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Clinical and Radiological Result of Ankle Fractures Matching Surgical Criteria in Elderly Patients

By Dr. Susana Donadeu Sanchez

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Materials and Methods: In a retrospective study, ankle fractures requiring surgery between September 2015 and September 2021 in patients over 70 years old were analyzed. Radiographic parameters, demographics, comorbidities, BMI, and complications were assessed. Fractures were classified based on AO/OTA, Weber, and Lauge-Hansen classifications. Functional outcomes were analyzed using the OMAS (Olerud Molander Ankle Score) scale.

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Results: The study included 71 patients, with an average age of 76.54 years. 60% were female(n=43). The average follow-up was 14 months (range 8-17). The most common fracture pattern was Supination-External Rotation (60 cases, 84.5%). Among them, 90% were classified as Weber B(n=64). 21 patients had a fracture-dislocation.

Closed reduction with a cast boot was initially performed, until achieving satisfactory reduction, followed by definitive orthopedic management or surgical treatment in 25 and 46 patients, respectively. The most frequently used surgical treatment was open reduction and internal fixation (ORIF) with a low-profile plate on the fibula and a cannulated screw on the medial malleolus (93% cases).

The conservative management group had a complication rate of 36%, but no surgical interventions were required. The surgical management group had a complication rate of 23.9%, including wound complications and hardware intolerance, with a reintervention rate of 20%. There was no increased risk of complications or reinterventions based on diabetes, overweight, or age stratification.

The average OMAS score did not significantly differ between the surgical and conservative groups.

Conclusion: The treatment of ankle fractures in geriatric patients remains controversial. Conservative management with a cast boot after proper reduction yields favorable functional outcomes with minimal complications. Surgical management using conventional techniques has a higher rate of soft tissue complications, suggesting the need for less aggressive approaches to achieve better biological synthesis.

Author: *e-mail: susanadonadeu@gmail.com*

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Highlights:

- The patterns of ankle fractures observed in the elderly population are complex, with Weber B and Supination-External Rotation being the predominant patterns.
- Conservative treatment of ankle fractures yields equally satisfactory functional outcomes as surgical treatment in geriatric population.
- Surgical treatment using ORIF in the elderly population has a significant percentage of complications related to wound and soft tissues.

I. Introduction

Hospitals are increasingly facing a larger and ageing population, posing challenges in the treatment of the geriatric population (1,2). It is estimated that by the year 2050, 20% of the population in the United States will be over 65 years old (3). It is calculated that 1 in 3 older adults experiences a fall each year, with 20% of these falls resulting in significant injuries such as fractures (4).

Ankle fractures rank as the third most common fractures in the elderly population, following hip and wrist fractures (5,6). Although they are not considered fragility fractures in themselves, ankle fractures in the elderly often exhibit more complex fracture patterns compared to younger individuals, despite being caused by low or very low energy mechanisms.

Many of these patients have osteoporosis, which increases the risk of fracture, reduces bone quality, and complicates management (7-9). Additionally, they frequently have multiple comorbidities that contribute to perioperative complications, poor baseline physical condition, and limited social and/or familial support, which can impede full recovery to the pre-fracture state.

The treatment objective for ankle fractures should aim to promote early weight-bearing to prevent bed rest, facilitate rehabilitation, and maintain functional independence in performing activities of daily living (ADLs) (10).

Over the past decades, ORIF have been advocated as the preferred approach for ankle fractures,

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aiming to achieve anatomical reduction and perfect joint congruence (11). This approach is believed to improve outcomes and reduce the risk of post-traumatic arthritis. However, in elderly patients with lower functional demands, poorer bone and soft tissue quality, shorter life expectancy, and limited healing and recovery capacity, the rates of delayed healing, wound infection, or implant failure are much higher compared to the younger population (12, 13). Therefore, it is suggested that exact restoration of joint congruence in the elderly may not be as closely related to function and pain (14, 15).

Evidence regarding conservative management of ankle fractures in the elderly is limited. Some studies have shown similar functional outcomes compared to surgical treatment (14,16-20), although complications such as malalignment or loss of reduction may occur (21). Thus, a detailed assessment of each case, considering both the patient and the fracture, is crucial in deciding the most appropriate treatment with fewer complications (14, 22).

The aim of this study is to analyze the radiographic and functional outcomes, as well as the complications, of surgically and conservatively treated ankle fractures with instability criteria in a geriatric population over 70 years old in our institution.

II. Materials and Methods

A retrospective study was conducted between Sep-2015 and Sep-2021. The study included all ankle fractures with an indication for surgical treatment treated in the emergency department of our center, in patients over 70 years old.

Surgical indication criteria included the presence on X-ray of: trans-syndesmotic or supra-syndesmotic fractures with a medial clear space >4mm, tibiofibular clear space <1cm, tibiofibular overlap <6mm, or talar tilt <2^{o}, ankle fracture-dislocations, and fractures with soft tissue injury.

Exclusion criteria were age under 70 years and fractures with an indication for conservative treatment: a total of 293 fractures were analyzed, of which 71 were finally included.

