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Arthroscopic assessment of the chronic unstable ankle joint

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Abstract The purpose of this study was to evaluate prospectively the findings during arthroscopy in patients with chronic instability of the ankle joint. One hundred and ten consecutive patients who had suffered at least two ankle sprains and were symptomatic for at least 6 months were included in this study. A complete rupture of the anterior talofibular ligament was found in 64%, of the calcaneofibular ligament in 41% and of the deltoid ligament in 6%. Cartilage lesions of the talus were seen in 54% of the joints, more of them medial (56%) than lateral (15%) or ventral (20%). Other frequently observed findings were synovialitis (38%), rupture of the syndesmosis (7%), and ventral scarring

(6%). While cartilage damage was found independently of the lateral ligament injuries, all complete tears of the deltoid ligament were associated with cartilage injury of the talus. Medial instability was assessed in five ankles clinically and found arthroscopically in 23 ankle joints. Our arthroscopic findings show that chronic instability of the ankle joint is associated with various pathological conditions of ligaments, capsule and cartilage. It can therefore give essential information about the status of the chronic unstable joint with regard to the choice of operative or conservative treatment.

Key words Arthroscopy · Ankle joint instability

Introduction

Ligamentous injuries to the lateral aspect of the ankle are the most common ligamentous injuries in the body [10]. Various studies have shown that results following operative reconstruction are not superior to conservative treatment, and there is general agreement that conservative therapy is the treatment of choice for acute injuries [8]. However, chronic lateral instability reportedly develops in 5%–30% of people suffering from acute lateral ankle ligament injuries [10, 11, 17]. Mechanical instability, deficiency of proprioception and weakness of the peroneal muscles are thought to contribute to this problem [4]. However, the mechanism which leads to these complaints is poorly understood [8]. When there is no improvement under conservative therapy, operative treatment is recom-

mended [9, 11, 14]. Both procedures focus mainly on the restoration of ligamentous insufficiency.

In a recent study it was shown that chronic instability of the ankle joint is associated with cartilage damage of the tibiotalar joint [15]. The purpose of this prospective study on 110 consecutive patients therefore was the arthroscopic evaluation of the chronically unstable ankle joint with regard to ligament and cartilage lesions.

Material and methods

At the Orthopaedic department of the University of Basel, 110 arthroscopies of the ankle joint were performed in patients suffering from symptomatic chronic ankle instability for at least 6 months. The age of the patients averaged 34 years (range 15–61 years). There were 59 left and 51 right ankle joints in 67 male and 43 female patients. All had sprained their ankle two or more times,

accompanied by pain and swelling. Instability was assessed clinically, and standard anteroposterior (AP) and lateral X-rays were taken in all cases [11]. Fifty-one arthroscopies were performed on an outpatient basis. Anaesthesia was applied locally in 49/110 cases and regional or general anaesthesia in the remainder. Forty (36%) arthroscopies were performed for diagnostic purposes, while 53 (48%) examinations were done before open ligament reconstruction. Seventeen (15%) operations were limited to arthroscopic procedures. A ventral portal was used in 51 (46%) cases, a lateral in 22 (20%) and a medial portal in 37 (34%); 97 (88%) joints were distended with carbon dioxide and 13 (12%), with saline solution.

The patient was placed in a supine position, and local anaesthesia was applied if necessary. The ankle joint was inflated with saline solution from an anterior approach, and after skin incision, the capsule was distended bluntly in order to avoid damage to the neurovascular structures. No distraction device and no tourniquet were utilized during the arthroscopy. After insertion of a 5 mm 30° standard arthroscope, the cartilage of talus, tibia and fibula was inspected. Distension was performed by manual traction of the heel. After visual evaluation of the ligaments, medial and lateral ligament stability was tested by applying varus and valgus stress to the ankle joint under arthroscopic control. Results were noted according to a specific protocol, and photo documentation was performed routinely. Ligament lesions were graded as distended if the ligament was thinned and elongated, and as ruptured if the continuity was lost. Cartilage damage was considered superficial when there was a cartilage layer covering the bone, and deep when the bone was visible.

