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Original Article

Comparative analysis of arthroscopic debridement in osseous versus soft tissue anterior ankle impingement

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ABSTRACT

Background: Arthroscopic debridement has been a gold standard procedure for anterior ankle impingement, both in cases of osseous and soft tissue impingement. There is sparse literature on comparative outcome with respect to functional results between the two types of impingement post-arthroscopic debridement.

Methods: Our study included 14 patients diagnosed as cases of anterior ankle impingement on the basis of clinical and radiological examination. They were segregated into two groups (on the basis of cause of impingement (osseous versus soft tissue)). Both groups were treated by arthroscopic debridement. Primary outcome was patient satisfaction, which was assessed by Likert scale and clinical outcomes were measured using AOFAS ankle-hind foot scale, VAS score, range of motion and time to return to pre-injury activity level in both groups.

Results: Mean follow-up was of 15 months where eleven patients reported an excellent recovery, two patients had good recovery while one patient reported poor outcome. Mean AOFAS ankle hind foot scale improved from 50.5 preoperatively to 85.71 postoperatively (statistically significant; p value = 0.0001). Mean Likert scale value post-operative was 4.21. VAS score showed significant improvement in patients of both the groups. Range of motion was slightly better in soft tissue impingement type with a relatively shorter time to return to sports or preinjury activity level as compared to osseous impingement group.

Conclusions: The patients in both the groups had comparable outcomes with no statistically significant difference with regard to patient satisfaction and clinical outcome.

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1. Introduction

Anterior ankle impingement has been long studied as a cause of chronic ankle pain. Anterior ankle impingement results from an impingement of the ankle joint by a soft tissue or osteophyte formation at the anterior aspect of the distal tibia and talar neck.¹ Clinical symptomatology along with radiological evidence remains the mainstay of diagnosis. A history of repeated hyper-dorsiflexion and recurrent inversion injuries are a key to diagnosis. The patient typically presents with pain, recurrent swollen ankle with a positive dorsal impingement sign at anteromedial or anterolateral aspect of ankle joint.² The etiopathogenesis lies with repeated trauma at the level of tibio-talar sulcus causing soft tissue injury with extravasation of inflammatory mediators causing hypertrophy of synovial tissue and/or new bone formation (osteophytes).³ The hypertrophic synovium can get entrapped in the anterolateral part of the joint during repetitive injuries. Authors have also reported the role of torn tibio-talar and tibio-fibular ligament (Bassett's ligament)⁴ in cases of soft tissue causing impingement syndrome. There have been cases where osteophytes were found as an intra/extra-articular loose body causing secondary osteoarthritis.^{5,6}

Typically, patients with recurrent sprains having soft tissue impingement present with pain in anterolateral part of ankle. The patients with traction spurs/osseous impingement typically have pain in the anteromedial aspect of ankle.⁷ The radiological assessment includes anteromedial oblique and lateral weight bearing skigram views.⁸ MRI scan can precisely locate the osteophytes, delineate synovial hypertrophy and can additionally detect cartilage erosion and osteochondral defects of talus.⁹ Despite a lot of advances, diagnostic arthroscopy still remains the gold standard for assessment of the disease.¹⁰ After failure of conservative treatment modalities like relative rest, ankle bracing, physiotherapy and corticosteroid injections, the primary treatment remains debridement, either open or arthroscopic. Good results have been reported with open debridement done previously.^{11–13} Of the two, arthroscopic debridement has gained popularity and is considered gold standard treatment for virtually all causes of impingement syndrome as it is minimally invasive and associated with low morbidity and faster recovery times.^{14,15}

The aim of our study was to evaluate the outcome of arthroscopic debridement in cases of anterior ankle impingement and to compare results between soft tissue and osseous types of anterior ankle impingement.

2. Material and methods

Records of 18 patients who underwent ankle arthroscopy for anterior ankle impingement between years 2008 and 2014 were obtained. Patients with clinically and radiologically proven anterior ankle impingement (soft tissue/osseous) were included in the study. All patients had received conservative treatment for at least 6 months in form of analgesics, ankle bracing, physiotherapy and corticosteroid

