(iii) Lateral ankle instability

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Abstract
Ankle sprains are the most common sports-related injury and are caused by forced plantar flexion and inversion. Most involve the lateral ligamentous complex and recover with conservative management, but 20% go on to develop biomechanical or functional instability. This article focuses on clinical symptoms, signs, conservative and surgical management of acute lateral ankle sprains and lateral ankle instability.

Keywords acute; arthroscopy; chronic; conservative treatment; diagnosis; lateral ankle instability; sport; surgery

Introduction

Ankle sprains account for 40% of all athletic injuries, making them one of the most common sporting soft-tissue injuries. Lateral sprains represent 85% of these injuries, and medial sprains are rare.[1] They are commonly seen in athletes participating in basketball, soccer, running, and ballet/dance,[1–3] comprizing 53% of basketball injuries and 29% of soccer injuries.[4,5] Indeed, among high school athletes, ankle sprains are the most prevalent soccer injury in both boys and girls (16% and 20%, respectively).[6–11] A variety of foot and ankle deformities, including plantar flexion of the first ray, hind-foot varus, mid-foot cavus, and generalized ligamentous laxity may predispose to a lateral ankle sprain.

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The most common mechanism of injury is forced plantar flexion and inversion of the ankle as the body's centre of gravity rolls over the ankle, accounting for the high rate of injuries of the lateral ligamentous complex.[5] Because the ankle is more complex than a simple rolling hinge joint, and the talus rotates internally and externally within the mortice of the ankle during movement, a single lateral ligament would not be able to provide stability at all the positions of the tibio-talar joint,[12] and thus the ligament has three major components, the

- anterior talo-fibular ligament (ATFL)
- calcaneo-fibular ligament (CFL)
- posterior talo-fibular ligament (PTFL).[13]

Together, these ligaments confer lateral stability on the ankle joint.

Terminology

Several terms such as 'ankle ligament laxity,' 'lateral ankle instability,' and 'chronic ankle instability' are often used interchangeably and inappropriately to describe different clinical conditions arising after ankle sprains. The term 'laxity' describes a physical sign that is objectively detected on clinical examination. Instability is a symptom, associated with an unstable ankle after lateral ligamentous injury.[11] The patient with such instability usually describes a subjective feeling of the ankle giving way. Chronic ankle instability is a pathological condition characterized by repeated episodes of instability that result in recurrent ankle sprains.[12]

Acute ankle instability

Lateral ankle sprains most commonly result from excessive inversion and internal rotation of the hind-foot while the leg is in external rotation.[14] The ATFL, the weakest of the ligaments of the lateral complex, is involved in the majority of lateral ankle sprains, the CFL is in 50%–75%, and the PTFL in <10%.[11] Broström[15] surgically explored 105 sprained ankles, and found that two-thirds of the ankles had an ATFL tear, while a quarter of the ankles had a combined ATFL and CFL rupture.

Assessment of the patient with a lateral ankle sprain begins with a careful history which can be crucial in identifying the mechanism of the injury and the severity of the trauma. However, a cracking sound at the time of the injury and the feeling that the ankle has been bent double are not necessarily indicative of a rupture of one or more of the ankle ligaments.[16,17] Inability to bear weight and ecchymosis occur early after injury and the acute ankle pain and swelling becomes more diffuse over the succeeding few days.

Clinical examination to exclude a possible ankle fracture[18] should be based on the Ottawa guidelines.[19] Pain on palpation and marked swelling are usually present if there is a ligament rupture, and patients typically localize the tenderness over the ruptured ligament. When indicated, standard ankle radiographs should be taken to exclude fracture and other associated pathologies.[1,20,21] Ultrasound evaluation is very dependent upon equipment and operator skill level. The reported diagnostic accuracy for ATFL tears is 95% and 90% for CFL tears.[22,23] Ultrasound can be useful for a non-invasive dynamic assessment of the ankle.

MRI and CT scans are not usually indicated for acute ankle sprains. However, if other injuries are suspected, MRI can be useful to elucidate associated conditions and soft-tissues injuries.

Classification

There are several systems to grade ankle sprains, but none has been shown to be better than the others. They include an anatomical system,[24] the Davis and Trevino system,[25] by presenting symptoms,[26] by anatomical damage and clinical presentation.[27,28] Malliaropoulos et al proposed a four grades classification system specific for athletes.[24] They modified Hertel's earlier classification into grades I, II and III,[14] by dividing grade III injuries into IIIA and IIIB to take account of anterior-drawer-test stress radiographs. In a grade IIIA injury, the reduction in the range of movement (ROM) was $>10^{\circ}$, with more than 2 cm of oedema but with normal stress radiographs. A grade IIIB injury differs in that comparing the injured and normal ankles radiographically there is more than 3 mm difference in the distance between the posterior articular surface of the tibia and the nearest point on the talus.

