



Treatment Outcomes of Ankle Fractures in Older Adults

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Original Article

Abstract

Background: Ankle fractures hold significant importance in terms of restoring mobility and independence, especially for elderly people.

Objective: To assess the outcomes of surgical intervention, specifically open reduction with internal fixation, in the management of unstable fractures of ankle among 65 years individuals and above, with a follow-up period of one year.

Patients and methods: A prospective, observational study was conducted on a cohort of patients aged 65 years and older who underwent surgical intervention for displaced ankle fractures between January 2022 and December 2023 at our institution. The patients were examined one year post-surgery.

Results: Among the cohort of 31 individuals, there were 6 male and 25 female participants, with an average age of 73.4 ± 3.5 years. Within this group, 12 individuals had cognitive impairment, 18 were undergoing anticoagulant therapy, and 14 were consuming more than four medications on a daily basis. The majority of cases in this study were characterized by groups with Charlson index scores of 3 and 4. Additionally, a significant proportion of these cases were classified as ASA III in terms of anesthetic risk and Dannis-Weber type C fractures. It is worth noting that out of the total number of fractures, 29 were managed using closed reduction techniques. The incidence of complications was infrequent, with 27 out of 31 patients achieving excellent or high ratings on the AOFAS scale. The visual pain scale indicated an average score of 3 ± 2 , suggesting relatively low levels of discomfort. Furthermore, a significant majority (86%) of patients were able to engage in their daily activities without difficulty.

Conclusion: The outcomes of surgical intervention for ankle fractures in individuals aged 65 years and older demonstrated favorable results, accompanied by a relatively low occurrence of sequel that could perhaps be attributed to pre-existing comorbidities.

Keywords: Unstable ankle fracture, open reduction with internal fixation, elderly patients, complications.

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1. INTRODUCTION

In accordance with the increase in life expectancy of the world population, the study and evaluation of fractures in geriatric patients has significantly increased. The central focus of these studies is the fractures of the upper end of the femur in the first place, the fractures of the wrist and thoracic spine in the second place. These fractures have always been considered as related to the morbid condition of osteoporosis (1). Ankle fractures hold significant importance in terms of restoring mobility and independence, especially for elderly people (1,2). Ankle fractures are prevalent bone injuries affecting the lower extremity and significantly contribute to mobility impairments (3). According to estimates, the annual occurrence rate of ankle fractures is 184 per 100,000 individuals. Among these cases, about 20 to 30% are observed in the older population. Recent studies have revealed a notable rise in both the quantity and severity of ankle fractures among individuals aged 65 years and older. It can be inferred that the occurrence of these fractures exhibits a secondary peak in the age group ranging from 65 to 84 years, with an even greater incidence observed among women. The rise in the prevalence may be attributed to an extended lifespan, although it is unquestionably linked to the heightened level of physical engagement among individuals aged 65 and above. In the past three decades, there has been a shift towards surgical intervention as the primary approach for managing unstable ankle fractures. This change is supported by numerous studies that have shown the advantages associated with surgical treatment in this context (4,5). The efficacy of surgical intervention lies in its ability to restore anatomical structures, hence facilitating optimal physiological functioning of the joint; to achieve this it is important to take care of the surrounding soft tissues as well as the repair of the capsule and ligaments (1,3,6). The management of soft tissues is of particular interest in orthogeriatric patients due to the pre-existence of medication, including anticoagulants and possibly steroids, which can affect the occurrence of healing disorders (1,7). The recommendations for surgical techniques in ankle fractures in older adults include the use of bolted plates with screws, due to osteoporosis, or reconstructions from the initial use of external fixation as damage control when there are soft tissue injuries (1). Orthogeriatric patients are at high risk of developing postoperative complications due to the multiple comorbidities they may present such as diabetes, osteoporosis and other conditions that may affect the soft tissues, the consolidation of fractures

