TORN ANKLE LIGAMENTS IN ELITE HANDBALL

DOES A PLAYER REQUIRE SURGERY?

– Written by Pieter d'Hooghe, Eric Giza, Umile Longo

Knowledge of the biomechanics of the foot and ankle joints is essential for understanding related handball injuries. The ankle joint (talocrural articulation) is comprised of the distal ends of the tibia and fibula, which form the mortise, and the superior aspect of the talar dome[1]. As a hinge joint, the ankle provides 20° of dorsiflexion (DF) and 50° of plantarflexion (PF)[2], with stabilisation mediated by lateral, medial and superior ligament complexes. The superior articular surface of the talus (trochlea) is narrower posteriorly, which creates a looser fit within the mortise during plantarflexion[1]. This decreased stability could help explain why the most common injury in handball involves a plantarflexion mechanism.

Inferiorly, the talus articulates with the calcaneus to form the subtalar joint. It is at this site that the majority of foot inversion and eversion occurs in elite handball players. The transverse tarsal joint separates the hindfoot from the midfoot. Movement of this joint depends on the relative alignment of its two articulations: the talonavicular and calcaneo-cuboid. During foot eversion, these two joints are aligned in parallel to allow supple motion and to aid in shock absorption during the heel-strike phase of the gait cycle. With foot inversion, the joints are non-parallel, creating the stiff transverse tarsal joint necessary for push-off[1,2].

This article will mainly discuss the surgical considerations of ankle instability in handball players, essentially focusing on mechanical ankle instability.

LATERAL LIGAMENT INSTABILITY

The most common mechanism of lateral ankle ligament injury in elite handball players is the result of combined plantarflexion and inversion motion. This mechanism of injury in lateral ankle sprains occurs through this motion, as the body's centre of gravity rolls over the ankle. Three-quarters of sports-related ankle injuries involve the lateral ligamentous complex, equally in males and females[3,4]. Further, lateral ankle sprains most commonly occur after excessive inversion and internal rotation of the hindfoot while the leg is in external rotation. The anterior talofibular ligament (ATFL) – which is the weakest of the ligaments of the lateral complex – is involved in the majority of lateral ankle sprains, while the calcaneofibular ligament (CFL) is involved in 50 to 75% of such injuries, and the posterior talofibular ligament in <10%.

A combined rupture of the ATFL and CFL is also commonly seen in ankle sprains with more severe inversion. These ligaments provide lateral stability to the ankle joint, which is more complex than a simple rolling hinge joint. As the talus rotates internally and externally within the mortice of the ankle during the joint movements, a single ligament on the lateral aspect of the ankle would not be able to provide stability at all positions of the tibiotalar joint.

Lateral ligament rupture may also cause talar subluxation, resulting in collision between the medial malleolus and medial talar facet, with subsequent articular

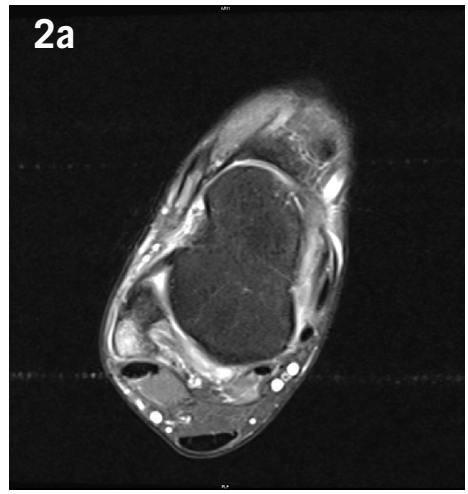

Figure 1: Clinical presentation of a traumatic ligamentous lesion around the ankle. Note the haematoma over the distal fibular area towards the lateral heel.

Figure 2: MRI axial and coronal image. Tear of the calcaneofibular ligament from its fibular attachment with a bony contusion involving the fibular tip. Intact anterior talofibular ligament and posterior talofibular ligament.

cartilage damage and/or bone bruising (Figure 2)[5]. Other injuries associated with ankle inversion injuries include loose bodies, peroneal tendon tears, flexor hallucis longus stenosis, and damage to the superficial and deep peroneal nerves[3,6].

Lateral ligament instability is the most common diagnosis of chronic ankle pathology, with associated subtalar ligamentous injury and functional instability only present in approximately 10% of patients with lateral ankle instability[3]. The posterior talofibular ligament is usually not involved[7].

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 after ankle sprains. 'Laxity' can be defined as a physical sign that is objectively detected by means of clinical examination of the involved joint. In contrast, 'lateral ankle instability' is a symptom that identifies the presence of an unstable ankle resulting from lateral ligamentous injury. A patient with such instability usually describes a subjective feeling of the ankle giving way. Meanwhile, 'chronic ankle instability' is a pathological condition characterised by repeated episodes of instability that result in recurrent ankle sprains.

