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Arthroscopically Assisted Versus Standard Open Reduction and Internal Fixation Techniques for the Acute Ankle Fracture

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Abstract

Background: Ankle fractures represent one of the most common orthopaedic injuries requiring operative treatment. Although open reduction and internal fixation (ORIF) of ankle fractures leads to good results in most patients, poor functional outcomes continue to be reported in some patients for whom anatomic reduction was achieved. It has been theorized that these lesser outcomes may in part be due to a component of missed intra-articular injury that reportedly ranges between 20% and 79%, although to date the true explanation for this subset of lower functional outcomes remains unknown. Such concerns have recently spawned novel techniques of arthroscopically assisted ankle fracture assessment in hopes of enabling better detection and treatment of concomitant intra-articular ankle injuries. The purpose of this systematic review was to summarize the literature comparing standard ORIF to arthroscopically assisted ORIF (AAORIF) for ankle fractures.

Methods: A systematic review of the English literature was performed using the PubMed database to access all studies over the last 50 years that have documented the functional outcomes of acute ankle fracture management using either a traditional ORIF or an AAORIF technique in the adult population. Relevant publications were analyzed for their respective Levels of Evidence as well as any perceived differences reported in operative time, outcomes, and complications.

Results: A total of only 14 ORIF and 4 AAORIF papers fit the criteria for review. There is fair quality (grade B) evidence to support good to excellent outcomes following traditional ORIF of malleolar fractures. There is fair-quality (grade B) evidence that ankle arthroscopy can be successfully employed for identification and treatment of intra-articular injuries associated with acute ankle fractures, but insufficient (grade I) evidence examining the functional outcomes and complication rates after treatment of these injuries and little documentation that this approach portends any improvement in patient outcome over historical techniques. There is also insufficient (grade I) evidence from 2 prospective randomized studies and 1 case-control study to provide any direct comparative data on functional outcomes, complication rates or total operative time between AAORIF and ORIF for the treatment of acute ankle fractures.

Conclusions: Ankle arthroscopy is a valuable tool in identifying and treating intra-articular lesions associated with ankle fractures. The presence of such intra-articular pathology may lead to the unexpectedly poor outcomes seen in some patients who undergo surgical fixation of ankle fractures with otherwise anatomic reduction on postoperative radiographs; the ability to diagnose and address these lesions therefore has the potential to improve patient outcomes. To date, however, currently available literature has not shown that treatment of these intra-articular injuries provides any improvement in outcomes over standard ORIF, and few prospective randomized controlled studies have been performed comparing these 2 operative techniques—rendering any suggestion that AAORIF improves clinical outcomes over traditional ORIF difficult to justify. Further research is indicated for what may be a potentially promising surgical adjunct before we can advocate its routine use in these patients.

Level of Evidence: Level II, systematic review.

Keywords: ankle fracture, ankle ORIF, ankle arthroscopy, outcomes

Introduction

Ankle fractures occur at a rate of 187 in 100 000 people per year and continue to be one of the most common injuries treated by orthopedic surgeons.[6,8,10] Initial careful assessment of fracture pattern, soft tissue status, and patient characteristics remain key in determining the risk-benefit tradeoffs of nonoperative versus operative management. Closed treatment of stable, acceptably aligned ankle fractures has demonstrated excellent results.[11] Open reduction and internal fixation (ORIF) is the current standard of care for displaced and unstable fracture patterns, with historical data showing good to excellent results for most of these patients.[2,11,15,25] There is, however, a subset of patients who experience unexpectedly poor functional outcomes.[27,32] A number of authors have purported that these adverse results may in fact be due to unrecognized and therefore unaddressed intra-articular injury.[14,18,27,32] Although their true cause remains unknown, this subset of patients has, among other reasons, fueled the advent of arthroscopically assisted ORIF (AAORIF) of ankle fractures. Ankle arthroscopy has become increasingly utilized as an adjunct to, or in some cases even an alternative to, traditional ankle ORIF. Advocates tout this technology as a means of diagnosing and treating intra-articular injuries.