injections (9 cases). Four cases were excluded because of concomitant pathologies: like arthritic changes in tibiotalar joint, presence of ankle instability and presence of talar chondral or osteochondral lesions. Out of the final cohort of 14 patients, thirteen had history of recurrent sports injuries. There were 12 males and 2 females. The mean age of the population was 26.2 years (19–38 years). All patients had presented with persisting anterior ankle pain, recurrent minor ankle effusion, pain on squatting and fall in their participation level in sports. Six patients were competitive sportsperson and eight were involved in recreational sports. They also complained of pain on extremes of ankle dorsi flexion and planter flexion. On examination, all had tenderness along anterior ankle joint and positive dorsal impingement sign. The range of motion at initial presentation and final follow-up was recorded by manual goniometer. Standard anteroposterior and lateral X rays were performed in all cases and revealed anterior tibiotalar osteophytes in five cases (Fig. 1a and b), intra-articular loose bodies in one case (Fig. 2a) and normal skigram in eight cases. MRI was done in six cases, in which impinging osteophytes (Fig. 1c) were seen in 3 cases, intra-articular loose bodies in one case (Fig. 2b) and two cases showed impinging anterolateral synovial hypertrophy. The patients were grouped according to the aetiology (cause of impingement), either soft tissue (Group A; $n = 8$) or osseous (Group B; $n = 6$) impingement.

Informed written consent was taken from all patients. All patients were operated on standard operating table in supine position. Smith & Nephew (USA) ankle distraction strap with hanging weight of 7 pounds was used for ankle distraction. Standard anteromedial and anterolateral portals were used, taking care to protect the neurovascular structures and dilate the portals by a blunt artery forceps. Hypertrophic synovium or scar tissue was debrided using open-ended 3.5 mm arthroscopic shaver taking care of keeping the cutting edge away from the anterior neurovascular structures (Fig. 3). The impinging osteophytes (in cases of osseous impingement) when found were excised using a narrow osteotome, burr and shaver to achieve smooth and non-impinging tibiotalar surfaces (Figs. 1d–f, 2c and e). Loose bodies when found were also removed (Fig. 2d). Intra-operative fluoroscopy was used to ensure complete osteophyte and loose body removal. Joint was thoroughly lavaged with normal saline and portals were closed with 1-0 proline. Post-operatively, ankle immobiliser was applied and the patient discharged the next post-operative day. Partial weight bearing was allowed for the next three weeks progressing to full weight bearing by 6–8 weeks as tolerated by the patient. Physiotherapy was started on day one that involved gentle passive ankle movements and progressing to proprioceptive exercises and strength training by 6–8 weeks.

The mean follow-up was 15 months (12–26 months). The patient satisfaction was assessed by Likert scale on a scale where 5 – excellent, 4 – very good, 3 – good, 2 – average, 1 – poor satisfaction. The clinical outcomes were assessed by American Orthopaedic Foot and Ankle Society (AOFAS) ankle hindfoot score, visual analogue scale (VAS), range of motion achieved and time to return to pre-injury activity/sports. The results were analysed using paired *t* test and independent *t* test. *p* value <0.05 was considered statistically significant.

Fig. 1 – (a) Lateral ankle skiagram and (b) oblique ankle skiagram showing anterior tibio talar osteophytes, (c) MRI T2 sagittal image showing impinging tibio talar osteophytes. (d) Arthroscopic burring of osteophyte from anterior talar surface, (e) burr used for arthroscopic debridement of tibial osteophyte and (f) final arthroscopic picture after debridement of anterior tibial osteophyte showing smooth articular surfaces. (g) Post-operative MRI T1 and (h) T2 sagittal images showing smooth anterior tibio talar opposing surfaces.

3. Results

Mean time between onset of symptoms and surgery was 11 months. There was no major complication in any patient. Three patients reported persisting peri-portal numbness and four patients showed signs of superficial peri-portal infection with serous discharge. All patients resolved with antibiotics

and analgesics except one who reported persistent deep ankle pain.

Mean planter flexion improved from 28.71° pre-operatively to 34.93° post-operatively (statistically significant; p value – 0.0001), whereas mean dorsiflexion showed an improvement from 10.79° pre-operatively to 14.79° post-operatively (statistically significant; p value – 0.0001). VAS score showed significant improvement in patients of both the groups. The

Fig. 2 – (a) Lateral ankle skiagram and (b) MRI T1 sagittal images showing anterior and posterior tibiotalar osteophytes with anterior loose bodies. (c) Arthroscopic picture showing anterior tibial osteophyte, (d) arthroscopic loose body removal and (e) final arthroscopic picture after burring and debridement. (f) Post-op MRI T1 sagittal image showing smooth anterior tibial edge.

mean VAS score of the cohort decreased to 2.57 at final follow-up from 7.93 at initial presentation (statistically significant; p value – 0.0001). Mean AOFAS ankle hind foot scale improved from 50.5 preoperatively to 85.71 postoperatively (statistically

significant; p value – 0.0001). Mean Likert scale value at final follow-up was 4.21 (Table 1) (Fig. 4).