For many years, there has been widespread debate concerning the optimal treatment of acute lateral ligament injuries. Recently, an evidence-based multidisciplinary guideline was formulated, consisting of recommendations based on formerly published research. The quality of included articles was assessed by epidemiologists on the basis of 'evidence-based guideline development' assessment forms, and classified in order of probative and scientific value. This guideline was then used by experts in the field of sports for a debate on the best treatment for acute lateral ligament injuries in athletes.

Functional treatment is recommended for the majority of patients suffering from an acute lateral ankle ligament injury. However, it seems that, overall, a lace-up brace or semi-rigid brace is preferable. For professional handball players, the use of tape can be considered, although this requires careful application because the risk of complications, such as skin problems, is greater than when a brace or elastic bandage is used. In addition, evidence from many years indicates that most professional handball players do not like bracing because this does not fit within their tight footwear.

It is well known that, among the general population, functional treatment is preferred over surgical therapy. However, in elite handball athletes, surgical treatment can be considered on an individual basis. A personal treatment approach for a handball athlete with an acute lateral ankle ligament injury is advocated, in which a direct anatomic repair of the ruptured ligaments by an expert foot/ankle or sports surgeon may be considered.

Arthroscopic management offers a promising solution for the management of lateral ankle instability. However, the impossibility to address the CFL arthroscopically, the technical difficulty of the run, and the lack of long-term results are relevant obstacles that are yet to be overcome. Nevertheless, arthroscopy can confirm ligamentous instability and reveal the state of the articular surface. It can also help in removing loose bodies, and inspecting and treating osteochondral defects. However, the definitive treatment of lateral instability requires surgical repair of the lateral ligaments[6].

The indications for lateral ligamentous reconstruction include persistent symptomatic mechanical instability and failed functional rehabilitation. Operative treatments for chronic lateral ankle instability can be divided into anatomic repair and anatomic or non-anatomic reconstruction[7]. Anatomic repair of the ATFL using the Bröstrom-Gould modified technique in the presence of CFL insufficiency has been shown to be highly successful, with reports of 93% excellent results at an average of 64-month follow-up[8], 80% excellent or good results at a 6-year follow-up[9] and 91% good to excellent results at a 26-year follow-up[10]. The original procedure consists of mid-substance imbrication and suture of the ruptured ends of the ligament, with good to excellent lesion repair.

The major advantages of this method are its simplicity and small incision size (Figure 3)[11]. The Bröstrom procedure also avoids the use of tendon grafts, maintains normal ligamentous anatomy and preserves physiologic tibiotalar and subtalar motion. The disadvantage lies in the fact that strong repair relies on innate tissue quality[4].

Tenodesis stabilisations can be performed with various types of local tendon graft, without repairing the injured ligaments, but in order to reduce ankle movements. The unfavourable result is an alteration of ankle and hindfoot biomechanics. Various surgical procedures have been described for the management of chronic lateral ankle instability. The first was Elmslie, in 1934, which reported the fascia lata graft for the reconstruction of the lateral ankle ligament complex. Common non-anatomic reconstruction techniques include the Watson-Jones, Evans and Chrisman-Snook procedures.

Watson-Jones first described a tenodesis stabilisation in 1952, by weaving a peroneus brevis graft through the calcaneum and talus. Evans subsequently simplified the procedure by passing the distally-attached peroneus brevis graft through an oblique posterior-superior drill hole in the distal fibula. This construct is not able to replicate the ATFL or CFL, determining the alteration of the hindfoot and ankle biomechanics. The Evans method has been used to augment the Broström repair, effectively negating the advantages of an anatomical procedure that respects biomechanics. Chrisman and Snook described a split peroneus brevis tendon