Over the past few years, several studies have been published showing the value of ankle arthroscopy to assess both the ligamentous and cartilaginous damage that can occur after acute ankle fracture. Studies have found the prevalence of articular lesions in patients with ankle fractures to be between 20% and 79%.[18,32] These findings have resulted in a significant surge of interest, and it is now well accepted that ankle arthroscopy can enhance the identification and even treatment of otherwise occult intra-articular injuries. What still remains unclear, however, is whether or not the application of this technique actually translates into improved outcomes and represents an equally safe operative alternative to standard ORIF.

The purpose of this systematic review, therefore, was to summarize the current literature comparing standard ORIF to arthroscopically assisted ORIF for ankle fractures.

Traditional Ankle Fracture ORIF

In general, stable ankle fractures with minimal periarticular displacement and no evidence of talar shift can be treated nonoperatively,[11,21,38,39] whereas unstable ankle fracture patterns or those with significant displacement are treated operatively.[6,10,11] The overall clinical results following ankle ORIF have typically been shown to be good to excellent. Lindsjö et al prospectively followed 306 ankle fracture-dislocations treated with standard ORIF and found the clinical results were "excellent" or "good" in 82%, "acceptable" in 8%, and "poor" in 10% of patients.[25] They also showed that following standard ORIF technique, patients often have high rates of return to preinjury activities, including work (90%), athletics (82%), and walking (89%). Likewise, Burwell and Charnley treated malleolar fractures with standard open techniques and reported that the clinical results were good in 82% (108 of 132), fair in 14.3% (19 of 132), and poor in 3.7% (5 of 132) of patients.[6]

Outcomes

Many studies have utilized validated outcome assessments as well as quality of life measurement tools to assess functional outcomes and quality of life after ankle surgery.[35] Egol et al prospectively followed 198 patients after ankle ORIF for a minimum of 1 year, evaluating functional status at 3, 6 and 12 months.[15] At 1 year, 88% (174 of 198) of the patients were pain-free or had only mild ankle pain and 90% had either no limitations or limitations in recreational activities only. The AOFAS Ankle Hindfoot Score showed that 90% (178 of 198) of the patients had 90% functional recovery. At 3 and 6 months postoperatively, all Short Musculoskeletal Function Assessment (SMFA) subscores were significantly higher than the baseline subscores but had returned to baseline by 1 year postoperation ($P < .001$). They concluded that 1 year following ankle ORIF, patients do well overall, experience little or mild pain, and have few restrictions in functional activities.[15] Likewise, Obremskey et al observed good outcomes on the SF-36 questionnaire in patients treated operatively at an average of 20 months. They looked at 20 adult patients with an isolated unstable ankle fracture (OTA 44B/C) who underwent standard ORIF and found at final follow-up that scores of all domains of the SF-36 were not significantly different from the US population norms, except for the domain of physical functioning, which indicated improved function ($P < .01$).[31]

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Other authors, however, have found poorer outcomes than previously reported following standard ORIF of malleolar ankle fractures. Ponzer et al looked at 41 patients with ankle fractures and assessed functional outcomes and quality of life measures 2 years postoperatively and found that only 36% (13 of 36) of patients reported complete recovery. Additionally, 44% (16 of 36) reported work-related problems and 61% (22 of 36) had some problems with sport activities. The SF-36 subscores for physical functioning, physical and emotional role function, vitality, and mental health were lower compared with an average Swedish population, suggesting that quality of life is negatively affected in ankle fracture patients up to 2 years following surgery.[35] Belcher and colleagues reached similar conclusions regarding functional outcomes after ankle surgery in their retrospective case-control study of 40 ankle fracture patients with between 8 and 24 months of follow-up. Operative patients had a mean Olerud Molander Ankle (OMA) Score of 72 versus 100 for the controls, an average UCLA Activity Score of 6.0 versus 9.43 for the controls, and patients took an average of about 3000 fewer steps per day than the controls. They concluded that significantly impaired function persists for most patients from 8 to 24 months after ORIF of malleolar fractures ($P < .01$).[1] Similarly, Lash et al found an average OMA score of 76 at 16 months after surgery in 62 patients who underwent ankle ORIF.[23] At 10 to 14 years postoperation, Day et al found that only 64% (16 of 25) of patients had a good or excellent functional outcome on the Phillips Scoring System.[12]

