# Arthroscopic treatment of traumatic anterior bony ankle impingement

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**Background**
Ankle impingement is a common orthopedic problem in sports athletes. It usually results from repetitive ankle sprains, which may lead to long-lasting pain, compromising the athlete's performance. Impingement syndromes of the ankle involve either osseous or soft-tissue impingement and can be anterior, anterolateral, or posterior. Pain is typically provoked by dorsiflexion of the ankle and palpation of the tibiotalar anterior joint space.

**Objective**
The objective of the study was to evaluate the outcome of arthroscopic treatment of the anterior bony ankle impingement syndrome.

**Patients and methods**
Fifteen patients (12 men and three women), with a mean age of 37.7 years (27–52 years), who complained of chronic ankle pain and were diagnosed as having bony anterior impingement of the ankle, grades I–III lesions, due to a trauma, without therapeutic response to conservative therapy over 3 months, were treated by arthroscopic excision of the bony spur and debridement of the impingement tissues. The results were evaluated with the American Orthopedics Foot and Ankle Society hindfoot score. The study was designed as a retrospective case series.

**Results**
At the end of follow-up, seven patients had excellent scores and were very satisfied with the results and six patients had good scores and were satisfied with the results; hence, about 86.7% had excellent or good results. Two patients had fair results, accounting for 13.3% of all patients; there were no poor results.

**Conclusion**
Arthroscopic resection of bony spurs, either tibial or talar, or both, after repeated ankle sprains was proven to be a reliable therapeutic approach for post-traumatic impingement syndrome of the ankle that does not respond to conservative treatment.

**Keywords:**
ankle anterior bony impingement, ankle impingement, arthroscopic treatment

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## Introduction

Anterior ankle impingement is a common orthopedic problem especially seen in sports athletes; it usually results from repetitive ankle sprains. It is characterized by anterior pain and restricted dorsiflexion arising from either soft-tissue or bony impingement [1]. Formation of a bony spur may also occur after supination trauma or because of repeated forced dorsiflexion that is typical in soccer players [2]. Pain is usually provoked by dorsiflexion of the ankle and palpation of the tibiotalar anterior joint space. Morris [3] first described impingement of the ankle in the English literature in 1943 in five patients who had what he called the athlete's ankle; this was later called footballer's ankle in a report by McMurray [4]. The study evaluates the outcome of arthroscopic treatment of the anterior bony ankle impingement syndrome.

## Patients and methods

Between April 2007 and March 2010, 15 patients presenting with chronic ankle pain (nine patients with pain in the right ankle and six with pain in the left) were diagnosed with bony anterior impingement of the ankle and were treated by arthroscopic excision of the bony spur and debridement of the impingement tissues. All patients were operated upon at Benha University and Al Helal Hospital. There were 12 men and three women of an average age of 36.5 years (range 27–44 years). Eight patients were athletes and had suffered from repetitive injuries during sporting activities – six while playing football and two while playing basketball – and all the eight were male. The remaining seven patients were not regular athletes.

All patients had a history of twisted ankle injury, either once or multiple times. All patients had painful limitation of dorsiflexion as well as swelling and difficulty in catching. Pain typically increased with mechanical activities demanding dorsiflexion, such as climbing stairs, sitting squat jumping, and sprinting. On clinical examination, there was hard or tender swelling in the anterior aspect of all ankles, which increased with dorsiflexion at the site, and maximum tenderness over the osteophyte, which was sometimes palpable.

Plain radiographs were taken for all patients in anteroposterior, lateral, and oblique views, and only patients with bony anterior tibiotalar impingement, either tibial (Fig. 1) or talar (Fig. 2a and b) spur, or both (Fig. 3), were included. In case of suspected instability of the ankle, especially in cases of multiple sprains in the ankle, stress films for both ankles were taken and patients with unstable ankles were excluded. An MRI examination was performed for nine patients to exclude any suspected osteochondral lesions of the talus as well as subtalar pathology.

The radiologic grading system for the impingement syndrome according to Scranton and McDermott [5] ranks the spurs from grades I to IV. Grade I lesions are caused by mere soft-tissue changes or a tibial spur of less than 3 mm in size. Grade II lesions show a bigger tibial spur, whereas grade III lesions are correlated with talar spurs or fragmentation of these spurs. A grade IV lesion corresponds with tibiotalar osteoarthritis. Our patients included eight with tibial lesions (four patients with grade I and four with grade II), five with talar lesions, and two patients with kissing osteophytes, both tibial and talar.

