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Early Results Utilizing a Novel Fibular Nail for Surgical Fixation of Ankle Fractures—A Retrospective Case Series

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Abstract

Ankle fractures are extremely common and often require surgical management, historically with open reduction and internal fixation (ORIF), although fibular intramedullary nailing (IMN) has demonstrated promising results in recent years. The purpose of this study is to report on risk factors, quality of reduction, and complications in a series of patients undergoing fibular IMN for management of ankle fractures using a novel device via a retrospective case series. Patients undergoing locked fibular IMN with the Flex-Thread nail (Conventus Flower Orthopedics, Horsham, PA, USA) by a single surgeon from January 2023 to March 2025 were included, with at least 6 months of follow-up. Demographics, comorbidities, injury characteristics, reduction quality, and post-operative complications were recorded. Descriptive analyses were reported for categorical variables. A total of 15 patients were included, with a mean age of 58.9 ± 22.0 (range 18–91) and mean BMI of 31.5 ± 5.7 kg/m^2. All patients experienced a fall as their mechanism of injury, with 12 Weber B and 3 Weber C fractures. The mean time to surgery from the date of injury was 9.5 ± 5.5 days. Of 15 patients, 66.7% had good reduction quality, 26.7% had fair, and 1 patient experienced poor reduction quality requiring subsequent hardware removal. There was one patient who experienced delayed wound healing. Patients undergoing fibular fixation using the novel Flex-Thread nail experience a fair to good quality of reduction, with limited complications. Both young and elderly patients have relatively positive early post-operative outcomes. Additional research with longer-term follow-up will be required to confirm its efficacy.

Keywords: ankle fracture; fibula fracture; fibular fixation; intramedullary nailing

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1. Introduction

Ankle fractures are common lower extremity injuries, with an incidence rate of 4.22 per 10,000 person-years in the United States, and often require surgical management [1,2]. Older populations, particularly those with osteoporosis, have a higher likelihood of ankle fractures due to increased fall risk [3,4]. Current standard surgical treatment for unstable ankle fractures involves open reduction and internal fixation (ORIF) with plates and screws [5]. However, ORIF has been associated with wound healing complications, symptomatic hardware irritation, and delayed weightbearing, particularly in vulnerable populations such as the elderly and those with multiple medical comorbidities [6–8].

In recent years, fibular fixation with intramedullary nailing (IMN) has emerged as a strong alternative option to standard ORIF with plates and screws (PS) [9]. Biomechanical

studies demonstrate a similar quality of reduction as PS, in addition to superior torque to failure via increased energy absorption [10,11]. Patients undergoing IMN report less pain and faster time to union, along with lower rates of symptomatic hardware irritation, compared to those undergoing ORIF with PS [12]. With regard to elderly patients specifically, IMN demonstrates comparable functional outcomes to PS with decreased overall complication rates [13].

While fibular IMN proves promising, there is still a paucity of literature on how the quality of reduction compares to standard fixation, which is a particular concern due to the minimally invasive technique [14,15]. The purpose of this study is to descriptively report on risk factors, quality of reduction, and complications in a series of patients undergoing fibular IMN for management of ankle fractures using a novel device.

2. Materials and Methods

This retrospective case series was determined exempt by the Institutional Review Board. All patients with ankle fractures treated with locked fibular IMN by a single surgeon between 1 January 2023 and 31 March 2025 were included. Patients were identified by Common Procedural Terminology (CPT) codes 27792, 27814, 27822, and 27829. Patients were included if they received a Flex-Thread fibular nail (Convent us Flower Orthopedics, Horsham, PA, USA) [16]. Patients indicated for such a nail included those with unstable distal fibular fractures with Weber B or C fracture patterns. Patients were excluded if they had less than 6 months of follow-up. All patients that did not receive this nail were thus excluded from the study. Demographics, injury characteristics, operative data, and post-operative outcomes were collected.

The mechanism of injury was documented based on encounter notes. Injury characteristics, including open versus closed, malleolar involvement, and Weber classification were documented from notes and assessment of radiographs. Operative information, including surgery time, posterior malleolar screws, medial malleolar screws, medial malleolar plates, syndesmosis screws, and flexible syndesmotic fixation device usage was included.

