Diagnostic guidelines for chronic ankle pain. From loose bodies to joint venture
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Introduction
and
Aim of this thesis
**Introduction**

**Chronic ankle pain**

Inversion sprains of the ankle and ankle fractures are common injuries. In 2002, in The Netherlands, 78,000 patients presented at hospital emergency departments with ankle injuries, 59% of which were treated for an inversion sprain.\(^1\) In more than 40% of cases the injuries were sports-related. Most patients with sprains of the lateral ligaments are young working adults.\(^1\) These patients place a large demand on the healthcare system and are often temporarily disabled due to the ankle injury. This leads to higher healthcare costs and loss of productivity. Although most patients go on to an uncomplicated recovery, those who continue to have pain in the ankle and hindfoot can present a diagnostic problem.\(^2\) This is known as chronic ankle pain.

**Causes of chronic ankle pain**

The causes of chronic ankle pain can be divided into three main groups: intra-articular, extra-articular, and peri-articular (Table). Nowadays most intra-articular conditions can be treated by means of an arthroscopic procedure. In the past extra-articular and peri-articular causes were not an indication for arthroscopy, however currently tendonitis, os trigonum syndrome, and subtalar pathology can all be treated by soft tissue endoscopy.\(^3-10\)

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* TA = Tibialis Anterior tendon  |
  | TP = Tibialis Posterior tendon  |
  | FHL = Flexor Hallucis Longus tendon  |
  | Per = Peroneal tendon  |
**Impingement**
The most important cause of residual ankle pain is impingement. This can be divided into bony or soft tissue impingement.

**Bony impingement**
Anterior impingement spurs in the ankle were first described by Morris in 1943, and later by McMurray and O'Donoghue. Anterior bony impingement is a common cause of chronic pain in the ankle, especially in athletes. It is a clinical diagnosis, caused by anteriorly located bony impediments. It is characterized by anterior pain, aggravated by repetitive movements, and restricted dorsiflexion. Physical examination reveals pain on palpation over the anterior aspect of the ankle joint with recognition of the pain. The differentiation between anterolateral and anteromedial impingement is generally accepted. Standard AP and lateral radiographs are used to detect the presence or absence of osteophytes. In patients with anterior talar and/or tibial spurs, these spurs are regarded as the cause of the anterior bony impingement syndrome. Due to their location they can lead to the “kissing” phenomenon and concomitant pinching of hypertrophic synovial tissue. This results in a limited dorsiflexion with associated symptoms of impingement.

Although it is a recognized clinical diagnosis, some authors state that additional diagnostic evaluation is necessary to differentiate between symptomatic and asymptomatic lesions. Bone scans may show increased uptake in the area of impingement in symptomatic lesions, while computed tomography (CT) can be helpful to determine the precise anatomical location and medial and lateral extent of the osteophyte preoperatively.

In ankles with no severe osteoarthritic changes, arthroscopic treatment of the anterior impingement syndrome has produced good results.

**Soft tissue impingement**
The clinical diagnosis of soft tissue impingement is one of exclusion. In patients with clinical signs of an anterior ankle impingement syndrome and no visible osteophytes on radiography, the diagnosis of anterior soft tissue impingement syndrome is made. Similar symptoms can occur in chronic ankle instability, peroneal tendon tears or subluxations, sinus tarsi syndrome, stress fractures, loose bodies, osteochondral lesions, bony impingement, and degenerative joint disease. Patients with the soft tissue impingement syndrome present with anterolateral ankle pain and tenderness after sprains, fractures, or surgery. Other clinical signs include exacerbation of the pain on dorsiflexion and an effusion.

An magnetic resonance imaging (MRI) finding of an abnormal soft tissue structure within the anterolateral ankle gutter, as distinct from the anterior tibiofibular ligament and chondromalacia of the talus, suggests the diagnosis of anterolateral soft tissue impingement. The predictive outcome in treating synovial impingement may be compromised when...
documented ankle instability is present. Therefore, it is recommended that patients with associated chronic ankle instability should have ankle ligament reconstruction as their initial treatment.26

If in patients with clinical signs of an anteromedial ankle impingement syndrome, routine radiographs show no abnormalities, a soft tissue impediment can be expected. However, it has been demonstrated that in the majority of these patients an anteromedially located osteophyte can be present.30 The reason being that in the standard lateral projection anteromedial osteophytes remain undetected due to superposition or overprojection of the more prominent anterolateral border of the distal tibia.19

