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van Dijk, C.N.; Scholte, D.

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Arthroscopy of the Ankle Joint

C. Niek van Dijk, M.D., Ph.D., and Dik Scholte, M.D.

Summary: Ankle arthroscopy has become a standard procedure for a variety of indications. Joint distraction is applied by many authors. A recent retrospective multicentre study provoked the following questions. Is there an indication for diagnostic arthroscopy? Can arthroscopic surgery of the ankle joint be routinely performed without joint distraction? Does the range of motion increase after arthroscopic treatment of an anterior impingement syndrome? A series of 122 consecutive patients were prospectively studied in a protocol that included preoperative history taking, physical examination, and standardized follow-up at 4 months and 2 years postoperative. Excellent and good results of arthroscopic treatment were obtained in 84% of impingement lesions, in 88% of osteochondral defects, and in 88% of loose body removal. In patients in whom no definite preoperative diagnosis was made and for whom diagnostic arthroscopy was performed, only 26% benefitted from the procedure. Treatment of anterior impingement lesions resulted in a subjective feeling of increase in range of motion in 66% of the patients. In 20% of patients, however, the dorsiflexion at 2-year follow-up increased $\geq 5^\circ$. The arthroscopic procedures could be performed without the use of joint distraction in 98% of the cases. Arthroscopic surgery of the ankle joint is a successful procedure in treatment of impingement lesions, osteochondral defects, and removal of loose bodies. It is beneficial to perform the procedure without joint distraction. There is only limited indication for diagnostic arthroscopy. **Key Words:** Arthroscopy—Ankle joint—Impingement—Osteochondral defect—Diagnostic.

Over the last decade arthroscopy of the ankle joint has become an important diagnostic and therapeutic procedure in chronic and post-traumatic complaints of the ankle joint. Burman in 1931 regarded the ankle joint unsuitable for arthroscopy, because of its typical anatomy.¹ Tagaki in 1939 was the first one to describe the systematic arthroscopic assessment of the ankle joint.² Watanabe published a series of 28 ankle arthroscopies in 1972 followed by Chen in 1976, who published on 67 patients.^{3,4} In the 80s several publications followed.⁵⁻¹² Joint distraction is routinely used by most authors.^{6-8,13-17} All published series concern retrospective follow-up studies.

Relative contraindications are degenerative changes with diminished range of motion, joint space narrowing, vascular disease, and edema.⁸ Absolute contraindications are infection and severe degenerative changes. A painful ankle with severe degenerative changes and diminished range of motion is an indication for arthrodesis. Under certain conditions this procedure can be performed arthroscopically.^{7,18,19}

In a recent retrospective, multicentre study, 245 ankle arthroscopic procedures were analyzed.²⁰ In patients with no definitive preoperative diagnosis in whom diagnostic arthroscopy was performed, the majority of patients did not benefit from the procedure, whereas arthroscopic treatment of anterior impingement lesions, osteochondral defects, and loose body removal gave good and excellent results in 90% of cases. The study raised the following questions:

1. Is there an indication for diagnostic arthroscopy in patients without a definitive preoperative diag-

From the Academic Medical Center, Department of Orthopaedic Surgery, Amsterdam, The Netherlands.

Address correspondence and reprint requests to C. N. van Dijk, M.D., Ph.D., Academic Medical Center, Department of Orthopaedic Surgery, Meibergdreef 9, 1105 AZ Amsterdam, The Netherlands.

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nosis in spite of extensive preoperative evaluation which includes history-taking, radiographs, bone scan, and possibly, computed tomography (CT) scan or magnetic resonance imaging (MRI)?

2. Does arthroscopic treatment of an anterior impingement lesion affect the range of motion?
3. Is routine joint distraction necessary to perform arthroscopic surgery of the ankle joint?

To answer these questions we prospectively enrolled 122 consecutive patients in a protocol.

PATIENTS AND METHODS

The study took place at the Academic Medical Centre in Amsterdam. All consecutive patients who had an ankle arthroscopy between January 1, 1990 and January 1, 1992 were registered. All patients underwent the same preoperative history-taking and physical examination. The findings were recorded on a standardized form.