Further, both the groups were found to be comparable with respect to age and patient satisfaction (Likert scale), AOFAS

Fig. 3 – Arthroscopic shaving of hypertrophic and hyperaemic impinging synovium in anterolateral ankle.

ankle hind foot scale, range of motion and time to return to pre-injury activity (p value > 0.05). The mean response to Likert scale was 4.37 (SD – 0.74) in group A and 4 (SD – 1.2) in group B (statistically insignificant; p value – 0.49). Postoperative

Fig. 4 – Comparative analysis of the pre- and post-operative variation in the cohort.

mean AOFAS score in group A was 88 (SD – 5.75) and 82 (SD – 11.63) in group B (statistically insignificant; p value – 0.27). The range of motion was slightly better in group A with a relatively shorter time to return to sports or pre-injury activity level as compared to group B (Table 2) (Figs. 5 and 6).

Table 1 – Pre- and post-operative evaluation in the cohort.

S. No.	Response on Likert scale (at final follow up)	AOFAS ankle hind foot score		VAS score		Time to return to pre injury activity (months)	Range of motion (°)			
		Pre- operative	Post- operative	Pre- operative	Post- operative		Dorsi flexion		Planter flexion	
							Initial	At final follow up	Initial	At final follow up
1	4	56	94	7	2	3	12	16	30	36
2	5	48	90	8	3	4	10	14	30	34
3	4	40	86	8	3	4	11	16	28	35
4	5	51	90	7	2	4	10	14	27	37
5	5	56	86	7	3	6	10	16	26	34
6	3	60	76	10	4	8	12	15	24	33
7	4	67	88	8	2	5	11	15	31	35
8	5	68	94	7	2	3	13	16	33	40
9	3	44	74	10	3	6	7	12	30	36
10	4	51	87	8	2	5	14	17	32	36
11	5	48	92	7	1	4	12	15	28	33
12	5	40	89	7	2	7	10	14	30	34
13	5	50	91	7	1	6	11	16	31	38
14	2	28	63	10	6	-	8	11	22	28

AOFAS – American Orthopaedic Foot and Ankle Society, VAS – visual analogue scale.

Table 2 – Post-operative outcome in patients of soft tissue (group A) and osseous (group B) impingement.

Outcome	Group A (n = 8)		Group B (n = 6)		p value
	Mean	SD	Mean	SD	
Age (in years)	23.37	1.4	22.83	1.47	0.49
Likert scale	4.37	0.74	4	1.2	0.49
AOFAS ankle hind foot score (post op)	88	5.75	82	11.63	0.27
VAS score (post op)	2.62	0.74	2.5	1.87	0.86
Return to sports time (months)	4.62	1.68	4.66	2.5	0.97
Dorsiflexion (°)	15.25	0.88	14.16	2.31	0.24
Plantarflexion (°)	35.5	2.2	34.16	3.47	0.39

AOFAS – American Orthopaedic Foot and Ankle Society, VAS – visual analogue scale.

Fig. 5 – Comparative pre- and post-operative parameters in both the groups of the cohort.

Fig. 6 – Comparative pre- and post-operative parameters in both the groups of the cohort.

4. Discussion

Ankle impingement syndrome is coming up as a common diagnosis in sports-related injuries due to better diagnostic and management modalities. The etiopathogenesis is repeated sports injuries in the form of hyper dorsiflexion causing soft tissue and osseous impingement. Anterior ankle impingement typically presents with pain and swelling at the anteromedial or anterolateral part of the ankle joint with a positive dorsal impingement sign. Soft tissue impingement resulting from recurrent supination injuries causes chronic inflammatory changes at tibiotalar sulcus. Repeated inversion injuries cause entrapment of hypertrophic scar tissue in the lateral gutter of the ankle. Bassett's ligament⁴ (anterior inferior talofibular ligament) has also been proposed to be an entrapped component in repeated planter flexion injuries. However, none of our cases witnessed the presence of Bassett's ligament as a cause of impingement. All cases of soft tissue impingement showed hypertrophic synovium and scar tissue anterolaterally that was debrided.

Bony impingement is the second etiological group where there is a growth of traction spurs/osteophytes between the talar sulcus and anterior tibial rim causing painful and restricted range of motion.⁶ This bony outgrowth is reported to be a result of repeated trauma being healed by fibrosis and its calcification. These spurs further become a cause of entrapment of soft tissue at the ankle and sometimes may even break to form an

intra-/extra-articular loose body.^{5,6} In two cases of our study, we found an intra-articular loose body which was successfully removed besides debridement of tibiotalar osteophytes. In all the cases of osseous impingement, it was found that the growth was intra-articular and away from capsular attachment.

