Treatment of osteochondral defects of the talus
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Chapter 3

Advancements in ankle arthroscopy

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Chapter 3

Abstract

Important progress has been made during the past 30 years in arthroscopic ankle surgery. Ankle arthroscopy has gradually changed from a diagnostic to a therapeutic tool. Most arthroscopic procedures can be performed by using the anterior working area with the ankle in dorsiflexion or plantar flexion; there is no need for routine ankle distraction. Anterior ankle problems, such as the anterior impingement syndrome, are approached by anteromedial and anterolateral portals and, if necessary, an accessory portal. Most osteochondral defects can be reached from anterior with the ankle in plantar flexion. For a far posterior location, the osteochondral defect can be approached from posterior. The two-portal hindfoot endoscopic technique (i.e., both arthroscopic and endoscopic surgery), with the patient in the prone position, provides excellent access to the posterior ankle compartment and to posteriorly located extra-articular structures.

Introduction

Although Burman in 1931 found the ankle joint unsuitable for arthroscopy because of its typical anatomy, Tagaki and, later, Watanabe made considerable contributions to arthroscopic surgery. Watanabe in 1972 published the results of a series of 28 ankle arthroscopies. Numerous publications followed, and during the past 30 years, arthroscopy of the ankle joint has become an important procedure for the detection and treatment of chronic and posttraumatic problems. The main indications for anterior arthroscopy are for treatment of anterior impingement syndrome and talar osteochondral defects (OCDs). Endoscopic surgery (i.e., both arthroscopic and endoscopic surgery) offers the possible advantages of direct visualization of structures, improved assessment of articular cartilage, less postoperative morbidity, faster as well as functional rehabilitation, earlier resumption of sports, and outpatient treatment. The value of diagnostic arthroscopy is limited. Some authors advocate routine mechanical distraction combined with a 2.7-mm arthroscope. In most procedures, however, ankle arthroscopy can be performed more effectively without routine joint distraction.

Posterior ankle problems pose a diagnostic and therapeutic challenge because of their nature and deep location. By means of a two-portal hindfoot approach with the patient in the prone position, posterior ankle joint problems (e.g., loose bodies, ossicles, osteophytes, OCDs) can be treated. In the case of a posterior impingement syndrome, bony impediments (e.g., os trigonum) can be detached and removed via the two-portal hindfoot approach.

Anterior ankle arthroscopy

Indications

Ankle problems that can be managed by means of routine anterior ankle arthroscopy include soft tissue and bony impingement, synovitis, loose bodies, ossicles, and OCDs. Certain ankle fractures (e.g., Weber type B distal fibular fracture, Tillaux fracture) also can be successfully treated by means of arthroscopy-assisted (open) reduction and internal fixation, which offers the advantage of direct visualization and treatment of concomitant intra-articular injuries. Other procedures include arthroscopic ankle stabilization by means of radiofrequency and arthroscopy-assisted ankle arthrodesis. In case
of multiple disorders (e.g., a symptomatic OCD or ankle impingement with concomitant ankle instability), a combined treatment is often possible.

Contraindications

Absolute contraindications are infection and severe degenerative changes. Relative contraindications are degenerative changes with diminished range of motion, narrowing of the joint space, vascular disease, and edema.124

Diagnosis

The value of diagnostic ankle arthroscopy without a preoperative diagnosis is limited; only 26% to 43% of patients benefit from the procedure.424,425 Hence, a diagnosis should be established preoperatively by physical examination and plain radiographs. If the diagnosis remains unclear, additional radiographs (e.g., heel rise view or anteromedial impingement view) can be obtained (Figure 1).397,440 Furthermore, local infiltration can be performed. Temporary relief from pain after intra-articular infiltration suggests intra-articular pathology, such as soft-tissue impingement or an OCD. When and OCD, a loose body, or an ossicle is suspected, the lesion may be disclosed by magnetic resonance imaging (MRI) or spiral computed tomography (CT).440 If the CT scan is negative and the preoperative diagnosis remains unclear, it is unlikely that the patient will benefit from diagnostic arthroscopy.424,425

Routine fixed distraction versus dorsiflexion

Previous investigators have reported the routine use of ankle joint distraction.59 The available noninvasive distraction devices are sterile and attach to the operating table. A strap connected to this distraction device is placed around the ankle. The surgeon using one of these devices stands beside the patient to perform
Several factors favor the use of dorsiflexion rather than distraction. First, distraction of the joint may result in tightening of the anterior capsule, leading to a reduction of the anterior working area (Figure 3). Second, loose bodies and osteophytes are usually located in the anterior compartment of the ankle joint. Dorsiflexion creates an anterior working area, which makes removal easy. Introduction of saline solution opens the anterior working area. In the case of a loose body and distraction, the loose body may fall into the posterior aspect of the joint, which makes removal more difficult. Third, in the dorsiflexed position, the talus is concealed in the joint, thereby protecting the cartilage from potential iatrogenic damage.