A single fellowship-trained foot and ankle orthopedic surgeon evaluated fracture patterns and graded the quality of ankle reduction as good, fair, or poor as previously described by McLennan et al. [17]. Radiographic criteria for "good" reduction included fibula out to length, <2 mm posterior displacement, in the groove of the tibia, or <1 mm increase in medial clear space; criteria for "fair" reduction included fibula shortened < 2 mm, 2–4 mm posterior displacement, <2 mm lateral displacement, or 1–3 mm increase in medial clear space; criteria for "poor" reduction included fibula shortened > 2 mm, >4 mm posterior displacement, >2 mm lateral displacement, or >3 mm increase in medial clear space [17]. In addition, post-operative complications, including loss of reduction, wound dehiscence, superficial surgical site infection, deep surgical infection (as defined by Infectious Diseases Society of America) [18], delayed wound healing > 1 year requiring wound care clinical follow-up, and fixation failure including broken screws/implants, during the length of the follow-up period were documented from chart review.

Descriptive data were presented as mean, standard deviation (SD) for continuous measures and count (% of total) for categorical variables. All analyses were performed using RStudio (R version 4.3.2; Posit, Boston, MA, USA).

3. Results

3.1. Demographics

Of 18 patients, 3 did not meet inclusion criteria; therefore, there was a total of 15 patients included in this study. Patient age at the time of surgery, sex, race, ethnicity, body mass index (BMI), smoking status, and medical comorbidities were collected

via manual chart review of the electronic medical record. The mean age of our patient cohort was 58.9 (SD = 22.0) years (range 18 to 91). Mean follow-up was 12.9 (SD = 4.9) months (range 6.0–22.0). Men made up 33.3% (n = 5) of the group. The mean BMI was 31.5 (SD = 5.7) kg/m^2. Comorbidities are listed in Table 1.

Table 1. Patient demographics.

	(N = 15 Patients)	**Range**
Age, years [mean (SD)]	58.9 (22.0)	18–91
Male sex, [n (%)]	5 (33.3)	
Body mass index, kg/m^2 [mean (SD)]	31.5 (5.7)	22.9–40.5
Race, [n (%)]		
Asian	0 (0.0)	
Black/African American	4 (26.7)	
Caucasian/White	11 (73.3)	
American Indian	0 (0.0)	
Other	0 (0.0)	
Comorbidities		
Current smoker [n (%)]	2 (13.3)	
Pack years for current smokers [mean (SD)]	7.5 (17.3)	9–62
Former smokers [n (%)]	5 (33.3)	
Type 2 diabetes mellitus [n (%)]	3 (20.0)	
Hypothyroidism [n (%)]	7 (46.7)	
Oral steroid use [n (%)]	0 (0.0)	
Peripheral vascular disease [n (%)]	1 (6.7)	

3.2. Injury Characteristics

All patients experienced a fall that led to their injury, with 46.7% (n = 7) occurring from a fall from height and 53.3% (n = 8) resulting from a ground-level fall. All patients had closed injuries. There were 33.3% (n = 5) of patients with only lateral malleolar fractures, 26.7% (n = 4) with both medial and lateral malleoli fractures, 26.7% (n = 4) with trimalleolar fractures, and 13.3% (n = 2) with posterior and lateral malleoli fractures. Assessing the level of lateral malleolar fracture based on the Danis–Weber classification revealed 80.0% (n = 12) of patients with Weber B and 20.0% (n = 3) with Weber C type fractures (Table 2).

Table 2. Injury characteristics.