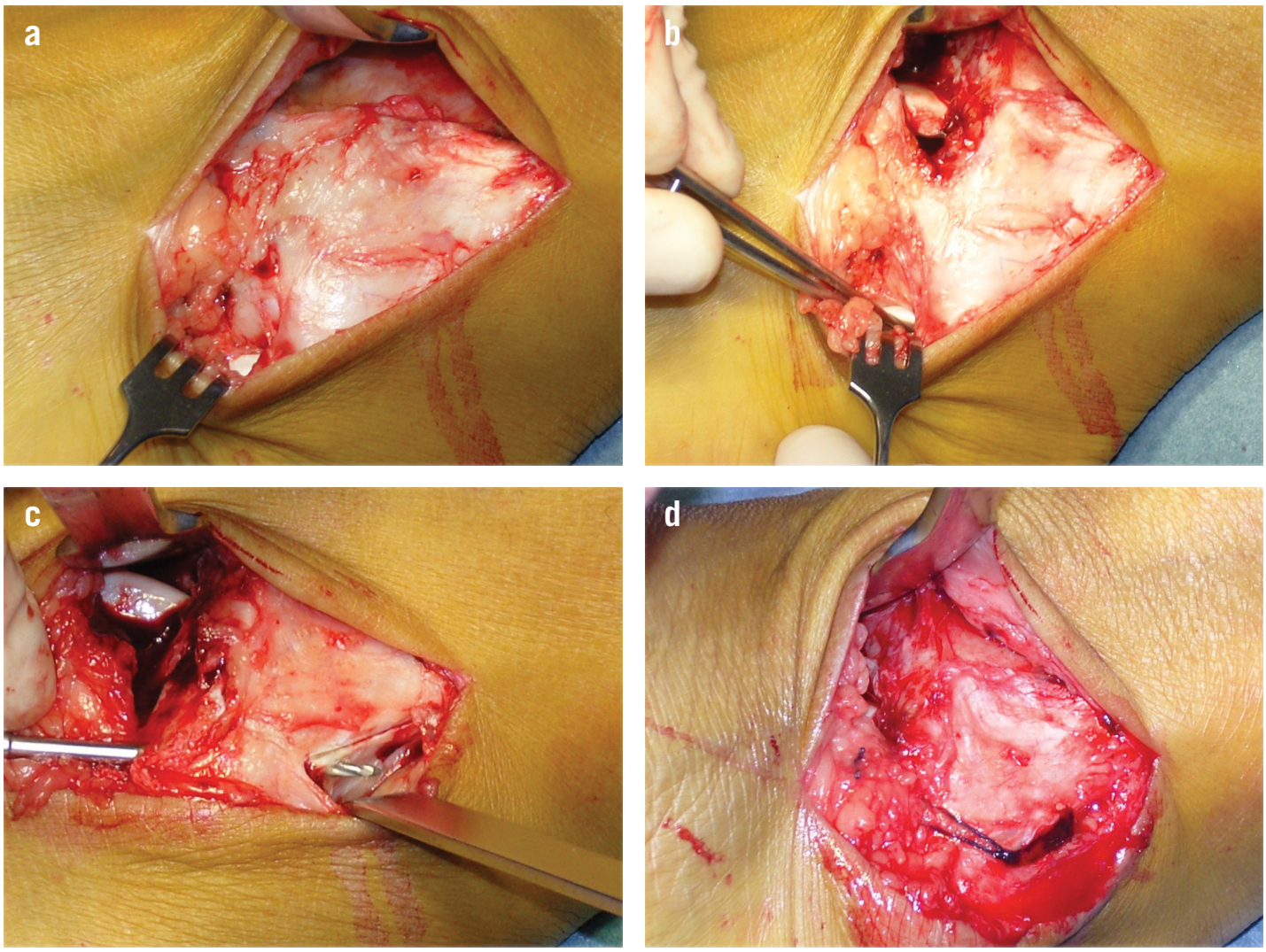

Figure 3: a) Approach to the lateral ligamentous complex of a left ankle. b) Identification of the torn lateral ligament and evaluation of its surrounding structures. c) Bröstrom-Gould technique with two divergent distal fibular drill holes created. d) Presentation of the stabilised lateral ligamentous construct.

> ***Anatomic repair might result in a more stable ankle joint at follow-up, without compromising or delaying return to participation in sports***

graft in order to maintain some function of peroneus brevis and to the ATFL and the CFL anatomy.

Non-anatomic reconstruction permanently changes normal ankle kinematics, resulting in impaired subtalar motion and residual instability. As such, many studies have reported poor long-term results for these procedures[7], and non-anatomic reconstructions should be avoided in elite handball players (because anatomic reconstructions have replaced historic non-anatomic reconstruction techniques)[11]. Anatomic repair might result in a more stable ankle joint at follow-up, without compromising or delaying return to participation in sports. The rehabilitation regimen after direct anatomic repair of the ruptured ligaments is a lower-leg cast for 1 or 2 weeks, followed by 2 to 4 weeks in a bivalve rigid orthesis. Following this, an active exercise protocol with the use of an ankle support is advocated.

In the case of chronic ankle instability, the initial treatment consists of neuromuscular training, thereby optimising lower limb postural control. In addition, treatment consists of restoring active stability by training, which provides good results in a short time. However, if symptoms persist and increased ankle laxity remains present, surgical treatment can be considered.

A Cochrane review by de Vries et al showed that there is insufficient evidence to support one specific superior surgical intervention in the treatment of chronic ankle instability[12]. However, based on Krips's early work on sports activities after surgical treatment of chronic ankle instability, as well as our personal experience, we advocate anatomical reconstruction for chronic lateral ankle ligament laxity in handball players. The rehabilitation regime after anatomic reconstruction for chronic ankle lateral ankle instability is the same as in the acute phase, with a lower-leg cast for 1 or 2 weeks, followed by 2 to 4 weeks in an orthesis. Following this, an active exercise protocol with the use of an ankle support is advocated. Further, it is recommended that the rehabilitation protocol after a surgical intervention for chronic ankle laxity is functional, with early mobilisation of the ankle joint, rather than 6 weeks of immobilisation. This will reduce the time required to return to competitive handball.