Mechanical distraction and use of a small-diameter arthroscope may be beneficial in some situations. These include treatment of ossicles, a soft tissue impediment, a loose body caught in the joint space between the fibula and tibia (the intrinsic syndesmotic area), an OCD located in the posterior tibial plafond, and posterior ankle problems. An important alternative for the treatment of posterior ankle problems is a two-portal posterior arthroscopy.

Figure 2. Positioning of the patient during anterior arthroscopy. The affected heel rests on the very end of the operating table, making it possible for the surgeon to fully dorsiflex the ankle joint by leaning against the sole of the foot.

Figure 3. Schematic lateral view of the ankle joint. In dorsiflexion the anterior working is enlarged (A). Distraction of the ankle joint (arrows) results in tightening of the anterior capsule, reducing the anterior working area (B).
Should distraction be indicated, a resterilizable noninvasive distraction device enables the surgeon to change quickly from the dorsiflexed position to the distracted position and vice versa (Figure 4).428

Operative technique

The anterior dorsiflexion procedure is performed as outpatient surgery under general or spinal anesthesia.424 The patient is placed in the supine position with slight elevation of the ipsilateral buttock. A tourniquet is placed around the upper thigh. The heel of the affected foot rests on the very end of the operating table, thus making it possible for the surgeon to fully dorsiflex the ankle joint by leaning against the sole of the patient’s foot (see Figure 2). The two primary anterior portals used for anterior ankle arthroscopy are the anteromedial and anterolateral, located at the level of the joint line. When their use is indicated, accessory anterior portals are located just in front of the tip of the medial or lateral malleolus. Some surgeons combine the anterior portals with a posterolateral portal.125

The anteromedial portal is made first. After a skin incision has been made just medial to the tibialis anterior tendon, the subcutaneous layer is bluntly divided with a hemostat. The 4-mm, 30°-angle arthroscope, which we use routinely, is introduced in the fully dorsiflexed position. Saline solution is then introduced into the joint. Under arthroscopic control, the anterolateral portal is made by introducing a spinal needle lateral to the peroneus tertius tendon while respecting the superficial peroneal nerve (Figure 5).

Depending on the procedure performed, the instruments can be exchanged between portals. After removal of the instruments, the arthroscopic incisions are closed with Ethilon sutures (Ethicon, Piscataway, NJ) to prevent sinus formation.

Figure 4. A resterilizable noninvasive distraction device, which permits the surgeon to move the ankle quickly from the dorsiflexed position to the distracted position and vice versa.
Complications

Several complications have been described, including injury to neurovascular structures, instrument breakage, articular surface damage, neuroma formation, infection, and reflex sympathetic dystrophy. The superficial peroneal nerve is at highest risk, and injury to this nerve is associated with the anterolateral portal. Reports of complications in ankle arthroscopy vary widely. With the use of either invasive or manual constant distraction, complication rates of 9% to 17% have been reported. In the largest series published to date, nearly 50% of complications were neurologic. The use of constant distraction might be indicative of higher complication rates. In a recent survey performed in our department in which 1,300 consecutive patients with ankle arthroscopy without routine joint distraction were included, the overall percentage of complications was 3.4%. This figure includes 1.4% for hindfoot endoscopy.

Osteochondral defects

An OCD is a lesion involving articular cartilage and subchondral bone. The incidence of OCDs of the talar dome in patients with acute lateral ankle ligament ruptures is 4% to 7%. Talar OCD are usually posteromedial (58%) or anterolateral (42%). Medial lesions are typically deep and cup-shaped; lateral lesions are shallow and wafer-shaped. Inappropriate treatment of OCDs may eventually result in osteoarthritis of the ankle.

