

Ankle Arthroscopy Findings During  
Ankle Fracture Fixation and Mid-Term  
Prognosis

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## Article Information

Received date: Jun 05, 2017

Accepted date: Sep 25, 2017

Published date: Sep 29, 2017

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**Keywords** Ankle fracture; Arthroscopy;  
Cartilage damage; Post traumatic  
osteoarthritis; Chondral damage

**Article DOI** 10.36876/smmd.1022

## Abstract

Anatomic reduction of ankle fractures does not ensure a normal ankle function. This might be related to chondral damage during the fracture or other intra-articular pathology. Arthroscopy in the setting of acute operative management of ankle fractures provides a means to completely assess intra-articular pathology and sometimes even direct therapeutic intervention. To date there is no consensus in the literature regarding the indications for arthroscopy in the setting of ankle fractures. It is our practice to perform an arthroscopic assessment of all ankle fractures requiring surgical intervention. The current study retrospectively evaluated a consecutive series of twenty-two adult patients who underwent routine arthroscopy performed during open reduction and internal fixation of ankle fractures and its correlation with the clinical results at a follow-up of 2 years. The clinical results at 2 year follow-up results demonstrated an average AOFAS score of 82±8. Patients with grade 4 talar damage fared significantly worse (70±8) than both patients with grade 3 talar damage (83±7) and with normal talus structure during arthroscopy 87±9 (5.42,  $p < 0.001$ ).

In conclusion the findings of this limited series seem to indicate that final clinical results at 2 years follow-up correlate with the presence of chondral damage observed during arthroscopy. A randomized clinical trial should be performed in order to assess the possible advantages of ankle arthroscopy as compared with open reduction technique in improving treatment outcomes in ankle fracture fixation.

## Introduction

The well-established technique for treatment of displaced ankle fractures involves open reduction and internal fixation which has been shown to confer some advantage, even in geriatric patients, as compared to conservative treatment [1].

Despite hardware improvement, there remains a substantial group of patients with less than optimal surgical results [2,3]. Many factors might contribute to this limited clinical success, including ligamentous injury, altered proprioception and muscle function [2] as well as intra-articular pathology.

While the routine open exposure technique allows the evaluation of the surfaces to a limited extent, some intra-articular pathology might be missed. This may potentially be solved by performing ankle arthroscopy a technique that allows evaluation of the intra-articular condition. Arthroscopy in the setting of acute operative management of ankle fractures provides a means to completely assess intra-articular pathology and sometimes even direct therapeutic intervention. This minimally invasive approach also might reduce tissue damage during open surgery which in turn could impact clinical outcome. Furthermore, such a technique may potentially improve fracture reduction and detect multiple soft tissue injuries that are undetectable using fluoroscopy [4-7].

Arthroscopic-assisted treatment of ankle fractures has been utilized for over a decade [8] and >70% of ankle fractures have chondral damage associated with the ankle fracture, especially in the high energy fracture types [9]. The defect is most often in the talus and certain injury types are more often associated with osteoarthritis during later follow-up [10]. Some authors have suggested that performing an arthroscopy does not affect the final outcome of the intervention [11]. The current retrospective study aimed to assess whether surgical findings during ankle arthroscopy can aid in predicting the eventual prognosis.

## Methods

## Patients

A consecutive series of twenty-two patients with ankle fractures were included (Table 1). The patients were all treated by the same team (D.R. & E.H.) using locked plates. There were no cases of peri-operative deep infection, a single case of delayed wound healing due to skin blistering and one due to steroid use, and no cases of peri-operative nerve damage.

OPEN ACCESS

ISSN: 2576-5442

Patients were evaluated pre-operatively and every 3 months, until 2 years after surgery, during routine clinic follow-up visits.

Functional outcomes at two years after operation were graded using the AOFAS scoring scales, which ranges from 0 to 100, with higher scores indicating lesser impairment [12].

### Syndesmosis stabilization

Syndesmosis stabilization was performed when necessary using either Tight Rope TM (Arthrex, USA) or two 3-cortical syndesmotic screws. The former option allows immediate weight bearing while the latter requires 6 weeks of non-weight bearing and secondary screw removal.

### Arthroscopic Surgical Technique

All patients were operated using lumbar anesthesia while lying in the supine position.

We avoided the use of a tourniquet to decrease the risk of nerve damage and compartment syndrome. The arthroscopy was performed using standard anteromedial and anterolateral portals using a 2.7 mm scope. Internal fixation was performed through a minimally invasive approach in some of the cases (12/22) with percutaneous plate insertion and screw fixation, and via a standard open approach in the

rest (10/22). Standard approach was required in comminuted fibular fractures (8/22), or in unreducible medial malleolar fractures (2/22).