Results

The arthroscopic findings are summarized in Table 1. A complete rupture of the anterior talofibular ligament was found in 64% of the cases and an elongation in 22%. The calcaneofibular ligament was ruptured in 41%. A complete rupture of the deltoid ligament was present in 6%. There were 9 patients (8%) with lesions of the anterior talofibular ligament alone, but no isolated rupture of the calcaneofibular ligament. A combined lesion of the ante-

Table 1 Arthroscopic findings ($n = 110$)

Findings	<i>n</i>	%
Synovialitis	42	38
Ventral scarring	7	6
Synovial plica	11	10
Talofibular ligament, elongation	24	22
Talofibular ligament, rupture	70	64
Calcaneofibular ligament, elongation	31	28
Calcaneofibular ligament, rupture	45	41
Deltoid ligament, elongation	28	26
Deltoid ligament, rupture	6	6
Syndesmosis, rupture	8	7
Cartilage lesions		
Talus, superficial	36	33
Talus, deep	23	21
Pilon, superficial	12	11
Pilon, deep	7	6

Table 2 Ligament lesions, lateral complex (there were 18 cases, in which the calcaneofibular ligament was not visible including 6 in which the anterior talofibular ligament was also not visible)

Anterior talofibular ligament	Calcaneofibular ligament			
	Intact	Elongation	Rupture	Osteoligamentous injury
Intact	6			4
Elongation	9	8	1	6
Rupture		23	40	2
Osteoligamentous injury	1		1	3
Inconclusive				6

Table 3 Lateral ligament lesions in the presence of complete deltoid lesions ($n = 6$)

	Anterior talofibular ligament	Calcaneofibular ligament
Intact	–	1
Elongation	2	–
Rupture	4	4
Inconclusive	–	1

Table 4 Cartilage damage of the talus, localisation

	Superficial	Deep	Total
Medial	21	12	33 (56%)
Central	2	2	4 (7%)
Lateral	6	3	9 (15%)
Ventral	7	5	12 (20%)
Complete talus	0	1	1 (2%)
Inconclusive	0	0	0

Table 5 Association of complete ligament rupture with cartilage damage of the talus

Cartilage	Anterior talofibular ligament	Anterior talofibular ligament + calcaneofibular ligament	Deltoid ligament
Intact	32	22	0
Superficial lesion	24	15	3 (1 medial, 2 central)
Deep lesion	9	7	3 medial

rior talofibular and the calcaneofibular ligament was observed in 76 patients (69%; Table 2). A complete rupture of the deltoid ligament, as found in 6 cases, was always associated with a lateral ligament injury (Table 3). Cartilage lesions of the talus were seen in 59 (54%) joints. These lesions were located mainly in the medial (56%) and ventral (20%) part of the talar cartilage (Table 4). However, not all complete ligament injuries were associ-

Table 6 Preoperative versus postoperative diagnosis (*n*)

Diagnosis	Pre-operative	Post-operative
Ventral impingement	32	33
Lateral instability	95	98
Medial instability	5	23
Ruptured syndesmosis	7	8
Synovialitis	1	42
Cartilage injury, talus	4	59
Cartilage injury, tibial pilon	0	19
Cartilage injury, medial malleolus	0	11
Cartilage injury, lateral malleolus	0	2
Corpus liberum	2	3
Osteochondritis dissecans	3	3
Arthrosis	2	1

ated with cartilage damage. While the complete lateral ligament injuries were nearly evenly distributed between joints with and without cartilage damage (54 versus 55 joints), all six complete tears of the deltoid ligament were associated with damage of the talar cartilage (Table 5). Table 6 compares the preoperative diagnoses to the arthroscopic findings. While lateral instability could be verified arthroscopically in all 95 cases, medial instability was presumed clinically in five cases, but was actually detected in 23 patients arthroscopically.

Discussion

Although it occurs commonly the natural course of chronic ankle instability is still a matter of discussion [10]. The incidence of degenerative arthritis following chronic lateral instability of the ankle has been reported from 13% [11] to 78% [6]. The main goal of the present study therefore was to evaluate cartilage damage in association with ligament instability.

The overall incidence of 54% of talar cartilage injury found in this study indicates that cartilage damage is a common lesion in unstable ankle joints. We saw 56% of lesions in the medial part of the talus and only 15% in the lateral aspect of the joint. These results may be explained by Noguchi's observation. He could show in his three-dimensional model of the human ankle joint an increase of stress distribution on the medial side of the ankle joint in the presence of lateral ligament instability [12]. Harrington [6], on the other hand, suggested unbalanced loading of the medial joint space as the cause for the development of degenerative arthritis. In a recent arthroscopic study on 22 chronically unstable ankle joints, Taka found an incidence as high as 95% of cartilage damage. He also reported a higher prevalence on the medial than on the lateral aspect of the talocrural joint [15]. The extent of cartilage damage increased with a longer period of symptoms

but did not correlate with the number of ligaments involved. The authors concluded that even single ligament lesions should be treated operatively to prevent further cartilage damage. Controversely, Lövfenberg et al. evaluated 37 patients with chronic ankle instability 20 years after the diagnosis had been made [11]. Only 6 developed degenerative changes, and the authors thus recommended conservative treatment primarily.

