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Review Article

Exploring Essential Orthopedic Sports Medicine Interventions for the Lower Extremities

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Abstract

A branch of orthopedics called orthopedic sports medicine is dedicated to treating musculoskeletal pathologies brought on by participation in sports. The most challenging thing to deal with while working with athletes is timing. Athletes usually want to get back to playing at their pre-injury level as quickly as feasible. This means that management needs to be tailored to balance the urge for a quick return to sports with the musculoskeletal system's natural healing process. Sports medicine surgeons face a significant challenge in light of this since they must stay up to date on the most recent scientific findings to provide their patients with the best possible care. We provide a quick overview of the most popular orthopedic sports medicine treatments and the current body of scientific research on their benefits and indications.

Keywords: Sports injury, Meniscus, Knee

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Introduction

Knee

Meniscal injuries: While pivoting actions are the primary cause of meniscal injuries in athletes, meniscal lesions have also been seen in low-impact activities like swimming. One of the most prevalent musculoskeletal conditions and the most common orthopedic surgery performed globally is a meniscal injury. In comparison to meniscectomy, repair of vertical peripheral longitudinal rips and root tears will result in better outcomes concerning symptoms, function, return to play, and cartilage preservation (1). A growing amount of research, particularly in younger patients, has supported the healing of horizontal tears in more recent years. For elite athletes (baseball, football, and basketball), the percentage of athletes who return to play after meniscus surgery ranges from 80 to 90%. Nonetheless, research on meniscal repair in athletes has revealed that pain accounted for up to one-third of the reoperations performed. Regarding meniscal repair surgical technique, a consensus is that the procedure should begin with debridement and abrasion of the meniscal lesion walls to promote local bleeding (2). Regarding suture technique, either vertical or horizontal sutures are advised, carried out using all-inside, inside-out, or outside-in techniques, as no technique is superior to the others. However compared to a horizontal structure, it has been shown that a vertical suturing configuration has better load-to-failure values. For the intermediate and anterior meniscal segments, inside-out sutures are typically employed, and all-inside sutures are used for the far posterior parts (3).

Anterior cruciate ligament injury: Roughly 200,000 injuries in the USA are caused by torn anterior cruciate ligaments (ACLs), which can impair knee stability and have a detrimental impact on sports participation. While non-contact injuries account for the majority of ACL tears, injuries sustained during collisions in sports like American football, rugby, or hockey are nevertheless common.

There are numerous known risk factors for ACL tears. Certain individuals rely on the form of the bone (tinier intercondylar notch widths, lower notch width index, and higher tibial slopes) while others are dependent on gender and hormones. ACL tear injuries have recently been linked to biomechanical variables including restricted hip internal rotation (4). Although surgical reconstruction is typically chosen in athletics, conservative therapy of ACL rupture can result in satisfactory outcomes. Restoring knee stability is the primary benefit of ACL reconstruction (ACLR), which will ultimately aid in preventing further meniscal and articular cartilage damage. There are various methods for carrying out ACLR. Outside-in and transtibial independent drilling (via the anteromedial portal) are the most widely utilized methods (5). Independent drilling is more likely than the transtibial method to produce better biomechanical and functional results, according to a comprehensive review, albeit there isn't enough conclusive clinical data to back this claim. The positioning of tunnels can be freely chosen with outside-in drilling, however, it requires two incisions. Reconstructions using single or multiple bundles of grafts have been suggested. Regarding rotational stability, biomechanical investigations supported double-bundle grafts, but no evidence of clinical superiority was found (6).

Three primary types of grafts can be distinguished: autograft, allograft, and synthetic graft. Newer synthetic grafts appear more promising than previous ones in the near term, although they still have a significant failure rate (7).

Allografts come at a high cost and include a risk of late failure, delayed integration, and infection transmission. Thus, autografts—the hamstring, the less common quadriceps tendon, and the bone-patellar tendon-bone (BPTB)—are the best option, particularly for young athletes. The merits of the hamstring and patellar tendon are hotly contested, with no clear winner having been established. Although they have a higher likelihood of complications, BPTB grafts guarantee better knee stability after surgery (8). Conversely, post-operative anteroposterior knee laxity is usually linked to hamstring autograft, which is the most common reason for revision surgery, especially in women. The percentage of patients who return to sports, however, varies from 63 to 92%, despite all the wonderful efforts made to improve ACL restoration. This pattern demonstrates how crucial psychological factors and rehabilitation with a neuromuscular focus are in influencing the rate of return to play (9).

Posterior cruciate ligament injury: The incidence of an isolated posterior cruciate ligament (PCL) injury following acute knee trauma varies from 3 to 44%. A PCL injury is frequently a component of complex knee injuries, which are linked to ACL tears, medial collateral ligament (MCL) injuries, and posterolateral corner injuries in 46, 31, and 62% of cases, respectively(10). Even in sportsmen, isolated PCL injuries to the knees that result in reduced joint laxity and the absence of other peripheral lesions are typically treated conservatively with good subjective outcomes, and approximately 50% of patients recover to resume their previous level of sport. When PCL injuries are treated conservatively, 41% of participants had early osteoarthritis with a gradual loss of joint function at the 14-year follow-up. The joint function can be maximized through surgical intervention. 67% of the individuals return to competitive sports after surgery, while 26% return to high-functional demand activities (11). After about 30 months of follow-up, clinical results do not differ between single- and double-bundle repair procedures. Double-bundle PCL repair, however, primarily enhances knee stability objective measurement (12).