Preventive treatment

A systematic review[29] of seven high-quality studies showed that proprioceptive/neuromuscular training is effective in reducing the incidence of certain types of sporting injuries in adolescent and young adult athletes during pivoting sports, including ankle sprains. Additionally, proprioceptive training is associated with better results and a reduced rate of ankle sprains when compared with no intervention in male soccer players.[30] However, player compliance with the prescribed training programmes can often be low, and the effect of the intervention on the risk of injury may not be detected, as shown in a randomized controlled trial.[31]

Treatment

Several randomized clinical trials have shown that adequate treatment of an ankle with a tear of the lateral ligament complex leads to a better outcome than no treatment.[17] In one randomized controlled trial, patients had either accelerated intervention with early therapeutic exercise (exercise group) or a standard regime with protection, rest, ice, compression, and elevation (standard group).[32] The accelerated exercise protocol during the first week after injury improved ankle function, and patients were more active during that week compared to the group receiving standard care.[32]

Another randomized controlled trial in patients with acute grade I or II[14] lateral ankle sprains demonstrated that treatment with peri-articular injections of hyaluronic acid combined with standard care (rest, ice, elevation, and compression) compared with a placebo injection of normal saline solution combined with standard care was associated with reduced pain, a more rapid return to sport, fewer recurrent ankle sprains, fewer missed days from sport, and fewer adverse events for up to 24 months post-injury.[33]

A randomized controlled trial with one-year follow-up showed that the use of a specific proprioceptive training programme after standard care of an ankle sprain was effective in restoring ankle function and stability and also useful in the prevention of self-reported recurrences in athletes who had sustained an acute sports-related injury to the lateral ankle ligament.[34]

Treatments advocated for grade III[14] acute lateral ankle ligament injuries[12] include cast immobilization, functional management, and surgical anatomical repair. Cast immobilization is usually for a brief period (3 weeks) in a below-knee walking cast, followed by up to 12 weeks of proprioceptive rehabilitation.[12] Immobilization in a below-knee cast or an Aircast (DJO Incorporated, Vista, CA) boot for 10 days results in faster resolution of pain than if a patient is only given a tubular compression bandage.[35]

A randomized controlled trial has shown no difference in terms of results and clinical outcomes comparing a below-knee cast and the Aircast brace. Additionally, such braces were considered as good, cost-effective alternatives to a tubular bandage for an acute, severe ankle sprain.[36] As there are no differences in the long-term outcomes, practitioners should equally consider patient acceptability and compliance when choosing a brace.[36]

Functional management is based on early mobilization with external support and rest, ice, compression, and elevation. This must be followed by a rehabilitation programme that comprises proprioception training, range of movement exercises, strengthening and activity-specific training.[1] Proprioception training, which comprises a series of progressive drills on devices such as wobble boards and trampolines, is essential to recover balance and postural control of the ankle.[11]

A systematic review of nine studies of functional management showed that lace-up supports were more effective than treatment with tapes. Tapes were no better than semi-rigid supports and also were associated with skin irritation. Elastic bandages were associated with poorer results.[37] A level 1 meta-analysis of randomized controlled trials comparing immobilization with functional management for acute lateral ligament injuries of the ankle[38] showed that functional management is associated with a higher percentage of patients returning to sports as well as higher rate of satisfaction compared with patients managed with cast immobilization.[38]

A meta-analysis of surgical versus non-surgical management of acute ankle injuries found that all available trials had methodological flaws, and it was not possible to demonstrate a clearly superior management option based on the available pooled data.[39] Controversially, a recent randomized controlled trial comparing functional management with surgery demonstrated statistically significant differences in favour of surgical intervention especially with regard to pain, giving way and recurrent sprains at follow-up.[16] However, a Cochrane review comparing surgical and conservative treatment for acute injuries of the lateral ligament complex of the ankle in adults[40] showed that there is insufficient evidence available from randomized controlled trials to determine the relative benefits of surgical or conservative treatments for acute injuries of the lateral ligament complex of the ankle.[40]

Chronic ankle instability

Patients with chronic ankle instability usually complain of recurrent sprains, episodes of the ankle giving way and persistent pain. The major clinical features of chronic ankle instability are a combination of mechanical and functional insufficiency resulting from the primary ankle sprain.

Clinical diagnosis may be difficult because symptoms and signs are more subtle than those seen after acute injuries. Swelling may be limited to the joint line and there may be minimal ecchymosis. However, ligamentous laxity is more easily

demonstrated in a patient with chronic instability because the joint tends to be less painful.

