Anterior ankle impingement in sports
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Ankle impingement syndromes are classified by their anatomical location around the tibiotalar joint and further sub-classified into either bony or soft tissue impingements (Hess, 2011; Russo et al., 2013). The five types of impingements described in the literature are: anterior, antero-lateral and antero-medial, posterior and postero-medial ankle impingements. The following paragraphs will review the underlying causes, symptoms and signs, rehabilitation and imaging of anterior and antero-medial ankle impingements.

The anterior ankle impingement syndrome

Anterior ankle impingement can occur in athletes playing sports that put repetitive dorsi- or plantarflexion loads on the ankle such as soccer, long distance running, ballet, basketball or gymnastics (Hess, 2011; Murawski & Kennedy, 2010). Morris, LH first described this condition in 1943 when he reported excessive bone formation on the proximal surface of the neck of the talus in 5 athletes suffering from anterior ankle pain. He concluded the condition was caused by a traction trauma to the anterior joint capsule of the talocrural joint and referred to it as an athlete’s ankle (Morris, 1943). In 1950 McMurray added to Morris’s findings by describing a bony outgrowth extending forward from the anterior surface of the tibia, at the capsular attachment of the talocrural joint. He reported these findings in 6 soccer players and renamed the condition a footballers ankle. He hypothesized that these bony spurs were caused by repetitive traction of the anterior joint capsule of the talocrural joint and formed as a result of repetitive ankle plantarflexion after repeatedly kicking a football (McMurray, 1950). In 1957 O’Donoghue challenged this “traction spurs” theory with findings of osteochondral masses along the anterior joint margin, proximal to the capsular attachment (O’DONOGHUE, 1957). This placement of osteochondral formation undermined the “traction spurs theory” which has had further criticism based on conclusions from an anatomical study of the ankle joint conducted by Tol in 2004 (J. L. Tol & van Dijk, 2004). This ankle pathology
is now commonly known as an anterior ankle impingement syndrome (Donley & Leyes, 2001; Murawski & Kennedy, 2010; Johannes L Tol, Slim, van Soest, & van Dijk, 2002).

Current concepts of injury mechanisms behind the development of osteophytes and soft tissue abnormalities at the anterior tibiotalar joint are three. These concepts all suggest that chronic damage to the chondral surfaces of the anterior tibiotalar joint lead to spur formations. The first concept describes osteophyte formation secondary to instability of the ankle joint following an inversion trauma. Another possible cause suggested is repeated direct micro trauma to the anterior tibiotalar joint such as possibly occurs when kicking a football (Johannes L Tol et al., 2002). The third injury mechanism associated with these joint abnormalities is repeated dorsiflexion trauma to the tibiotalar joint causing stress on the anterior tibiotalar joint line (Donley & Leyes, 2001; J. L. Tol & van Dijk, 2004). Although these spur formations are seen in patients with symptomatic anterior impingement syndrome they are also seen in the asymptomatic population and therefore are not hypothesized as being the primary cause of pain. The primary pain producing structures are believed to be the anterior soft tissue structures of the talocrural joint. The osseous spurs are believed to lead to impingement either by reducing the width of the joint space and causing impingement of the soft tissue or simply by enhancing pressure on already painful soft tissue structures (Tol, 2004; Tol, 2002).

Clinical symptoms and signs of an anterior ankle impingement are subjective complaints of pain at the anterior ankle, catching, blocking and painful limitation of ankle dorsiflexion. This reduces patient’s functional abilities and patients commonly describe limitations in activities involving ankle dorsiflexion, such as walking up hills or stairs, jumping, sprinting or squatting. Athletes will often describe troubles with landing from jumps and problems with “driving off”. Pain and swelling usually increases with activity and symptoms are relieved with rest (Slater & O’Malley, 1999; J. L. Tol, Verheyen, & van Dijk, 2001). Objective signs are swelling at the anterior ankle joint, palpation soreness over the neck of the talus or distal tibia and a painful limitation of passive dorsiflexion (Donley & Leyes, 2001; J. L. Tol et al., 2001). Often these findings are accompanied by functional instability of the ankle (Hess, 2011).
The anteromedial ankle impingement syndrome
Anteromedial impingement is a relatively new clinical diagnosis and is becoming more widely recognized in the literature (Chilvers, Donahue, Nassar, & Manoli, 2007; Robinson, White, Salonen, & Ogilvie-Harris, 2002). It was first described in 1997 with a case report describing a finding of an anteromedial meniscoid lesion during surgery (Egol & Parisien, 1997). Since then studies have reported findings of soft tissue abnormalities at the anteromedial tibiotalar joint, such as synovial thickening (Robinson et al., 2002) or thickening of the anterior tibiotalar fascicle of the deltoid ligament (Mosier-La Clair et al., 2000). These studies have also found a combination of osteophytes and soft tissue changes at the anteromedial tibiotalar joint causing the impingement (Mosier-La Clair et al., 2000; Robinson et al., 2002). In 1997, Egol hypothesized that the lesion was a result of an eversion trauma (Egol & Parisien, 1997), however this hypothesis was not based on any sound evidence, purely a description of injury from the patient. There has been a shift in believes since then and the impingement is now thought to be a relatively uncommon side effect of an inversion injury with a possible rotational component that leads to damage of the anteromedial joint capsule and ligaments (Mosier-La Clair et al., 2000; Robinson et al., 2002; Russo et al., 2013). These soft tissue abnormalities are hypothesized as being caused by repeated micro-trauma to the joint by the same injury mechanisms as discussed above for the anterior impingement (Russo et al., 2013). The syndrome is particularly seen in sports that cause high impacts on the ankle with the highest suspected occurrence rate in young gymnasts. Other sports that have documented cases of anteromedial impingements syndrome include basketball, soccer and cross-country running (Vann & Manoli, 2010).