Disadvantages and Limitations

Standard ORIF of ankle fractures, however, is not without some inherent risk and limitations. Postoperative infection, wound dehiscence, failed bone healing, hardware failure, loss of reduction/fixation, pulmonary embolism, below-knee amputation, and mortality, are all reported complications following ankle ORIF.[29] Despite open reduction and internal fixation of ankle fractures, visualization of the entire joint is difficult and thus treatment of associated intraarticular injuries may be difficult to preform. Soohoo et al retrospectively reviewed a database of 57 183 patients who had undergone ORIF of a lateral malleolar, bimalleolar, or trimalleolar ankle fracture and found that the overall rate of short-term complications was low, including the rates of pulmonary embolism (0.34%), mortality (1.07%), wound infection (1.44%), amputation (0.16%), and need for revision ORIF (0.82%).[32] The intermediate-term rates of reoperation were also low, with ankle fusion or ankle replacement being performed in 0.96% of the patients who were observed for 5 years. In a retrospective review, Bohm et al reviewed 501 ankle ORIF patients and found the rate of early complications and mortality were 5% and 1%, respectively.[4] Mak et al studied 116 cases of ankle fractures that underwent ORIF. There were no deaths or nonunions in the group but there were local complications, including wound infection (8.6%) (10 of 116) and skin necrosis (3%) (4 of 116).[28]

Arthroscopically Assisted ORIF

Ankle arthroscopy has the potential benefit of allowing the surgeon to detect and treat concomitant intra-articular pathology occurring with an ankle fracture.[5,13,14,32,41] Arthroscopy in patients undergoing ankle fracture surgery offers the proposed advantages of improved visualization of articular reductions, assessment and treatment of cartilage and ligamentous damage, removal of loose bodies, decreased soft tissue exposure, preservation of vascularity, and evaluation of the syndesmosis.[5,9,13,20] Indeed, a recent study by Watson et al demonstrated the effectiveness of arthroscopy in evaluating even partial disruptions of the syndesmosis,[44] and Takao et al have shown the superiority of arthroscopy in the evaluation of the syndesmosis as compared to plain radiographs.[40] The ability of arthroscopy to enhance the diagnosis of syndesmotic instability indicates that there may well be an important role for arthroscopy in the treatment of ankle fractures.

Hintermann et al performed a prospective study to assess intra-articular lesions using arthroscopy in 288 consecutive patients with acute ankle fractures. The results revealed a 79% (228 of 288) rate of articular lesions and an overall complication rate of 6.3% (18 of 288).[18] Loren and Ferkel performed arthroscopic assessment in 48 consecutive patients with acute unstable ankle fractures and reported a 63% (30 of 48) rate of traumatic articular lesions and a 45.8% (22 of 48) rate of syndesmotic ligament disruptions.[25] No clinical outcomes were assessed in either of these studies.

Outcomes

Investigators have now begun to publish their experience with using AAORIF for ankle fracture management; these early adopters are reporting promising results. Ono et al looked at 105 patients with ankle fractures who underwent AAORIF with a mean follow-up of almost 4 years and found articular cartilage damage in 20% (21 of 105) of patients and ligamentous injury in 51.4% (54 of 105) of patients. These lesions were addressed at the time of surgery.[29] Their clinical results were reported as good in all patients, and they had no postoperative complications, posttraumatic arthritis, or pseudoarthrosis. They concluded that fracture treatment aided by arthroscopy is an outstanding therapeutic modality that allows direct confirmation of intra-articular lesions and is cost-effective relative to magnetic resonance imaging.[29]