MRI is essential to demonstrate any associated causes of ankle pain, such as radiographically occult fractures, bone bruising, chondral injury, peri-articular tendon tears, degeneration, sinus tarsi injury, and impingement syndrome. The main signs of ligament injury on MRI scans are ligament swelling, discontinuity, lax or wavy ligament, and non-visualization.[41]

Treatment

Generally, surgery is indicated for patients with chronic instability of the ankle and failure of conservative management.[42] Several surgical techniques have been described in the literature. They can be divided into two basic categories: anatomical repair and tenodesis stabilization.[43,44] However, a meta-analysis of seven randomized trials of surgical management of patients with chronic lateral instability of the ankle did not determine the best surgical option due to poor statistical and methodological quality of the trials.[45]

Anatomical repairs restore normal anatomy along with joint mechanics and seek to maintain movement of the ankle and subtalar joints. However, anatomical repairs are extremely dependent on the condition of the injured ligaments, which may be attenuated. Tenodesis stabilizations seek to reduce abnormal ankle movements using various local tendon grafts without repairing the injured ligaments. Unfavourable results arise from an alteration of ankle and hindfoot biomechanics.[46]

Various techniques have been described. Of the direct repairs, over the years, the Broström technique[47] has been most commonly performed. The original procedure, consisting of mid-substance imbrication and suture of the ruptured ends of the ligament, provides satisfactory functional repair of the lesions (Figures 1–3a & b).

Elmslie, in 1934, used a fascia lata graft to reconstruct the lateral ankle ligament complex.[48] Watson–Jones described a tenodesis stabilization in 1952,[49] weaving a peroneus brevis graft through the calcaneum and talus. Subsequently, Evans[50] simplified the procedure by passing the distally-attached peroneus brevis graft through an oblique posterior-superior drill hole in the distal fibula. This construct does not replicate the ATFL or the CFL, and alters hindfoot and ankle biomechanics. It has been used to augment a Broström repair,[51] but this effectively negates the advantages of an anatomical procedure that

Figure 1 The ATFL is prepared.

Figure 2 A vicryl suture is passed through the ATFL.

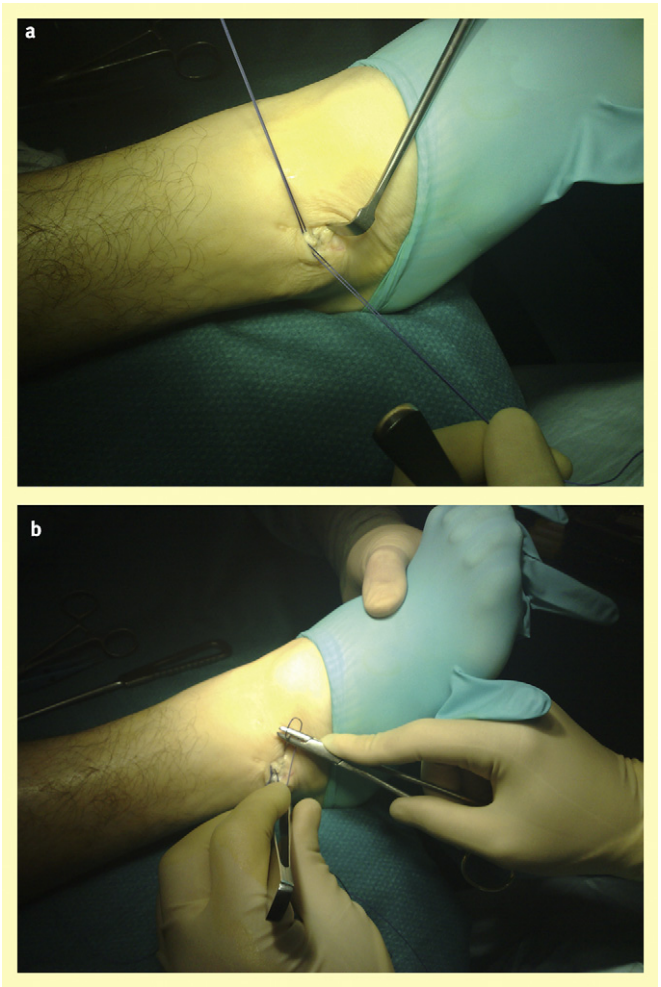

Figure 3 The torn ends of ATFL are shortened and repaired directly with mid-substance suturing.

respects biomechanics. Chrisman and Snook[52] described a split peroneus brevis tendon graft to restore the ATFL and the CFL anatomy and to attempt to maintain some function of peroneus brevis.

Arthroscopic management of lateral instability of the ankle is an emerging method of treatment which offers the possibility to repair the injured ligaments (except CFL), without performing an open surgical procedure and exposing patients to major operative risks, but it is technically difficult. A recent study[53] demonstrated that a combined arthroscopic and open treatment of peroneal tendon dislocation and coexisting lateral and medial ligamentous laxity in the ankle joint results in a good clinical outcome and high patient satisfaction. In our opinion, the inability to address the CFL arthroscopically has yet to be overcome, and there is a lack of published long-term results.[12]

Conclusion

Acute lateral ankle instability should be managed initially with conservative treatment such as rest, ice, compression and immobilization for a short period, followed by proprioceptive training to regain full ankle function. When chronic ankle instability occurs, especially following repeated episodes of ankle sprains, or if functional rehabilitation fails, surgery is required. The Broström–Gould anatomic repair is the most successful surgical procedure. A non-anatomic repair is indicated in case of failure of previous anatomic repair. For the future, arthroscopic treatment shows promise. ◆

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