Arthroscopic examination of the lateral ligament injuries demonstrated that the pattern of injury observed most often was a combined rupture of the anterior talofibular ligament and calcaneofibular ligament (69%). This is higher than the usually reported 20% incidence of combined lesions versus 60%–70% isolated anterior talofibular ligament injuries [10], but may be due to the fact that in our study a substantial proportion of the patients had been transferred from other orthopaedic surgeons for diagnostic arthroscopy.

Comparing complete ligament ruptures to cartilage damage, there was nearly an even distribution of intact and altered cartilage in the presence of isolated or combined lateral complete ligament ruptures (Table 5). It is not clear why the degree of ligament injury does not correlate with the degree of cartilage damage. As we did not record the duration of symptoms of instability, a bias cannot be ruled out. However, Taga et al. also found no correlation between cartilage damage and degree of instability in their arthroscopic study [15]. They hypothesized that even minimal talar displacement can result in medial stress concentration in the tibiotalar joint and lead to cartilage damage. Our data indicate that the cartilage injury cannot be estimated from the degree of instability. Therefore, arthroscopic assessment of the ankle joint should be included in the evaluation of chronic ankle instability.

Medial instability was generally underestimated, while the diagnosis of lateral instability demonstrated a high degree of correlation pre- versus postoperatively. In six ankle joints a complete rupture of the deltoid ligament was noted. The clinical relevance of such medial ligament insufficiency is not known exactly. Recently, deltoid ligament ruptures associated with acute fibular fractures were reported in 28 patients in whom only the fibular fracture was surgically treated [16]. Eighteen months postoperatively, there was no sign of medial laxity either clinically nor on eversion stress radiographs and it was concluded that anatomical reconstruction of the lateral malleolus allows conservative treatment of a concomitant rupture of the deltoid ligament. Harper, too, saw no evidence for repair of the deltoid ligament in surgically treated ankle injuries, based on experience with 42 cases [5]. However, all ankles with complete rupture of the deltoid ligament in our study also had lateral ligament injuries, mostly of two ligaments, indicating that these cases represent severe instability (Fig. 1). According to the *in vitro* findings of Cass and Settles [2] and Hintermann and Nigg [7], this situation could correspond to rotational instability. This,