All patients were started on conservative treatment in the form of rest, bracing, nonsteroidal anti-inflammatory drugs, muscle strengthening, and physiotherapy for 2 months before shifting to surgical treatment.

Patients complaining of pain, swelling, giving-way in the anterior and anterolateral region of the ankle with history of twisted ankle injury, and bony anterior and anterolateral soft-tissue impingement diagnosed clinically and by plain radiograph and MRI were included in the study.

**Figure 1**

Anterior tibial spur.

Patients with anterior ankle impingement with conserved tibiotalar mobility compared with the contralateral side, soft-tissue anterior impingement, stiffness of nonarticular or mixed origin, and evident tibiotalar osteoarthritis were excluded from the study.

All patients were operated upon using the same protocol under general or spinal anesthesia. All patients were in dorsal decubitus with application of noninvasive strap distraction secured to a sterile post. A pneumatic tourniquet was applied at the root of the thigh. The equipment used was the same in all cases and included a 4.5 mm scope at 30°, an electric shaver, knife, and bone rasp. An arthropump was used in nine patients. Surgery was performed using the anterior ankle arthroscopy technique in all cases, using anteromedial and anterolateral portals. Three patients required a second accessory lateral portal to complete the bony debridement. Anterior tibiotalar cleansing began with anterior synovectomy along the tibiotalar osteophytes in maximal dorsiflexion so as to relax the anterior capsule and withdraw the anterior tibial artery. After partial synovectomy, the tibiotalar joint line was located; partial resection of tibiotalar osteophytes was frequently necessary to facilitate anterior exploration and increase the anterior workspace.

Once the joint line and osteophyte borders were completely visualized, synovectomy was continued along the osteophytes in maximal dorsiflexion. Anterior capsule release and detachment was then performed beyond the osteophytes, proximally along the anterior edge of the tibial pilon and distally along the talar neck. Following this extensive capsule release, the osteophytes were completely resected from their origin, either at the anterior edge of the tibia or talar neck, or both, up to the joint line to guarantee complete resection (Fig. 4a–c). Synovectomy and capsule release were continued in the malleolar grooves until the malleolar tips were fully visualized.

After debridement, the joint was washed several times to wash out any debris or small bony parts from the joint space; then a local anesthetic (bupivacaine hydrochloride) was injected and the portals were closed.

Postoperatively, a back slab was applied in dorsiflexion, cold fermentation was carried out, pain killers were administered, and partial weight bearing was allowed for 1 or 2 weeks as tolerated. All patients were followed up at regular intervals of 2 weeks for 2 months, every month for 4 months, and every 3 months thereafter. Range of motion exercises were started at 2 weeks, in addition to physical therapy for peroneal strengthening and proprioceptive training. The American Orthopedics Foot and Ankle Society (AO FAS) [6] hindfoot score evaluates pain (40 points), function (50 points), and alignment (10 points) Table 1. These scores were recorded before surgery and at the latest postoperative follow-up. Patient satisfaction was added as another parameter in this study. Patient satisfaction was rated as very satisfied, satisfied,

**Figure 2**


(a, b) Talar spur protruding from the talar neck.

**Figure 3**

Both tibial and talar spur (kissing lesion).

noncommitted, and disappointed. The AO FAS scores were rated as poor, fair, good, or excellent.

## Results

The mean follow-up period after arthroscopy was 17.3 months after surgery (12–30 months). The mean preoperative time between onset of symptoms and surgery was 25 months (range 18–48 months) Table 2. The impingement was tibial in eight patients, talar in five, and kissing lesion in two patients.

At the end of follow-up, seven patients had excellent scores and were very satisfied with the results and six patients had good scores and were satisfied with the results; hence, about 86.7% had excellent or good results. Two patients (13.3%) had fair results, and there were no poor results. Thirteen patients (86.7%) said that they would accept the same arthroscopic procedure again for the same complaints. In 86.7% of patients (13 patients) there was an improvement in the level of pain and swelling at 1-year follow-up. Of the eight patients who preoperatively had to stop their sport activities, six had resumed sports activities by their 6-month follow-up and two by 1-year follow-up.

One patient had moderate superficial wound infection at the anteromedial portal, which healed completely after 2 weeks with local rest and antibiotic treatment. The final result of this patient was rated as grade III (fair).

