**Ankle arthritis: diagnosis and conservative management**

R Grunfeld*, U Aydogan*, P Juliano*, J Bustillo*

**Abstract**

**Introduction**

The ankle joint is the most commonly injured joint in the body and absorbs more force per square centimetre than any other joint. However, the incidence of ankle arthritis is nine times less common than symptomatic arthritis in the knee and hip. This paper reviews ankle arthritis.

**Discussion**

Post-traumatic arthritis is the most common form of ankle osteoarthritis. The most current literature on the diagnosis and non-surgical management of ankle arthritis, including physical examination, radiographic parameters, advanced imaging and treatment modalities are reviewed.

**Conclusion**

This paper gives an overview of the most recent literature to assist physicians in the diagnosis and non-surgical management of ankle osteoarthritis.

**Introduction**

The ankle joint is the most commonly injured joint in the body and absorbs more force per square centimetre than any other joint. However, the incidence of ankle arthritis is nine times less common than symptomatic arthritis in the knee and hip. Unlike arthritis in the knee and hip joint, ankle arthritis is most commonly post-traumatic and primary arthritis remains very uncommon. Saltzman reported 7.2% of primary ankle arthritis compared to 70% of post-traumatic arthritis, in a sample of 639 patients across a 13-year period. Rheumatoid arthritis was seen in 11.9% of patients. The aim of this review was to discuss the diagnosis and conservative management of ankle arthritis.

**Aetiology/Pathophysiology**

Previous trauma to the ankle joint is the most significant predisposing factor contributing to the development of ankle osteoarthritis. This includes ankle fractures, pilon fractures (distal tibia, intra-articular fractures), recurrent ankle sprains and ankle instability, and osteochondral injuries to the talus (OCD). A rate of 14% of post-traumatic ankle arthritis can be seen with ankle fractures. Obtaining an anatomic reduction, either closed or open means appears to be the most important factor in decreasing the risk of post-traumatic arthritis.

Pilon fractures are high energy intra-articular ankle fractures with a high degree of comminution (Figure 1). These are also associated with the development of ankle arthritis and damage to the articular cartilage. Open fractures can lead to an additional increased risk of infection and post-traumatic arthritis (Figure 2). In one study, onset of osteoarthritis occurred at an average of 20.9 years after the original injury. Patients' age (i.e. older patients) as well as complications during the treatment of the fracture was related to a shorter latency in the onset of arthritis.

Osteochondral injuries to the talus (OCD lesions), whether acquired at the time of an ankle fracture-dislocation or of idiopathic origin, predispose patients to the development of ankle arthritis. These lesions are best diagnosed with MRI scans (Figure 3).

**Clinical presentation**

Pain and functional limitations are the most common presenting symptoms in patients with ankle arthritis. A simple

* Corresponding author
Email: rgrunfeld@hmc.psu.edu; uaydogan@hmc.psu.edu; pjuliano@hmc.psu.edu; jbustillo@hmc.psu.edu

Penn State College of Medicine, Department of Orthopaedic Surgery, Milton S. Hershey Medical Center, Pennsylvania, USA

**Figure 1:** A) X-ray (AP) of comminuted, high-energy pilon fracture, with continued deformity and tibiotalar joint arthritis. B) Lateral radiograph of pilon fracture, previous external fixator pin site seen.
algorithm to facilitate diagnosis of ankle arthritis is shown in Figure 4.

Coughlin recommends that all patients should be asked the following:

1) Is there a history of trauma, ankle surgery or recurrent ankle sprains?

2) What activities worsen the ankle pain and limit function?

Patient History
We assess for a history of trauma, ankle surgery and recurrent ankle sprains to aid in diagnosing post-traumatic ankle arthritis. All patients are asked about a history of rheumatoid arthritis and diabetes. We also address other major medical comorbidities, including, haemophilia, infection and avascular necrosis.

