

# ANKLE LIGAMENT INJURY

## CONSERVATIVE TREATMENT

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The majority of handball players with acute lateral ankle ligament injuries are now treated with functional treatment. The decision for this approach as the first choice is predominantly based on three factors:

1. that the majority will recover without chronic complaints,
2. its cost effectiveness and
3. the absence of potential postoperative risks.

The impact therapy aims at an optimal return to play. The second aim is preventing functional instability-related symptoms. Persistent functional instability may lead to ankle impingement, osteochondral defects and, eventually, osteoarthritis.

### EPIDEMIOLOGY

The impact of ankle injuries, particularly ankle sprains, is high in indoor team sports, such as handball, basketball and volleyball<sup>1</sup>. Ankles can probably be considered the most common location of injuries among handball players, however the literature is

inconclusive. Hands, heads and knees have also been reported as the most common locations by different studies<sup>2</sup>. This difference can mainly be explained by the different injury definitions used. The ankle and knee are the most common locations when considering a time loss injury definition – these are injuries that force players to suspend sports activity. It has been estimated that 13.5% of the lesions of handball players are located on the ankle<sup>3,4,5</sup>. Of these, Seil et al<sup>3</sup> found that 100% of ankle injuries in handball were sprains. In terms of incidence, ankle injuries in handball have been found to occur between 0.4 to 1.6/1,000 hours of exposure<sup>1</sup>.

Recent research undertaken at the elite level revealed that an increased level of play leads to a higher incidence and increased risk of injury<sup>3</sup>. This has been explained by the higher speed of the game, tougher play and high number of matches during a short period at elite level tournaments. However, these differences may also be due

to differences in injury definition<sup>6</sup>. There are also differences in injury incidence between team positions, with back players most affected by injuries, followed by line players. In handball, previous injuries are a risk factor for new lesions, with ankle sprain the most likely to recur<sup>7</sup>.

### TRAUMA MECHANISM OF LATERAL LIGAMENT INJURIES

When playing handball, landing on the lateral border of the foot is the most frequent cause of acute ankle injury. With this trauma mechanism, there is forced plantarflexion with an anterolateral internal rotational movement of the foot. This mechanism causes traction lesions on the lateral aspect of the foot and ankle, and compression lesions on the medial site. Experimental studies have shown that this mechanism will first rupture the anterior tibiofibular ligament, and subsequently the posterior tibiofibular ligament and calcaneo-fibular ligament. Another described mechanism is



forced plantarflexion and eversion that will induce damage to the anterior tibiofibular ligament, then calcaneo-fibular ligament and finally posterior tibiofibular ligament. Isolated adduction-induced calcaneo-fibular ligament lesions are rare. Kannus and Renström showed that there is no difference in outcome between single or combined lateral ligament ruptures<sup>8</sup>. This implies that it is not the number of involved ligaments that will have clinical consequences, but the degree of damage of the most severely injured ligament.

#### GRADING OF LATERAL LIGAMENTS

A three-grade system is widely used to classify mild (grade I), moderate (grade II) and severe (grade III) ankle ligament injuries. Grade I injuries are simple sprains of ligament stretch injuries, without macroscopic rupture. In grade II, there is a partial rupture of at least one of the ligaments. In grade III, there is a complete rupture of at least one of the ligaments. In daily practice and recent guidelines, grade II and III lesions are frequently

grouped together, and the recommended conservative therapy is identical for these partial and complete ruptures.

#### DELAYED CLINICAL EXAMINATION

In the initial phase, clinical examination is unreliable due to the pain and swelling. After, when indicated, using an X-ray to exclude the possibility of a fracture, it is recommended to re-examine the ankle after 4 to 7 days. During this delayed physical examination, it is possible to differentiate between an ankle sprain with or without lateral ligament ruptures. The sensitivity of detecting a lateral ligament injury is 96% when there is pain on palpation of the lateral ligaments, haematoma and a positive anterior drawer sign. The 84% specificity for these tests leads to the diagnosis of ankle injury without a lateral ligament rupture<sup>9</sup>.