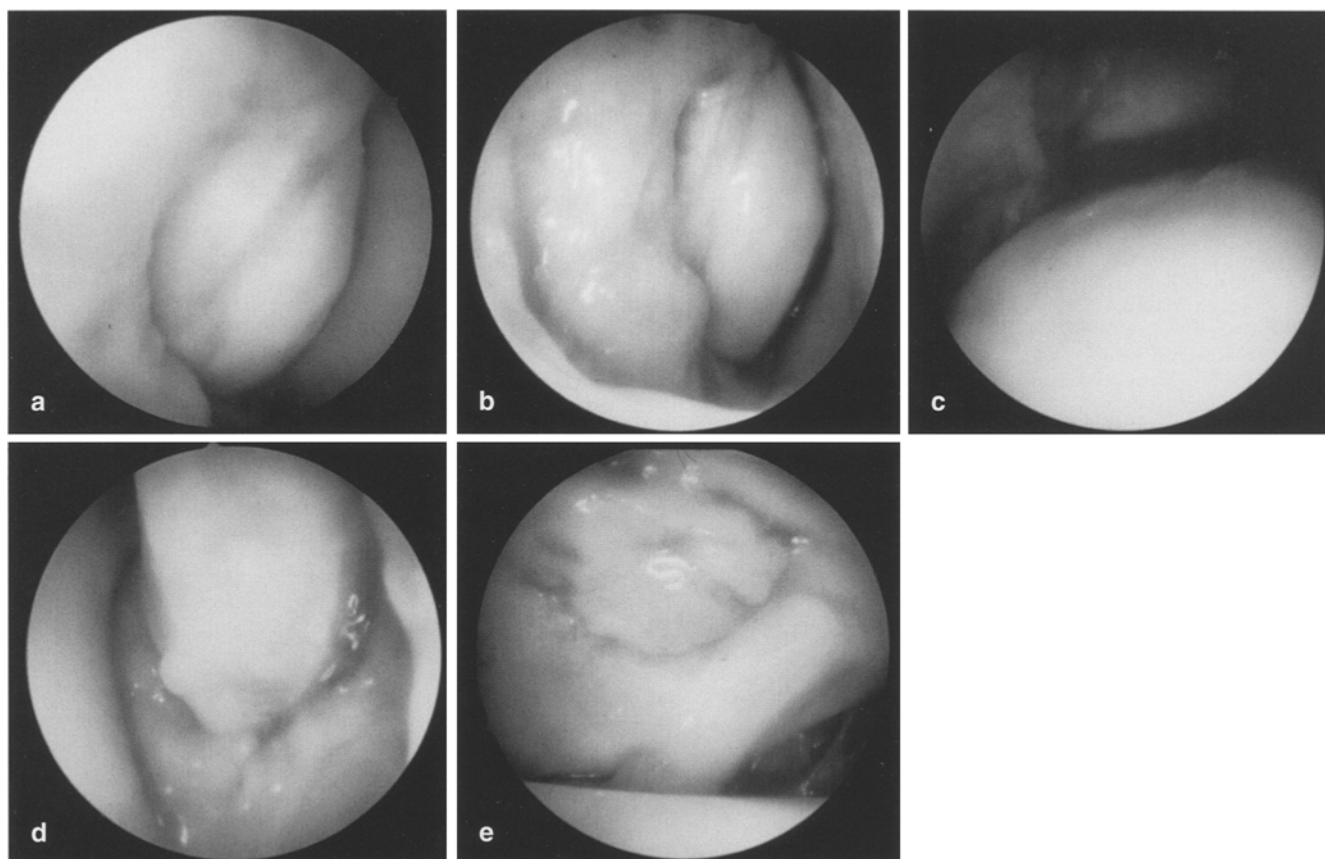


Fig. 1 a-e A 33-year-old male patient with a history of recurrent ankle sprains and symptomatic instability. **a, b** Anterior view of the talofibular joint: there is no anterior talofibular ligament and no talocalcaneal ligament, indicating lateral instability. **c** Ventrolateral aspect of talus: there is a superficial lesion of the cartilage of the talus at the ventrolateral border. **d** The medial malleolus, as seen from the anterior: the complete anterior part of the medial malleolus is visible and no ligamentous structures of the deltoid ligament are detectable indicating medial instability. **e** Manual distension in this case of severe, combined medial and lateral instability of the ankle joint allows inspection of the posterior syndesmosis, which was intact in this case

in turn, could explain the high correlation with cartilage lesions.

We performed our examinations without an external distraction device. The application of invasive distraction with pinning of the tibia and fibula allows good visualisation of the joint, but is not without complications [3, 13]. It has been reported that forces up to 135 N were associated with ligament damage, and manual distraction is as effective as external distraction [1]. Although the medial and the lateral ligament complex as well as tibial and talar cartilage were visible in most cases, there were some exceptions. In 6 cases the anterior talofibular ligament and in 18 cases the calcaneofibular ligament were not clearly visible. However, 5/6 and 11/18 examinations respectively, were performed under local anaesthesia. Obviously, this

does not allow enough distraction for a complete examination of the ankle joint. We therefore consider arthroscopy of the ankle joint under local anaesthesia inappropriate with regard to the functional evaluation of instability.

The arthroscopic portal used most often in our study was the anterior one. This allowed an inspection of the medial and lateral aspect of the joint without changing the portal. Blunt dissection of the subcutaneous tissue minimized the risk of damage to the neurovascular structures, and the only complication we observed was additional damage to the talar cartilage in one case, caused by the arthroscope.

In conclusion, abnormalities of different structures were involved in chronic ankle instability, and there was no single entity causing it. This was especially true for the lateral and medial ligaments. Clearly, the degree of lateral ligament lesions was not correlated with cartilage lesions of the talus, whereas medial ligament lesions were associated with talar cartilage damage. The long-term outcome with regard to these cartilage lesions remains unknown. This, in turn, emphasizes the need for accurate diagnosis and treatment of acute ligamentous injuries to the ankle, to prevent secondary problems such as chronic instability and cartilage damage. Preoperative arthroscopy can therefore give essential information about the status of the chronic unstable ankle joint with regard to the choice of operative or conservative treatment.

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