Hip

Femoroacetabular impingement: Young, energetic individuals and sportsmen frequently experience hip and groin pain due to femoroacetabular impingement (FAI). FAI first results in labral tears and chondral lesions, which in turn lead to early arthritis. When patients are not responding to conservative treatment, arthroscopic surgery is performed, using targeted physical therapy and oral anti-inflammatory medications (13). A few studies that provided information on surgical treatments such as femoroplasty, acetabuloplasty, and labral restoration in athletes found that arthroscopic surgery is successful in improving clinical and functional outcomes and allowing 87% of patients to return to sports. Furthermore, the timing of arthroscopic treatment is crucial; in professional hockey players, the length of their athletic career was found to be considerably impacted by the duration of their symptoms before arthroscopic surgery (14).

Achilles tendon: Athletes frequently get Achilles tendinopathy, which causes 6–17% of all injuries in runners. Although the exact cause of tendinopathy is still unknown, several factors contribute to its pathogenesis. There is currently insufficient scientific data to support the use of pharmaceutical therapies, although multiple level I studies significantly support the conservative care of chronic midportion Achilles tendinopathy with eccentric workouts and extracorporeal shock waves therapy (ESWT)(15). Patients who are unresponsive to these conservative approaches may benefit from high-volume image-guided injections, which are beneficial in both the short and long term for symptom relief and tendon function restoration. Minimally invasive multiple percutaneous longitudinal tenotomies are a viable option for more invasive operations in non-insertional Achilles tendinopathy, at least for those patients who show no signs of para tendinopathy and who do not improve after six months of conservative treatment. This procedure improves ankle function and produces long-term good results. In light of the well-known risks associated with infections and challenging wound healing, tendoscopy has been suggested as a successful substitute for open surgery in recent years. This includes debridement performed alone or in conjunction with flexor hallucis longus tendon transfer (16).

According to a fairly recent comprehensive evaluation, eccentric workouts for insertional Achilles tendinopathy did not yield excellent results, whereas ESWT did [63]. Surgery is necessary to remove the calcaneal bony prominence and/or debride the tendinopathic tissue in patients who are not improving with conservative care. This procedure may involve tendon detachment and subsequent fixation to the calcaneus tuberosity. When nonsurgical treatment for insertional Achilles tendinopathy fails after three to six months, surgery is recommended. Complete debridement is required, which frequently results in the tendon's insertion being almost completely detached. As a result, two anchor repairs are advised; in fact, they are linked to good to exceptional outcomes. Surgery can produce satisfactory results, although recovery takes time (17).

Ankle

Lateral ankle ligaments: Particularly in team sports, ankle sprains are frequent. Ankle injuries can be the cause of up to 40% of all sports injuries, and they account for 29% of injuries sustained in American football. Forefoot adduction, hindfoot inversion, tibia external rotation, and plantar flexion of the ankle are the most frequent patterns of injury. One or more of the ankle's lateral ligaments may tear as a result of this process (18). The anterior talo-fibular ligament (ATFL) is the only joint involved in up to 70% of sprains. It is estimated that over half of ankle sprains go untreated. RICE (rest, ice [cryotherapy], compression, and elevation) is beneficial for patients with ankle sprains, of which grades I and II comprise the majority. The administration of Grade III is less standardized. While many other writers have reported disappointing results following acute repair in favor of functional treatment, some authors have suggested surgical repair for the acute grade III lesion. The condition of symptomatic ankle instability after an acute ankle injury treated with conservative measures is known as chronic ankle instability (19).

The Brostrom-Gould approach is one method of anatomic restoration that can be used for surgical management of the lateral ligaments of the ankle. Other techniques involve the use of tendon grafts, either autografts or allografts, to augment the surrounding tissue. A recent comparison between allograft reconstruction and lateral anatomic ankle restoration (Brostrom-Gould) revealed no significant variations in function or patient satisfaction between the two groups, and no revision was required in any of the patients (20).

When more than one ligament is damaged, such as the calcaneofibular ligament (CFL) in addition to the ATFL, allografts should be taken into consideration since they show good to exceptional results in up to 85% of instances (21).

An ankle arthroscopy is strongly advised at the time of surgical restoration of the ankle lateral ligaments as it will enable the search for intra-articular lesions. Different minimally invasive methods (arthroscopic repair, non-arthroscopic minimally invasive repair, arthroscopic reconstruction, and non-arthroscopic minimally invasive reconstruction) have been developed recently for the treatment of chronic ankle instability. High-level evidence, however, is still lacking to support its application in routine clinical practice (22).

Osteochondral lesions in ankles Roughly half of cases of acute ankle sprain result in talus chondral lesions (OCL), which can cause discomfort that doesn't go away even when conservative or surgical measures are taken. An inversion ankle sprain is the cause of the majority of OCL (49%) which are central-lateral (23). Conservative measures don't work well for those kinds of lesions. For lesions less than 1 cm2, arthroscopic debridement with removal of the loose OCL is typically recommended in the acute setting. For larger lesions, fragment fixation with bioabsorbable screws is recommended (24).

Loomer et al. have divided chronic OCLs into five kinds. Retrograde drilling is a technique that can be used to treat type I and II lesions to stimulate bone marrow. Either curettage or excision can be used to treat type III and IV lesions with good results (25). Lastly, osteochondral plugs (mosaicplasty) are typically used to fill or graft bone in cases with type V cystic lesions (26).

Conclusions

Orthopedic sports surgeons can provide excellent care for elite athletes and help them return to successful sports practice through the careful use of preventative, surgery, and rehabilitation approaches. Nonetheless, for certain conditions like FAI, and persistent ankle instability, there is a dearth of conclusive information from large-scale research regarding the most effective course of care. More research is required, bearing in mind that newer does not always equal better and that, in many cases, one should remain suspicious of miracle treatments and flashy new inventions.

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