Anatomic tenodesis reconstruction using an autograft or allograft augments anatomic repair without compromising lateral ankle anatomy or kinematics. This technique is indicated when poor tissue quality is present, or for revision surgery, and may be an excellent option for high-demand ankles (such as in elite handball) with chronic instability[7]. Colville et al found that 12 of 15 patients available at a 3.5-year follow-up showed radiographically confirmed restoration of mechanical stability[13]. Sammarco et al reported good to excellent results in 29 of 31 ankles (94%) at a mean follow-up of 44 months, using a split peroneus brevis tendon graft for reconstruction[14].

MEDIAL LIGAMENT INSTABILITY

Elite handball players also place high demand on the medial foot and ankle structures because the explosive jumps and torsional landings require a player to abduct and externally rotate the foot, preloading the medial structures. In a prospective study of 54 cases of medial ankle instability, Hintermann et al found that injury to the medial ankle ligaments commonly occurred during landing on an uneven surface[15]. This may apply to handball players in scenarios such as wrong landings or landing on somebody else's foot. Pronation with eversion and extreme rotational injuries are well known to cause deltoid ligament injury, yet most patients can report multiple ankle sprains and be unable to identify a single causal event[16]. Complete deltoid ligament rupture is rare, and is more often associated with ankle fractures. Due to its close proximity and similarly shared function in medial plantar arch stabilisation with the tibiospring and spring ligaments, posterior tibialis (PT) tendon dysfunction is also frequently seen in medial ankle instability[16].

Handball players with medial ankle instability often describe the ankle as 'giving away', especially when walking on uneven surfaces, downhill or down stairs. A history of eversion trauma to the ankle is common. After acute injury, players can present with a medial ankle haematoma and pain along the deltoid ligament[16]. Chronic deltoid insufficiency is diagnosed based on this feeling of 'giving away', pain in the medial gutter of the ankle, and a valgus and pronation deformity of the foot that can be corrected by activating the PT muscle[16]. Tenderness can also be present along the PT tendon and anterior border of the lateral malleolus. The tiptoe test is used to identify PT dysfunction[16].

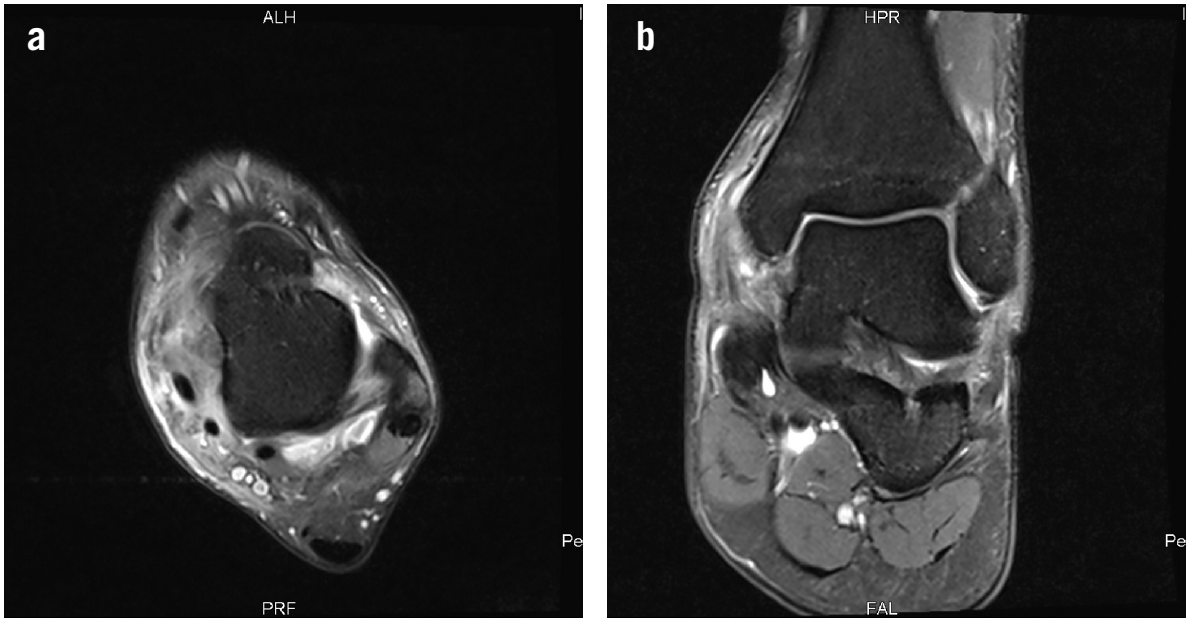

Figure 4: MRI axial and coronal image. There is a complete tear of the superficial component of the deltoid ligament and tear of the deep component from its tibial attachment. Tear of the deltoid ligament with stripping of the flexor retinaculum. Bone contusion involving the medial malleolus.