Etiology

Previous trauma to the ankle joint is reported in 93% of lateral lesions and 61% of medial lesions. In lateral lesions, the trauma mechanism is usually a combination of inversion and dorsiflexion; in medial lesions, the combination is inversion, plantar flexion and rotation. In nontraumatic osteochondral defects, possible causes are genetic, metabolic, vascular, endocrine, and degenerative factors, as well as morphologic abnormalities.
Clinical presentation

Patients with a chronic lesion typically experience persistent or intermittent deep ankle pain during or after activity, sometimes accompanied by swelling and limited range of motion. Often, on examination, few abnormalities are found. Affected ankles may have a normal range of motion with the absence of swelling and no recognizable tenderness on palpation.

Diagnosis

Routine radiographs consist of weight-bearing anteroposterior and lateral views of both ankles. The radiographs may show an area of detached bone surrounded by radiolucency. Initially, the damage may be too small to be visualized on a routine radiograph.

A heel rise mortise view may reveal a posterior defect. For further diagnostic evaluation, CT and MRI have demonstrated similar accuracy. A multislice helical CT scan is preferred because it is more helpful for preoperative planning (Figure 6).

Classification and staging

Several classifications based on radiography, CT, MRI, and arthroscopy have been proposed. The first and most frequently used classification was that of Berndt and Harvey: stage I, a small compression fracture; stage II, incomplete avulsion of a fragment; stage III, complete avulsion of a fragment without displacement; and stage IV, displaced fragment. Scranton and McDermott later added stage V, representing cystic lesions. None of the current grading systems, however, is sufficient to direct the choice of treatment.

Treatment

Various surgical techniques for the treatment of symptomatic osteochondral lesions have been published. These are generally based on one of the following three principles: (1) debridement and bone marrow stimulation (microfracturing, drilling, abrasion arthroplasty); (2) securing a lesion to the talar dome (fragment fixation, retrograde drilling, bone grafting); and (3)
development or replacement of hyaline cartilage (autologous chondrocyte implantation [ACI], osteochondral autograft transplantation system [OATS; i.e., mosaicplasty], allografts). The choice of treatment depends on the patient's age, symptoms, duration of complaints, and location and size of the defect, as well as whether it concerns a primary or secondary OCD.149,457

Asymptomatic or low-symptomatic lesions are treated nonsurgically by rest, ice, temporarily reduced weight bearing, and, in case of giving way, an orthosis.346,457 Symptomatic lesions are treated primarily by debridement and bone marrow stimulation.149 With this technique, all unstable cartilage is removed, including the underlying necrotic bone. Any cysts underlying the defect are opened and curetted. The sclerotic-calcified zone that is most commonly present is perforated by means of microfracturing into the vascularized subchondral bone. The underlying intraosseous blood vessels are disrupted and growth factors are released, leading to the formation of a fibrin clot into the created defect. The formation of new blood vessels is stimulated, marrow cells are introduced into the OCD, and fibrocartilaginous tissue is formed.301 In case of a (cystic) defect ≥15 mm in size, a cancellous bone graft may be placed in the defect.149

Retrograde drilling, combined with cancellous bonegrafting when necessary, may be performed for primary OCDs when there is intact cartilage with a large subchondral cyst.381 When primary treatment fails, OATS or ACI are options.39,417 Although both techniques are promising, results are not yet widely published, and the number of patients included in studies is small.

OATS consists of harvesting one or more osteochondral plugs in a lesser—weight-bearing area of the knee, and transplanting them into the talar defect.177 Although most reports show excellent results, the technique is associated with donor site morbidity, and a medial malleolar osteotomy is often required.31,147,327 ACI is the implantation of in vitro cultured autologous chondrocytes, using a periosteal tissue cover after expansion of isolated chondrocytes. Despite excellent results reported by some investigators,39,448 disadvantages include two-stage surgery, high costs, and reported donor site morbidity.147,448

Fragment fixation with one or two leg screws is preferred in acute or semiacute situations in which the fragment is ≥15 mm. In adolescents, fixation of an OCD always should be considered following failure of a 6-month period of conservative treatment.

