

# Editorial Commentary: Optimizing Surgical Management of Ankle Fractures: Is Arthroscopy the Answer?



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**Abstract:** The surgical management of ankle fractures can be an unforgiving endeavor. Subtle malreductions in fracture fragments lead to significant deviations in joint reactive forces and, consequently, accelerated arthritis. The diagnosis of associated ligamentous pathology, such as deltoid and syndesmotic injuries, is often difficult and ideal surgical management is debated. Ankle fractures that are seemingly optimally managed using traditional surgical techniques may remain persistently painful and function poorly—a scenario that begs the question, was there more to the injury than met the eye (or radiographs)? Here, unrecognized concomitant intra-articular injuries and subtle surgical malreductions have been implicated. In my practice, concurrent ankle arthroscopy at the time of definitive acute ankle fracture reduction and fixation results in improved accuracy of reduction, evaluation and management of concomitant syndesmotic and ligamentous injuries, assessment and treatment of occult intra-articular injuries, options for less-invasive fixation techniques through arthroscopic reduction, and a means to provide prognostic patient information. I typically reserve its use for fracture patterns that have been more closely associated with intra-articular injuries: high-energy mechanism injuries, Weber B and C fibula fractures, and those with a high likelihood of syndesmotic disruption based on preoperative imaging. Despite these intuitive advantages, concurrent ankle arthroscopy for acute fracture fixation is not routinely performed by most orthopedic surgeons, and a relative dearth of literature regarding its use and clinical impact remains.

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Ankle fractures are complex and heterogeneous injuries. Although one of the most common injuries treated by practicing orthopedists, ankle fractures can challenge the most seasoned surgeons' diagnostic acumen, technical skills, and wit. Despite adherence to standard surgical principles of ankle fracture treatment (anatomic reduction, restoration of articular congruency and stability, and use of appropriate fixation), a subset of patients continue to experience poor functional outcomes.<sup>1</sup> A prevailing explanation for this phenomenon is that traditional open surgical techniques are inadequate to assess and treat the entire injury. To this end, it has been purported that unrecognized and untreated associated intra-articular injuries are to blame for many instances of unfavorable

outcomes.<sup>2-4</sup> Moreover, traditional open reduction techniques in which reduction accuracy is based on cortical alignment may not result in accurate articular reduction, particularly when there is impaction injury.<sup>5</sup> Arthroscopy as an adjunct to ankle fracture surgery may circumvent these potential shortcomings of standard open techniques.

Liu, You, Yang, Zhu, Yu, Fan, and Li should be commended for their article, "Arthroscopy-Assisted Reduction in the Management of Isolated Medial Malleolar Fracture."<sup>6</sup> The authors prospectively evaluated 77 patients with isolated medial malleolar ankle fractures, of whom 34 underwent arthroscopic-assisted fracture reduction and percutaneous screw fixation and 43 were managed with fracture reduction and fixation using standard open techniques. The authors compared Olerud-Molander Ankle Score, pain scores, ankle range of motion, and radiographs between the 2 groups at multiple time points during the mean follow-up period of 5 years. Olerud-Molander Ankle Score scores were statistically and clinically superior at 6 months and 1 year for the arthroscopy cohort. Pain scores were clinically and statistically better in the

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arthroscopy cohort at 3 days and 2 weeks following surgery, but not at 6 months. Ankle plantarflexion motion was superior for the arthroscopy group at all time periods and dorsiflexion at 6 months and 1 year; however, in both groups the operative limb had restricted motion compared with the uninjured side. All fractures successfully united, and 3 (7%) in the open cohort developed arthritis during follow-up. Three (8.8%) patients in the arthroscopy group were found to have a Grade I deltoid ligament injury, 15 (44.1%) had injuries to the anterior inferior tibiofibular ligament but no syndesmotic stabilization procedures were indicated per the authors, and no loose bodies were identified. Eleven (32.4%) patients had articular cartilage lesions, most of which were low-grade talar dome lesions treated with debridement and microfracture at the surgeon's discretion. The authors concluded that concurrent arthroscopy resulted in superior short-term outcomes compared with traditional open techniques, but the advantages were tempered in the longer term.

The authors' work represents one of the few investigations to date evaluating the effect of concurrent arthroscopy on ankle fracture management. Although the primary focus of using arthroscopy in this series was to describe a technique to assist with fracture reduction and compare its results with open techniques, findings of arthroscopic joint inspection were also reported. Approximately one third of patients had a chondral injury in this cohort. Debridement, shaving, and microfracture were performed at the surgeon's discretion. Previous investigations have revealed associated osteochondral lesions in the majority of patients undergoing concomitant ankle arthroscopy at the time of fracture management, ranging upwards of 79%.<sup>3,7-11</sup> These investigations have typically included heterogeneous fracture types in their analyses, and results have indicated that certain injury patterns have a stronger correlation with intra-articular injuries, such as Weber B and C fibula fractures as well as those with syndesmotic injuries.<sup>3,7,9-11</sup> The prevalence of intra-articular pathology in the cohort of Liu et al. is lower than that which has typically been reported.<sup>3,7-11</sup> It stands to reason that this discrepancy is due to the homogenous injury types analyzed by Liu et al. compared with the previous studies that have typically included higher energy injuries, those with multiple fracture fragments, syndesmotic injuries, and dislocations, all of which are more likely to have osteochondral injuries.<sup>3,7-10</sup> Nevertheless, the results of Liu et al. expand on the growing consensus that intra-articular injuries are a frequent component of ankle fractures. It is plausible that treating identified intra-articular pathology did at least contribute to the favorable results in the arthroscopy cohort of Liu et al.; however, no subgroup analysis was performed to compare patients in whom

pathology was identified and treated with those who did not.