Activities
Next patients should be asked about activities that aggravate their pain and limit their function. See Figure 5. As a general rule, pain that worsens with uphill climbing may be related to the anterior ankle, whereas downhill pain is related to posterior ankle. Pain on uneven round is often related to pathology in the subtalar joint, whereas pain in the posteromedial pain is often due to posterior tibial tendon dysfunction and less related to ankle arthritis. Subfibular or posterolateral ankle pain can be due to peroneal tendons or impingement between the calcaneus and talus and/or fibula. This may be seen in the aftermath of calcaneal fractures.

Clinical findings
We examine the patient while standing, sitting and walking. The ankle joint and overall extremity alignment needs to be examined from an anterior and posterior view. During the gait examination, the examiner needs to note the

Figure 2: Open ankle fracture with exposed tibial plafond.

Figure 3: T1-weighted MRI scan of a talus OCD lesion. This is located in the medial talus.

Figure 4: Algorithm to facilitate diagnosis of ankle arthritis.

Figure 5: Landmarks for patient location of pain in the ankle region. A) anterior view, B) Medial and posteromedial ankle, C) lateral foot and ankle region.
position of forefoot during heel strike. When examining patients with flatfoot deformity and posterior tibial tendon dysfunction (PTTD), single and double toe rise needs to be tested (Figure 6). If patients are unable to stand-up on their toes, physicians need to have a high level of suspicion for PTTD.

**Sitting examination**

**Ligament exam**
The stability of all ankle ligaments is assessed, including anterior talofibular ligament (ATFL) and calcaneofibular ligament (CFL). The ATFL is examined in plantarflexion (Figure 7) and the CFL in slight dorsiflexion (Figure 8). Testing of the ATFL for instability is known as the anterior drawer test and a positive finding is referred to as the ‘suction sign’ (Figure 9).

**Range of motion**
The range of motion of the ankle is documented

**Achilles/Gastrocnemius contracture**
In patients with limited dorsiflexion and a plantarflexes ankle, we perform the Silversköld test. Dorsiflexion of the ankle is examined, with the knee extended and flexed. Improved dorsiflexion with the knee flexed indicates gastrocnemius contracture, where if dorsiflexion is not affected, the Achilles is contracted.

**Skin and vascular**
Pulses are carefully assessed and documented. Sensation and skin condition are assessed and areas of erythema, ulcers or callouses are noted. Skin changes can indicate underlying medical conditions, such as vasculitis, rheumatoid arthritis or complex regional pain syndrome.

**Diagnostic imaging**
Please see Table 1 for a summary on diagnostic modalities of ankle arthritis

**Plain films**
Standing films of the ankle with three views are obtained: Anteroposterior (AP), mortise, lateral views (Figure 10). This remains the gold standard for initial imaging modality. X-rays of the foot are also included if surgery in the hindfoot or midfoot is planned as part of the surgical treatment. The Kellgren-Lawrence scale is the most widely utilised radiographic scoring system for osteoarthritis. It has been most commonly applied to knee and hip osteoarthritis and evaluates the following: osteophytes, preservation of joint space and subchondral changes. Physicians evaluate radiographs and assign a grade from 0 to 4. Grade 0 denotes a normal joint, grade 1: small osteophytes, grade 2: more substantial, significant osteophytes, grade 3: decrease in joint pace and grade 4: significant decrease in joint space and subchondral sclerosis. Inter-observer reliability was found to be 0.6. Using computerised imaging...
Table 1 Summary on diagnostic modalities of ankle arthritis