Mechanism of injury [n (%)]	(N = 15 Patients)
Fall from height	7 (46.7)
Ground-level fall	8 (53.3)
Open injury [n (%)]	0 (0.0)
Type of fracture [n (%)]	
Lateral malleolus [n (%)]	5 (33.3)
Bimalleolar (medial and lateral) [n (%)]	4 (26.7)

Table 2. *Cont.*

Bimalleolar (posterior and lateral) [*n* (%)]	2 (13.3)
Trimalleolar [*n* (%)]	4 (26.7)
Danis–Weber classification	
Weber A	0 (0.0)
Weber B	12 (80.0)
Weber C	3 (20.0)

3.3. Management

The mean time to surgery was 9.5 (SD = 5.5) days from the time of injury. Posterior malleolar screws were utilized in one patient (6.7%), who received two such screws; all other patients received no posterior malleolar screws. There was one patient (6.7%) who received one medial malleolar plate and one patient (6.7%) who received two medial malleolar plates. In addition, there was one patient (6.7%) who received one medial malleolar screw and five patients (33.3%) who received two medial malleolar screws. There were seven patients (46.7%) who received neither medial malleolar plate nor screws. In our cohort, 40.0% (*n* = 6) received syndesmosis screws, 33.3% (*n* = 5) received a flexible syndesmotic fixation device, and 26.7% (*n* = 4) received neither (Table 3).

Table 3. Management.

Time to surgery from injury date, days [mean (SD)]	9.5 (5.5)
Posterior malleolar screws	
1	0 (0.0)
2	1 (6.7)
No screws	14 (93.3)
Medial malleolar plate or screws	
1 plate	1 (6.7)
2 plates	1 (6.7)
1 screw	1 (6.7)
2 screws	5 (33.3)
No plates or screws	7 (46.7)
Syndesmosis screws vs. flexible syndesmotic fixation device	
Syndesmosis screws	6 (40.0)
Flexible syndesmotic fixation device	5 (33.3)
Neither	4 (26.7)

3.4. Post-Operative Outcomes

Most patients had fair to good quality of reductions with 66.7% (*n* = 10) good, 26.7% (*n* = 4) fair, and 6.7% (*n* = 1) poor (Table 4). The patient with the reduction rated as poor experienced failure of fixation with post-operative displacement of ankle joint and underwent hardware removal 50 days following index surgery. During hardware removal, the patient's ankle was reduced and pinned with two percutaneous wires through the heel. There was one patient that experienced post-operative delayed wound healing with a non-healing ulcer at the incisional site for over one year. This patient underwent bedside wound debridement. Of note, this patient had a history of peripheral artery

disease and chronic venous insufficiency. No other patients in our cohort experienced post-operative complications.

Table 4. Post-operative outcomes at last follow-up.

Quality of reduction	N (%, [95% CI])
Good	10 (66.7, [38.4–88.2])
Fair	4 (26.7, [7.8–55.1])
Poor	1 (6.7, [0.2–31.9])
Complications	
Delayed wound healing	1 (6.7, [0.2–31.9])
Fixation failure, displaced ankle joint	1 (6.7, [0.2–31.9])

4. Discussion

In this cohort of 15 patients, the most important finding is that a majority of patients experience fair to good quality of reductions after fibular IMN for unstable ankle fracture with limited complication rates using the Flex-Thread nail [16]. To the best of our knowledge, this is the first series reporting on surgical outcomes with this novel device. Young and elderly patients experienced relatively favorable outcomes, demonstrating that this nail may be considered an option for surgical management of ankle fractures, regardless of age. Additional research with longer-term follow-up will be required to confirm its efficacy.

Historically, unstable ankle fractures have been treated with ORIF using lateral fibular plates with cortical and/or locking screws and are often augmented with lag screws across oblique fracture lines [8]. While this has been considered the gold standard approach across many decades, concerns exist regarding potential complications of wound dehiscence, infection, and hardware irritation [6]. Prior to modern fibular nails, percutaneous intramedullary nails and minimally invasive plate osteosynthesis (MIPO) provided more minimally invasive alternatives to plates and screws [19]. Percutaneous screws, either solid or cannulated, can be utilized to obtain internal splintage with small incisions and maintain mortise stability while ideally reducing wound complications [20]. MIPO utilizes submuscular tunneling and limited incisions, preserving soft tissues and periosteal blood supply in animal models [21]. Suture buttons have also been utilized for acute syndesmotic diastasis, with advantageous results in terms of lower postoperative complication risk, less implant irritation and failure, and fewer reoperations [22].