The size and location of the lesion determine whether to use a standard 4.0-mm arthroscope and treat the OCD in the anterior working area by full plantar flexion of the ankle, or to use a 2.7-mm arthroscope in combination with mechanical distraction.346,424 In patients with unlimited plantar flexion, all defects located in the anterior half of the talus or in the anterior part of the posterior half can be reached and treated by anterior arthroscopy.346,424 Other options are to approach the defect from posterior by means of a two-portal hindfoot approach or to proceed by means of a medial malleolar osteotomy.12,427

**Surgical technique and rehabilitation**

A 4.0-mm scope and a 4.5- or 5.5-mm shaver are routinely used. In case of synovitis, a local synovectomy is performed with the ankle in the dorsiflexed position. The lesion is identified in the forced plantarflexed position by palpating the cartilage with a probe or hook (Figure 7). During this part of the procedure a soft-tissue distractor can be applied (see Figure 4). If possible, the full-radius resector is introduced into the defect. In doubtful cases, identifying the defect by introducing a spinal needle, probe, or curette can be useful before introduction of the resector.
Advancements in ankle arthroscopy

The key to success is to identify the anterior part of the defect and remove the unstable cartilage and subchondral necrotic bone. The instruments are subsequently brought into the defect to treat the posterior part. Every step in the debridement procedure is checked by regularly switching portals. After full debridement, the sclerotic zone is penetrated by means of a microfracture probe or a Kirschner wire (see Figure 7). Postoperatively, a compression dressing is applied.

Active plantar flexion and dorsiflexion are encouraged. Partial weight bearing (i.e., eggshell pressure) is allowed as tolerated. We allow progress to full weight bearing within 2 to 4 weeks in patients with central or posterior lesions of up to 1 cm. Larger lesions and anterior lesions require partial weight bearing up to 6 weeks. Running on even ground is permitted after 12 weeks. Full return to normal and sporting activities is usually possible 4 to 6 months after surgery.

Results

In the treatment of osteochondral lesions, nonsurgical therapy yields a 45% success rate. However, a trial period of nonsurgical treatment does not adversely affect the outcome of surgery.

In a systematic review of the literature, debridement and bone marrow stimulation was superior to other methods, with a mean of 86% good or excellent results in 21 studies (total, 272 patients). However, OATS and ACI were not included because of the few number of studies using these methods, and sizes of the treated lesions were not described.

A recent randomized controlled that compared chondroplasty, microfracture, and OATS showed similar results among these methods at 2-year follow-up. However, the chondroplasty and microfracture techniques are recommended because of less postoperative pain. Furthermore, costs are lower compared with those of other techniques.
Anterior ankle impingement

Chronic anterior ankle pain is commonly caused by formation of tibial or talar osteophytes at the anterior part of the ankle joint. Morris and later McMurray named this condition athlete’s ankle or footballer’s ankle; these terms were later replaced by the anterior ankle impingement syndrome. The condition predominantly affects soccer players, but it also occurs in runners, ballet dancers, high jumpers, and volleyball players.

Etiology

Various theories exist regarding the causes of anterior impingement: traction, trauma, recurrent microtrauma, and chronic ankle instability. The hypothesis of traction is not plausible because the anterior joint capsule is attached more proximally to the site where the tibial spurs originate. In trauma secondary to or associated with supination stress, damage to the non—weight-bearing cartilage rim occurs. A repair reaction is initiated, with cartilage proliferation, scar tissue formation, and calcification. Ankle sprains resulting from chronic instability as well as forced dorsiflexion enhance this process.

The pain in anterior ankle impingement likely is caused by the inflamed soft tissue along the anterior tibiotalar joint line, which is compressed by the talar and tibial osteophytes during forced dorsiflexion.

Clinical presentation

Anterior ankle impingement is characterized by anterior pain at the level of the ankle joint, swelling after activity, and, occasionally, limited dorsiflexion. Athletes with recurrent ankle sprains are prone to this condition, and sporting activities are often reduced because of the pain.

Diagnosis

Standard anteroposterior and lateral radiographs may not detect the presence of osteophytes. When anteromedial osteophytes are suspected, an oblique radiograph should be added because some osteophytes may be undetected by standard radiographs. Anteromedial tibial or
talar osteophytes may be overprojected by the anterolateral border of the distal tibia or by the lateral part of the talar neck and body, respectively. In the oblique anteromedial impingement view, the beam is tilted in a 45° craniocaudal direction, with the leg in 30° external rotation and the foot in plantar flexion in relation to the standard lateral radiograph position (Figure 9). The anteromedial impingement radiograph has a high sensitivity for detecting anteromedial osteophytes: 93% for tibial and 67% for talar osteophytes (see Figure 1).397

**Results**

Open resection and arthroscopic resection of osteophytes were compared by Scranton and McDermott.348 The average length of hospitalization and time to recovery were shorter in the arthroscopic group.