In handball, isolated deltoid ligament injuries typically recover well via a functional rehabilitation programme, without requiring surgical intervention. Initial rest and bracing should be used until acute inflammation and tenderness resolve. The decision between surgically or conservatively treating the deltoid injury in a combination injury will depend on the severity of the combined lateral ligament, syndesmotic and osseous injuries, and resultant instability (Figure 4). For chronic injuries to the deltoid ligament, non-operative management may be attempted initially. Surgical options are discussed when physical therapy, shoe modifications and other non-operative modalities fail.

Arthroscopy is the most specific way to confirm clinically suspected instability of the medial ankle. Direct intra-articular visualisation with an arthroscope may elucidate or confirm the preoperative diagnosis. however MRI can demonstrate loss of organised medial fibres (Figure 4). In the setting of symptomatic ankle instability with clinically and arthroscopically confirmed medial ankle instability, surgical exploration of the medial ankle ligaments should be performed[16]. Primary surgical repair of deltoid ligament tears yields good to excellent results and should be considered for handball players in order to prevent the problems associated with chronic non-repaired tears, such as instability, osteoarthritis and impingement syndromes[15,16]. Additional procedures may be necessary, such as posterior tibial tendon debridement or repair, calcaneal lengthening osteotomy or reconstruction of lateral ankle ligaments[15].

The usual open approach to the medial deltoid ligament employs a longitudinal curving incision along the course of the posterior tibial tendon, first incising the laciniate ligament. The superficial deltoid ligament may be inspected anteriorly. The posterior tibial tendon is directly visualised and inspected, then retracted to allow exposure of the underlying deltoid and spring ligament complex. Repair or reattachment of the ligament is frequently possible with the use of proper suture materials – with or without anchors – even in chronic cases. When direct repair is not possible, autograft or allograft tendon for reconstruction have been employed. When appropriate, midfoot and hindfoot realignment osteotomies should be considered to protect the repaired or reconstructed deltoid ligament in an advantageous mechanical position.

Medial ankle impingement is less common than its anterior and posterior counterparts. The location may be anteromedial or posteromedial, and caused by injury or irritation to the superficial or deep components of the ligament, respectively. For cases with refractory to conservative management, surgical treatment with arthroscopy or small arthrotomy may be indicated.

Degenerative changes and ossicles at the medial malleolar tip are a relatively common finding – as high as 4.6% in the series reported by Coral. Early arthritic changes involve a sharpening of the tip of the medial malleolus from its rounder, native shape. Avulsion injuries of the superficial deltoid from the anterior colliculus may contribute to inframalleolar ossicle formation. An accessory ossicle, called an 'os subtibiale', is a potential source of misdiagnosis for acute or chronic avulsion injuries. Further imaging investigation, such as CT, MRI or single photon emission CT, can help determine the possible donor site for an avulsion injury and the contribution of the ossicle to the patient's symptoms.

SYNDESMOSIS INSTABILITY

Handball players may have increased risk of syndesmotic sprains due to foot planting and cutting actions[17]. Acute syndesmotic injury occurs when the fibula is pushed away from its distal articulation with the tibia. This has been described to occur through several possible mechanisms,

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including external rotation of foot, eversion of the talus and ankle dorsiflexion[18]. Chronic injury can occur through instability that causes shear stress on the ankle joint, with eventual ankle arthritis[17].

Syndesmotic injury is diagnosed though several physical exam findings, including pain with palpation of the anterior inferior tibiofibular ligament (AITFL), external rotation of the foot or dorsiflexion of the foot. Proximal extension of pain indicates involvement of the underlying interosseous membrane, with potential for more serious injury. Patients often walk with a heel-raised gait, thereby maintaining the foot in plantarflexion to avoid pain during push-off. An antalgic gait can also be observed, in which the patient displays a shortened stance phase, relative to swing phase, to minimise the pain felt when weight-bearing. The injury is associated with minimal swelling, which can lead to misdiagnosis of a common ankle sprain[16,17].

Importantly, the deltoid ligament can be associated with syndesmotic sprain because they share similar external rotation and eversion mechanisms of injury[17]. Increased swelling, pain with palpation, ecchymosis over the medial ankle, and greater than 4 mm widening of the syndesmosis on plain films may be indicative of deltoid ligament involvement[19]. The special clinical tests used to diagnose syndesmotic injury (which are also helpful in deciding for or against surgery) include the external rotation test, squeeze test, crossed-leg test, Cotton test (Figure 5), point test, dorsiflexion manoeuvre and one-legged hop test[17]. It is also advisable to always check the proximal fibula for Maisonneuve-type injuries.