Clinical data of the patients, radiographic studies, and information on the definitive treatment were collected from the hospital's medical records database. Fractures were classified according to the Weber classification, the Lauge-Hansen classification, and the AO/OTA classification for ankle fractures. Clinical assessment was performed using the visual analog scale (VAS), and functional evaluation was done using the Olerud Molander Ankle Score (OMAS).

The statistical program SPSS V26.0 (SPSS Inc., Chicago, IL) was used. Differences between groups with quantitative variables were analyzed using Fisher's exact test (chi-square), and those with qualitative variables were analyzed using Fisher's exact test. Differences were considered significant if the p-value was <0.05.

III. Results

A total of 293 ankle fractures were obtained, of which 71 met the inclusion criteria (flowchart).

The average age was 76.54 years (70-98), with 43 females and 28 males. The majority of patients had more than 2 chronic diseases (n=63), and 30 of them were on multiple medications.

Among the personal history, notable factors include hypertension (n=48), osteoporosis (32), type 2 diabetes mellitus (n=31), previous fractures (n=9), smoking habit (n=7), prior corticosteroid use (n=3), and peripheral vascular disease (n=1). The cohort's average BMI was 26.98 (+/- 3.59) kg/m2. Most patients were classified as overweight (n=42), followed by normal weight (n=17), and a smaller number as obese (n=6).

There were 55 fractures resulting from falls, 12 fractures from ankle twists, 3 fractures from stepping down a stair, and 1 case from a traffic accident. 39 fractures were on the left side. 21 patients had fracture-dislocations, and in 4 cases, there was an additional concomitant fracture along with the ankle fracture.

There were 34 fractures of the lateral malleolus associated with medial malleolus fractures, 19 cases of trimalleolar fractures, and 18 cases of isolated lateral malleolus fractures.

The most common fracture pattern according to the Weber classification was trans-syndesmotic fractures (n=64), followed by supra-syndesmotic fractures (n=7). According to the Lauge-Hansen classification, the predominant pattern was supination-external rotation (n=60), followed by pronation-external rotation (n=7), supination-adduction (n=3), and finally, pronation-abduction (n=1). According to the AO classification, they were distributed as follows: 25 cases of 44B2, 21 cases of 44B3, 15 cases of 44B1, 5 cases of 44C1, 3 cases of 44A1, and 2 cases of 44C3.

Initially, in the emergency department, all fractures were reduced using a closed plaster cast, with satisfactory reduction in 37 cases, suboptimal reduction in 25 cases, and unsatisfactory reduction in 9 cases. A second reduction was necessary in 7 patients, and external fixator (EF) placement was required in 3 cases.

After manipulation and reduction with a plaster cast, improvements were observed in all radiographic measurements (Table 1).

Despite being fractures with surgical indications, conservative management was decided for 25 patients due to their baseline condition, medical complications, or soft tissue complications.

The treatment consisted of a plaster cast for an average of 46 days (+/- 11 days), followed by a WALKER-type immobilizer. Weight-bearing was avoided for the affected limb for an average of 51 days (+/- 10).

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During the follow-up, fracture displacement was observed in 6 cases, with a mean time of 11 days (+/- 3). It did not lead to a change in treatment indication. As for complications of conservative treatment, no clinical complications were recorded, but there were 3 cases of radiographic complications, pseudoarthrosis of the fibula/tibia in 3 cases.

Surgical treatment was decided as the definitive treatment for 46 patients. The most commonly used treatment was ORIF, used in 43 patients. Only in 3 cases, pan-arthrodesis was chosen as the definitive treatment. Among the patients who underwent ORIF, plate fixation for the fibula was performed in 37 cases using low-profile plates, and in 7 cases, canulated screws to the medial malleolus.

Among the patients who underwent surgical treatment, 7 experienced soft tissue distress prior to the intervention. Following the surgery, there were 8 wound complications (4 dehiscences, 2 dehiscences with infection, and 2 infections), as well as 3 discomforts related to the osteosynthesis material. Reintervention was necessary for 9 patients: 6 due to wound complications and 3 due to discomfort with the osteosynthesis material. Material extraction (ME) was performed in 7 cases, and ME with debridement in 2 cases. Additionally, there were 2 cases of a third intervention due to wound complications. There was no increased risk of complication or post-surgical reintervention associated with DM (p 0.061 and p 0.085), overweight (0.34 and 0.55), or age stratified as <75 or >75 years (p 0.44 and 0.51). From a functional perspective, there were no significant differences observed when comparing conservative and surgical treatment in this population. The total score using the OMAS scale was 66.8 points +/- 17.1 points. Among the operated patients, the score was 65.9 points +/- 15.7 points, and for the conservatively treated patients, it was 67.9 points +/- 10.3 points (p 0.719). The 50th percentile on the EVA scale for conservative treatment was 3.0 points, and for surgical treatment, it was 3.3 points, with no differences found (Table 2).

IV. Discussion

Ankle fractures in the elderly population present a challenge today due to their increasing incidence, complex pattern, and the lack of clear treatment guidelines indicating the best approach. Therefore, it remains a controversial topic.