In prospective studies, success rates varied from 73% to 96%.15,38,426 A significant difference in outcome was seen between patients with normal joint spaces and (90% success) and those with joint space narrowing (50% success).426 This finding was later confirmed in two long-term follow-up studies.86,394 Because the alternative in these osteoarthritic patients is arthrodesis, a 50% success rate is acceptable. Both series also reported a high rate of recurrence of osteophytes.86,394 However, no statistical correlation was seen between recurrence of osteophytes and return of symptoms.

**Hindfoot endoscopy**

**History**

The deep location of hindfoot structures makes direct access difficult. Historically, the hindfoot was approached by a three portal technique (i.e., anteromedial, anterolateral, posterolateral), with the patient in the supine position.125 The traditional posteromedial portal is associated with potential damage to the tibial nerve, the posterior tibial artery, and local tendons.124

A two-portal endoscopic approach with the patient in the prone position was introduced in 2000.427 This technique has been shown to provide excellent access to the posterior ankle compartment, the subtalar joint, and extra-articular structures.427
Indications

The main indications for endoscopy in the posterior compartment of the talocrural joint are posteriorly located OCDs of the ankle joint, loose bodies, ossicles, posttraumatic calcifications or avulsion fragments, posterior tibial rim osteophytes, chondromatosis, and chronic synovitis. In the posterior compartment of the subtalar joint, the main indications are osteophytes, loose bodies, an intraosseous talar ganglion, and subtalar arthrodesis. Other extra-articular structures that can potentially be treated are the posterior tibial tendon, the flexor hallucis longus tendon, the peroneal tendons, the Achilles tendon, the deep portion of the deltoid ligament, and a symptomatic os trigonum or hypertrophic talar process.

Posterior ankle impingement syndrome is a clinical diagnosis in which the patient experiences pain in the hindfoot when the ankle is forced into a plantarflexed position (Figure 10). It is caused by overuse or trauma and mainly occurs in ballet dancers, downhill runners, and soccer players. After an injection of lidocaine, the forced hyperplantarflexion test should be negative. On plain radiographs and CT, an os trigonum or hypertrophic posterior talar process may be detected. Treatment consists of resection of a symptomatic os trigonum, reduction of a prominent posterior talar process, or removal of a soft-tissue impediment.

Surgical technique and rehabilitation

The procedure is performed as outpatient surgery under general or spinal anesthesia. The patient is placed in a prone position. A tourniquet is applied around the upper leg, and a small support is placed under the lower leg, making it possible to move the ankle freely (Figure 11). A soft-tissue distraction device can be used when indicated. For irrigation, normal saline with gravity flow is suitable. A 4.0-mm, 30° arthroscope is routinely used for posterior ankle arthroscopy. In addition to the standard excisional and motorized instruments for treatment of osteophytes and ossicles, a 4-mm chisel and small periosteal elevator can be useful.

With the ankle in the neutral position, a line is drawn from the tip of the lateral malleolus to the Achilles tendon, parallel to the foot sole. The posterolateral portal is situated just above this line, in front of the Achilles tendon (Figure 12A). After a vertical stab incision is made, the subcutaneous layer is split by a mosquito clamp. The mosquito clamp is directed anteriorly, pointing in the direction of the interdigital web space between the first and second toe (Figure 13).
When the tip of the clamp touches the bone, it is exchanged for a 4.0-mm arthroscope. The direction of view is 30° to the lateral side.

The posteromedial portal is now made at the same level (Figure 12B). After making a vertical stab incision in front of the medial aspect of the Achilles tendon, a mosquito clamp is introduced and directed toward the arthroscope shaft in a 90° angle. When it touches the shaft of the arthroscope, it is moved anteriorly in the direction of the ankle joint, all the way down, touching the arthroscope shaft until it reaches the bone (Figure 14). The arthroscope is now pulled slightly backward until the tip of the mosquito clamp touches the bone (Figure 14).
The clamp comes in to view. The clamp is used to spread the extra-articular soft tissue in front of the tip of the lens. In situations where scar tissue or adhesions are present, the mosquito clamp is exchanged for a 4.5-mm full-radius shaver.