Imaging for syndesmotic injury starts with anteroposterior (AP), lateral and mortise ankle radiographs to rule out ankle fracture. Two measurements made 1 cm above the tibia plafond are used to evaluate the integrity of the syndesmosis, tibiofibular clear space and tibiofibular overlap[16,17]. Tibiofibular clear space greater than 6 mm and tibiofibular overlap less than 1 mm indicate a disrupted syndesmosis[20]. MRI is indicated for syndesmotic injuries because it has high sensitivity and specificity (Figure 6)[21]. It can reveal secondary findings such as bone bruises, ATFL injury, osteochondral lesions and tibiofibular joint incongruity[22]. Finally, arthroscopy has been shown to be a diagnostic tool for syndesmotic injury, with the characteristic triad finding of posterior inferior tibiofibular ligament (PITFL) scarring, disrupted interosseous ligament and posterolateral tibial plafond chondral damage[23]. While there is currently no consensus regarding the optimal management of a syndesmotic injury[24], classification of the ligaments involved can aid in the selection of appropriate treatment.

Grade I involves AITFL tears; grade IIa involves AITFL and interosseous ligament tears; grade IIb includes AITFL, PITFL and interosseous ligament injury and grade III involves injury to all three syndesmotic ligaments, as well as fibula fracture. Conservative treatment is recommended for grades I and IIa. For grade I sprains without instability and only partial disruption of the AITFL, the maximum management entails immediate rest, ice and immobilisation in a pressure bandage or compression-cooling system. Rehabilitation can be initiated, using players' pain complaints as a guide. If the ankle is very painful because of concomitant injuries, immobilisation in a cast or non-weight-bearing boot for 5 to 7 days can be considered to allow the acute inflammation and swelling to subside.

Partial weight-bearing commences when pain complaints have subsided, or approximately 7 to 14 days post-injury, as tolerated and active assisted physiotherapy concentrating on a range of motion and light proprioception exercises are instituted. Progression to the next phase is also with the player's complaints as the guide. Full weight-bearing, as tolerated, strength training and proprioception are emphasised and, thereafter, sport-specific functional handball exercises can begin. Toe standing and light running are commenced initially, increasing to toe running and single-leg hopping. A sign of a healing syndesmosis is the ability to repeatedly single-leg hop. A return to sporting activity is permitted when the player is able to single-leg hop for 30 seconds without significant pain. The time to pain-free full recovery is variable.

Surgical intervention is indicated for grades IIb and III syndesmotic injuries. These injures take twice as long to heal as other ankle sprains[18]. Hopkinson et al reported a mean recovery time of 55 days following syndesmosis injury in cadets

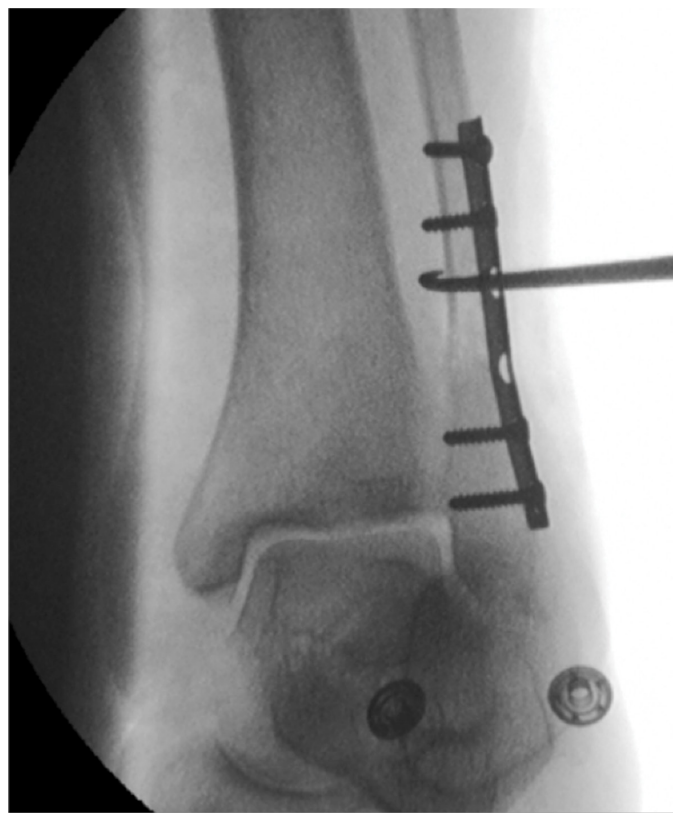

Figure 5: Anteroposterior X-ray of an intraoperative Cotton test.