Several authors have stated that surgical distinction between normal variant bony and soft tissue and pathological conditions is difficult, due to subtle variations in joint anatomy.31,32 Anteromedial bony spurs are often poorly visualized at arthroscopy and can be easily missed particularly in patients with accompanying secondary synovial reflections overlying the concealed osteophytes.33 As radiographic classification of the spur formation has proven to be correlated with the outcome of surgery, detection of these osteophytes is important for a precise diagnosis, defining a treatment plan, the peroperative procedure and the final outcome.11,19,34,35

Osteochondral lesion

Another important cause of residual pain after an ankle sprain is osteochondral lesion of the talus (OLT). It is defined as the separation of a fragment of articular cartilage, with or without subchondral bone.36-38 The incidence of OLT after an ankle sprain is probably underestimated because these lesions often remain undetected. The incidence has been reported to be as high as 6.5% after ankle sprains.39,40 OLTs most frequently occur in young adults with a nearly equal distribution between the sexes. In the acute situation, symptoms depend on the amount of damage to the peri-articular tissues and the involvement of afferent pain fibres in the subchondral bone.

Figure Arthroscopic view of 42-year old man with persistent ankle pain after ankle sprain.
A. Posterolateral osteochondral lesion of talar dome with loose fragment
B. Same lesion after removal of loose fragment, curettage and drilling
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Usually, the lesion is located in the anterolateral or posteromedial aspect of the talar dome. Histologically the medial and lateral lesions are identical, but morphologically they differ. The lateral lesions are shallow and more wafer shaped, indicating a shear mechanism of injury. In contrast, medial lesions are generally deep, cup shaped, and located posteriorly, indicating a mechanism of torsional impact.\textsuperscript{36,41} From the aetiological point of view, trauma is the most common cause of OLT, but idiopathic osteonecrosis may often be the underlying pathological process. In the literature the latter has been associated with alcohol abuse, use of steroids, endocrine disorders and some hereditary conditions.\textsuperscript{40,42-47}

Although initial symptoms may be absent, in chronic cases most patients present with intermittent pain located deep in the ankle joint which increases on weight bearing. On physical examination signs are often lacking. A discrete limitation of range of motion with some synovitis may be present. Local tenderness on palpation with recognition is absent in most cases. Since there are no specific pathognomonic signs or symptoms, it is of key importance that the examining physician and radiologist are aware that an osteochondral lesion could be present. The frequent absence of radiographic changes on conventional radiography has led to the use of more sensitive methods for detection.\textsuperscript{48,49} Radiouclide bone scanning,\textsuperscript{50} CT,\textsuperscript{51-53} MRI,\textsuperscript{43,54-57} and diagnostic arthroscopy\textsuperscript{58} have been used to assess the ankle joint for osteochondral lesions.

There have been no reports on the accuracy of CT arthrography for detection of osteochondral lesions in the ankle. However, case reports suggest that CT arthrography may be a useful tool for assessing the stability of osteochondral lesion.\textsuperscript{59}

Nevertheless prospective studies that compare the efficacy of these modalities in the evaluation of osteochondral lesions are still absent.\textsuperscript{60}

Loose bodies

Chondral and osteochondral loose bodies of the ankle joint are often caused by trauma (ankle sprains and fractures of the ankle and talus), degenerative and posttraumatic osteoarthritis, osteochondral lesion of the talus, and synovial chondromatosis. Loose bodies are not as common in the ankle as in the knee and elbow.\textsuperscript{61} Loose bodies may cause locking, catching, swelling, pain, and decreased range of motion as they float freely within the joint. These symptoms can be intermittent because the loose bodies may become fixed to the synovium and are therefore asymptomatic, only to recur when the chondral or osteochondral fragments come loose. Physical examination is usually unremarkable. Rarely is there any specific area of tenderness or a palpable loose body. Nowadays, radiographs are still the modality of choice when a loose body is suspected on clinical grounds. However, the false positive rate is quite high. Lesions that appear to be loose bodies on standard radiographs may actually be intracapsular, or extra-articular in location, particularly in the posterior ankle joint compartment.\textsuperscript{32}
If additional imaging is requested CT is the modality of choice. CT arthrography can help detect intra-articular loose bodies.\textsuperscript{62} On MRI loose bodies are sometimes difficult to identify, but in MR arthrography the detection of intra-articular loose bodies is improved due to the high contrast and joint distension.\textsuperscript{63}

