Diagnostic guidelines for chronic ankle pain. From loose bodies to joint venture
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Chapter 9

General Discussion
Chronic ankle pain is a major problem! Each year in The Netherlands 78,000 persons are treated at hospital emergency departments for a trauma of the ankle joint. Requests for radiographic evaluation of the ankle have been reported to account for 10% of all radiographic examinations requested from emergency departments. In 59% of all patients inversion trauma is the cause. In more than 40% the trauma is sports-related. This means that more than 45,000 persons each year are treated for inversion trauma at hospital emergency departments in The Netherlands. And this number is underestimated, because not everyone with inversion trauma of the ankle seeks medical attention or attends the emergency department. In about 30% to 40% of patients with an inversion trauma of the ankle, residual symptoms persist, i.e. each year about 15,000 new patients present with chronic ankle pain. As stated in Chapter 2, it can safely be concluded that there is no such thing as “a simple ankle sprain”.

Knowing the prevalence and incidence of ankle sprains leading to long-term residual symptoms, additional diagnostic procedures are a prerequisite in order to achieve the correct diagnosis. To evaluate ligamentous integrity in the ankle and subtalar regions (i.e. peri-articular conditions) stress radiographs are used. Standardized stress radiographs can be used in both differential diagnostic evaluation and assessment of therapy. Their main drawback is the limited correlation between functional stability and increased laxity. A good correlation between functional and mechanical instability has been shown in some studies, but this correlation is highly variable, since several factors other than mechanical instability can be responsible for the development of functional instability. Delayed physical examination at 5 days after injury was found to have the highest overall sensitivity and specificity for the detection of lateral ligament rupture compared to stress radiographs, arthrography, and ultrasound. Excluding delayed physical examination, additional diagnostic procedures for evaluating ligamentous integrity yield little additional information.

As was demonstrated in Chapter 3, an established preoperative diagnosis is essential for good outcome of the therapeutic procedure. In the past bone scanning (99mTc methylene diphosphonate) was used to assess patients with chronic ankle pain if there was clinical suspicion of an osteochondral lesion but the plain radiographs appeared to be negative. However, since the widespread use of CT and MRI, the use of nuclear medicine bone scanning for osteochondral lesions and other residual symptoms has decreased, although bone scanning continues to play a role because of its relatively low cost and high sensitivity.

Additional diagnostics need to be developed further and improve in performance. Not only high-tech scanning techniques can perform better, but also additional radiographs. For example a mortise view with four centimetres heelrise was introduced to detect posterior localized osteochondral lesions of the talus. For detecting anteromedial bony impingement a new oblique radiograph (AMI-view) has also been introduced (Chapter 4). Using this technique a higher detection rate of anteromedial bony spurs was achieved and hence a better diagnostic preoperative workup. Better preoperative planning will lead to a better clinical outcome.
Soft tissue lesions of the ankle can present a difficult diagnostic problem. Even after careful history, physical examination, and diagnostic testing, the diagnosis may not be readily apparent. From literature it is known that an intra-articular injection of local anaestheti is a reliable method of distinguishing articular disease (post-traumatic osteoarthritis) from extra-articular sources of pain (tenosynovitis, heel pad injury, or plantar spurs). Anaesthetic injection may be useful in assessing a painful ankle in which articular-based pain cannot be distinguished from pain originating in the adjacent soft tissues. Injection of anaesthetic into specific joints of the hindfoot to determine the source of the pain has not been widely discussed. Further research is needed to determine the place of intra-articular injections as a diagnostic modality. The use of an ankle distraction device facilitates operation. By distracting the joint better detection and treatment of posteriorly located lesions can be accomplished. At any time during the operative procedure the newly developed non-invasive ankle distraction device can be applied and the amount of distraction easily modified (Chapter 5). In comparison to other ‘fixed’ distraction devices this is a major advantage.

The quality of a diagnostic modality depends not only on its performance (sensitivity, specificity, positive and negative predictive value), but also on the items the examiner is interested in. For example, the best performing diagnostic modality for detection of an osteochondral lesion may be second best for the exclusion of an osteochondral lesion. Therefore the superiority of a given diagnostic test strongly depends on the purpose of that test. In the literature MRI is advocated as the best test in evaluating osteochondral lesions of the talus. We found that conventional MRI did not prove better than high-resolution helical CT for simultaneous detection or exclusion of osteochondral lesions (Chapter 6). Our results seem in contrast to the results published in literature, however it must be realized that the two criteria we assessed have not previously been evaluated in literature. Thus our conclusion that helical CT and MRI show no significant difference in diagnostic performance is new, because we were interested in detection or exclusion of osteochondral lesions simultaneously.