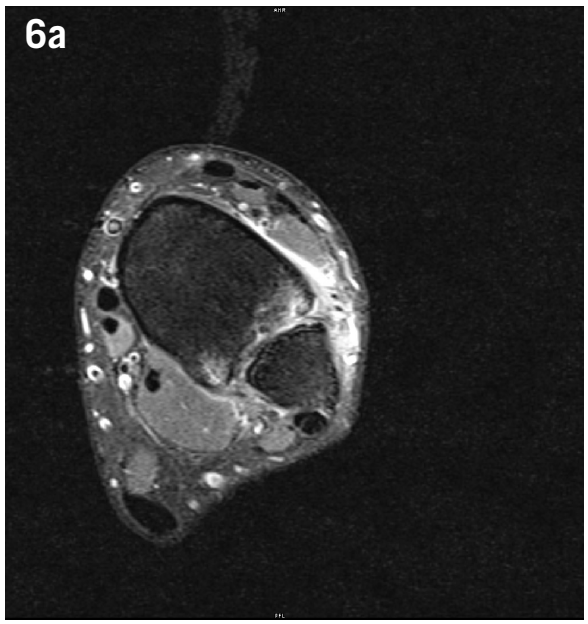

Figure 6: MRI axial and coronal image. There is complete rupture of the anterior inferior tibiofibular ligament with bone marrow oedema at the tibial attachment (tibial avulsion). There is also a complete rupture of the posterior inferior tibiofibular ligament and transverse ligament.

Figure 7: Arthroscopic image of intra-operative syndesmotic instability assessment, using a 5.5 mm shaver blade.

Figure 8: Anteroposterior X-ray of a syndesmotic screw fixation.

at the United States Military Academy at West Point[25]. Grade II injuries are varied, and decision-making can be difficult to determine between a grade IIa and IIb lesion. A recreational handball player without diastasis can be treated non-operatively with good results, as discussed above. However, prolonged time to return to sports is expected, and patients must be told this. For professional handball players with a grade II injury and clinical suspicion of dynamic instability, we recommend an examination under anaesthesia, and arthroscopy with assessment of the syndesmosis. Dynamic diastasis of 2 mm or more warrants fixation. Postoperative CT scanning is indicated in some cases where an accurate reduction is a concern.

Grade III injuries are uncommon among professional handball players and are often associated with other injuries around the ankle. An arthroscopy prior to fixation can identify intra-articular pathology, and address this pathology if present (Figure 7). Historically, the most commonly used surgical technique is syndesmotic screw fixation. This technique is indicated if there is a laterally displaced fibula or significant mortise widening, with positive lateral radiography and external rotation stress test[26]. Lateral talus subluxation greater than 1 mm is also an indication for screw fixation, which is suggested to assure reduction and stability of the ankle mortise (Figure 8)[27]. Unfortunately, there is no consensus regarding optimal screw size, level of placement or timing of removal; therefore, other devices for fixation (such as Tightrope) are also being used[28–30]. Since malreduction is the most important indicator of poor long-term functional outcome, any surgical device that offers adequate fixation should be considered for the treatment of handball players. Surgical intervention is also recommended in the presence of persistent pain following syndesmotic injury due to the development of anterior impingement syndrome (Figure 9) and heterotopic ossification[17].

Postoperatively, the ankle is treated in a non-weight-bearing splint for 10 days to 2 weeks to allow wound healing and resolution of inflammation. Rehabilitation should be gradual and pain-free, starting

with low-level balance training, then progressing to double-leg heel raises, single-leg heel raises, walking, fast walking, jogging, cutting and finally sport-specific training[17]. Range of motion is regained first with early proprioception training and partial weight-bearing at 3 to 4 weeks postop. Full weight-bearing is commenced at 4 weeks, as tolerated, and strength training is continued. Return to running and high-impact activity is commenced after 8 weeks, as dictated by rehabilitation progress and resolution of pain. Screw removal is optional and depends largely on the surgeons' preference. Handball players are able to return to their elite competitive level after an average of 4 months following an initial grade IIb or III syndesmotic injury.