Patients were divided into five groups: (1) anterior impingement lesions; (2) osteochondral defect; (3) loose body; (4) diagnostic procedure; and (5) other indications. A diagnosis of anterior impingement was made in patients who presented with anterior ankle pain, slightly limited painful dorsiflexion, localized swelling or synovitis, and pain on palpation on the anterior aspect (anteromedial of anterolateral) of the ankle joint. The impingement lesions were classified using the Scranton and McDermott classification.⁷ Os-

teochondral defects were classified according to the Loomer classification.²¹ Diagnostic ankle arthroscopy was performed in patients with a painful ankle who did not fall into one of the first three groups. In spite of extensive preoperative investigations, a definitive diagnosis could not be made in these patients. All surgery was performed by the senior author.

Arthroscopic Procedure

The procedure is carried out as outpatient surgery under general anaesthesia or epidural anaesthesia. The patient is placed in a supine position with slight elevation of the ipsilateral buttock. The heel of the affected foot rests on the very end of the operation table, thus making it possible for the surgeon to fully dorsiflex the ankle joint by leaning against the patients foot sole. An anteromedial skin incision is made. The subcutaneous layer is divided utilizing a haemostat. A 4 mm, 30° angle arthroscope is routinely used. The anterolateral portal is made under arthroscopic control. Additional portals just anterior to the tip of the lateral or medial malleolus or a posterolateral portal are used when indicated. Osteophytes are removed by chisel and burr. In the fully dorsiflexed position these spurs can be easily identified (Fig 1A).

Distraction of the joint results in tightening of the anterior capsule, thus making it more difficult to identify the osteophytes (Fig 1B). Treatment of osteochondral defects consists of curetting and drilling.²² The defect is identified by forced plantar flexion of the ankle joint (Fig 2A,B). A local synovectomy around

FIG 1. (A) In the dorsiflexed position by filling the joint with saline the anterior compartment “opens up.” All structures in front of medial malleolus, lateral malleolus as well as the front of the distal tibia and talar neck can be easily inspected and treated. The arrows point out the osteophytes on distal tibia and talar neck. (B) Distraction of the joint results in tightening of the anterior joint capsule, thus making it more difficult to identify the structures in the anterior compartment.

FIG 2. (A) In the neutral position the osteochondral defect cannot be detected by arthroscopy. (B) By forced plantar flexion of the ankle joint the defect can be brought into the anterior working area and thus be identified and treated. (C) Joint distraction makes it possible to identify the lesion but for treatment a transmalleolar portal has to be made.

the portal opposite the talar defect usually has to be carried out first to make identification and treatment of the defect possible. Postoperative rehabilitation treatment consists of a compressive bandage and partial weight bearing for 3 to 5 days. From the moment the patient is awake, he should actively fully dorsiflex his ankle and foot. The patient is stimulated to continue this exercise a few times every hour.

Results

During the study period 122 patients were included of whom 96 were men. The right ankle was involved in 71 patients.

Age and indication are given in Table 1. All 122 patients returned for a 4-month follow-up. A 2-year follow-up was performed in 117 patients. Five patients could not be traced. There were two complications. One patient developed a sympathetic dystrophy with a negative result. In another patient a peroneal nerve irritation was present at 4-months follow-up, which

restored at the 1-year follow-up. Two patients had numbness on the dorsal aspect of the foot. There were no infections.

In 51% of patients there was a history of one or more significant supination traumas. Such traumas were prevalent in 63% of the impingement group. In the impingement group there were 45 bony impingements and 12 soft tissue impingements. Twenty-seven osteophytes were located on the anterior part of the medial malleolus, 19 at the anteromedial part of the distal tibia, 6 at the anterolateral part of the distal tibia, 11 at the medial talar neck, and 1 at the lateral talar neck. Of the soft tissue impingements, 7 were located anteromedial and 5 anterolateral. According to the classification of Scranton and McDermott there were 23 grade I lesions, 3 grade II lesions, 20 grade III lesions and, 11 grade IV lesions.

At 4-month follow-up the range of motion was unaffected by the operative procedure in 47 of the 57 patients ($<5^\circ$ difference between preoperative and post-

FIG 3. Preoperative and 2-year postoperative level of pain in patients with impingement lesions (= imp); diagnostic procedures (= diag); osteochondral defects (= OD); and loose bodies (= LB).

operative measurement). Of these 47 patients 28 stated that their dorsiflexion subjectively improved.