<table>
<thead>
<tr>
<th>Indications</th>
<th>Views</th>
<th>Findings</th>
<th>References</th>
</tr>
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<tbody>
<tr>
<td>Radiographs</td>
<td>Initial imaging study of choice</td>
<td>Joint space narrowing, osteophytes, subchondral sclerosis</td>
<td>2,6,8,9</td>
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<tr>
<td></td>
<td>Standing, lateral, anteroposterior, mortise, hindfoot alignment</td>
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<td></td>
<td>Pre-operative planning</td>
<td>Cartilage thickness: within 0.1 mm of direct physical measurements</td>
<td>10–13</td>
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<td></td>
<td>Presence of retained hardware</td>
<td>Prediction of post-traumatic osteoarthritis using CT-based algorithm and acute injury severity</td>
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<td></td>
<td>Revision ankle procedures</td>
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<td></td>
<td>CT arthrogram</td>
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<td></td>
<td>Single photon-emission computed tomography and computed tomography (SPECT-CT)</td>
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<td></td>
<td>MRI</td>
<td></td>
<td></td>
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<tr>
<td>Focal arthritis</td>
<td>T1, T2 axial, coronal and sagittal slices</td>
<td>Grade 0: normal cartilage,</td>
<td>13–22</td>
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<tr>
<td>Osteochondral defects</td>
<td>MR arthrogram: Direct/Indirect</td>
<td>Grade 1: signal abnormality without defect,</td>
<td></td>
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<tr>
<td>Adjacent soft tissue involvement</td>
<td>FSPGR: fat-suppressed fast spoiled gradient-echo MRI</td>
<td>Grade 2 as fibrillation or fissures not extending to bone</td>
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<td></td>
<td></td>
<td>Grade 3 as cartilage flap or bone exposed</td>
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<td></td>
<td></td>
<td>Grade 4 as loose non-displaced fragment</td>
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<tr>
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<td>Grade 5 as a displaced fragment</td>
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<td>Scintigraphy</td>
<td>Early osteoarthritis</td>
<td>More sensitive detection of early OA changes: Medial/lateral tibia, lateral fibula, talus, subchondral tibia</td>
<td>23</td>
</tr>
<tr>
<td>Scintigraphy</td>
<td>N/A</td>
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</table>

**Figure 10:** Standing X-rays of the ankle. A) The AP view allows for greater visualisation of the medial clear space. B) Mortise view allows for the most comprehensive view of the tibiotalar joint.

software, a joint space narrowing of 2 mm or less was found in 77% of Grade 3 and 4 ankles.

Other radiographic features to consider are, medial joint space narrowing and hindfoot alignment. Saltzman et al., focused on the hindfoot alignment for diagnostic and operative planning purposes. Hindfoot imagining utilising the Harris view can be easily accomplished in the office setting. For post-traumatic and patients with significant lower extremity deformity, a scanogram can assist in therapeutic and diagnostic decision making (Figure 11).
Computed Tomography (CT scans)

Advanced imaging with Computed Tomography (CT) scans is appropriate in select settings. CT scans may be utilised to gain an improved appreciation of post-traumatic changes at the tibiotalar joint, non-unions and in cases of complex deformity or retained hardware. Recently, CT scans have been utilised to predict post-traumatic ankle osteoarthritis in the acute trauma setting, in both ankle fractures and intra-articular tibial plafond fractures. CT scans are less susceptible to hardware artefacts and motion artefacts compared to MRI. CT arthograms can be utilised for diagnostic injections as well for the quantification of cartilage thickness. In a recent study, CT arthograms were within 0.1 mm of direct physical measurements of cadaver cartilage thickness. CT arthograms appear to be more reliable in the detection of cartilage lesions in the ankle joint compared to MRI arthograms.

Magnetic Resonance Imaging (MRI) scans

MRI can be utilised for the diagnosis of ankle osteoarthritis, specifically in patients with osteochondral lesions of the talus and in cases of focal chondral lesions. MR arthograms appear to be more reliable than conventional MRI scans for the evaluation of ankle cartilage. MR arthograms involve intra-articular injection of contrast medium into the ankle joint. Intra-articular location is confirmed under fluoroscopic or alternatively CT-guided or ultrasound-guidance. Indirect MR arthograms can be performed by intravenous injection of gadolinium, thereby avoiding a more invasive, intra-articular procedure.