**Osteoarthritis**

A noteworthy characteristic of the ankle is its resistance to osteoarthritis. This observation is reinforced when the incidence of osteoarthritis in the ankle is compared with that of the hip or the knee, but ankle osteoarthritis is still a fairly common sequela of traumatic injuries.\textsuperscript{64} Diagnosis is by definition made by standard AP and lateral weight-bearing radiographs. The severity of the osteoarthritic changes of the ankle can be classified.\textsuperscript{16}

Operative arthroscopy for osteoarthritis of the ankle has not been successful.\textsuperscript{12,65} Arthroscopic debridement does not offer a cure for all forms of degenerative joint disease of the ankle. However, it does alleviate symptoms in many patients and seems to resolve symptoms permanently in some cases of degenerative arthritis.\textsuperscript{66}

**Diagnostic modalities in chronic ankle pain**

There are multiple imaging options for the assessment of chronic ankle pain, including stress radiography, radionuclide bone scanning, ultrasound, CT, MRI, and injection procedures. Injection procedures for assessment include arthrography, CT arthrography, MR arthrography, and diagnostic injection with anaesthetics.

The first and most important steps in the preoperative diagnostic process are history taking, physical examination, combined with standard AP and lateral weight bearing radiographs.\textsuperscript{67} Most research on additional diagnostic imaging for chronic ankle pain has focused on the accuracy of one imaging method for specific conditions. Only a few studies have compared imaging methods for a specific condition.\textsuperscript{68} There have been no studies comparing imaging methods for the assessment of chronic ankle pain of uncertain aetiology. For example there have been no studies specifically addressing the value of plain films in the assessment of chronic ankle pain.\textsuperscript{68} However, plain films are routinely obtained as the first option to exclude arthritis, infection, fracture, or neoplasm. Because there are many different tests available for use in diagnosing ankle and foot problems, they must be used judiciously. Therefore, a keen understanding of the indications and limitations of each diagnostic test is mandatory. At present no single test clearly stands out as superior for foot and ankle problems.

The diagnostic modality of choice depends not only on effectiveness, but also on availability and costs. Generally in medical practice there is a growing awareness of the need for practice guidelines for diagnosis and treatment of disease. This is also true of orthopaedic surgery. To address this need for practice guidelines a prospective study was designed at the Academic Medical Center in Amsterdam, The Netherlands.
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Questions that remain
Reviewing the literature reveals that most studies concerning chronic ankle pain are retrospective and non-comparable. Nor have there been studies in which different diagnostic modalities are prospectively compared with particular reference to their accuracy. Healthcare finances play an important role and the diagnostic modality used depends not only on effectiveness (accuracy), but also on costs of that modality. This has led to evidence based algorithms ('evidence based medicine').

Although there are existing orthopaedic and radiological guidelines for chronic ankle pain, improvements in CT and MR imaging and an ever-expanding armoury of therapeutic options require that these guidelines be continuously updated.

Aim of this thesis
The aim of this thesis is to develop evidence based guidelines for diagnosis of patients with chronic ankle pain, especially osteochondral lesions of the talus.

In Chapter 2 the prevalence and incidence of ankle sprains leading to residual complaints in the long term is presented and discussed. The incidence of residual complaints after lateral ankle ligament rupture is compared with the data from the literature.

In Chapter 3 a prospective study concerning the need for a preoperative diagnosis in the treatment of chronic ankle pain is presented. Does the outcome of an arthroscopic procedure depend on having a preoperative diagnosis or not? If it does then preoperative diagnostic modalities have to be evaluated for their accuracy in patients with chronic ankle pain. Considering the conclusion of chapter 3 the accuracy of existing and new diagnostic modalities for patients with chronic ankle pain has to be evaluated.

In Chapter 4 a new type of radiograph for detecting anteromedial bony impingement of the ankle joint is evaluated.

For detection of osteochondral lesions of the talar dome and tibia plafond, ankle distraction can be used. In Chapter 5 a new resterilizable non-invasive distraction device is presented and discussed. By using joint distraction in ankle arthroscopy more posterior localized osteochondral lesions can be detected and treated.

Various diagnostic modalities for identifying osteochondral lesions in the ankle are described in Chapter 6. It concentrates on single diagnostic strategies in a prospective cohort study. In Chapter 7 the same cohort of patients is used to find the best combination of diagnostic strategies for detection or exclusion of osteochondral lesions in a study based on decision modelling.

In Chapter 8 the results of a systematic review are presented considering the treatment options of osteochondral lesions of the talar dome.
In Chapter 9 an overview of the results of the studies presented is given and the conclusions are discussed. Potential new developments and areas for future research are described.
References


Osteochondritis Dissecans of the Talus

Chapter 1


