Medical Practice for Sports Injuries and Disorders of the Knee

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Abstract: The knee joint is the central weight-bearing joint of the lower limb, where various types of injuries and disorders are caused by sports. This paper summarizes recent topics on typical sports injuries, focusing on those occurring in the anterior cruciate ligament and meniscus. Anterior cruciate ligament injury often requires surgical treatment, because the instability after the injury seriously interferes with sports activities due to its very poor healing potential. In diagnosis, manual tests such as the Lachman's and pivot shift tests are important. To return to the strenuous pre-injury activity level, ligament reconstruction is necessary. Meniscal injury occurs in relation to sports activities in the younger athletes at a high rate. The patients have symptoms that include pain, catching, and locking. Care should be taken in the meniscal tear accompanied by anterior cruciate ligament injury. In principle, treatment is concerned with the functional preservation of the meniscus, i.e., meniscal repair. However, with this treatment, it takes a longer duration of time for the athlete to return to his sport, and concerns such as healing failure and re-tear remain.

Key words: Anterior cruciate ligament injury; Meniscal injury; Articular cartilage; Recurrent dislocation of the patella

Introduction

The knee joint is the central weight-bearing joint of the lower limb, where various types of injuries and disorders are caused by sports.

In this paper, both injuries and disorders are referred to as injury. This includes anterior/posterior cruciate ligament injury, medial/lateral collateral ligament injury, meniscal injury, articular cartilage injury, recurrent dislocation/subluxation of patella, and a number of chronic conditions such as overuse syndrome. An accurate differential diagnosis of each injury is essential. Minimally invasive arthroscopic surgery has been established as standard treatment for these injuries.
This paper reviews the injuries and their recent topics, focusing on the anterior cruciate ligament injury and meniscal injury as typical sports injuries.

**Anterior Cruciate Ligament Injury**

Anterior cruciate ligament injury is the most frequently known sports injury, where healing mechanisms hardly work. Many cases of this injury require surgical treatment due to remaining instabilities that greatly trouble athletes in their sports activities. These instabilities are the most important problem among sport-related knee injuries.

1. **Injury mechanisms and symptoms**

   The anterior cruciate ligament injury occurs at the moment of jumping, landing, or quick turning with mid-range knee flexion. It also occurs when the knee is excessively rotated during a landing while skiing with the foot remaining fixed to the ski. Many patients say that they heard their knee joints “pop” when they were injured. The pain, which gradually increases after the injury, is severe enough to force most patients to discontinue the activity and visit a medical institution on the same or next day.

   Through follow-up, the pain is relieved to the point where the patient has no trouble in daily life, but it is difficult to continue sports activities because of the unstable knee joint. If the patients continue their sports activity, re-injuries will mostly occur and cause a combined injury of the meniscus and the articular cartilage. Thus, such patients complain about the pain due to these injuries as well as the instability.

2. **Diagnosis**

   Since most patients experience the above mentioned injury mechanism, a detailed interview about the mechanism and the history of symptoms will often be helpful in its diagnosis. In cases of acute injuries, the severe haemarthrosis can be frequently seen at the initial visit.

   The most sensitive manual testing is the anterior drawer test with mid knee flexion (Lachman’s test), where the results are positive in most cases of injury except acute cases with severe pain. The pivot shift test is also an important manual test that reproduces the functional rotatory instability.

   In actual pivot shift tests, axial load as well as valgus and internal rotation force is applied to the fully extended knee, and then the knee joint is passively flexed. If the anterior cruciate ligament insufficiency is serious enough to cause tibial anterior and internal rotatory subluxation, rapid tibial reduction can be observed with knee flexion. The grade of the pivot shift test correlate with the clinical symptoms to some extent. MRI and diagnostic arthroscopy are important in the diagnosis of complications but are not essential for diagnosis of anterior cruciate ligament injury.

3. **Treatment**

   Generally, the conservative treatment of the injury is not likely to cure the instability. In inactive or elderly cases, conservative treatments with muscle exercise and limitation of activity may be effective. Patients need ligament reconstruction to return to the strenuous pre-injury activity level.
Ligament reconstruction usually needs autotransplantation of the patellar tendon or hamstrings (Fig. 1). Arthroscopic surgery has become a standard operation, and surgical techniques are becoming minimally invasive. It is now possible to fix the graft to the appropriate anatomical site.