A staging system for talus osteochondral lesions has previously been developed. Cartilage lesions are assigned grades 0 to 5, grade 0: normal cartilage, Grade 1: signal abnormality without defect, Grade 2 as fibrillation or fissures not extending to bone, Grade 3 as cartilage flap or bone exposed, Grade 4 as loose non-displaced fragment and Grade 5 as a displaced fragment. A special MRI sequence, fat-suppressed fast spoiled gradient-echo (FSPGR) MRI appears to be more sensitive in detection of osteochondral talus lesions compared to conventional MRI. It can also shed light on the mechanism of injury that led to the development of post-traumatic arthritis. MRI scans are also a useful adjunct in the characterisation of the surrounding soft tissues.

Scintigraphy

Bone scans have a higher sensitivity for the detection of early osteoarthritis in the ankle and this diagnostic modality may be especially applicable in patients who have multiple joint involvement and joint pain.

Understanding lower extremity deformity

Biomechanics at the ankle joint are influenced by lower extremity deformities both proximal and distal to the ankle. These can be classified primary or acquired deformities and secondary / compensatory deformities. The mechanical axis of the lower extremity involves a straight line originating at the centre of the femoral head, through the centre of the knee and to the centre of the ankle joint and finally the weight-bearing portion of the calcaneus. The correct diagnosis and recognition of deformity involves assessing the tibia and fibula along the following parameters: length, angulation, rotation and translation.

Length

Assessment of correct tibia and fibula length are best measured from scanogram radiographs. The length in millimetres is recorded for both the symptomatic side as well as the contralateral extremity.

Angulation

The degree of varus or valgus in the tibia and fibula can also be assessed based on scanograms. The location of the deformity can be identified, which is essential for the pre-operative planning and for decision making. For example, in planning supramalleolar osteotomies, identifying the degree and location of the major malrotation in the tibia and fibula facilitates surgeons’ decision in choosing the location of the osteotomy (proximal/distal) as well as the type (closing wedge/opening wedge).

Rotation

Rotation is assessed on clinical examination and axial CT scans, if available. On exam, the foot-thigh angle is utilised to determine internal and external tibial rotation. The contralateral extremity needs to be examined, as addressing patient’s deformity needs to be based on their asymptomatic...
extremity. A line drawn from the tibial tubercle should bisect the second metatarsal and should also be utilised to understand patients’ lower extremity rotation.

Translation
Translation is most relevant when examining patients with post-traumatic arthritic deformities and previous fractures at the level of the tibia and fibula, above the level of the ankle joint. Callus formation and bony union following high energy trauma can lead to significant translation seen in coronal, sagittal and axial planes.

Compensatory Mechanism for Deformity
Patients’ compensate for their acquired deformities at the level of the ankle joint and distal to it. In general, valgus tibiotalar deformity is better tolerated and compensated for compared to varus deformity. Varus tibiotalar alignment leads to compensatory subtalar eversion and forefoot pronation. In contrast, valgus alignment leads to compensatory subtalar inversion and forefoot supination. The subtalar joint allows for 5–15 degrees eversion and 15–30 degrees of inversion.

Diagnostic testing and procedures
One of the most important modalities for both diagnostic and therapeutic purposes includes the utilisation of the corticosteroid injections into the tibiotalar joint. A positive response to an ankle injection has been found to be predictive of a positive response to surgery. These injections can be completed in the office setting without fluoroscopic guidance (Juliano, personal communications) or can be accomplished under fluoroscopic guidance in the radiology suite. Administration of contrast dye to delineate the joint may be helpful in cases of severe osteoarthritis or in patients with complete varus or valgus deformities. Diagnostic injections with viscosupplementation are less well established and remain more controversial.

The landmark used for tibiotalar injection is the soft tissue depression between the medial malleolus and the medial border of the tibialis anterior (Figure 12). This is a reliable and reproducible location, even in patients with narrowed joint spaces secondary to degenerative disease.