Adoption of fibular nails has accelerated in the past decade. In their randomized trial of 71 patients, Asloum et al. found that IMN with the Episifa FH nail could lead to similar union, lower complication rates, and better function outcomes at 1 year postoperatively in noncomminuted fracture patterns when compared to standard plating [23]. Multiple newer generation nail options have emerged on the market, including more flexible options to conform with the S-shaped fibular canal [24].

Previous literature demonstrates fibular IMN as a favorable alternative compared to standard ORIF for the treatment of ankle fractures. In meta-analyses, IMN and ORIF demonstrate similar functional outcomes and union rates for distal fibular fractures, but fibular nailing is associated with lower complications, especially in older patients [5,25]. In two randomized control trials, White et al. reported similar patient-reported outcomes at 1 year between nails and plates, with significantly lower complication rates. Walsh et al. reported no likely clinically significant difference between fibular nails and ORIF up to 12 months postoperatively, with a slightly lower risk of complications [26]. Rodriguez-Materon et al. similarly described potential lower complication rates and decreased need for future implant removal in patients undergoing IMN [27]. In their randomized control

trial, Badenhorst et al. reported no differences in post-operative range of motion, with patients undergoing IMN experiencing significantly smaller scars and no reported cases of deep infection [28]. While the literature demonstrates fibular IMN is not disadvantageous with regard to clinical and functional outcomes, it proves cost-effective with implants being significantly less expensive compared to locking PS [29]. As prior investigations report on standard locked IMN, to the best of our knowledge this is the first study to report early outcomes following fibular fixation with the Flex-Thread nail. Designed to flex during insertion, this nail theoretically conforms to patient's individualized anatomy for enhanced fixation. Additionally, the screw-like shape of the nail assists in maintaining fracture reduction and fibular length while minimizing soft tissue irritation [16].

The majority of patients in this study experienced fair to good quality of reductions, with only one patient experiencing a poor reduction and requiring subsequent reoperation. These results are similar to those reported by Ricketts et al., although their sample size was much larger and the surgeon utilized a different locked IMN device [9]. Risk factors for poor reduction quality previously described in the literature include complex fracture patterns such as Weber C, pronation injuries, and comminuted trimalleolar fractures [30]. The single patient experiencing a poor reduction quality in our cohort had a trimalleolar fracture, although classified as a Weber B given the level of the fibular fracture component of the injury. Of note, all three patients with Weber C fractures in our cohort experienced fair to good quality reductions. Additionally, patients in our study rarely required posterior malleolar screws, demonstrating reduced hardware burden compared to previous investigation with alternative nails [9]. As screws contribute to increased irritation and wound complications after ankle surgery, limiting additional hardware, while also achieving a quality reduction, may be an advantage of the Flex-Thread nail [31,32]. Further investigation utilizing a larger patient cohort and comparing outcomes to other fibular IMN devices are required to realize the full extent of advantages conferred by the Flex-Thread nail.

This study demonstrates decent early outcomes in young and elderly patients, with patients in this cohort ranging from ages 18 to 91. Kho et al. reported significantly decreased risk of post-operative complications in younger patients undergoing fibular IMN versus ORIF with a locking plate [30]. In elderly patients, Odeh et al. described excellent clinical outcomes with minimal complication rates [33]. Our findings, while descriptive in nature, align with previously reported favorable outcomes of fibular IMN in patients, regardless of age. Only one patient in this cohort experienced delayed wound healing after surgery. Of note, they were also the only patient in our cohort with peripheral arterial disease and chronic venous insufficiency. Risk factors for post-operative complications after ankle surgery include vascular disease, although fibular IMN demonstrates decreased soft-tissue injury and wound complications compared with ORIF [5,34]. Future investigations of the Flex-Thread nail are required to further characterize these trends at short- and mid-term follow-up.

Limitations of this study include its small sample size. Our case series is observational and descriptive, lacking a comparison group, and we did not collect nor report on functional outcomes postoperatively. Other baseline variables, such as bone density and fracture comminution, were not recorded in this study, which further limits the interpretation of our results. Additionally, this is a single surgeon series utilizing a specific device, which confers some selection bias that limits the generalizability of our results and discussion of fibular nails. As this device is novel, biomechanical studies on fixation and stability of the implant are unavailable. As our study is retrospective, it relies on the accuracy of the electronic medical record. Lastly, our time to surgery varied significantly, which may be due to patient-specific comorbidities and other factors impacting their clearance for surgery.