In daily practice diagnostic procedures are used in concert to come to the correct diagnosis. However, most published studies are based on single diagnostic procedures. By combining diagnostic procedures (which was possible with our data set) a more realistic approach of using different diagnostic modalities sequentially could be achieved. And, as a consequence a different outcome was possible. However, the controversy between authors as to which diagnostic modality is the best for OLT is tackled by Chapter 7. When looking for simultaneous detection or exclusion of OLT both helical CT and MRI have a place in the diagnostic algorithm for patients with chronic ankle pain.

The stage of the lesion is another issue in diagnosing OLT. Different classification systems have been introduced. However, in patients with OLT symptoms of more than 6 to 12
months duration, there is no reason to persist in treating conservatively since delay in treatment affects the results adversely.\textsuperscript{22} Operative therapy is then indicated. In Chapter 8 various treatment options are compared. At present, excision, curettage and drilling (ECD) of the lesion seems to be the most effective treatment strategy for osteochondral lesions of the talus, irrespective of their grade. As a consequence, staging of OLT is a redundant procedure. Maybe staging and classification will become relevant in the future. This depends on the more sophisticated therapeutic options that are being developed with preservation of the overlying cartilage.\textsuperscript{23,24}

**Proposed algorithm**

The decision tree for intra-articular chronic ankle pain is based on the imaging options currently thought to be the most efficacious in addressing the problem. The options are supported by the literature and our own data (this thesis). The algorithm (Figure 1) is derived from our data and the literature for detecting intra-articular pathology.\textsuperscript{25-27} In Figure 2 the algorithm for excluding osteochondral lesion of the talus is presented. If no MRI scan is

\begin{figure}[h]
\centering
\includegraphics[width=\textwidth]{algorithm}
\caption{Algorithm for intra-articular chronic ankle pain (> 6 months) (infection, neoplasm, or (inflammatory) arthritis already excluded)}
\end{figure}

\# Additional diagnostic modalities are not necessary in cases where the plain radiographs disclose the location and extent of the osteochondral lesion clearly, or when the surgeon uses an operative approach which enables him to locate and treat the lesion by direct visualization and palpation.

\* Other diagnostics such as CT arthrography, MR arthrography.

\begin{figure}[h]
\centering
\includegraphics[width=\textwidth]{algorithm2}
\caption{Algorithm for excluding osteochondral lesion of the talus}
available Figure 2 can be followed for both detection or exclusion of OLT. The differences between the two algorithms for OLT are discussed in Chapter 7.

For optimal treatment it is assumed that all patients have had a complete clinical examination and appropriate routine radiography (HPX), with additional diagnostic information.

After history taking, physical examination, and standard radiography a clinical judgement is made: bony impingement (BI) or soft tissue impingement (SI), osteochondral lesion (OCL), loose body, or osteoarthritis (OA). If infection, neoplasm, or (inflammatory) arthritis is suspected the appropriate therapy is instituted.

If clinical impingement is present in which the impediment is seen on the standard radiographs (i.e. bony impingement) arthroscopy can be scheduled. If there is suspicion of anteromedial bony impingement (BI), but no bony impediment is seen on standard radiographs an AMI-view radiograph is taken. If an anteromedial bony spur is seen, the diagnosis is anteromedial BI and arthroscopy can be scheduled. If no spur can be seen on the lateral and AMI-view radiograph, anterolateral or anteromedial soft tissue impingement (SI) is diagnosed by exclusion and the patient is also scheduled for arthroscopy.

If a patient is judged to have an osteochondral lesion of the talus, a CT is advised for determining the exact location and extent of the lesion. In this way accurate planning of the operative procedure is possible: anterior or posterior approach, open or arthroscopic procedure, medial malleolar osteotomy. All have to be taken into consideration during preoperative planning.

If there is suspicion of OCL, but nothing is seen on the radiographs, an MRI is scheduled. If this is positive for OCL then arthroscopy is scheduled. If it is negative, another diagnosis must be considered.