Diagnostic dilemmas and differentials
Ankle arthritis can be classified based on anatomy and underlying aetiology. In terms of anatomy, arthritis can be global, where the entire tibiotalar joint is affected, or localised (specific portions of the articular surface are affected). Underlying aetiology of the arthritis can be classified into three broad categories: Post-traumatic, Osteoarthritis and Rheumatoid arthritis, Charcot arthropathy, hemochromatosis or degenerative changes due to tumour. The stages of osteoarthritis can be outlined using radiographic parameters:

Stage 0: normal joint or subchondral sclerosis
Stage 1: Presence of osteophytes without joint space narrowing
Stage 2: Joint space narrowing, with or without osteophytes
Stage 3: Subtotal or total disappearance or deformation of joint space

Figure 12: A) anterior view of the ankle. The medial malleolus and tibialis anterior are labeled. Landmark for ankle joint aspiration and injection. The soft divot located lateral to the medial malleolus and medial to the tibialis anterior tendon is palpated.

Stage 1: Presence of osteophytes without joint space narrowing
Stage 2: Joint space narrowing, with or without osteophytes
Stage 3: Subtotal or total disappearance or deformation of joint space (Figure 13)

More recently, the Canadian Orthopaedic Foot and Ankle Society (COFAS) Classification for End-Stage Ankle Arthritis has been described. Studies The COFAS classification has been shown to have good inter-observer reliability (kappa = 0.62) and intra-observer reproducibility (kappa = 0.72). A post-operative classification was developed for the COFAS stages, with even higher inter-observer reliability and improved reliability.

Prognosis
Ankle arthritis reduces the number of total steps per day patient take, as well high-intensity steps and are associated with a slowing walking speed, when compared to age matched controls. This can have a detrimental impact on patients’ activities of daily living (ADLs). The prognosis of ankle arthritis can be self-limiting but some patients can experience a continued decline in their activity level and an increase in their pain. Besides a decrease in the number of steps taken by patients, studies have also found decreased ankle range of motion and decreased plantar flexion power during gait analysis.

Management goals
The goal of management is pain control and improvement of patient’s function and activities of daily living and a decrease in their level of pain.

Non-pharmacologic strategies
See Table 2 for a summary of the non-pharmacological treatment strategies

Self-management strategies
Activity modifications can be one of the most effective strategies in early
ankle arthritis. By avoiding uneven platforms (i.e., subtalar arthritis), uphill climbs (anterior ankle arthritis), and utilising treadmills or Elliptical exercise machines to continue to stay active, patients can achieve some pain control. An important aspect also includes patient weight loss.

**Physical therapy**

Physical therapy for ankle arthritis includes: strength training, range of motion exercises and improving ankle balance and proprioception. Strength training focuses on strength exercises of the gastrocnemius and soleus muscles (ankle plantarflexion), the tibialis anterior (ankle dorsiflexion) and the peroneus muscles (peroneus longus and brevis – ankle eversion). Balance and proprioception exercises include ankle dorsi- and plantarflexion exercises with the use of ‘airex cushions’ and ‘wobble boards’. Other modalities include the use of hydrotherapy, especially in patients where severe pain or obesity may limit their therapeutic exercises on land.

**Shoe modifications**

Conservative management of ankle arthritis should involve an attempt at shoe wear modifications. Gait patterns can be normalised with the utilisation of rocker-bottom shoes with the addition of a solid ankle cushioned heel (SACH). The SACH has the ability to decrease both ankle and hindfoot range of motion during both normal gait and stair climbing. It also off-loads ankle joint from heel strike to push-off.

**Orthotics**

Another effective strategy appears to be mechanical unloading of the joint. This can be accomplished via ankle foot orthosis (AFOs), based on either ankle or calf lacers. Lace-up ankle support can be especially effective in patients who experience instability or mechanical misalignment. Rigid hindfoot orthoses have previously been shown to restrict ankle and hindfoot motion, while allowing for forefoot motion.