Disadvantages and Limitations

Despite its potential to improve the treatment of ankle fractures, ankle arthroscopy is not without disadvantages and limitations. There is limited data to suggest that this treatment leads to any improvement in functional outcome. Other concerns with the use of ankle arthroscopy include the potential for increased setup and operative time, a steep learning curve for the surgeon, and increased initial costs, all of which may pose challenges for the surgeon, particularly when first using this technology to aid in ankle fracture fixation.[20] Furthermore, the overall complication rate with ankle arthroscopy has been reported to range between 6% and 17%, with neurologic injury being the most commonly reported complication.[7,13,46] Other reported complications include compartment syndrome, soft tissue swelling from fluid extravasation, tourniquet complications, tendon injury, ligament injury, articular cartilage damage, hemarthrosis, complex regional pain syndrome, distraction-related problems, and pulmonary embolism.[13] Although rare, these may be devastating complications.

Comparison Studies

Few studies have actually compared standard ORIF to AAORIF for acute ankle fractures, and the several that are available have shown mixed results. Thordarson et al performed a prospective randomized study on the operative treatment of malleolar fractures with or without ankle arthroscopy. They looked at 19 patients with an average follow-up of 21 months. Eight of 9 patients in the AAORIF group were found to have articular damage to the dome of the talus. At final follow-up, all patients had healed their fractures, and no difference could be identified between the 2 groups with respect to SF-36 scores, MODEMS lower extremity and foot and ankle scores, or clinical outcomes. The authors acknowledged that the study was limited by the small number of patients and only 21 months of follow-up.[35]

In a prospective randomized study by Takao et al, 72 patients with distal fibular fractures at the level of the syndesmosis were randomized to treatment with either AAORIF or ORIF alone, with 3½ years of follow-up. In the AAORIF group, arthroscopy revealed osteochondral lesions in 73.2% (30 of 41) of cases and tibiofibular ligament disruptions in 80.5% (33 of 41). If the osteochondral lesion was grade III or IV according to the modified Prisch classification, arthroscopic drilling was performed. If the AITFL or PITFL was found to be disrupted via arthroscopic assessment, then an external rotation stress test under arthroscopy was performed. They defined instability as 2 mm of widening of the distal tibiofibular articulation and if this was found the authors preformed syndesmotic screw fixation.[40] There were no complications in the AAORIF group, and 2 cases of superficial wound infections in the ORIF group. AOFAS score was significantly higher in the AAORIF group (91.0) as compared to the ORIF group (87.6) (P = .0106). They concluded that better AOFAS scores were achieved when combined intra-articular disorders were diagnosed and treated than when only the fracture site was treated.[40]

Similarly, in a recent case-control study, Turhan et al compared 47 patients with medial malleolar fractures treated by either AAORIF or standard ORIF. The mean follow-up was 26 months for the AAORIF and 38 months for the ORIF group. Median Olerud Scores were 92.3 and 86.3 for the AAORIF and for ORIF groups, respectively. This difference reached statistical significance (P = .015), indicating a potential benefit for AAORIF.[43]

Tables 1 and 2 summarize the above studies and outcomes.

Discussion

Although the outcomes of ankle fractures treated by standard ORIF techniques are reported to be good to excellent in the vast majority of patients, recent studies have shown that some patients still suffer from persistent pain and disability even years after surgery. Variables including age, obesity, immunodeficiency, alcohol abuse, patient noncompliance, open fractures, gender, severely comminuted fractures, delay in operative treatment, and diabetes have been associated with poorer outcomes after ORIF.[12,15,24-26,34,39] Soohoo et al showed that open fractures, diabetes, and peripheral vascular disease were strong risk factors portending a complicated short-term postoperative course and that fracture type, particularly trimalleolar and open fractures, was a strong predictor of the need for later ankle fusion or replacement.[39]

