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Original Article

The incidence of cartilage lesions in anterolateral impingement syndrome of the ankle and their effect on clinical outcome

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Abstract

Aim: To investigate the incidence of concomitant osteochondral lesions of the talus (OLT) and their effect on clinical outcome in anterolateral impingement syndrome (ALIS).

Materials and Methods: Patients who underwent ankle arthroscopy due to ALIS of the ankle between 2012 and 2018 were retrospectively screened. The patients were divided into two groups according to the presence of OLT. Preoperatively hindfoot alignment (HA) was measured on long axial view radiographs. All measurements were performed by the experienced musculoskeletal radiologist. The association between osteochondral lesions of the talus and hindfoot alignment disorder was statistically assessed. The patients before and after surgery were evaluated with American Orthopedic Foot and Ankle Society (AOFAS) Hindfoot score for clinical performance.

Results: OLT accompanied impingement syndrome in 38 (34.8%) of 109 patients examined. The preoperative and postoperative AOFAS Pain and AOFAS Function results were found no significantly different between the two groups according to the presence of OLT (n.s.). However, AOFAS Alignment results of OLT (-) Group were significantly higher than OLT (+) Group. Mean Hindfoot Angle (HA) was −3.7 ± 12.8 (varus) and 4.6 ± 11.2 (valgus) in feet with and without OLT, respectively (Table 1). In this study, there was a significant association between positive OLT and clinical varus hindfoot ($p < .001$)

Conclusion: In the current study the hindfoot alignment showed association with the location of OLT in Anterolateral Impingement Syndrome. However, it was also determined that the presence of chondral damage had no negative effect on the treatment of anterolateral impingement syndrome. It should be kept in mind that this syndrome can be accompanied by osteochondral lesions of the talus at a significant rate.

Keywords: Ankle impingement; hindfoot alignment; osteochondral lesion

INTRODUCTION

Ankle impingement syndrome refers to the painful clinical condition that occurs as a result of compression of pathological bone formation and hypertrophied soft tissues in the tibiotalar joints and ankle malleolus. This syndrome includes posttraumatic and chronic degenerative changes in the ankle joint, which are manifested by limitation of certain movements and pain, depending on the region where it occurs. This diagnosis is common and an important cause of morbidity, especially among athletes (professional or amateur) (1-3).

The classification of ankle impingement syndrome is made according to their relationship with the tibiotalar joint. Although all types of impingement syndrome have a similar injury etiology, they manifest with different clinical and imaging findings. Anterolateral impingement syndrome (ALIS) is caused by the compression of the anterior tibiofibular ligament (ATFL) and hypertrophic soft tissues that are damaged in the anterolateral ankle joint and lateral malleolus. ALIS is also considered to occur as a result of mechanical factors, traction, trauma, or chronic ankle instability (4-7).

Chronic ankle instability, intra-articular free bodies, peroneal tendon pathologies, sinus tarsi syndrome, tarsal coalition, and osteochondral lesions may accompany ankle impingement syndromes. A review of the literature

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shows that the incidence of chondral lesions that accompany ankle impingement syndromes varies (8-12).

This study aimed to determine the incidence of concomitant chondral lesions in patients that presented with chronic ankle pain and limitation of motion, diagnosed with ALIS, and underwent arthroscopic debridement surgery, and to evaluate the effect of presence of chondral lesions on the clinical outcomes of the treatment of this syndrome.

MATERIALS and METHODS

The study protocol was approved by the Health Sciences University Baltalimani Bone and Joint Diseases Training and Research Hospital Institutional Review Board (Approval date and number: 29.06.2018/31). A total of 211 patients that underwent arthroscopic debridement surgery due to ankle impingement syndrome between January 2010 and January 2018 were included in the evaluation. Excluded from the study were patients with other impingement syndromes of the ankle (anterior, anteromedial, posterior, posteromedial impingement), previous ankle surgery history, having undergone surgery due to ankle instability, inflammatory arthropathy, diagnosis of osteoarthritis, and distal tibial chondral damage (due to low number of patients; n = 3). The inclusion criteria were determined as a history of trauma (ankle inversion injury) at the onset of symptoms, no response to conservative treatment for at least six months, and arthroscopic surgery with the diagnosis of ALIS. 62 patients with other ankle impingement syndromes, seven with a history of ankle instability surgery, 17 with incomplete follow-up data, eight with history of ankle fractures, eight with inflammatory arthropathy, tibiotalar arthrosis or chondral damage of the distal tibia were excluded from the study.