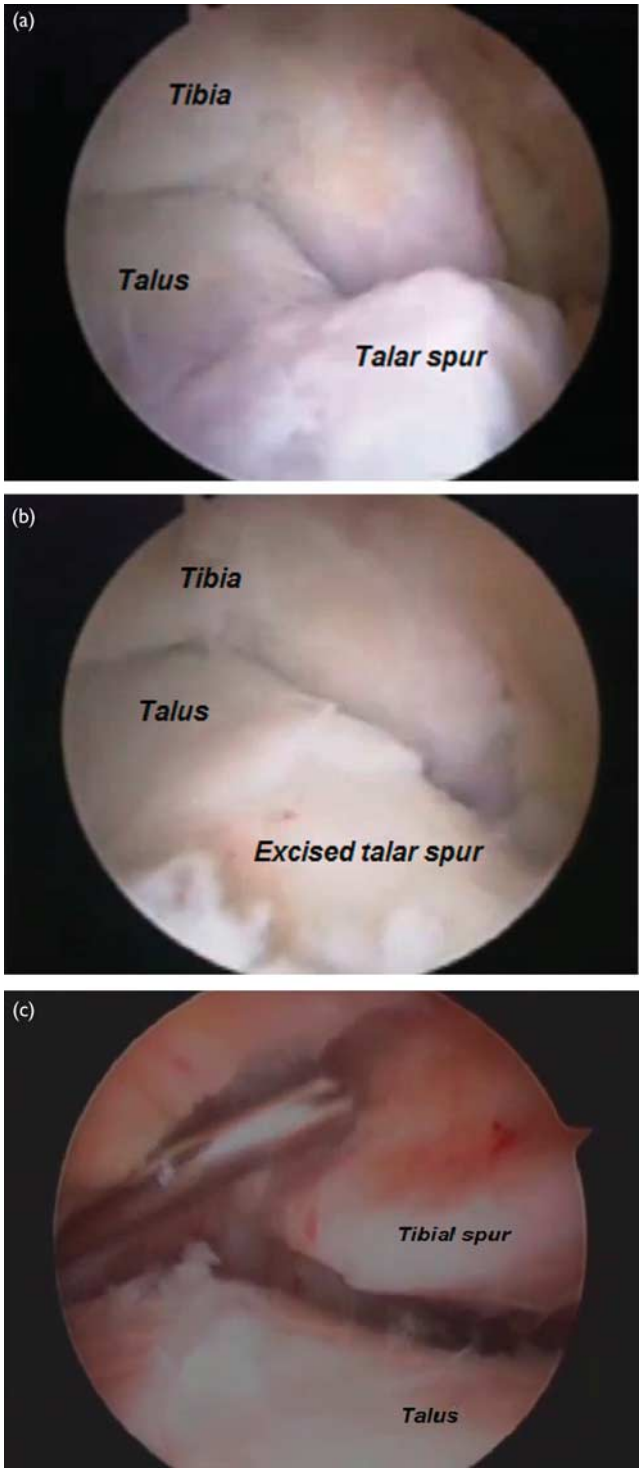
Two patients had numbness on the dorsal aspect of the foot for weeks, which disappeared by the 6-month follow-up and did not affect the final results.

The mean average improvement in the AO FAS score was about 24.4 points; the preoperative score was 62.5 (54–72) and at the end of follow-up the score was 86.9 (range 68–98).

The mean improvement in maximum dorsiflexion was 9°; preoperatively the angle was −10° (0 to −20°) and postoperatively it was +1° (range −5 to +5°).

Mean maximum flexion plus extension range increased from 14° preoperatively (10–25°) to 27° postoperatively (25–40°).

**Figure 4**




(a, b) During arthroscopy before and after excision of the talar spur; (c) arthroscopic debridement of the anterior tibial spur.

## Discussion

Bony anterior ankle impingement usually results from recurrent ankle sprains, which may be of osseous origin because of spur formation or interposition of soft tissue [7]. Tol *et al.* [8] in a study on cadavers found that these spurs were situated distal to the tibial insertion of the joint capsule, in contrast to McMurray's [4] opinion that spurs result from repetitive traction injuries; McMurray found these spurs to be the result of a metaplastic change in pre-existent connective tissue. The size of the spur is measured on the lateral radiograph. In cases with narrowing of the anterior joint space, arthroscopy has not been successful [9]; hence, we excluded patients with apparent osteoarthritis. The size of the osteophytes has been shown to correlate with the results of surgery [10].