Egol et al showed that younger age was a predictor of short-term recovery and that individuals younger than 40 years were more likely to regain more than 90% of function.[15] Men were more likely than women to recover function, and patients with a lower ASA class and absence of diabetes were more likely to have improved functional recovery at 1 year. Day et al suggested that the severity of the initial injury and delay to surgery of more than 4 days were poor prognostic factors for outcomes in ankle ORIF in their 10- to 14-year follow-up period.[12] Bhandari et al performed a prospective observational study looking at independent predictors of poor outcomes following ankle surgery for Weber B ankle fractures.[3] Smoking history (P = .02), presence of a medial malleolar fracture (P = .02), and lower levels of education (P = .01) were all found to be significant independent predictors of lower physical function up to 3 months after surgery. The findings of these studies suggest that many factors play a role in how patients fare after operative repair of an ankle injury. Other issues that may contribute to poor outcomes include wound dehiscence, infection, ankle stiffness, failure to achieve or maintain adequate reduction

Table 1. Summary of Literature Reviewed.

Author/Year	Type of Study / Level of Evidence	No. of Patients AAORIF	No. of Patients ORIF	Fracture Type / Classification Used	Follow-Up Time (Mean)	Complication Rate	Outcome Measurement Tools
ORIF							
Belcher et al (1997)	Retrospective cohort (level III)		40	Lauge-Hansen	Range 8-24 mo	Not documented	OMA UCLA Activity Score Pedometer count of average number of steps per day
Day et al (2001)	Case series (level IV)		25	Danis-Weber Lauge-Hansen	Range 10-14 y	Not documented	Phillips Scoring System
Egol et al (2006)	Prospective cohort (level I)		198	OTA	12 mo	Not documented	SMFA AOFAS Ankle Hindfoot Score
Lash et al (2002)	Retrospective cohort (level III)		74	Danis-Weber	2 y	8.1%	OMA EQ-5D VAS
Obremskey et al (2002)	Prospective cohort (level II)		20	OTA	1st SF-36: 4.4 mo2nd SF-36: 19.7 mo	Not documented	SF-36
Ponzer et al (1999)	Case series (level IV)		41	Danis-Weber	27 mo	Not documented	OMA SF-36 VAS
AAORIF							
Ono et al (2004)	Case series (level IV)	105		Lauge-Hansen	46 mo	No complications, posttraumatic arthritis, or pseudoarthrosis	Burnwell and Charnley method Clinical exam
Comparison studies							
Takao et al (2004)	RCT (level I)	41	31	Danis-Weber Lauge-Hansen	AAORIF: 40 mo ORIF: 41 mo	AAORIF: no complication ORIF: 2 superficial wound infections	AOFAS Ankle Hindfoot Score
Thordarson et al (2001)	RCT (level I)	9	10	Lauge-Hansen	21 mo	None for both AAORIF and ORIF	SF-36 Lower Extremity Scores AAOS Foot and Ankle MODEMS Questionnaire
Turhan et al (2013)	Case-control (level III)	21	26	Herscovici	AAORIF: 26 mo ORIF: 38 mo	AAORIF: no complications ORIF: 3 wound complications	Median Olerud scores van Dijk classification system

Abbreviations: AAORIF, arthroscopically assisted ORIF; AAOS, American Academy of Orthopaedic Surgeons; AOFAS, American Orthopaedic Foot & Ankle Society; OMA, Olerud Molander Ankle score; ORIF, open reduction and internal fixation; RCT, randomized controlled trial; SMFA, Short Musculoskeletal Function Assessment; VAS, visual analog scale.

Table 2. Outcome Results for Each Study Reviewed.