Future investigation via prospective studies looking at functional outcomes measures, such as PROMIS or AOFAS scores, is needed to further determine the efficacy of this device.

5. Conclusions

Patients undergoing fibular fixation using the novel Flex-Thread nail appear to experience fair to good quality of reduction, with limited complications at early time points. Both young and elderly patients demonstrate high rates of maintenance of reduction and decent early post-operative complication profiles. Additional research with longer-term follow-up will be required to confirm its efficacy.

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Informed Consent Statement: This study was determined exempt by our IRB as it is retrospective in nature; thus, informed consent was not applicable.

Data Availability Statement: Data is unavailable publicly due to privacy reasons.

Conflicts of Interest: The authors declare no conflicts of interest.

Abbreviations

The following abbreviations are used in this manuscript:

ORIF	Open reduction and internal fixation
IMN	Intramedullary nailing
PS	Plates and screws
CPT	Common procedural terminology
SD	Standard deviation
BMI	Body mass index
ASA	American Society of Anesthesiologists
MIPO	Minimally invasive plate osteosynthesis

References

1. Court-Brown, C.M.; Caesar, B. Epidemiology of adult fractures: A review. *Injury* **2006**, *37*, 691–697. [CrossRef] [PubMed]
2. Scheer, R.C.; Newman, J.M.; Zhou, J.J.; Oommen, A.J.; Naziri, Q.; Shah, N.V.; Pascal, S.C.; Penny, G.S.; McKean, J.M.; Tsai, J.; et al. Ankle Fracture Epidemiology in the United States: Patient-Related Trends and Mechanisms of Injury. *J. Foot Ankle Surg.* **2020**, *59*, 479–483. [CrossRef]
3. Dabash, S.; Eisenstein, E.D.; Potter, E.; Kusnezov, N.; Thabet, A.M.; Abdelgawad, A.A. Unstable Ankle Fracture Fixation Using Locked Fibular Intramedullary Nail in High-Risk Patients. *J. Foot Ankle Surg.* **2019**, *58*, 357–362. [CrossRef] [PubMed]
4. Bridges, R.; Saulabiu, A. Repair of Distal Fibula Fractures with Minimally Invasive Intramedullary Nailing in the Elderly. *J. Am. Podiatr. Med. Assoc.* **2023**, *113*, 22–121. [CrossRef] [PubMed]
5. Tas, D.B.; Smeeing, D.P.J.; Emmink, B.L.; Govaert, G.A.M.; Hietbrink, F.; Leenen, L.P.H.; Houwert, R.M. Intramedullary Fixation Versus Plate Fixation of Distal Fibular Fractures: A Systematic Review and Meta-Analysis of Randomized Controlled Trials and Observational Studies. *J. Foot Ankle Surg.* **2019**, *58*, 119–126. [CrossRef] [PubMed]
6. Guo, W.; Wu, F.; Chen, W.; Tian, K.; Zhuang, R.; Pan, Y. Can Locked Fibula Nail Replace Plate Fixation for Treatment of Acute Ankle Fracture? A Systematic Review and Meta-Analysis. *J. Foot Ankle Surg.* **2023**, *62*, 178–185. [CrossRef]

