral knee (12) (Fig. 2).

In addition, post-meniscectomy joint degeneration seems to be more severe in lateral meniscus injury. Beaufils et al. (13), in a 13-year follow-up study, indicated a greater lateral joint line reduction (40%) than medial joint line reduction (28%), attributable to the function of the lateral meniscus in joint congruence. Biomechanical post-meniscectomy studies have revealed a 235% pressure increase in the lateral compartment cartilage *versus* a 75% increase in the

medial compartment, with consequent higher loading and joint degeneration in lateral compartment injury (14).

People practicing sports at competitive level are statistically more exposed to post-meniscectomy degenerative changes (15). As early as 4.5 years after the surgical procedure, initial radiographic signs of arthritic degeneration can be observed in about 89% of 15-year-old athletes, with 46% dropping out of sports activities due to knee pain (16-18). Meniscectomy is therefore currently indicated as a treatment for basketball injuries only in selected cases and generally in athletes who are already in the later stages of their sporting career.

Although arthroscopic techniques have been developed in recent years, making it possible to perform increasingly selective meniscectomies aimed at preserving meniscal tissue, the risk of knee osteoarthritis 10 years after meniscectomy is nearly 20% for medial meniscal injuries and 40% for lateral meniscal injuries (7).

Stimulation techniques

The healing of some meniscal injuries is strictly dependent on location of the lesion at the peripheral 10-25% of meniscus. In this site, mechanical stimulation of the injured meniscal tissue with rasping or trephination seems to favor meniscal tissue repair through local growth factors (GFs) and the formation of a super-clot. Ochi et al. (19) studied the effect of rasping of the injured meniscal surface on the presence of different GFs, including platelet-derived growth factor (PDGF), transforming growth factor- β (TGF- β), interleukin α 1 (IL- α 1), and proliferating cell nuclear antigen (PCNA). Their study showed that TGF- β , IL-1 α , PDGF and PCNA reached peak levels 14 days after the procedure (19).

Several studies in the literature have shown good results

obtained by treating vertical, non-degenerative, peripheral meniscal tears with trephination (20-23) (Fig. 3). In our experience, the use of trephination to treat a peripheral lesion of the medial meniscus in an 18-year-old member of the Italian national basketball team led to resolution of pain, recovery of function and a return to competitive playing after three months.

Meniscal repair

In recent years, the approach to meniscal injuries in athletes has become increasingly preserving as numerous studies in the literature suggest. Meniscal repair is an approach that exploits the healing capacity of peripheral meniscal injuries, in order to restore full meniscal function (Fig. 4). Repair represents a valid treatment option in longitudinal injuries located at the peripheral 25-30% of the meniscus, the so-called "red-red zone".

The indication for repair in the case of injuries located in the red-white zone seems to be controversial, whilst the repair of meniscal injuries in the white-white zone is contraindicated (24). In the presence of instability the meniscal repair must always be associated with ligament reconstruction.

Although meniscal repair allows meniscal tissue healing in about six weeks, it involves longer recovery times compared with other techniques as well as a later return to sport. Current guidelines suggest that the return to competitive activities should not be earlier than three months (25).

Another important aspect to take into consideration when choosing the treatment for meniscal injuries in basketball players is the risk of repair failure, a not uncommon occurrence, with rates of between 5 and 43% reported in the literature (26).

In recent years different studies have compared, over mid-

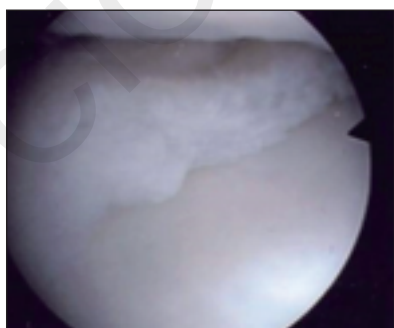


Fig 2. Late degenerative changes after meniscectomy.

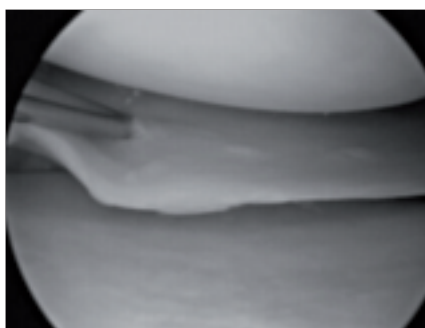


Fig 3. Treatment of a peripheral lesion of the medial meniscus found in an 18-year-old member of the Italian national basketball team.