Author/Year	Outcome Results
ORIF	
Belcher et al (1997)	• Mean ankle OMA score 72 (control average was 100) ($P < .01$) • UCLA activity score average 6.0 (control average was 9.3) ($P < .01$) • Average amount of steps per day 4838 (control average was 7607) ($P < .01$)
Day et al (2001)	• 52% good or excellent overall outcome, 24% poor overall outcome
Egol et al (2006)	• At 1 y, 88% had either no or mild ankle pain, 90% had either no limitations or limitations in recreational activities • AOFAS Ankle Hindfoot Score: 90% of patients had >90% functional recovery • SMFA score: all scores were significantly higher than baseline scores at 3-6 mo postoperation; subscores were almost back to baseline at 1 y ($P < .001$)
Lash et al (2002)	• OMA scores: ORIF mean 76, cast mean 86 • All fracture types OMA score average of 71.1, Weber A average 90, Weber B average 80, Weber C average 78 • 5% had poor results, 16% had fair results, 41% had good results, 36% had excellent results • VAS scores: ORIF mean 77, cast mean 88 • EQ-5D scores: patients who said they had more problems on this questionnaire had significantly lower OMA scores and poorer functional outcome, and patients who said they had less problems on this questionnaire had significantly higher OMA scores and better functional outcomes ($P < .01$)
Obremskey et al (2002)	• Physical function, emotional function, social function, body pain, mental health, and energy were significantly lower on first SF-36 compared with the second; general health was not significantly different ($P < .05$)
Ponzer et al (1999)	• Mean OMA score 84 (range 10-100) and 64% scored >90 • Physical exam: 64% of patients had 0, 1, or 2 abnormal clinical signs • Radiographic results: minimal dislocation in 3 ankles, OA in 2 ankles, both dislocation and OA in 1 ankle (all of these 6 people had OMA scores <90 and 5 reported nonrecovery) • 36% reported subjective complete recovery, 44% had work-related problems, 61% had some problems with sports activities • SF-36 subscores were lower compared with average Swedish population ($P < .05$) • Mean VAS score was 55 mm during hospitalization and 26 mm at follow-up
AAORIF	
Ono et al (2004)	• 100 patients rated good and 5 patients rated fair based on postoperative radiographs • Clinical results were good in all patients
Comparison studies	
Takao et al (2004)	• Mean AOFAS Ankle Hindfoot Score was 91.0 ± 3.5 (range, 85-100) in the AORIF group and 87.6 ± 5.5 (range, 77-97) in the ORIF group ($P = .0106$) • Including duplication, 73.2% had osteochondral lesions of the talar dome and 80.5% with tibiofibular syndesmosis disruptions; 14.6% had no combined disorders
Thordarson et al (2001)	• No difference between the 2 groups in SF-36 scores or lower extremity scores
Turhan et al (2013)	• AAORIF group: Median OMA score was 95 (range 75-100); 1 patient had OA changes grade 1 according to the van Dijk classification system ($P = .015$) • ORIF group: Median OMA score was 87.5 (range of 70-100), 3 patients had grade 1 OA, 2 patients had grade 2 OA changes according to the van Dijk classification system, and 3 patients had wound problems ($P = .015$)

Abbreviations: AAORIF, arthroscopically assisted ORIF; AAOS, American Academy of Orthopaedic Surgeons; AOFAS, American Orthopaedic Foot & Ankle Society; OMA, Olerud-Molander Ankle; ORIF, open reduction and internal fixation; SMFA, Short Musculoskeletal Function Assessment; VAS, visual analog scale.

(ie, malunion), syndesmosis malreduction, nerve injury, and scar formation.*

Unrecognized intra-articular injuries are another feature of operatively treated ankle fractures that some authors tout as an important contributor to poor outcomes, but establishing a relationship between the presence of such derangements and patient outcome has proven to be elusive thus far.[27,32] These injuries may not be detected on preoperative radiography or intraoperative fluoroscopy. Ankle arthroscopy can help the surgeon in identifying these intra-articular injuries, including cartilaginous lesions or loose bodies.[14,27] Furthermore, many of these lesions can be treated at the time of arthroscopy.[14,32]

In the course of our research, we found only 1 study, a case series by Ono et al, that looked at functional outcomes after AAORIF for ankle fractures to examine whether addressing

*References 16, 19, 22, 30, 33, 36, 37, 42.