Bony anterior ankle impingement is a syndrome featuring anterior ankle pain. Pain is typically provoked by dorsiflexion of the foot and palpation of the anterolateral or anteromedial ankle joint space [11]. Anterior impingement involves bone spurs or osteophytes on the anterior edge of either the tibia or talar neck or both on lateral

**Table 1 American Orthopedics Foot and Ankle Society hindfoot scale (100 points total) [6]**

| Variables | Score |
|---|---|
| Pain (40 points) | |
| None | 40 |
| Mild, occasional | 30 |
| Moderate, daily | 20 |
| Severe constant pain | 0 |
| Function (50 points) | |
| Activity limitation, support required | |
| No limitation, no support | 10 |
| No limitation of daily activity, limitation of recreational, no support | 7 |
| Mild limitation of daily activity and limitation of recreational, cane | 4 |
| Severe limitation of daily activity, and limitation of recreational, walker, crutches, wheelchair, or brace | 0 |
| Maximum walking distance (blocks) | |
| <6 | 5 |
| 4–6 | 4 |
| 1–3 | 2 |
| >1 | 0 |
| Walking surfaces | |
| No difficulty on any surface | 5 |
| Some difficulty on uneven terrain, stairs, inclines, ladders | 3 |
| Severe difficulty on uneven terrain, stairs, inclines, ladders | 0 |
| Gait abnormality | |
| None, slight | 8 |
| Obvious | 4 |
| Marked | 0 |
| Sagittal motion (flexion plus extension) | |
| Normal or mild restriction (≥30°) | 8 |
| Moderate restriction (15–29°) | 4 |
| Severe restriction (<15°) | 0 |
| Hindfoot motion (inversion plus eversion) | |
| Normal or mild restriction (75–100% of normal) | 6 |
| Moderate restriction (25–74% of normal) | 3 |
| Severe restriction (<25% of normal) | 0 |
| Ankle–hindfoot stability (anteroposterior varus–valgus) | |
| Stable | 8 |
| Definitely unstable | 0 |
| Alignment (10 points) | |
| Good, plantigrade foot, midfoot well aligned | 10 |
| Fair, plantigrade foot, some degree of midfoot malalignment, no symptoms | 8 |
| Poor, nonplantigrade foot, severe malalignment, symptoms | 0 |
| Total | 100 |

**Table 2 Preoperative and postoperative American Orthopedics Foot and Ankle Society scores and patient satisfaction**

| *N* | Sex | Age | Side | Sport | Preoperative (m) | Preoperative AO FAS | Postoperative AO FAS | Follow-up (months) | Lesion | Patient satisfaction |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | M | 33 | Rt | Fb | 24 | 61 | 98 | 24 | Tibial | Vs |
| 2 | M | 28 | Rt | Fb | 18 | 65 | 90 | 20 | Talar | Vs |
| 3 | M | 34 | Rt | Fb | 18 | 72 | 80 | 30 | Tibial | S |
| 4 | F | 42 | Lt | Na | 24 | 59 | 82 | 18 | Tibial | S |
| 5 | M | 38 | Lt | Fb | 24 | 59 | 98 | 18 | Talar | Vs |
| 6 | M | 36 | Rt | Bb | 18 | 59 | 80 | 24 | Tibial | S |
| 7 | M | 44 | Lt | Na | 24 | 69 | 95 | 12 | Talar | Vs |
| 8 | M | 27 | Rt | Bb | 18 | 54 | 98 | 12 | Tibial | Vs |
| 9 | F | 33 | Rt | Na | 36 | 62 | 82 | 12 | Tibial | S |
| 10 | M | 43 | Lt | Na | 36 | 59 | 68 | 12 | Kissing | Da |
| 11 | M | 41 | Rt | Fb | 24 | 65 | 98 | 18 | Talar | Vs |
| 12 | F | 36 | Rt | Na | 24 | 65 | 80 | 12 | Talar | S |
| 13 | M | 30 | Rt | Fb | 24 | 65 | 98 | 12 | Tibial | Vs |
| 14 | M | 42 | Lt | Na | 48 | 62 | 82 | 18 | Kissing | S |
| 15 | M | 40 | Lt | Na | 15 | 65 | 74 | 18 | Tibial | Nc |

AO FAS, American Orthopedics Foot and Ankle Society; Bb, basketball; Da, disappointed; F, females; Fb, football; Lt, left; M, males; Na, nonathletic; Nc, not committed; Rt, right; S, satisfied; Vs, very satisfied.

ankle radiographic views [5]. In all our patients with anterior osteophyte impingement there were accompanying inflammatory soft-tissue problems.