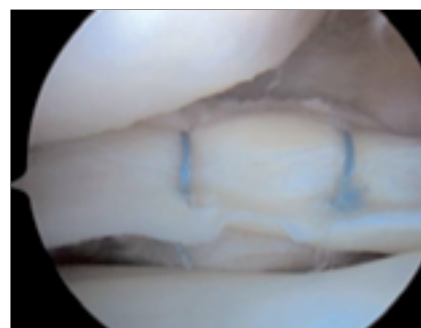


Fig 4. Completed repair of the lesion with meniscal sutures.

to long-term follow-ups, the clinical results obtained in athletes undergoing partial meniscectomies and athletes treated with meniscal repair. In a study with an 8.8-year follow-up, Stein et al. (27) showed that a return to the pre-injury level of activity was observed in 96.2% of the athletes treated with meniscal repair and in 50% of those undergoing meniscectomy. Paxton et al. (28) documented meniscectomy failure in 3.7% of cases and meniscal repair failure in 20.7% of cases, with a higher prevalence of surgical revision in the latter group (28).

Meniscal scaffolds

In athletes with irreparable meniscus injuries or sequelae of previous meniscectomy injuries, meniscal tissue regeneration can be obtained utilizing 3D porous resorbable scaffolds, which favor stem cell migration and proliferation and vascularization and can thus help to produce a tissue similar to that of the native meniscus (29). Scaffolds must therefore be biomechanically structured so as to favor tissue regeneration and afford protection against joint loading. Anterior and posterior meniscal horn integrity is the fundamental prerequisite for a successful scaffold implantation (Fig. 5).

A European multicenter study carried out in 52 patients with partial meniscal defects estimated the long-term evolution of the Actifit (Orteq) biodegradable scaffold. MRI evaluations showed new tissue formations inside the scaffold in 81.4% of patients at 3 months and scaffold integration with native meniscus in 97.7% of patients at 12 months after implantation (30).

A single case of lateral meniscal scaffold implantation in a meniscectomized professional athlete is described in the literature. The young athlete returned to sports activity at pre-injury level 10 months after the operation with lasting results (31).

Meniscal transplantation

Meniscal allograft transplantation is currently a valid treatment option in active young patients with a meniscus-deficient knee, in that it resolves pain, allows functional restoration and slows down arthritic progression. Among athletes, the ideal candidate for meniscal implantation is a youth with persistent femur-tibial pain following partial or total meniscectomy, uninjured joint surfaces, no axial malalignment, stable joints, and a body mass index < 30.

In a recent meta-analysis, Elattar et al. (32) showed that

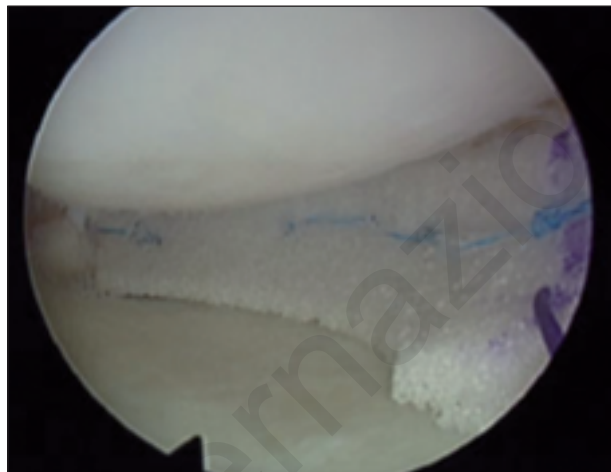


Fig 5. Implant Actifit scaffold and suture in place.

donor meniscal implantation is associated with good-excellent results in 84% of patients undergoing implantation. Cole et al. (33) presented the clinical and functional results of 13 professional athletes, including 5 basketball players, undergoing meniscal transplantation. In all the athletes, a significant increase of all scores was observed. The athletes returned to competitive activities after an average of 16.5 months and 77% of the players resumed their pre-injury level of activity (33).

Despite the good results achieved in the athletic population, the indications for meniscus transplantation are still controversial on account of potential infection risks and long recovery times before the return to competitive activities.

Conclusions

Restoration of full meniscal function is today considered one of the main objectives of the treatment of meniscal injuries in the athletic population. Even though recent decades have seen considerable developments in arthroscopic meniscectomy techniques geared at preserving as much meniscal tissue as possible, basketball players undergoing this treatment often present, in the long run, clinical symptomatology severe enough to compromise their participation in competitive sport. Hence the treatment of meniscal injuries in athletes has become more and more conservative in recent years, through recourse to surgical techniques such as meniscal repair, biological replacement

implantation and donor meniscus implantation, which allow pain relief, return to competitive activities and stable long-term results, slowing down arthritic progression. The choice of treatment in the basketball players should not be influenced by the pressure from the athlete's sports club or by economic interests, but rather should aim exclusively at restoring anatomical and meniscal function. Whichever treatment is chosen, successful treatment of meniscal injuries is based on joint stability and absence of large axial deviations, which are a major risk factor for the development of osteoarthritis. In the presence of combined ligament injuries, ligament reconstruction is performed together with treatment of the meniscal injuries.

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