Clinical signs of anteromedial ankle impingement are similar to those seen in the anterior impingement syndrome. However there are some key differences that help differentiate between these syndromes. The main difference subjectively is that patients suffering from anteromedial ankle impingement complain of pain on the anteromedial side of the ankle. Objective assessment findings differ from the anterior impingement in two ways. The first is that the location of palpation soreness is over the anteromedial tibiotalar joint where a talar osteophyte may often be palpable (Manoli, 2010; Murawski &
Kennedy, 2010; Robinson et al., 2002). The other finding is a painful reduction in supination as well as dorsiflexion (Robinson et al., 2002).

**Treatment of anterior impingement syndromes**

Conservative management is considered the first line of treatment for anterior ankle impingement syndromes. The literature suggests a trial of conservative treatment ranging between 3 and 6 months (Hess, 2011) and that treatment consists of rest, non-steroidal anti-inflammatory medication, physiotherapy and possibly intra-articular steroid injections (Donley & Leyes, 2001). Despite this being the first line of treatment, there is a lack of studies looking at conservative management for these conditions. It is therefore not surprising that non-operative management is often reported to be ineffective (Donley & Leyes, 2001). The physiotherapy management approaches described in the literature are directed toward increasing functional stability of the ankle joint and aim to decrease micro-traumas occurring at the tibiotalar joint during weight bearing movements (Hess, 2011). Offloading the anterior tibiotalar joint structures with a heal lift is also recommended in the initial stages (Donley & Leyes, 2001). If conservative management does not yield any results, an arthroscopic surgery is performed to alleviate the impinging structures. Arthroscopy has shown good results in this patient group with a high rate of athletes getting back to their former athletic activity levels (Donley & Leyes, 2001; Vann & Manoli, 2010). Physiotherapy plays a big role in rehabilitation in the postoperative stage for this condition. Murawski and Kennedy (2010) recommend that physiotherapy should be implemented 1 week or 10 days post surgery and further suggest that return to sport specific training can commence at 2 weeks post operatively (Murawski & Kennedy, 2010). Physiotherapy intervention is aimed at restoring ankle dorsiflexion range, ankle proprioception, muscle strength and endurance around the ankle joint (Donley & Leyes, 2001). It is extremely important that the rehabilitation programs are sports specific, addressing the skills needed for full return to the athlete’s particular sport. The literature suggests that full return to sports can be expected about 6 weeks post surgery. This timeframe can however vary between individuals and sport, depending on how demanding it is on the ankle joint (Donley & Leyes, 2001).
The role of imaging
The role of imaging for anterior ankle impingement is primarily to confirm the clinical diagnosis of impingement and rule out other possible pathologies such as talar stress fractures, osteochondritis dessicans or loose bodies (Haller et al., 2006; Vann & Manoli, 2010). Plain radiographs are useful in detecting and assessing the extent of osteophytes at the tibiotalar joint. MR imaging can give additional information regarding the synovium, ligamentus and capsular structures even thought MR imaging is not thought to be necessary in many cases (Haller et al., 2006; Robinson et al., 2002).

Conclusion
The anterior ankle impingement syndrome has been recognized as a clinical entity since 1943. Since then the concepts regarding injury mechanism, sources of symptoms, classifications and treatment have been evolving and are still today not fully understood. Further understanding might help guide conservative management, which is reported as first treatment implemented but often stated as unsuccessful. Furthermore, there are no high quality studies to be found that look at specific physiotherapy interventions for these conditions although physiotherapy is suggested as a first treatment choice. Arthroscopic surgery has been extensively studied and shows good result. However it should be considered that complications such as damage to neurovascular tissue, loose body formation, damage to articular cartilage and infection are among possible complications reported in the literature (Donley & Leyes, 2001). Even though there has been much progress concerning our understanding of these conditions, further research is needed to improve management and define the role of physiotherapy as a primary treatment method.
References