these occult lesions leads to improved outcomes. Despite a lower Level of Evidence of this study, it did show good results overall in patients treated with AAORIF; there was no comparison or control group, however, and their outcomes were not evaluated by a well-accepted scoring system. The authors were therefore unable to conclude whether AAORIF can minimize poor outcomes, stating that prospective randomized comparative trials between ORIF and AAORIF for ankle fractures are necessary.[32] Likewise, there are only a few published reports of prospective studies comparing functional outcomes after AAORIF with standard ORIF. These studies have shown more conflicting results.[40,41,43] Thordarson et al showed no difference in outcomes between their AAORIF and ORIF groups.[41] Takao showed minor improvements in the AOFAS scores of the AAORIF group compared to the ORIF group; however, they did not assess syndesmotic stability in the ORIF group preoperatively, intraoperatively, or at the final follow-up, but they did so for the AAORIF group.[40] Therefore, the poor outcomes in the ORIF group could be associated with undiagnosed and untreated syndesmotic injuries.[45,47] A prospective study by Turhan et al found OMA scores to be significantly greater in the AAORIF group compared to the ORIF group, but there was a 12-month difference in average follow-up between the AAORIF and ORIF groups (P = .015).[43] Overall, the literature is lacking good evidence comparing AAORIF with ORIF for ankle fractures, thereby making any claim that AAORIF improves clinical outcomes over traditional ORIF difficult to justify.

Available literature suggests that the identification and treatment of intra-articular lesions at the time of ORIF may lead to improved outcomes as compared to standard ORIF, but there is currently insufficient long-term data and a paucity of prospective trials to allow for this conclusion to be firmly established. In 2009, Glazebrook et al systematically reviewed the literature to provide a comprehensive description of the level of evidence available to support ankle arthroscopy for generally accepted indications and assigned a grade of recommendation for each of them. With regard to ankle fractures, they concluded that given the lack of evidence-based literature, it was not possible to make a recommendation on AAORIF of ankle fractures, thus giving it a grade I recommendation (insufficient or conflicting evidence not allowing a recommendation for or against intervention).[17] Likewise, in 2011, Bonasia et al looked critically at the literature to compare AAORIF to ORIF for several fractures about the ankle. For malleolar fractures, they concluded that although AAORIF has the advantage of identifying intra-articular pathology that may later cause chronic ankle pain, given the lack of evidence-based literature, they could not recommend AAORIF over ORIF for the management of ankle fractures.[5]

Although the use of arthroscopy at the time of ORIF may improve outcomes in certain patients, others may not be ideal candidates for AAORIF. Open injuries and vascular pathology may represent relative contraindications to ankle arthroscopy.[20,39] Although few comparative studies between standard ankle ORIF and AAORIF are available to directly compare the complication rates between these 2 approaches, reported rates of complication from 6% to 17% have been reported for ankle arthroscopy compared to that of 0.16% to 8.6% for standard ankle ORIF.[13,28,39]

Ankle arthroscopy may also be associated with increased setup and operative time, particularly in the initial stages of implementation, because of a steep learning curve of this procedure. This results in an overall increased initial cost and anesthestic time.[16] Additional prospective studies looking at the total operative time and cost between AAORIF and ORIF should be performed to better understand the cost benefit analysis of this procedure. This knowledge will help the surgeon in their decision-making process, especially in an era of cost control medicine.

Conclusion

Ankle arthroscopy is a valuable tool for identifying and treating intra-articular lesions of the ankle, and represents a promising evolving technology in the field of foot and ankle surgery. Available evidence, however, currently neither supports nor refutes the use of this technology in assisting with the management of acute ankle fractures because its ability to change the outcome in these patients compared to standard ORIF management remains unclear. To date, few prospective randomized controlled studies have been performed comparing these 2 operative techniques, rendering the suggestion that AAORIF improves clinical outcome over traditional ORIF difficult to justify. It is also unclear whether arthroscopy should be routinely performed or is indicated for only certain situations, the nature of which would need to be elucidated by future research to be most beneficial to surgeons. Finally, differential complication rates and total operating times resulting from AAORIF and ORIF have also not been well studied. Improved analysis of these variables are needed as part of better long-term, prospective, randomized trials in order to accurately delineate any promise AAORIF may offer in improving patient outcomes compared to traditional ORIF alone—the knowledge of which definitely bears the potential to change our standard of care for ankle fracture management.

Declaration of Conflicting Interests

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