A possible disadvantage of the tourniquet-free technique might be limited visualization during arthroscopy. However we did not encounter this in our clinical experience. In order to diminish the risk of developing compartment syndrome, gravity-assisted lavage was used instead of a perfusion pump.

### Statistical analysis

Univariate analyses of variance and Student's t-tests were performed using the add-in program Analyse-it version 2.30 Excel 12+ (Analyse-it Software Ltd. 2015). All statistical tests were tested at a 5% level of significance. Nominal p-values are presented.

### Results

The average operative time was 54 minutes. There were no infections following these procedures, nor was any nerve damage found post operatively. In two cases wound healing was prolonged resulting in the requirement for treatment with hydrogel bandages. Complete healing was observed at about 2 months follow-up.

In 15 out of 22 patients, arthroscopy revealed abnormal findings that could not be seen on radiographs (Table 1). Interestingly, damage to the distal tibia surface was very common (69%) while fibular

**Table 1:** Patient characteristics and arthroscopy evaluation findings.

Age	Weber Fracture Type	Grade from Arthroscopy Evaluation			Syndesmosis
		Talar Cartilage	Tibia Cartilage	Fibular Cartilage	
22	B	norm	norm	2	norm
45	C1	3	3	3	Anterior rupture
48	C2	3	4	norm	complete rupture
33	B	norm	3	norm	complete rupture
75	B	2	3	norm	complete rupture
69	C1	4	3	norm	complete rupture
71	C2	3	3	norm	complete rupture
38	C2	4	3	norm	complete rupture
81	A	3	norm	norm	Norm
57	B	norm	norm	norm	Anterior rupture
18	C1	norm	3	2	complete rupture
22	C2	4	norm	2	complete rupture
34	A	norm	3	norm	Norm
37	B	3	3	norm	Anterior rupture
27	C1	3	3	norm	Anterior rupture
54	C2	3	4	2	complete rupture
47	C2	3	4	2	complete rupture
41	A	norm	norm	norm	norm
19	B	3	3	norm	complete rupture
20	C1	3	3	norm	complete rupture
28	C2	4	norm	norm	complete rupture
32	B	2	norm	norm	norm

Norm, no apparent damage visually or by palpation; Anterior rupture, rupture of the anterior syndesmosis which presents like an opened door whose hinges are on the posterior ligaments.

cartilage damage was present in less than one third of the cases (28%). In (6/22) 36% of the patients with grade 4 cartilage damage, a loose body was removed. Most of the patients (78%) had some syndesmosis damage. In 4/22 patients hypertrophic synovitis of the anterior ankle was observed and resected.

In general, 2 years follow-up results were quite good with an average AOFAS score of  $82 \pm 8$ . Patients with grade 4 talar damage were doing significantly worse ( $70 \pm 8$ ) than patients with grade 3 talar damage ( $83 \pm 7$ ) and those with normal talus during arthroscopy  $87 \pm 9$  (ANOVA, F-statistic 5.42,  $p < 0.001$ ).

Patients with syndesmosis damage ( $80 \pm 8$ ) tended to not do as well as those with normal syndesmosis ( $88 \pm 7$ ) but the difference was not statistically significant (Student's t-test, t-value -1.8,  $p < 0.085$ ).

## Discussion

Arthroscopic evaluation of the ankle joint during fracture fixation appears to allow appreciation of the actual damage as well as treatment of loose bodies. In the current study no attempt was made to treat any observed chondral lesions using sophisticated marrow-stimulation or scaffold techniques. Thus, it is unclear whether the worse prognosis could be mitigated by induction of cellular repair at the time of fracture fixation. In the current study the clinical outcome shows no arthroscopy related complications. Compartment syndrome, is a known risk of arthroscopy during fracture fixation [13]. To reduce the risk of this unfortunate complication we avoided using a fluid infusion pump and relied solely on gravity-assisted irrigation.

The high frequency of chondral damage occurring during ankle fractures has been described by many authors [8,9]. This study demonstrates that cartilage damage observed during arthroscopy affects the long term prognosis as evaluated using the AOFAS score. This supports the findings of Stufkens et al [10]. Who observed progression to osteoarthritis in patients with talar injury or medial malleolar cartilage damage. Previous authors have found that unimalleolar fractures do not affect the gait pattern as severely as bimalleolar and trimalleolar fractures [2]. This observation is probably related to the amount of cartilage damage in the latter types.

Limitations of the study include a small cohort, and a relatively short follow-up period.

In conclusion, this study adds to the growing body of evidence indicating the clinical benefits of performing ankle arthroscopy on ankle fractures in adults, and the positive impact this minimally-invasive and revealing technique has on patient outcomes.

Further research should be carried out in order to evaluate whether using a bone-marrow stimulation technique or a scaffold might allow better prognosis for patients with acute fractures and associated cartilage damage.

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