#### INITIAL PHASE

During the initial days after lateral ankle ligament injury, the therapy aims to control the inflammatory response. In the absence of a fracture, rest and ice application are

generally accepted interventions during this inflammation phase. Although it is suggested that ice application might reduce the degree of initial swelling, this is not supported by scientific evidence<sup>10</sup>. The major effect of icing during the initial phase is to reduce pain<sup>11</sup>. Three to four daily sessions of 15 minutes of cooling with a simple plastic bag with ice and water at a temperature between 0 and 7°C will reduce the pain without a significant risk of skin damage or neurological complications.

There is conflicting evidence published on the effect of compression to reduce swelling during the first 48 hours. An elastic bandage during the first 24 hours is generally advised, and can be replaced afterwards by a brace. Non-steroidal anti-inflammatory drugs (NSAIDs) are effective during the first 2 to 7 days for pain reduction and are associated with initial improvement in the restricted range of motion. However, in the long-term, there is no reported beneficial effect of NSAIDs on functional improvement. The short-term positive effects should be considered on an

individual basis, with attention given to the potential side-effects<sup>12,13</sup>.

#### IMMOBILISATION OF LATERAL LIGAMENT INJURIES

In the past, 4 to 6 weeks of cast immobilisation was the treatment of choice for partial and complete lateral ligament ruptures. However, this intervention was frequently complicated by a decreased range of motion and physical impairments. There is still debate regarding whether a short period of plaster immobilisation is beneficial. Some researchers have shown its positive effect on swelling and pain reduction, indicating that it might be beneficial during the acute phase<sup>11,14</sup>. Ankle injuries without lateral ligament ruptures can be treated with solely functional treatment, and a relatively quick return to sporting activities. Ruptured lateral ankle ligaments require 4 to 6 weeks of bracing or taping to protect the range of motion of the ankle and lateral ligaments. For athletes, semi-rigid protection using a brace or tape is recommended because its outcome is superior to elastic bandages in terms of the time taken to return to sports and the prevention of future ankle instability<sup>11</sup>.

#### FUNCTIONAL TREATMENT OF LATERAL LIGAMENT INJURIES

Guided by pain and swelling, the athlete is encouraged to begin weight-bearing as soon as possible. The first step of functional treatment begins with walking with a

protective brace. This allows a gradual increase of the functional range of motion (plantar- and dorsiflexion) of the ankle. After the acute phase, increased pain-free exercises and proprioceptive exercises should be implemented, with a graduated evolution to increasing complexity, functional movements and finally sport-specific activities. There is general consensus that proprioception training is an effective rehabilitation strategy in reducing residual symptoms and preventing further injuries<sup>15</sup>. However, the exact dosage needed to cause balance improvements and decrease the risk of recurrences remains unknown. Improvements in postural control have been reported after a few days in some patients, and after weeks in others<sup>16</sup>. There is evidence that the longer the proprioceptive training is performed, the greater the preventative effect obtained<sup>17</sup>. Early specific functional training has been shown to be useful not only to accelerate return to play<sup>18</sup>, but also to prevent re-injury<sup>19</sup>.

The use of physical therapy devices, such as electrotherapy, laser therapy and ultrasound, is widespread in clinical practice, particularly during the first phases of treatment, when the goal is to reduce swelling and inflammation. However, the evidence of their effectiveness is limited and therefore, cannot be considered part of the gold standard treatment of ankle injuries<sup>20-22</sup>. Further research, possibly exploring different dosage and application methods, is warranted.

Despite the evidence still being weak, it seems that manual therapy has a role in the management of acute ankle sprains, particularly during the early stages. The restoration of dorsal flexion is a critical indicator for returning to functional activities. Passive anteroposterior glide of the talus, osteopathic techniques, Mulligan's mobilisation with movements and chiropractic techniques have been proven to be effective in increasing dorsal flexion and improving recovery. However, the effect of these techniques on long-term outcomes appears to be limited<sup>23-26</sup>.

#### SYNDESMOTIC INJURIES

The majority of syndesmotic injuries are associated with ankle fractures. The trauma mechanism of an isolated syndesmotic injury is a forced external rotation-dorsal flexion trauma with axial compression. These injuries are prone to causing tibiofibular diastasis. Syndesmotic injuries secondary to an inversion trauma are less common. With this trauma mechanism, and in the presence of a lateral ligament rupture, the syndesmotic rupture is most frequently only partial. For daily practice, it is important to keep in mind that, in 40% of athletes with a classical inversion trauma, there will be pain on palpation of the anterior syndesmotic area without the presence of a syndesmotic rupture on further imaging<sup>27</sup>.