The diagnosis of ALIS was made based on physical examination findings and the evaluation of the anteroposterior, lateral and mortises images of the ankle, and magnetic resonance images. After the diagnosis, conservative treatment (resting, non-steroidal anti-inflammatory drugs, physical therapy, ankle splints, shoe modification) were applied to all patients. Surgical intervention was recommended to patients who did not respond to conservative treatment. The patients were divided into two groups as follows: OLT (+) Group (patients with ALIS accompanied by talus osteochondral lesions) and OLT (-) Group (patients with isolated ALIS without talus osteochondral lesions). The patients were followed up in the second and sixth weeks, and third, sixth, and 12th months after surgery and annually thereafter. Before and after surgery, the patients were evaluated with American Orthopedic Foot and Ankle Society (AOFAS) score for clinical performance.

Hindfoot radiographic examination was performed before the ankle arthroscopy. Preoperatively hindfoot alignment (HA) was measured on long axial view radiographs (13) (Figure 1). All measurements were performed by the same musculoskeletal radiologist. Negative degree was varus alignment (positive-valgus). The association between hindfoot alignment and OLT location was statistically assessed.

Figure 1. Measuring hindfoot alignment radiographically: the long axial view

Surgical Technique

The operations were performed by three experienced arthroscopy surgeons with the patients under regional anesthesia. The patients were placed in a supine position in a manner that allowed the ankle to move completely. In all patients, an arthroscope of 4 mm and 30°angle was used. Anteromedial and anterolateral portals were used as standard in all cases. During ankle arthroscopy, in addition to synovial impingement, diffuse hypertrophic synovial thickening and scar tissue in the talofibular or tibiotalar joints were detected for all patients. The debridement of these pathological tissues was performed using a punch and shaver. The condition of the articular cartilage was examined and the presence of osteochondral lesion was noted according to the Modified Arthroscopic Outerbridge Classification (14). Additional procedures, such as debridement and microfracture were performed simultaneously.

Postoperative Follow-up

Compressive elastic bandage and ice treatment were applied after the operation. Physical therapy was started on the first postoperative day, and active and passive movements were allowed. The load restriction was not applied in patients undergoing arthroscopic debridement. Weight-bearing was not allowed for six weeks in patients with OLT who underwent simultaneous arthroscopic microfracture. An eight-week physiotherapy program (joint range of motion enhancer, isometric muscle strengthening, and proprioception exercises) was applied to all patients.

Statistical Analysis

Statistical analysis was performed using SPSS v. 22.0 (SPSS Inc., IBM, NY, USA). Categorical variables (gender and affected site) were provided as percentages. The comparison of the mean values was undertaken using

independent samples t-test and Mann Whitney U test for two independent variables. To compare feet with and without OLT against HA, generalized mixed model was used to take into account correlation between the 2 feet of the same patient, unadjusted and adjusted on age and sex. The significance was evaluated at the p level of <0.05.

RESULTS

The demographic characteristics of the patients are presented in Table 1. The mean age was 36.7 ± 5.8 (range; 18-54) years. Patients with a minimum of six months follow-up were included. Osteochondral lesions of the talus were found to accompany ankle impingement syndrome in 38 (34.8%) of the 109 patients examined. Twenty-seven of these lesions (71%) were localized in the talus medial and 11 (29%) in the lateral of the talus. The chondral lesions were evaluated according to the Modified Arthroscopic Outerbridge classification. According to this classification, the osteochondral lesions detected in the medial part of the talus were 77% (21/27) stage 2, 14.8% (4/27) were stage 1, and 8.2% (2/27) were stage 3 while 81.8% of the lateral lesions (9/11) were stage 1 and 18.2% (2/11) were stage 2.