Additional diagnostic modalities are not necessary in cases where the plain radiographs disclose the location and extent of the osteochondral lesion clearly, or when the surgeon uses an operative approach which enables him to locate and treat the lesion by direct visualization.
and palpation. Further research is necessary that takes explicitly into account the certainty of diagnosis based on history taking, physical examination, and standard radiographs. If a loose body is visible on the radiographs, arthroscopy can be scheduled. If the loose body is not seen on standard radiographs but it is suspected then a CT scan is performed. If positive, an operation is planned. If negative, another diagnosis must be considered. If the standard radiographs reveal osteoarthritis of the ankle joint further treatment depends on the severity of the osteoarthritis. Operative arthroscopy for osteoarthritis of the ankle has not always been successful.\textsuperscript{28,29} On the other hand, there are studies in which arthroscopic debridement has been shown to alleviate symptoms and seems to resolve symptoms permanently in some cases of degenerative arthritis.\textsuperscript{30}

In contrast to the above mentioned algorithm which is only for osteochondral lesions of the talus, study data are available for an algorithm to exclude conditions that cause chronic intra-articular ankle pain (Chapter 8). As seen in Figure 2, if a possible lesion has to be excluded and is not visible on standard radiographs, a heel rise view (MX) is performed and if this is positive then a CT for preoperative planning. If the MX is also negative, another diagnosis must be considered. With this algorithm a false positive rate of 0.00 can be achieved and unnecessary arthroscopy prevented (Chapter 8).

Detection of OCL is described in the same algorithm. In cases of clinical suspicion of OCL where the lesion is seen on the standard radiograph, a CT can be performed to determine the exact location and extent of the lesion. In case this CT is negative, a different diagnosis must be considered.

**Future prospects**

**Diagnostic developments**

New techniques, like CT arthrography and MR arthrography still have to establish their position in the diagnostic algorithm for chronic ankle pain.\textsuperscript{31-33} Intra-articular contrast is especially helpful in detecting intra-articular lesions (i.e. chondral lesions) but not in excluding lesions. Since the sensitivity of the CT can be enhanced more than the sensitivity of MRI with respect to osteochondral lesions, CT arthrography seems a more logical choice than MR arthrography. Knowing that MRI has a higher sensitivity than CT, but a lower specificity (Chapter 7), MR arthrography will not benefit as much as CT from the intra-articular contrast to enhance the accuracy for simultaneous detection and exclusion of osteochondral lesions of the talus. This is also recognized in the literature, where CT arthrography appears to be more reliable than MR arthrography for the detection of cartilage lesions in the ankle joint.\textsuperscript{34}

Since virtual MR arthroscopy is possible, new diagnostic procedures have become available.\textsuperscript{35} As was stated in Chapter 3, ankle arthroscopy for diagnosis only is of limited value. But with
this new technique, performing an arthroscopy without operating on the patient, diagnostic (virtual) arthroscopy comes into a new perspective. And perhaps in cases were pain persists and additional diagnostic modalities are not able to help in attaining a diagnosis, virtual MR arthroscopy, although it has some limitations, is a promising alternative in visualizing the ankle joint intra-articularly.

**Therapeutic developments**

With the recent advances in diagnostic imaging, as well as the development of ankle arthroscopy, the identification and classification of cartilage lesions has become much more precise. To date, various articular cartilage resurfacing techniques have the potential to improve the repair of cartilage defects and reduce the patient's disability.

Autogenous osteochondral transplantation (so called ‘mosaicplasty’) is a relatively new procedure for the treatment of osteochondral lesions of the ankle joint.\(^\text{36-39}\) Osteochondral cylindrical grafts from the ipsilateral knee are delivered into the talar defect using specially designed tube chisels. Originally these procedures were done by arthrotomy, but nowadays can be done by arthroscopy. Although the results of this new technique are promising, there is a need for a randomized, prospective study in the treatment of talar OLT to define a reproducible treatment algorithm.\(^\text{40}\) Allografts can also be used for osteochondral transplantation. Allografts are particularly useful for avascular necrosis, for larger lesions with more extensive disease, or as a salvage procedure for failed autografting or subchondral perforation.\(^\text{41}\) Early results are encouraging, but studies evaluating this procedure are limited.\(^\text{42,43}\)

Another promising technique is autologous chondrocyte implantation with a periosteaal graft which was first attempted in 1987 for treatment of articular cartilage lesions of the knee.\(^\text{44,45}\) Currently, the chondrocyte implantation procedure requires a formal arthrotomy at the very least and, in most cases, a malleolar osteotomy as well. In the future, technical improvements in the biological scaffold and chondrocyte delivery system will make arthroscopic implantation possible, diminishing the morbidity associated with arthrotomy and osteotomy.\(^\text{46}\)

The future of foot and ankle arthroscopy is exciting as better equipment and more innovative ideas are developed. Some of the new developments use the principles of both arthroscopy and endoscopy to visualize not only joints but also the spaces or compartments in the foot and ankle.\(^\text{47-49}\) With all these new developments in both diagnostic and therapeutic areas, continuous updates of guidelines for treatment of chronic ankle pain remain necessary. This thesis is a new step forwards towards diagnostic guidelines for chronic ankle pain based on the latest results from diverse diagnostic modalities and outcomes of treatment.
References