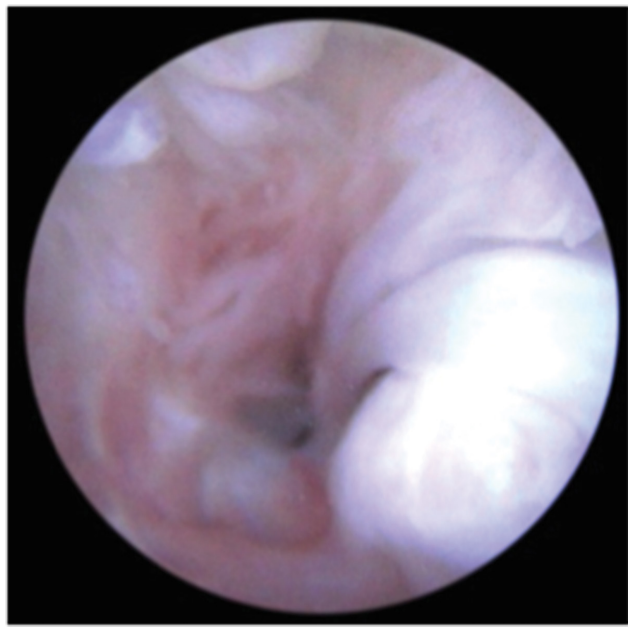

Figure 9: Arthroscopic image of antero-lateral soft tissue syndesmotic impingement.

Chronic syndesmosis injuries usually do not respond to conservative treatment methods, and require surgical intervention. These surgical interventions include arthroscopic debridement, screw fixation, anatomical reconstruction of the syndesmotic ligaments or an arthrodesis. A recent meta-analysis found that none of these surgical treatment modalities is superior, with success rates for screw fixation, arthrodesis and arthroscopic debride-ment of 88, 80 and 78%, respectively[31]. Most studies published used screw fixation as the surgical intervention. It is noteworthy that the rates of success of this procedure are not significantly affected by gender, age, average follow-up, mean duration of symptoms or the method in which the diagnosis was initially set[31]. We feel that, in cases where syndesmotic pain – rather than functional syndesmotic instability – is the key complaint (syndesmotic impingement), an arthroscopic debridement can be successful as the sole treatment. In all other cases, an arthroscopy is useful to inspect the ankle joint and treat concomitant intra-articular pathology, however, surgery should really consist of a ligament reconstruction technique or an arthrodesis of the distal tibiofibular joint.

SUPERIOR PERONEAL RETINACULUM INJURY

The superior peroneal retinaculum (SPR) forms the roof of the superior peroneal tunnel. The tunnel contains the peroneus brevis and longus tendons, and is bordered by the retromalleolar groove of the fibula and lower aspect of the posterior intramuscular septum of the leg[32]. Injury to the retinaculum results from ankle dorsiflexion, inversion and forceful reflex contraction of the peroneal muscles that might cause subluxation or dislocation of the contained tendons. Since these patients present with similar injury mechanisms as simple lateral ankle sprains, the clinician must maintain high suspicion for peroneal tendon injury, especially in the presence of retrofibular pain, snapping or popping sensations about the lateral malleolus, or chronic ankle instability that worsens on uneven surfaces.

SPR injury can be divided into three grades[33]. A grade I injury involves SPR separation from its periosteum origin at the lateral malleolus, leading to anterior displacement of the peroneal tendons about the fibrocartilagenous ridge. In a grade II injury, the fibrocartilagenous ridge is stripped with detached SPR. A grade III injury involves both SPR detachment and fibrocartilagenous ridge stripping, as well as osseous fibular fragmentation. MRI is the best imaging modality to assess peroneal tendon and SPR pathologies, although ultrasound may be more useful in revealing an episodic subluxation. Conservative management is often associated with poor outcomes, and surgery is indicated for all acute and chronic dislocations in elite handball players[33]. Anatomic reconstruction of the SPR is the preferred surgical method. Peroneus brevis debulking and fibular groove deepening may also augment retinaculum repair[34].

> ***Bröstrom-Gould anatomic repair can be considered the most successful surgical procedure, especially for an explosive impact sport such as elite handball***

CONCLUSION

The major cause of ligamentous ankle lesions in elite handball players involves plantarflexed and inversion ankle movements. Due to the decreased stability in that postural position, and due to sport-specific cutting actions, severe inversion/eversion injuries can occur. Acute lateral ankle injury must be initially managed with functional treatment. A short immobilisation period should be followed by proprioception training to obtain full recovery of ankle function. When chronic lateral ankle instability occurs (following repeated episodes of ankle sprains) and/or when functional rehabilitation fails, surgery is required. Bröstrom-Gould anatomic repair can be considered the most successful surgical procedure, especially for an explosive impact sport such as elite handball.

A non-anatomic repair is indicated in cases in which previous anatomic repair has failed. Arthroscopic management offers a promising solution for the management of ligamentous ankle instability, however, the impossibility of addressing the CFL arthroscopically and the lack of long-term results are relevant obstacles that are yet to be overcome.

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Pieter d'Hooghe M.D.
Orthopaedic Surgeon
Aspetar – Qatar Orthopaedic and Sports Medicine Hospital
Doha, Qatar

Eric Giza M.D.
Dept of Orthopaedic surgery
University of California at Davis
Sacramento, USA

Umile Longo M.D.
Dept of Orthopaedic surgery
University of Roma, Italy