Table 1. Demographic data of the patients

	OLT (+) Group (n = 38)	OLT (-) Group (n = 71)	p
Age	35.5 ± 7.4	37.2 ± 6	0.304[a]
Gender (male)	17 (44.7%)	38 (53.5%)	0.526[a]
Affected side (right)	21 (55.2%)	33 (46.4%)	0.421[a]
Follow-up time (months)	23.6 ± 4.4	27 ± 6.3	0.251[a]
HA, degrees	−3.7 ± 12.8	6.6 ± 11.2	<.000[b]

HA, hindfoot angle, p < 0.05. [a] Independent samples t test. [b] Linear mixed model taking into account correlation between patients' feet.

The preoperative and postoperative AOFAS Pain and Function results were found no significantly different between the two groups (n.s.). However, AOFAS Alignment results of OLT (-) Group were significantly higher than OLT (+) Group (p<0.009). In OLT (+) Group, the mean preoperative and postoperative AOFAS Alignment results were 3.92 ± 1.80 (range; 0-8) and 4.22 ± 3.05 (range; 0-8), respectively. In OLT (-) Group, the AOFAS Alignment results were observed to increase from 7.75 ± 3.05 (range; 8-15) preoperatively to 8.16 ± 3.77 (range; 8-15) postoperatively (Table 2).

Table 2. Preoperative and postoperative functional outcome scores in patients with and without osteochondral lesions of the talus. AOFAS, American Orthopedic Foot and Ankle Society

Aofas Hind-Foot Score		OLT (+) Group (n=38) mean ± SD	OLT (-) Group (n=71) mean ± SD	p[a]
Pain	Preoperative	13.21 ± 8.16	14.36 ± 7.24	n.s.
	Postoperative	32.60 ± 6.04	33.79 ± 8.08	n.s.
	p	**0.000**	**0.000**	
Activity limitations, support requirement	Preoperative	3.1 ± 7.27	3.73 ± 6.54	n.s.
	Postoperative	7.15 ± 6.43	8.35 ± 5.93	n.s.
	p	**0.000**	**0.000**	
Maximum Walking Distance	Preoperative	1.8 ± 2.27	1.66 ± 1.70	n.s.
	Postoperative	4.15 ± 6.43	3.95 ± 2.01	n.s.
	p	**0.000**	**0.000**	
Walking Surfaces	Preoperative	2.28 ± 2.27	2.46 ± 2.66	n.s.
	Postoperative	4.75 ± 6.43	4.88 ± 2.76	n.s.
	p			
Gait Abnormality	Preoperative	2.65 ± 3.24	3.13 ± 2.86	n.s.
	Postoperative	5.15 ± 6.43	6.35 ± 5.93	n.s.
	p	**0.000**	**0.000**	
Sagital Motion	Preoperative	1.46 ± 1.14	2.02 ± 0.98	n.s.
	Postoperative	6.78 ± 2.34	5.96 ± 1.48	n.s.
	p	**0.000**	**0.000**	
Ankle Hind Foot Stablity	Preoperative	2.73 ± 1.13	3.50 ± 3.05	n.s.
	Postoperative	6.32 ± 1.42	7.76 ± 3.62	n.s.
	p	**0.000**	**0.000**	
Alignment	Preoperative	3.92 ± 1.80	7.75 ± 3.05	**0.009**
	Postoperative	4.22 ± 1.05	4.16 ± 2.77	**0.011**
	p	n.s.	n.s.	

[a] Significant P values are in bold

Mean HA was −3.7 ± 12.8 (varus) and 4.6 ± 11.2 (valgus) in feet with and without OLT, respectively (Table 1). In this study, there was a significant association between positive OLT and clinical varus hindfoot ($p < .001$).

Complications

In one patient, tibialis anterior artery damage occurred due to the use of an intraoperative shaver. When the anteromedial portal incision was expanded, a 3x4 mm defect was seen in the artery. Primary repair was performed, and a full recovery was achieved. Complex regional pain syndrome was detected in five patients postoperatively. After consultation with the physical therapy and rehabilitation department, the patient was followed up with the recommendation of conservative treatment. Recovery was achieved in all patients. Superficial peroneal nerve hypoesthesia was observed in one patient, who was followed up and seen to improve within six months.