Ankle arthroscopy is arguably the most reliable means to diagnose intra-articular injuries of the ankle, but arthroscopy adds expense and time to these surgical procedures, as was also noted in current study, as operative time was 12 minutes longer in the arthroscopy group. Increased operative time can increase patient risk. Furthermore, in an era in which more emphasis is placed on value-based care, it is particularly relevant to justify the additional time and expense of concomitant arthroscopy. There is certainly sensible rationale for arthroscopy and ankle fractures from the standpoint of addressing concomitant intra-articular injuries. First, chondral injuries, osteochondral lesions, and loose bodies are well-established sources of pain and dysfunction independent ankle fractures. Second, intra-articular pathology has been identified with relative frequency in patients undergoing arthroscopy for persistent pain after ankle fracture surgery.<sup>12,13</sup> Third, such injuries are commonly detected during concomitant ankle arthroscopy at the time of acute ankle fracture surgery.<sup>3,7-11</sup> In this context, it is not surprising that a prospective randomized analysis comparing patients who underwent concomitant arthroscopy for Weber B fractures to standard open techniques yielded improved outcomes in the arthroscopy group that the authors attributed to addressing intra-articular disorders, which were diagnosed in 80.2% of patients.<sup>14</sup> However, in a separate comparative study by Fuchs et al., results were not superior in a group of patients that underwent arthroscopy at time of definitive fracture treatment compared to traditional open techniques.<sup>8</sup> Thus, current evidence is insufficient to strongly recommend arthroscopy in the routine management of ankle fractures particularly for the purposes of addressing intra-articular pathology.<sup>15</sup> Additional high-quality studies, particularly randomized comparative ones, are needed to solidify the role of arthroscopy in this capacity.

The other primary potential benefit of ankle arthroscopy that has been touted, is its ability to improve reduction accuracy and facilitate minimally invasive fixation techniques. The work of Liu et al. is most relevant in this context.<sup>6</sup> The authors provided an excellent description of their arthroscopic technique for treating isolated medial malleolus fractures. Summarily, the authors ensured anatomic articular alignment arthroscopically while using a percutaneous reduction technique and screw fixation method. It seems most logical that the superior results afforded by this technique, which were most significant in the short term, were owed to less soft-tissue dissection and preservation of the capsule and vascular supply compared with the open technique. Long term, one can reason that ensuring anatomic

reduction of the articular surface through arthroscopic assessment will mitigate the incidence of post-traumatic arthritis. Swart and Vosseller<sup>5</sup> have shown previously that realigning the cortical fracture lines does not reliably translate to alignment of the articular surface. In light of this, arthroscopy assistance with reduction affords the potential to more accurately reduce the articular surface. This is in line with previous data, which has suggested that arthroscopic assessment is the most reliable means to assess syndesmotism instability and optimize an anatomic reduction which does portend the best chances at a satisfactory outcome.<sup>16,17</sup> However, high-quality studies specifically investigating the clinical impact of arthroscopic assistance with reduction are lacking, and Liu et al.'s work certainly does meaningfully add to the relative paucity of literature.

It must be noted that Liu et al. did not randomize patients.<sup>6</sup> The choice of arthroscopy was made by the patient and surgeon, and it was disclosed that patients with insurance were more likely to choose concomitant arthroscopy. Thus, a selection bias exists and the potential for confounding must be considered by the reader. Nevertheless, these results do feasibly impact my practice. To date, I have routinely used ankle arthroscopy in the treatment of ankle fractures but have typically reserved its use for fracture patterns that have been more closely associated with intra-articular injuries: high-energy mechanism injuries, Weber B and C fibula fractures, and those with a high likelihood of syndesmotism disruption based on preoperative imaging. Treating associated intra-articular pathology such as removal of loose bodies, debridement of chondral injuries, and microfracture of osteochondral lesions seems worthwhile. In addition, I have found that I am able to more accurately diagnose syndesmotism injuries and more reliably assess my reduction. Liu et al. provide a solid basis to expand the use of arthroscopy to assist with ensuring a more accurate reduction of medial malleolus fractures in particular, as well as a means to minimize incisions and soft-tissue dissection. The superior results in the short term reported by Liu et al. hold the potential to feasibly translate into real-world improvements in patient care, such as quicker return to work and play through improved function, minimizing narcotic use through less surgical pain, and the potential to obviate the need for physical therapy through improved motion. Thus, the work of Liu et al. supports the notion that arthroscopy is part of the evolution of improving treatment of ankle fractures and should be considered by orthopaedic surgeons who routinely treat ankle fractures and are technically proficient at ankle arthroscopy.

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