Standard radiographs are recommended for the detection of diastasis of the ankle mortise. Especially in elite athletes, MRI is increasingly used to detect syndesmotic injuries due to its high sensitivity and specificity. Stable syndesmotic injuries after inversion trauma with lateral ligament injury can be treated in the same manner as a lateral ankle ligament injury. For athletes with acute syndesmotic instability, there might be an indication for surgery (see elsewhere in this issue).

#### DELTOID LIGAMENT LESIONS

The classical injury mechanism of a deltoid ligament lesion is forced eversion of the foot, such as a direct trauma to the lateral aspect of the foot and ankle. It is relatively uncommon that an inversion trauma induces combined lateral ligament injury and deltoid lesions. Physical examination reveals swelling and pain on palpation of the medial ligament with signs of talar

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subluxation in complete lesions. Standard radiographs are frequently normal. The sensitivity of MRI to detect deltoid lesions is high. However, there is a risk of over-diagnosing deltoid ligament lesions—deltoid ligament abnormalities after a classical inversion trauma (with lateral ligaments injuries) are reported to be present in 60% of the cases, but this frequently does not align with the clinical findings<sup>28,29</sup>.

The therapy of deltoid lesions is dependent on associated injuries, such as syndesmotic injuries and ankle fractures. Combined lateral and deltoid ligament injuries can frequently be treated in the same manner as a lateral ligament injury. Simple isolated deltoid sprains can be treated with functional treatment. Isolated deltoid ruptures are mostly treated conservatively by 4 to 6 weeks of immobilisation and progressive rehabilitation; however, high-level athletes can be advised to consider a surgical option (see elsewhere in this issue).

#### SECONDARY PREVENTION

After an acute ankle injury, the intrinsic factors of reduced dorsal flexion, disturbed proprioception and weakness of the peroneal muscles are associated with an increased risk of re-injury. A recent systematic review showed that neuromuscular and proprioceptive training is an effective secondary preventative method. This

has been shown to be more effective in preventing secondary recurrences than primary sprains<sup>19,30</sup>. There is some evidence that taping and bracing may play a protective role in recurrent ankle sprains, however, it is unclear which device gives better results<sup>31–34</sup>.

It has also been questioned whether the shoes can play a role in preventing ankle sprains; however, it appears that there is no effect of shoe design on the risk of ankle sprains. Rather, the newness of the shoe seems to have a greater effect than design on the incidence of ankle sprains<sup>35</sup>.

The best preventative treatment effect will most likely be obtained by a combination of these strategies.

#### CONCLUSION

Ankle injuries, in particular sprains, are one of the most common injuries in handball. The most frequent mechanism of acute ankle injury is landing on the lateral border of the foot, which implies a forced plantarflexion with an anterolateral internal rotational movement. Due to the unreliability of clinical examination immediately after the trauma, it is recommended to re-examine the ankle 4 to 7 days later. The initial phase treatment consists of icing, elastic bandage replaced by a brace after 24 hours and NSAIDs. However, short term positive effects should

be considered on an individual basis, with attention given to the possible side-effects. While ankle injuries without lateral ligament ruptures can be treated solely with functional treatment, ruptured lateral ankle ligaments require 4 to 6 weeks of semi-rigid bracing or taping protection. Early functional treatment should be encouraged, as it has shown an accelerate return to play and a decrease of reinjuries. It consists of walking with a protective brace, proprioception (despite the exact dosage is still unknown) and exercises with a graduated evolution to increasing complexity, functional movements and finally sport-specific activities. The use of physical therapy devices and manual therapy may play a role in ankle injuries rehabilitation, but the scientific evidence is still limited. While lateral compartment sprains are generally treated conservatively, syndesmosis and deltoid ligament lesions deserve attention because surgical treatment may be indicated. Finally, having a previous ankle sprain is a risk factor for a recurrent ankle injury, therefore the role of prevention is significant. In this view, neuromuscular and proprioceptive training, together with taping and bracing, have shown to be effective.

References at [www.aspetar.com/journal](http://www.aspetar.com/journal)

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