After removal of the very thin joint capsule of the subtalar joint by a few turns of the shaver, the posterior compartment of the subtalar joint can be visualized. At the level of the ankle joint, the posterior tibiofibular and talofibular ligaments are recognized. The posterior talar process can be freed of scar tissue, and the flexor hallucis longus tendon is identified. The flexor hallucis longus tendon is an important landmark to prevent damage to the medial neurovascular bundle (Figure 15). One should always stay lateral to this tendon and move medially only when release of the neurovascular bundle is indicated (e.g., tarsal tunnel syndrome). After removal of the thin joint capsule of the ankle joint, the ankle joint can be entered and inspected.

Removal of a symptomatic os trigonum or treatment of a nonunion of a posterior talar process fracture involves partial detachment of the posterior talofibular ligament, release of the flexor retinaculum, and release of the posterior talocalcaneal ligament (Figure 16). The os trigonum can be lifted from the subtalar joint by means of a small-sized bone elevator (Figure 17) and removed with a grasper. At the end of the procedure, hemorrhage is controlled by electrocautery, and the skin is closed with Ethilon sutures. A sterile compression dressing is applied.

Postoperative treatment is functional and consists of weight bearing on crutches as tolerated for 3 days, after which the dressing is removed. The patient is advised to start range-of-motion exercises as soon as possible after surgery. If necessary, physiotherapy is begun.

Results

We performed 146 endoscopic hindfoot procedures on 136 consecutive patients. The main indications were bony impingement, OCDs, and flexor hallucis longus tendinitis. Treatment was successful in most patients; two minor complications (1.4%) were seen (i.e., an area of diminished sensation over the heel pad of the hindfoot in both cases). Similar results have been published by other surgeons. Furthermore, the technique described is considered to be a safe method, according to a recent anatomic study. It is recommended that the procedure be performed by an experienced arthroscopist who has practiced this type of surgery in a cadaveric setting at arthroscopy courses.
Figure 14. Schematic transverse section of the right ankle joint at the level of the arthroscope. The posterolateral portal is made first (A). The arthroscope is directed toward the first web space. The posteromedial portal is made at the same level (B). The mosquito clamp is directed toward the arthroscope shaft at a 90° angle. When the mosquito clamp touches the shaft of the arthroscope, the clamp is moved anteriorly in the direction of the ankle joint, all the way down, touching the arthroscope shaft until it reaches the bone (curved arrow) (C). All following instruments (e.g., shaver) are introduced in the same manner.

Figure 15. Hindfoot endoscopy of the right ankle. A combination of two separate procedures is shown. The flexor hallucis longus (FHL) is the important landmark in posterior ankle arthroscopy. Instruments should always stay lateral to this tendon. Viewing medial to the FHL (left) reveals the neurovascular bundle (tibial nerve [N], and the posterior tibial artery and veins [V]). This medial view is only indicated when a tarsal tunnel release is performed.

Lat = lateral, M = mosquito clamp in lateral portal, and Med = medial.
Figure 16. Endoscopic picture of a left ankle. Removal of a symptomatic os trigonum or treatment of a nonunion of a posterior talar process fracture involves partial detachment of the posterior talofibular ligament (PTFL), release of the flexor hallucis longus (FHL) retinaculum, and release of the posterior talocalcaneal ligament (TCL).

Lat = lateral and Med = medial.

Figure 17. Endoscopic view of a right ankle. The os trigonum can be lifted from the subtalar joint with a small bone elevator.

Lat = lateral and Med = medial.
Summary

Over the last three decades, the field of arthroscopic foot and ankle surgery has progressed significantly. Arthroscopy of the ankle joint has become the procedure of choice for the treatment of chronic and posttraumatic pathologies. The diagnosis should be established before surgery. If necessary, CT and additional radiographs (e.g., heel rise view, anteromedial impingement view), can be obtained to confirm a clinical diagnosis and for preoperative planning. When the dorsiflexed position is used with anterior arthroscopy, ankle distraction is necessary only in a minority of cases.

Most OCDs can be treated by anterior arthroscopic debridement and microfracturing with the ankle in planter flexion. The anterior impingement syndrome is treated by arthroscopic excision of osteophytes. Posterior ankle problems (e.g., posterior impingement syndrome) can be effectively treated by means of a two-portal hindfoot approach with the patient in the prone position. This approach offers excellent access to the posterior ankle compartment, the subtalar joint, and extra-articular structures.

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