7. Schumann, J.; Burgess, B.; Ryan, D.; Garras, D. A Retrospective Analysis of Distal Fibula Fractures Treated With Intramedullary Fibular Nail Fixation. *J. Foot Ankle Surg.* **2023**, *62*, 737–741. [CrossRef]
8. White, T.O.; Bugler, K.E.; Appleton, P.; Will, E.; McQueen, M.M.; Court-Brown, C.M. A prospective randomised controlled trial of the fibular nail versus standard open reduction and internal fixation for fixation of ankle fractures in elderly patients. *Bone Jt. J.* **2016**, *98*, 1248–1252. [CrossRef]
9. Ricketts, C.; Sajid, M.I.; McCaskey, M.; Andrews, R.; Mir, H.R. Ankle Fractures Treated With Locked Fibular Intramedullary Nailing: Description and Outcomes of a Minimally Invasive Open Technique. *J. Orthop. Trauma* **2025**, *39*, 1–7. [CrossRef]
10. Smith, G.; Mackenzie, S.P.; Wallace, R.J.; Carter, T.; White, T.O. Biomechanical Comparison of Intramedullary Fibular Nail Versus Plate and Screw Fixation. *Foot Ankle Int.* **2017**, *38*, 1394–1399. [CrossRef]
11. Switaj, P.J.; Fuchs, D.; Alshouli, M.; Patwardhan, A.G.; Voronov, L.I.; Muriuki, M.; Havey, R.M.; Kadakia, A.R. A biomechanical comparison study of a modern fibular nail and distal fibular locking plate in AO/OTA 44C2 ankle fractures. *J. Orthop. Surg. Res.* **2016**, *11*, 100. [CrossRef] [PubMed]
12. Rushing, C.J. Comparison of Ankle Fracture Fixation Using Intramedullary Fibular Nailing Versus Plate Fixation. *J. Foot Ankle Surg.* **2024**, *63*, 546–556. [CrossRef] [PubMed]
13. Lin, Y.; Gao, J.; Zheng, H.; Guo, Y.; Liu, Z.; Sun, T. Evaluating Fibular Intramedullary Nails vs Traditional Plating in Geriatric Ankle Fractures: A 12-Year Single-Center Retrospective Study. *Foot Ankle Int.* **2024**, *45*, 824–832. [CrossRef]
14. Giordano, V.; Boni, G.; Godoy-Santos, A.L.; Pires, R.E.; Fukuyama, J.M.; Koch, H.A.; Giannoudis, P.V. Nailing the fibula: Alternative or standard treatment for lateral malleolar fracture fixation? A broken paradigm. *Eur. J. Trauma Emerg. Surg.* **2021**, *47*, 1911–1920. [CrossRef] [PubMed]
15. Bugler, K.E.; Watson, C.D.; Hardie, A.R.; Appleton, P.; McQueen, M.M.; Court-Brown, C.M.; White, T.O. The treatment of unstable fractures of the ankle using the Acumed fibular nail: Development of a technique. *J. Bone Jt. Surg. Br.* **2012**, *94*, 1107–1112. [CrossRef]
16. Orthopedics, C.F. Flex-Thread Nail. Available online: https://conventusflower.com/flexthread/ (accessed on 5 May 2025).
17. McLennan, J.G.; Ungersma, J.A. A new approach to the treatment of ankle fractures: The Inyo nail. *Clin. Orthop. Relat. Res.* **1986**, *213*, 125–136. [CrossRef]
18. Stevens, D.L.; Bisno, A.L.; Chambers, H.F.; Dellinger, E.P.; Goldstein, E.J.C.; Gorbach, S.L.; Hirschmann, J.V.; Kaplan, S.L.; Montoya, J.G.; Wade, J.C. Practice Guidelines for the Diagnosis and Management of Skin and Soft Tissue Infections: 2014 Update by the Infectious Diseases Society of America. *Clin. Infect. Dis.* **2014**, *59*, e10–e52. [CrossRef]
19. McClure, T.T.; Taylor, B.C.; Huber, G.; Glazier, M.; Myers, D.M.; DeGenova, D.T. Intramedullary Screw Fixation Versus Traditional Plating for Distal Fibula Fractures. *J. Foot Ankle Surg.* **2023**, *62*, 355–359. [CrossRef]
20. Luong, K.; Huchital, M.J.; Saleh, A.M.; Subik, M. Management of Distal Fibular Fractures With Minimally Invasive Technique: A Systematic Review. *J. Foot Ankle Surg.* **2021**, *60*, 114–120. [CrossRef]
21. Bazarov, I.; Kim, J.; Richey, J.M.; Dickinson, J.D.; Hamilton, G.A. Minimally Invasive Plate Osteosynthesis for Treatment of Ankle Fractures in High-Risk Patients. *J. Foot Ankle Surg.* **2018**, *57*, 494–500. [CrossRef]
22. Ramadanov, N.; Bueschges, S.; Dimitrov, D. Comparison of Outcomes Between Suture Button Technique and Screw Fixation Technique in Patients With Acute Syndesmotic Diastasis: A Meta-analysis of Randomized Controlled Trials. *Foot Ankle Orthop.* **2021**, *6*, 24730114211061405. [CrossRef]
23. Asloum, Y.; Bedin, B.; Roger, T.; Charissoux, J.L.; Arnaud, J.P.; Mabit, C. Internal fixation of the fibula in ankle fractures: A prospective, randomized and comparative study: Plating versus nailing. *Orthop. Traumatol. Surg. Res.* **2014**, *100*, S255–S259. [CrossRef]
24. Bäcker, H.C.; Vosseller, J.T. Fibular Nail Fixation: Topical Review. *Foot Ankle Int.* **2019**, *40*, 1331–1337. [CrossRef] [PubMed]
25. Migliorini, F.; Schäfer, L.; Cocconi, F.; Kämmer, D.; Eschweiler, J.; Maffulli, N. Open reduction and internal fixation compared to intramedullary nail fixation in distal fibula fractures: A meta-analysis. *J. Foot Ankle Surg.* **2025**, *64*, 498–505. [CrossRef] [PubMed]
26. Walsh, J.P.; Hsiao, M.S.; LeCavalier, D.; McDermott, R.; Gupta, S.; Watson, T.S. Clinical outcomes in the surgical management of ankle fractures: A systematic review and meta-analysis of fibular intramedullary nail fixation vs. open reduction and internal fixation in randomized controlled trials. *Foot Ankle Surg.* **2022**, *28*, 836–844. [CrossRef]
27. Rodriguez-Materon, S.; Trynz, S.; Fanfan, D.; Fleites, J.; Gil, J.; Hodgkins, C. Use of Fibula Nails With Proximal and Distal Fixation. *Foot Ankle Orthop.* **2024**, *9*, 24730114241230563. [CrossRef] [PubMed]
28. Badenhorst, D.; Terblanche, I.; Ferreria, N.; Burger, M.C. Intramedullary fixation versus anatomically contoured plating of unstable ankle fractures: A randomized control trial. *Int. Orthop.* **2020**, *44*, 561–568. [CrossRef]
29. Smeets, B.; Hoekstra, H. Fibular Nailing Seems an Effective Strategy to Decrease Treatment Crude Costs for AO-Type 44B Ankle Fractures in Elderly Patients. *J. Foot Ankle Surg.* **2016**, *55*, 684–685. [CrossRef]
30. Kho, D.H.; Cho, B.K.; Choi, S.M. Midterm Outcomes of Unstable Ankle Fractures in Young Patients Treated by Closed Reduction and Fixation With an Intramedullary Fibular Nail vs Open Reduction Internal Fixation Using a Lateral Locking Plate. *Foot Ankle Int.* **2021**, *42*, 1469–1481. [CrossRef]