At the 2-year follow-up in 12 patients the dorsiflexion was increased $\geq 5^\circ$ (average 7° , varying from 5° to 11°). A subjective feeling of improved dorsiflexion was still present in 19 others. The preoperative and 2-year postoperative level of pain and swelling are given in Figs 3 and 4. Table 2 gives the findings at physical examination. In 94% of patients there was an improvement in the level of pain and swelling at the 2-year follow-up.

Of the 33 patients who preoperatively had to stop their sport activities at 2-year follow-up, 26 had resumed sports activities; of these 26 patients, 17 resumed sports at a maximum level. Testing succeeding categories there was a significant better satisfaction in patients who had grade I lesions than in type II lesions and less pain for patients classified as having grade III lesions compared with those with grade IV lesions. Of the 16 patients with an osteochondral defect, 8 lesions were located medial, 6 were located lateral, and 2 were located in the distal tibia (pilon tibiale). According to the Loomer classification there were 10 grade Vb lesions, 1 grade Va lesions, 2 grade IV lesions, and 3 grade III lesions. All six patients with a lateral defect had a history of supination trauma, whereas in the group of patients with a medial defect, only two patients had a trauma history. In the two pilon tibial lesions, mechanical distraction using an external fixator was necessary to be able to treat the lesion. One had a good result and one had a poor result. All the talar lesions could be detected and treated by bringing the ankle joint into the forced plantar flexed position. The operative findings in the diagnostic group were generalized synovitis in 3 patients, localized synovitis

in 4 patients, and adhesions in 3 patients. Synovectomy and adhesiolysis resulted in 1 excellent, 1 good, and 8 poor results at 2-year follow-up.

In 4 patients a meniscoid type lesion was found and removed. Three of these had a good or excellent 2-year result. One patient had an avulsion fragment of the lateral malleolus. The fragment was excised, which gave an excellent 2-year result. In three patients degenerative cartilage changes were found and debrided. The result was poor in all three patients. In 9 patients there were no pathologic intra-articular findings.

The overall subjective results at 4-months and 2-year postoperative are given in Fig 5. Excellent and good results were obtained in 84% of impingement lesions, 88% of osteochondral defects and loose body removal, while only 26% of patients benefitted from the procedures that were performed in the diagnostic group.

Discussion

The most common clinical manifestation of localized post-traumatic ankle pathology is the anterior impingement syndrome. Arthroscopic treatment has shown to be successful for this type of lesion.^{7,10,20,23} Our prospective study demonstrates a similar high percentage of good and excellent results.

Repetitive microtrauma of the anterior joint capsule is recognized as the most frequent cause of anterior impingement.^{5,16,24,25} Soft tissue swelling with scar tissue formation limits the range of motion. Spurs and osteophytes build up, due to direct trauma to the anterior joint or due to traction onto the joint capsule. An important cause of osteophyte formation is damage of the cartilage of the anterior aspect of the medial malleolus and distal tibia due to supination trauma. This

FIG 4. Preoperative and 2-year postoperative level of swelling in patients with impingement lesions (= imp); diagnostic procedures (= diag); osteochondral defects (= OD); and loose bodies (= LB).

Impingement

Diagnostic

Osteochondral lesion

Loose body

FIG 5. Subjective results at 4 months and 2 years postoperative in impingement lesions ($n = 57$), osteochondral defects ($n = 16$), loose bodies ($n = 8$); and diagnostic procedures ($n = 27$).

TABLE 1. *Number of Patients per Indication and Differentiation in Age Groups*

	Total	imp	diag	OD	LB	Other
<20 yr:	9 (8%)	1 (2%)	5 (19%)	3 (19%)	—	—
20 yr:	51 (44%)	27 (47%)	7 (26%)	9 (57%)	4 (50%)	3 (33%)
30 to 39 yr:	39 (33%)	21 (37%)	11 (41%)	2 (12%)	4 (50%)	2 (22%)
40 to 49 yr:	14 (12%)	7 (12%)	2 (7%)	1 (6%)	—	4 (45%)
>50 yr:	4 (3%)	1 (2%)	2 (7%)	1 (6%)	—	—
Main age yr:	117 (100)	57 (100)	27 (100)	16 (100)	8 (100)	9 (100)
	30,8	31,1	31,5	27,0	29,1	34,5

NOTE. imp = impingement; diag = diagnostic; OD = osteochondral defect; LB = loose body.