The most common fracture pattern is type B according to the Weber classification. Shivarathre et al. recorded an 83.7% incidence of this pattern, similar to the 90% obtained in our series (23).

Evidence for conservative management of ankle fractures in the elderly is limited. However, several studies show similar functional outcomes with conservative management compared to surgical treatment, with lower complication rates, suggesting it as a suitable option for some patients (14,17-20). However, conservative treatment with immobilization using a cast can lead to complications, especially related to loss of reduction and malalignment (21).

Conservative treatment seems to have lower complication rates or clinically irrelevant complications (20). In our study, 3 patients (12%) experienced complications during follow-up. These were three cases of tibia/fibula nonunion as a radiographic finding without clinical impact. None of the surgically treated patients had consolidation problems. In the study published by David J. Keene, nonunion occurred in 15% of patients treated with a cast compared to 3% of surgically treated patients (20). According to the comparative study published by David W. Sanders et al., 10% of patients in the conservative group had nonunion at 12 weeks compared to 0% in the surgical group (16). These bibliographic data are consistent and similar to those obtained in our study, where we achieved an 88% consolidation rate in the conservative group compared to 100% in the surgical group.

Conventional surgical treatment using plate fixation of the fibula appears to have high complication rates, particularly related to soft tissue evolution and the surgical wound (24). Zaghloul A. et al. describe a wound complication rate of 21.5% in their series of 186 cases, with a reintervention rate of 10.8% for wound debridement, material extraction, and fixation revision (25). Shivarathre et al. reported wound complication rates of 11.6%, with 7% superficial infection and 4.6% deep infection (23). Pagliaro et al. reported a 26% complication rate with a 13% reintervention rate (26). Natasha M.'s study also registered reintervention rates of up to 9% (5), although this lower incidence may be due to the analysis of a slightly younger population (>55 years). In our study, 11 out of 46 (24%) surgically treated patients experienced complications (8 related to the wound and 3 due to discomfort with the osteosynthesis material), requiring 9 (19%) reinterventions. These results are similar to the previously mentioned studies, although the revision rate is slightly higher.

The results from Lyndel et al. are more optimistic, with a 2.90% failure rate of the osteosynthesis material and a 9.9% wound complication rate. They also describe an association between the risk of wound complication and the presence of comorbidities (p = 0.05) (27).

Recently, the use of less invasive techniques in the surgical treatment of ankle fractures (28, 29) has gained relevance. These techniques have shown 0% wound complication rates, and no statistically significant differences have been found in the OMAS scale compared to conventional surgical treatment with a plate (30). The use of smaller incisions, which are more gentle to the soft tissues and do not damage the vascularization of the fragments, has yielded good

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results in complex fractures (31, 32). In the present study, minimally invasive osteosynthesis techniques were not performed, although they are starting to be implemented following this review and other similar works.

The association between surgical wound complications and patient history, such as diabetes, dementia, peripheral vascular disease, or tobacco use, has been documented (23, 25, 33). Particularly, an increased risk of up to 4 times in diabetic patients (34). However, in our study, we have not been able to demonstrate such a statistically significant relationship. This may be due to a small sample size. Stratified age, as previously reported in studies (14), also does not appear to be a prognostic factor.

David W. Sanders et al. (16) also studied the functional differences between conservative and surgical treatment of ankle fractures, obtaining a mean OMAS (35) score of 61.4±23.4 points in the surgical treatment group compared to 56.8±23.8 points in the conservative group, without statistically significant differences (p 0.936) regardless of the follow-up period. Functionally, we did not find statistically significant differences between both treatments, with a mean OMAS scale score of 66.8 points +/- 17.1 points. Among the operated patients, we recorded a score of 65.9+/-15.7 points, and among the conservatively treated patients, it was 67.9+/-10.3 points (p 0.719). These results are consistent with those published by other authors.

On the contrary, the study presented by Salai et al. concludes better outcomes with conservative treatment, with an OFAS scale score of 91.37 ± 8.96 compared to only 75.22 ± 14.38 points after surgery (p 0.001) (14).

This study has several limitations. Firstly, its retrospective nature, with inherent limitations of studies of this kind. Secondly, the sample size may be insufficient to achieve adequate statistical power. Finally, it is possible that small differences in function may not be reflected in the scale used. The OMAS scale assesses the ability to walk or the presence of pain but does not capture subtle differences such as "being able to walk as before the fracture." Additionally, it includes items that are less relevant to the geriatric population, such as jumping or running.

V. Conclusion

There is ongoing controversy regarding the management of ankle fractures in the elderly population. Conservative treatment of ankle fractures appears to be a viable option in these patients, as it demonstrates comparable functional outcomes to surgical intervention. Moreover, surgical treatment carries a notable risk of wound complications. In patients aged 70 years and above, it would be advisable to consider conservative treatment using a cast. There is a need for larger-scale studies, preferably prospective in design, to further assess the efficacy of minimally invasive surgical approaches.

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