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**Table 2** Summary of the non-pharmacological treatment strategies

<table>
<thead>
<tr>
<th>Intervention</th>
<th>Details</th>
<th>Method of action</th>
<th>Efficacy</th>
<th>References</th>
</tr>
</thead>
<tbody>
<tr>
<td>Activity Modifications</td>
<td>Weight loss, avoiding high impact activities</td>
<td>Off-loading of ankle joint</td>
<td>Evidence from knee arthritis literature: one pound of weight loss, four-fold reduction in force at knee joint.</td>
<td>6,31,32</td>
</tr>
<tr>
<td></td>
<td>(going upstairs/downstairs)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rocker sole and solid-ankle cushion-heel (SACH)</td>
<td>Shoe modifications</td>
<td>Decrease ankle motion, off-load ankle joint from heel strike to push-off</td>
<td>No controlled studies</td>
<td>34,35,37,40</td>
</tr>
<tr>
<td>Orthotics</td>
<td>Rigid hindfoot orthoses</td>
<td>Restrict ankle and hindfoot motion, allows for forefoot motion</td>
<td>No controlled studies</td>
<td>38, 39</td>
</tr>
<tr>
<td>Physical Therapy</td>
<td>Ankle dorsiflexion/plantarflexion range of motion and strengthening</td>
<td>Improved range of motion, and maintenance of strength</td>
<td></td>
<td>33, 34</td>
</tr>
</tbody>
</table>

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**Figure 13:** AP and lateral X-ray of an ankle with Stage 3 degenerative changes

Subtotal or total disappearance or deformation of joint space.
Braces
Walking plaster or fiberglass short leg casts can also be utilised for conservative management of ankle arthritis. Additional strategies include a temporary plaster or fiberglass cast, or the utilisation of a CAM boot walker. These options can be selected based on both patient preference and financial resources available. The therapeutic benefit of immobilisation includes motion at the painful ankle joint, which can mimic the effects of ankle arthrodesis. In addition to the conservative treatment options listed above, obese patients should be counselled on weight loss, which has been shown to improve the effectiveness of both conservative and surgical options. Other non-surgical, non-pharmacological options include: physical therapy modalities, chiropractic care, and acupuncture. There are currently very little peer-reviewed studies or reviews on these modalities.

Pharmacologic strategies
See Table 3 for a summary of the Pharmacological strategies.

Non-steroidal anti-inflammatory drugs (NSAIDs)
The most common pharmacologic strategy addressing ankle arthritis are non-steroidal anti-inflammatory drugs (NSAIDs). The side effects of NSAIDs require judicious prescribing and utilisation. These can include GI bleeding, stroke and increased cardiovascular risks. Recent recommendations have focused on the utilisation of topical NSAIDs, particular in high-risk patients for localised osteoarthritis. All patients need to be carefully screened for comorbidities prior to the initiation of an NSAID regimen. Based on our clinical experience, the efficacy of NSAIDs varies and is patient dependent.

Corticosteroid injections
Tibiotalar joint injections with corticosteroids continue to be one final non-surgical option can be offered in the office setting for the patients after failing NSAID therapy and activity modifications. Injections are intra-articular and involve a mixture of lidocaine and corticosteroid. In the U.S., the following compounds are available:

Table 3 Summary of the pharmacological treatment strategies

<table>
<thead>
<tr>
<th>Intervention</th>
<th>Details</th>
<th>Method of action</th>
<th>Efficacy</th>
<th>Dose/frequency</th>
<th>References</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-steroidal anti-inflammatory drugs</td>
<td>Celebrex has fewer adverse side effects and increased patient tolerance</td>
<td>Decrease in inflammation</td>
<td>Ankle sprain literature: 7-day trial: VAC reduction from 73 to 29–32</td>
<td>12-week treatment program</td>
<td>6,42,52</td>
</tr>
<tr>
<td>Corticosteroids</td>
<td>Diagnostic and Therapeutic decreases in synovial fluid leukocyte counts and lysosomal enzyme levels</td>
<td>Response at 2 months predicts positive response at 1 year</td>
<td>3–4 times per year, allowing 3–4 months between injections</td>
<td>24–27,41,44,46</td>
<td></td>
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</table>
| Viscosupplementation           | Unknown mechanism, alteration synovial fluid and responsiveness of nociceptors | no literature to support the use of these substances in the ankle | Two double-blind studies:
Cohen: 5 weekly intra-articular injections of 1 mL of sodium hyaluronate
Significant improvement from saline control
Cohen: at 3 months, sig. improvement in Ankle Osteoarthritis Scale (AOS) scores | Weekly injections (1 mL) for 5 weeks | 26,48–50     |
ble and approved by the Food and Drug Administration (FDA): methylprednisone acetate (Depo-medrol), betamethasone—acetate and betamethasone sodium phosphate (Celestone Soluspan), triamcinolone acetate (Kenalog 10/40), triamcinolone hexacetonide (Aristospan) and dexamethasone (dexamethasone sodium phosphate). The mechanism of action for the pain relieving effects of the injection appears to stem from its anti-inflammatory effects, including a decrease in synovial fluid leukocyte counts and lysosomal enzyme levels.