31. Belmont, P.J., Jr.; Davey, S.; Rensing, N.; Bader, J.O.; Waterman, B.R.; Orr, J.D. Patient-Based and Surgical Risk Factors for 30-Day Postoperative Complications and Mortality After Ankle Fracture Fixation. *J. Orthop. Trauma* **2015**, *29*, e476–e482. [CrossRef]
32. Han, X.; Chu, F.; Jia, D.; Gao, M.; Zhang, R.; Zhang, X.; Wang, H. Wound complication risk factors following open reduction and internal fixation of ankle fractures. *Int. Wound J.* **2024**, *21*, e14581. [CrossRef] [PubMed]
33. Odeh, A.; Archer, J.; Budair, B.; Marsh, A.; Fenton, P. Management of Open Ankle Fractures in Elderly Patients With a Fibula Nail is a Safe and Reliable Technique. *Foot Ankle Spec.* **2024**, *17*, 561–566. [CrossRef] [PubMed]
34. Ashman, B.D.; Kong, C.; Wing, K.J.; Penner, M.J.; Bugler, K.E.; White, T.O.; Younger, A.S. Fluoroscopy-guided reduction and fibular nail fixation to manage unstable ankle fractures in patients with diabetes: A retrospective cohort study. *Bone Jt. J.* **2016**, *98*, 1197–1201. [CrossRef] [PubMed]

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