There is a typical history of repeated ankle sprains/inversion and supination injuries. Bony impingement usually presents with pain at the anteromedial aspect and soft tissue impingement causes anterolateral pain at ankle. Standard lateral weight bearing skiagram view and an anteromedial oblique view are of prime importance. MRI scan is the confirmatory modality to confirm the diagnosis. It helps by delineating the aetiology of impingement along with loose bodies, osteochondral defects and associated ligament injuries. Recently, proton weighted MR sequences have been used for diagnosing thickened synovium and soft tissue impingement.¹⁵

Non-operative treatment in the form of rest, physiotherapy, ankle support and intra-articular steroid is advised for up to six months after which surgical treatment remains the mainstay in resistant patients. Patients have been treated earlier with arthrotomy and debridement but now arthroscopic debridement has become the treatment of choice,^{14,15} chief reasons being less invasive, less scar related problems, reduced hospital time and return to normal activity. Complications of open approach include cutaneous nerve entrapment, wound dehiscence, damage of long extensor tendons and formation of hypertrophic scar tissue.

There have been a lot of updates over arthroscopic debridement for anterior ankle impingement but less has been discussed regarding patient satisfaction and various measures of clinical outcome post-surgery. Numerous authors have reported good to excellent results in cases of anterior ankle impingement. In a study by Ogilvie-Harris et al., there was a modest gain of mobility in dorsiflexion in cases of osseous impingement.¹⁴ They, however, reported no change in planter flexion. Ferkel et al. reported excellent and good recovery in 84% patients with a return to pre-injury activity level by about 6 weeks time.¹⁵ In another study by Biedert, about 17 patients (67%) of a total of 21 included in the study had a satisfactory recovery and rest of the patients had an unsatisfactory follow-up.¹⁶

There was a statistically significant improvement in VAS score, AOFAS score and range of motion from pre-injury level at the affected ankle in the present study (Table 1). Our study also evaluated the comparative outcome of arthroscopic debridement in cases of both osseous and soft tissue impingement, in terms of patient satisfaction and clinical outcomes. The patients diagnosed with a soft tissue cause had a better AOFAS score, VAS score and comparatively earlier time to return to sports activities in comparison to the patients with osseous impingement. But this was statistically insignificant ($p > 0.05$) (Table 2). Few earlier studies have shown similar results in both types of impingement,¹⁷ whereas some authors have reported better outcomes in patients with soft tissue impingement.¹⁸

At the time of final follow-up, none of our patients in either group showed recurrence of impingement symptoms. One patient who had deep boring pain was believed to develop in neuroma and showed partial relief with local corticosteroid injection.

Most important advantages of arthroscopic debridement are lower morbidity and early return to function. 84% of the patients

in the study returned to the same level of activity/sports after a mean of 15 months of surgery. In cases of osseous cause, tibiotalar stiffening is frequently observed. Arthroscopic debridement aims at treating impingement while maintaining tibiotalar mobility. Improvement in the range of motion is also a major outcome after arthroscopic debridement, especially in osseous anterior ankle impingement. In our case series, both the groups showed improvement in range of motion with no statistically significant inter-group difference. We had four cases with peri portal hypoesthesia and one of our patients developed neuroma. Careful portal creation with attention to neurovascular bundle is the key to a successful procedure.

It has been seen that osteoarthritis and osteochondral talar defects secondary to impingement syndrome are important factors that prognosticates results of surgery.¹⁹ It is clearly evidenced by earlier studies that osteophyte growth & osteoarthritis at initial presentation are a guide to surgical outcome.

In our study, we excluded patients with arthritic changes as it is an important factor affecting outcome. Osteochondral defects have a role in post-surgery outcomes with poorer results of patients with respect to pain relief, AOFAS ankle scores and return to sports time in patients having an osteochondral defect.²⁰

The limitations of our study include small number of patients and a short period of follow-up. However, no recurrence was seen in any of our patients at the time of final follow-up. Recurrence has been reported within 3–4 years to up to 10 years of resection. Long-term follow-up of patients can show up recurrence of symptomatic impingement osteophytes or synovial tissue.^{21,22}

5. Conclusion

Arthroscopic debridement is the treatment of choice for patients of ankle impingement syndrome of both osseous and soft tissue nature with least morbidity and early return to function. However, there was no statistically significant difference between patients of both the groups with respect to patient satisfaction and clinical outcomes.

Conflicts of interest

The authors have none to declare.

Author contributions

Rajesh Rohilla assisted all surgeries and helped in manuscript data compilation. Milind Tanwar, Aditya Jain, Karan Siwach and Radika Devgan provided language help, writing assistance or proof reading the article.

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