A significant limitation of corticosteroid injections is that the majority of the pain relief does not extend beyond 8 weeks and in the long-term, no significant differences to placebo have been found. However, most recently, a study has identified patients experienced relief of pain of up to at least one year. Patients experienced pain relief at a 2-month visit following an injection were significantly more likely to experience pain relief from the injection at one year. Current recommendations are that injections are to be given not more than three to four times per year and allowing from 3 to 4 months between injections.

**Side effects of ankle injections**

As a general rule, for both corticosteroid injections and HA, risks of the injection need to be explained to the patient and all questions answered. These risks include injection site reactions, infections, risk of damage to articular cartilage and permanent skin depigmentation. Several clinicians have experienced the unpleasant effect of permanent skin discoloration and patient dissatisfaction that can accompany this.

**Viscosupplementation**

Although corticosteroid injections remain the golden standard, there is an increased number of research articles examining the role of viscosupplementation with hyaluronate (HA) in ankle arthritis. Currently, in the US, HA injections are only FDA-approved for the knee and injections into the ankle, shoulder and hip are considered ‘off-label’ use. The AOFAS was not able to come to a consensus statement for or against HA injections for ankle arthritis and states that there is an inadequate amount of good quality research studies examining its efficacy and safety. To date, only a single placebo controlled prospective study was undertaken to examine HA injections for ankle arthritis. The AOFAS cautions against drawing conclusions from this data, as the treatment and placebo were not equivalent and significant differences in Age, WOMAC scores and patients’ baseline pain from ankle arthritis.

For HA injections, the most commonly reported adverse effect is injection site pain. Incidence has reported to range from 6.6 up to 25%. Other adverse reactions specific to HA injections include pseudo-septic reactions. This constitutes a severe inflammatory reaction that may mimic a septic joint. Patients require treatment for this with NSAID’s and a work-up to rule out a septic joint may need to be undertaken.

**Discussion**

Post-traumatic arthritis is the most common form of ankle osteoarthritis. A thorough patient history and physical examination remains the cornerstone for the accurate diagnosis of ankle arthritis. Plain radiographs will identify Stages 3 and 4 osteoarthritis with less than 2 mm in a reliable and reproducible manner and obtaining antero-posterior, lateral and hindfoot views in the office will be sufficient in imaging in the majority of patients. Non-operative treatment should be initial treatment for patients, even in severe cases. Weight loss, activity modifications, shoe modifications and orthotics should be the first line of conservative treatment. The utilization of NSAIDs and intra-articular corticosteroid injections can be considered as a second-line treatment. Patients should be thoroughly informed on the risks and side effects of these medications and treatments. Viscosupplementation remains controversial in the foot and ankle literature and should not be the initial choice for an intra-articular injection.

**Conclusion**

An overview of the most recent literature to assist physicians in the diagnosis and non-surgical management of ankle osteoarthritis is provided. Additional research is needed to evaluate the effectiveness of non-operative modalities such as orthotics, physical therapy, weight loss and viscosupplementation for patients with ankle arthritis.

**References**

Review


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