

LITERATURE REVIEW

Ankle fractures account for approximately 9% of all fractures and are the most common fracture requiring operative treatment. An estimated 40% of all ankle fractures require surgical management typically in the form of open reduction internal fixation (ORIF) to restore anatomic position (1,2). A large portion of patients with surgically managed ankle fractures will subsequently undergo removal of hardware. Indications and clinical need for hardware removal are disputed, and it is typically surgeon preference to remove symptomatic implants versus routine hardware removal. Jacobsen et al. reported that out of 66 patients with ankle hardware, 89.4% reported pain including soreness over the hardware, reduced ankle joint movement and strain related pain (3).

In addition to symptomatic hardware, untreated ankle lesions caused by ankle fracture are another major factor that can prolong pain and recovery after surgical management (4). Even anatomic surgical realignment of ankle fractures has been associated with poor clinical outcomes, and occult intra-articular injury has been described as a potential cause (4-7). Ankle arthroscopy is an important diagnostic and treatment modality for evaluation of ankle pain and can therefore be useful in this patient population. Previous literature has suggested that chondral lesions are common after acute ankle fractures, with prevalence as high as 73% identified arthroscopically (5).

Although post-traumatic arthroscopically-identified chondral lesions have been well defined, there are otherwise few studies in the literature that evaluate intra-articular damage identified by exploratory arthroscopy with concomitant removal of ankle fracture internal fixation.

STATEMENT OF PURPOSE

Post-traumatic arthritis and painful retained hardware are known sequelae following open reduction and internal fixation of ankle fractures. The purpose of this study is to describe intra-articular ankle pathology detected arthroscopically in patients requiring removal of ankle hardware following ankle fracture ORIF.

CASE STUDY AND SURGICAL PROCEDURE

Retrospective review of twenty-one patient charts that underwent hardware removal with ankle arthroscopy performed by a single surgeon (BLC) from January 2017 to September 2018. There were 18 females and 3 males included in the study, with an average age of 48 years (range 25 to 78) at time of surgery (Table 1). The severity of the initial ankle injury (Figure 1) and arthroscopically-identified intra-articular ankle pathology were recorded (Figure 2).

Patients were brought into the operating room and placed on the operating table in supine position with the operative extremity placed in a Ferkel thigh holder. After administration of general anesthesia, the extremity was prepped and draped using sterile technique. An ankle distractor was applied. The foot and leg were exsanguinated and a thigh tourniquet was inflated to 300mmHg for the duration of the case. The ankle joint was inspected arthroscopically through standard anteromedial and anterolateral portals.

Arthroscopic evaluation of ankle pathology was systematically performed using a modified 21-point examination. Synovectomy, debridement of impingement lesions, removal of loose bodies, and debridement and microfracture of osteochondral defects was done as necessary. When the arthroscopic portion of the case was complete, the ankle joint distractor and thigh holder were removed, and complete removal of retained orthopedic hardware from the fibula, medial malleolus, posterior malleolus and/or syndesmosis followed as necessary. Post-operatively, the patient was placed non-weight bearing in a posterior splint for a time period dependent upon the procedure.



Figure 1. Radiographic example of bimalleolar ankle fracture (A) preoperatively and (B) post hardware removal, and radiographic example of trimalleolar ankle fracture (C) preoperatively and (D) post hardware removal.

Table 1. Patient Characteristics		
Mean Age ± SD (years)	48 ± 16.8	
Gender n (%)	Male	3 (14.3%)
	Female	18 (85.7%)
Severity of Initial Ankle Injury n (%)	Isolated Malleolar	7 (33.3%)
	Bimalleolar	11 (52.4%)
	Trimalleolar	3 (14.3%)

RESULTS

The type of initial ankle fracture patterns included 7 (33.3%) isolated malleolar, 11 (52.4%) bimalleolar, and 3 (14.3%) trimalleolar (Table 1, Figure 1). Synovitis was identified in 21 patients (100%), chondromalacia in 11 (52.4%), osteochondral defect in 2 (9.5%), and soft tissue impingement in 19 (90.5%) (Table 2, Figure 2). Severity of initial ankle injury associated with each type of intra-articular pathology was also recorded (Table 3).