Recently, anatomical two-bundle reconstruction, which uses double-bundle grafts, has been performed aimed at reproducing physiological constraint of the anterior cruciate ligament. Further reports on this method are anticipated.

**Meniscal Injury**

The meniscus is a fibrous cartilage tissue located between the femur and tibia in the knee joint. It is associated with load transmission, shock absorption, and stability of the joint.

Meniscal injury frequently occurs especially among young people during sports activities. Its treatment requires a consideration of degenerative changes in the future even after treatment.

1. **Injury mechanisms and symptoms**

The mechanism of meniscal injury has been considered attributable to the combination of flexion and rotation of the knee. In young people, such external forces are frequently generated in sports activities. In middle-aged and elderly people with degenerated knee joints, minor injuries or undetectably slight external forces may cause the injuries. In the diagnosis of such people, meniscal injury should always be considered.

Most of the sport-related meniscal injuries are accompanied by anterior cruciate ligament injuries, and most patients complain of instabilities from anterior cruciate ligament insufficiency and pain due to meniscal injuries. In the early stage of meniscal injury, a symptom called “catching” is observed; thereafter, the rupture develops into a state called “locking,” in which the full extension of the knee joint is impossible.

2. **Diagnosis**

In the diagnosis, it is essential to have the complete medical history of the patient. The important physical findings are quadriceps atrophy, tenderness consistent with the joint space, and pain in the hyperextended and hyperflexed knee. Manual tests for meniscal injury such as the McMurray test are also important.

Although quadriceps atrophy is not a specific finding for meniscal injury, it is observed in most of the clonic stage of this injury. In addition to the traditional manual tests, the authors reported the usefulness of the pivot shift maneuver to diagnose meniscal injury, by observing the location of pain and click in the knee. Arthrography was often used as an auxiliary method to diagnose meniscal injury, but is no longer used, because the maneuver is invasive and its accuracy in the diagnosis of lateral meniscal injury is very low.

On the other hand, thanks to advanced equipment for the MRI, the diagnosis rate of injuries in the meniscus as well as ligaments and cartilage has markedly improved (Fig. 2).
repair. Thus, the meniscus should be resected only if repair is impossible. Accordingly, meniscectomy is indicated for tears near the free edge of the meniscus or peripheral tears with severe degeneration or complex tears in the meniscal body.

Meniscectomy, in principle, resects unstable parts and preserves as much of the meniscus as possible in a stable and smooth shape without any major injury. Therefore, a total meniscectomy is not recommended unless total degeneration or severe damage of the meniscus is found. Instead, partial meniscectomy should be performed in most cases. Improved techniques and instruments have enabled surgeons to perform almost all meniscectomy arthroscopically. Generally, partial meniscectomy can accomplish recovery in a short time, but it should be noted that some patients take more time than expected to return to strenuous sports activities.

In most cases, meniscal suture can be performed arthroscopically. Suture methods can be classified as follows: inside-out method, where the surgeon directs the suture thread from the inside to the outside of the joint; and the all inside method, where the surgeon performs all operations inside the joint. Most of the tears can be sutured by the inside-out method, but the outside-in method is suitable for sutures in the anterior segment. The all inside method is suitable for the posterior segment including the posterior horn.

Theoretically, meniscal suture is an excellent method of preserving the meniscus. The patients who underwent the treatment, however, cannot return to their sports activities for a long period of time, and the possibility of healing failure and re-tear remains.

Other Topics

1. Articular cartilage injury

Injury of the articular cartilage is difficult to diagnose and treat to the extent where the patient can return to their sports activities. In treating this injury, many problems remain unsolved. The basic and clinical studies on autologous osteochondral graft such as mosaicplasty and autologous chondrocyte implantation have recently provided new research topics. However, long-term clinical results are still needed, and their efficacy remains obscure. Therefore, it is necessary to study their efficacy in comparison with the microfracture technique and the abrasion technique, which are comparable to the conventional drilling technique.

2. Recurrent dislocation and subluxation of patella

For the treatment of recurrent dislocation and subluxation of patella, reconstruction of the medial patello-femoral ligament as well as the traditionally reported proximal realignment and medialization of tibial tuberosity are considered to be efficient.

Conclusion

This paper has presented an outline of the
topic of sports injuries of the knee. Accurate diagnosis and treatment are essential for patients to return to their sports activities. Hopefully, less invasive treatments will be developed in the future.

REFERENCES