DISCUSSION

In this study, concomitant osteochondral lesions of the talus were detected in 38 (34.8%) of 109 patients who underwent arthroscopic surgery with the diagnosis of anterolateral ankle impingement syndrome. Twenty-seven (71%) of 38 lesions were localized in the talus medial side of the talus. It was also observed that the presence of concomitant chondral lesions had no negative effect on the clinical outcome. The importance of this study is to contribute to the literature on this subject, which has different results in the literature.

Jordan et al. investigated the magnetic resonance imaging findings of ALIS and reported that 40% of the patients had concomitant chondral damage in the distal tibia and lateral talar dome (8). Ferkel et al. found that 51% of patients with ALIS had accompanying chondral damage. Most of the chondral lesions were stages 1 and 2 and located in the anterolateral talar dome (10). DeBerardino et al., who evaluated 60 patients that underwent arthroscopic debridement due to all ankle impingement syndromes, reported that 28% of the cases also presented with chondral lesions. The authors also noted that the presence of a chondral lesion had no adverse effect on the clinical outcome (15). Bassett et al. determined that 21% of patients with ALIS had chondral damage according to arthroscopic imaging (16). Meislin et al. showed that in 21% of patients, ankle impingement syndrome was accompanied by chondral lesions (17). Odak et al. reported that 17% of the patients with a diagnosis of ALIS had concomitant osteochondral damage in the anterolateral talar dome (18). Moustafa El-Sayed et al., who evaluated 25 patients that underwent arthroscopic debridement due to all anterolateral Impingement syndromes, reported that 28% of the cases also presented with chondral lesions. The authors also noted that the presence of a chondral lesion had no adverse effect on the clinical outcome (19). Urguden et al. showed that in 46.34% of patients, anterolateral ankle impingement syndrome was accompanied by chondral lesions. In this study, 19 of the patients had grade I to III cartilage damage of the anterolateral talar dome and of the distal tibia. Two of those patients had excellent and 13 had good results (20). In the current study, osteochondral lesions of the talus were detected in 38 (34.8%) of 109 patients with anterolateral ankle impingement syndrome. Also, contrary to the literature, the vast majority (71%) of concomitant chondral lesions were seen in the talus medial. Furthermore, the cartilage lesions detected lateral to the talus were more superficial (lateral 81.8% stage 1, medial 77% stage 2). It was also observed that the presence of concomitant chondral lesions had no negative effect on the clinical outcome.

There are not enough results in the current literature that examined the relationship between osteochondral lesions of the talus and hindfoot alignment disorder. Hindfoot varus alignment disorder may cause increased stress in the medial compartment and lead to increased strain in the lateral compartment. It shows an increased medially metabolic activity in the varus alignment and an increase laterally metabolic activity in the valgus alignment (21-23). Therefore, it can be concluded from these data that there is increased pressure in the corresponding compartment due to progressive degeneration (23-24). Hindfoot varus alignment disorder, especially in the coronal plane causes an increase in contact stress in the medial tibiotalar joint, resulting in chondral damage in this area (25). Paul et al. did not find significant differences between hindfoot alignment and OLT localization. However, they reported that based on available data, they could not ignore the possible effect of hindfoot malalignment on OLT (26). In this study, we found significant differences between the hindfoot alignment and OLT. And, chondral lesions were more frequently on the medial side, and the lesions on the lateral side were more superficial. We consider that the higher incidence and more advanced stage of chondral damage in the talus medial dome might be related to hindfoot alignment disorder. Also based on these results, it can be thought that ALIS developed secondary to OLT In patients with hindfoot varus alignment.

The first limitation of the study was the relatively small number of patients and its retrospective design. Second, measurements were performed by a single musculoskeletal radiologist, which did not allow us to assess intra- or interobserver reproducibility. Third, ALIS grading wasn't done. We did not evaluate the relationship between ALIS stages and clinical varus hindfoot.

CONCLUSION

In the current study, the hindfoot alignment showed association with presence of OLT in Anterolateral Impingement Syndrome. However, it was also determined that the presence of chondral damage had no negative effect on the treatment of anterolateral impingement syndrome. It should be kept in mind that this syndrome can be accompanied by osteochondral lesions of the talus at a significant rate.

Competing interests: The authors declare that they have no competing interest.

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