cartilage damage occurs in most patients with a lateral ankle ligament rupture due to direct impingement contact between the medial malleolus and medial talar facet.^{26,27}

Sixty-three percent of the patients in the impingement group had a history of one or more significant supination traumas. The initial cartilage damage induces a repair reaction with scar tissue formation, ossification, and spur formation. In these patients the joint surface itself is not damaged.²⁶ The osteophytes therefore are not the result of osteoarthritis, but they are the result of local pathology. Patients experience pain on the anterior aspect of the joint which inhibits full dorsiflexion. Removal of these osteophytes and scar tissue (Scranton and McDermott I-III) resulted in 91% good to excellent results at 2-year follow-up. Removal of bone spurs resulted in a subjective feeling of increased range of motion in a majority of patients. In only 20%, however, an improvement of $\geq 5^\circ$ could be measured at 2-year follow-up. When osteophytes are the result of arthritis (Scranton and McDermott grade IV lesions) we feel there is limited indication to remove

them.¹⁷ These osteophytes stabilize the joint and removal may result in progressive arthritis.

Our study confirms the result of others, that osteochondral defects can be successfully treated arthroscopically.^{21,28,29} In all 16 patients with osteochondral defects, the defect could be identified and treated without the use of mechanical joint distraction. The defects were brought into the anterior working area by maximal plantar flexion of the ankle joint (Fig 2B). The alternative would have been performing mechanical distraction and drilling the defect through a transmalleolar portal (Fig 2C). This approach is certainly more traumatic. Only in very dorsally located lesions with limited plantar flexion the defect cannot be treated in the anterior working area. All 27 patients we treated since 1993 were treated through the anterior portal in the maximal plantar flexed position.

Our results confirmed an earlier study that diagnostic arthroscopy gives a poor outcome.²⁰ A diagnosis must be established preoperatively, using physical examination and plain radiographs. If the diagnosis remains unclear additional tests as local infiltration or a bone

TABLE 2. *The Findings at Physical Examination Concerning Location of Pain and Swelling in Patients With Impingement Lesions (n = 57) and in Patients Who Underwent Diagnostic Arthroscopy*

		AL	AM	AL + AM	PL	PM	Total
Impingement	Pain	pre-op	5	24	26	1	57
		4 mo. p.o.	3	10	4	—	1n8
		1 yr p.o.	3	7	4	—	15
	Swelling	pre-op	4	10	23	—	37
		4 mo. p.o.	1	3	11	—	15
		2 yr p.o.	3	3	10	—	16
Diagnostic	Pain	pre-op	8	6	7	1	22
		4 mo. p.o.	5	4	3	1	13
		1 yr p.o.	5	3	3	1	12
	Swelling	pre-op	4	3	3	1	17
		4 mo. p.o.	2	2	5	—	9
		1 yr. p.o.	1	—	5	—	6

NOTE. AL = anterolateral; AM = anteromedial; PL = posterolateral; PM = posteromedial.

scan should be performed. A positive bone scan should be followed by CT scan. When the bone scan is negative we suggest to perform an intraarticular infiltration with a local anaesthetic. If the patient has a pain free interval, this is suggestive for intraarticular pathology such as a meniscoid type lesion. In case of negative outcome of this preoperative decision making process, diagnostic arthroscopy is not indicated because of poor results.

Is joint distraction necessary to perform ankle arthroscopy? In patients with anterior impingement lesions due to soft tissue or spur formation distraction results in tightening of the anterior joint capsule thereby decreasing the anterior working area (Fig 1B). When the joint is brought into the forced dorsiflexion position, however, the anterior compartment opens up and the pathology can be identified and treated (Fig 1A). All 43 osteochondral talar defects that we treated since 1990 to 1995 could be debrided and drilled arthroscopically without joint distraction.

Loose bodies are usually located in the anterior aspect of the ankle joint. Dorsiflexion creates an anterior working area and makes removal easy. Distracting the joint makes it possible for the loose body to "fall" into the posterior aspect of the joint, thus making removal more difficult.

We conclude that it is possible and beneficial for the treatment of anterior impingement lesion, osteochondral defects, and anteriorly located loose bodies to perform the arthroscopic procedure without joint distraction. There are situations however in which distraction is essential. Examples include ankle arthrodesis and posteriorly located loose bodies.

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