The therapy of an ankle impingement syndrome can start with conservative treatment such as the application of nonsteroid drugs, some local corticoid injections, heel lifting, and physiotherapy. If there are persisting ankle troubles, surgery should be discussed [12].

Arthroscopically, it was noted that hypertrophic synovium or inflammatory tissue scar was compressed between the osteophytes during forced dorsiflexion. This compression causes pain. In theory, arthroscopic excision of inflammatory tissue (synovitis, fibrosis) could relieve pain; however, talar and tibial osteophytes reduce the anterior joint space, favoring future soft-tissue formation and reimpingement.

In some cases of bony anterior ankle impingement, there may be considerable tibiotalar stiffening, usually predominating on dorsiflexion but sometimes on plantar flexion as well. Anterior tibiotalar osteophytes may cause stiffness, creating an anterior bony buffer that limits dorsiflexion and increases anterior capsule traction, thus limiting plantar flexion [12].

In our study, the mean AO FAS score at the end of follow-up was 86.9, with average improvement of about 24.4 points in relation to the preoperative score, indicating considerable functional benefit, with resolution of or marked decrease in anterior pain. In terms of patient satisfaction, 13 patients (86.7%) were very satisfied or satisfied with the results. These results were nearly similar to those of Tol and van Dijk [11], in whose study arthroscopy provided 82% good or excellent results in case of anterior osteophytes without joint space narrowing, compared with only 50% in case of joint space narrowing. A distinction is thus to be made between bony anterior impingement with 'isolated' osteophytes, which has good prognosis under arthroscopy, and bony anterior impingement in which osteophytes are the early sign of degenerative tibiotalar cartilage lesion, for which prognosis is more reserved [11].

Ogilvie *et al.* [13] reported modest gain in mobility with arthroscopic management of bony anterior ankle impingement, and only in dorsiflexion, which improved by 9°, similar to the improvement seen in our series, whereas plantar flexion in our series improved by 5° but remained unchanged in his series.

Bauer *et al.* [12] described arthroscopy both to manage the anterior impingement with anterior synovectomy and for osteophyte resection to improve tibiotalar mobility. This procedure significantly improved mobility in both dorsiflexion and plantar flexion (by 9 and 14°, respectively, at last follow-up).

Our results were nearly similar to those of Ogilvie-Harris *et al.* [13] who reviewed 17 patients at a mean of 39 months after removal of anterior bony spurs. Sixteen of them showed significant improvement. Ogilvie-Harris *et al.* [14] evaluated 11 athletes after resecting the anterior tibial and corresponding talar bony spur. Nine patients could return to sporting activities without restrictions and two with only some amount of restriction. In particular, there was significant decrease in the primary outcome of pain and improvement in the activity level, as also shown in the present study.

Limitations of this study are the small number of patients and short follow-up period. Over the longer term there may be recurrent loss of mobility and recurrence of pain especially if soft tissue or bony osteophytes recur.

Tol *et al.* [15] conducted a long-term follow-up of arthroscopic ankle debridement and removal of osteophytes; they found that osteophytes recurred in two-thirds of the ankles with grade-I osteo-arthritis. All patients in whom osteophytes recurred had a history of ongoing supination trauma and/or repetitive forced dorsiflexion, most often as a result of regular participation in soccer. There was no statistical correlation between the recurrence of osteophytes and the return of symptoms [14].

However, anterior arthroscopy is a simple procedure that is less traumatic than open surgery and hence has low

morbidity. It yields significant rapid functional improvement in terms of anterior impingement, pain, and stiffness, and should be reserved for bony anterior impingement not responding to conservative measures with poorly tolerated stiffness.

## Conclusion

Arthroscopic resection of bony spurs, either tibial or talar, or both, after repeated ankle sprains has proven to be a reliable therapeutic approach for post-traumatic impingement syndrome of the ankle that does not respond to conservative treatment.

## Acknowledgements

### Conflicts of interest

There are no conflicts of interest.

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