Intra-Articular Pathology	n (%)
Synovitis	21 (100%)
Chondromalacia	11 (52.4%)
OCD	2 (9.5%)
Instability	0
Impingement	19 (90.5%)

Intra-Articular Pathology	Isolated Malleolar Fracture n (%)	Bimalleolar Fracture n (%)	Trimalleolar Fracture n (%)
Synovitis	7 (100%)	11 (100%)	3 (100%)
Chondromalacia	4 (57.1%)	5 (45.5%)	1 (33.3%)
OCD	1 (14.3%)	0	1 (33.3%)
Impingement	6 (85.7%)	10 (90.9%)	3 (100%)

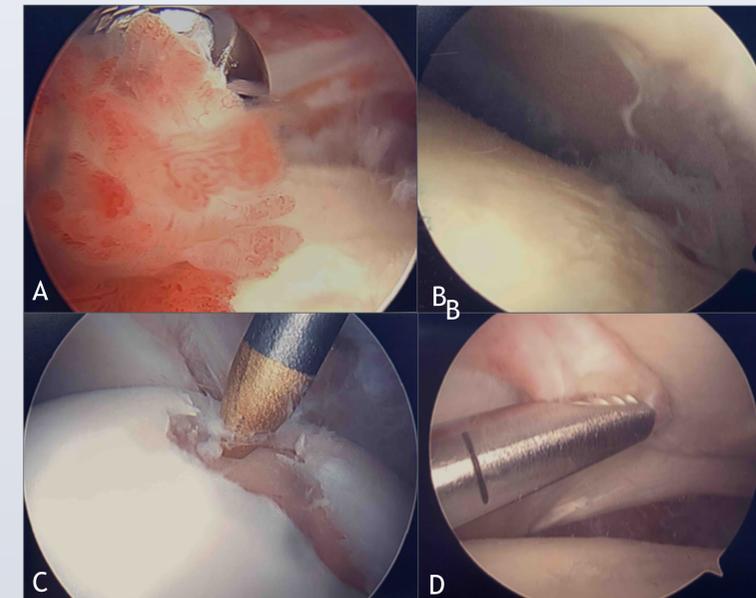


Figure 2. Example of arthroscopically identified ankle joint pathology including (A) synovitis, (B) chondromalacia, (C) OCD lesion of the talus and (D) soft tissue impingement lesion.

ANALYSIS AND DISCUSSION

Results from this study indicate that associated ankle pathology such as synovitis, chondromalacia, OCD lesions, and impingement are common even after rigid anatomic internal fixation of ankle fractures and regardless of the severity of the initial ankle fracture. Synovitis and soft tissue impingement lesions were the most commonly identified pathologies at 100% and 90.5%, respectively. Similarly, in a case series of 50 patients undergoing ankle hardware removal with adjunctive arthroscopy, Thomas et al. identified synovitis in 92% of cases; however, the second most common pathology identified was chondral lesions (90%) varying in severity from scuffing to subchondral defects (9). In a similar study, Loren and Ferkel reported 63% of cases had chondral lesions, and the extent of damage was dependent on the severity of the ankle fracture (10). We report some form of chondral damage in 61.9% of cases, which is fairly consistent with recent literature, and soft tissue impingement in 90.5% of cases which has not been previously reported.

Ankle arthroscopy as an adjunct to hardware removal affords the ability to directly observe and diagnose multiple pathologies that could explain ongoing ankle pain after an ankle fracture. These pathologies are often missed or overlooked on radiographs or MRI, and therefore arthroscopy should have a diagnostic and therapeutic role in the setting of chronic ankle pain after ankle fracture internal fixation.

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