or even the cardiovascular system. In addition to the above, these elderly patients may show insecurity in the postoperative period and even not be able to follow the necessary medical recommendations and protocols on the weight load on the affected limb, depending on the traumatic injury suffered (1). Another aspect of the treatment of fractures in orthogeriatric patients is the social one, not all patients return after their surgical intervention to an environment with possibilities of being cared for by a relative during their convalescence, while their chances of standing on their own to perform the activities of daily living are diminished and their independence is greatly affected. This observation leads us to propose that, despite the rising prevalence, ankle fractures in the elderly have not been subjected to the same level of comprehensive evaluation in the medical literature as hip or wrist fractures, resulting in ongoing controversy about their optimal management (3). A number of writers presently advocate for the use of conservative treatment strategies for ankle fractures in senior individuals. This recommendation is based on the unsatisfactory outcomes observed in surgical interventions, which can be attributed to compromised bone quality resulting from conditions such as osteoporosis, diabetes mellitus , peripheral vascular disease, and complications associated with skin and scarring. The user has provided a set of numbers: (1, 3, 8). The conservative management of a joint fracture that is anatomically unreduced may result in bone consolidation deficiencies, necessitating extended immobilization, post-traumatic osteoarthritis, malformation, reduced joint flexibility, functional impairment and lastly chronic pain. In geriatric individuals, the state of being immobilized and experiencing delayed weight loss can potentially result in a lasting alteration of their physical, outpatient, and systemic well-being. Hence, it is imperative to allocate significant focus towards investigating ankle fractures in the senior population, given the high incidence rate, the diverse and severe nature of these injuries, and the consequential influence of therapy on the overall health, functional capacity, and autonomy of affected individuals. The user has provided a coordinate pair, specifically (1,8).

2. PATIENTS and METHODS

A prospective, observational study was conducted on a cohort of patients aged 65 years and older who underwent surgical intervention for displaced ankle fractures between January 2022 and December 2023 at our institution. The patients were examined one year post-surgery. The study included patients who underwent open reduction as well as internal fixation for a displaced and unstable ankle fracture. These patients were selected according to their willingness to participate in the study, age (under 65 years at the time of surgery), ambulatory status, absence of tibial pylon fractures, absence of concomitant fractures in the lower extremity, absence of injuries or previous surgeries that could impact ankle functionality, and absence of pathological fractures unrelated to osteoporosis. The collected data included age, sex, body mass index; the existence of cognitive impairment, use of anticoagulant therapy and presence of multiple medications intake. Charlson comorbidities index which is an effective prognostic instrument for the 10-year survival rate among individuals who have several comorbidities was calculated as a compilation of 17 distinct diagnoses. The ASA anesthetic risk was determined. Finally, the fractures were classified according to the Dannis-Weber method. Post-surgical complications were divided into two sub-categories: those that were related to the surgery (namely surgical complications) and those that were not related to it (namely, non-surgical). Finally, the evaluation of the results obtained was carried out using the American Orthopedic Foot and Ankle Society (AOFAS) criteria, the visual pain scale, and the possibility of performing daily living activities. Surgical procedure was determined by the attending specialist on the day of the patient's admission. Following the surgical procedure, all patients had immobilization with the application of either a posterior splint or a cast boot. During this period, any form of support or movement of the affected limb was strictly prohibited for a duration of 6-8 weeks. Following the designated immobilization period, patients were assigned individual rehabilitation exercises to be conducted at home. In cases where patients encountered challenges with the individual rehabilitation regimen, they underwent evaluation and treatment by the rehabilitation service offered at the affiliated hospital centers. Descriptive statistics, data tabulation and presentations were performed using the statistical package for social sciences and Microsoft Office, Excel Program 2019.

3. RESULTS

A total of 31 patients were recruited sequentially with a mean age of 73.4 ± 3.5 years and mean body mass index of 26 ± 3.7 kg/m², (**Table 1**). Females were dominant, 25/31, contributed for 80.7% of the studied group. Cognitive impairment was present in 12 patients (38.7%). Use of previous anticoagulant therapy and history of consumption of four or more medications on regular bases were reported in 18 (58.1%) and 14 (45.2%) patients, respectively. These factors may influence the assessment of the results of the surgical treatment by hindering compliance with medical indications and the protocol of post-surgical support of the affected limb. Among the studied group, 54.3% had a Charlson comorbidity index (CCI) of 3-4 points, giving that they had a life expectancy close to 10 years at the time of their fracture, which signified the result of the surgical treatment that was performed. The distribution of the studied group according to the ASA classification revealed that 32.3% of cases at class I and II, 64.5% at ASA III-IV and only one case at ASA V. Regarding the type of fractures; most patients 29/31 (93.5%) presented with closed ankle fractures while only two patients presented with open fractures; from other point of view, fractures in 19 patients (61.3%) were classified as transsyndesmotoc lesion, type B of the Dannis-Weber classification, nine showed suprasyndesmotoc fractures corresponding to type C of classification. All the aforementioned findings are shown in (**Table 2**). Unfortunately, some patients had developed post-surgical complications; the surgery related complications reported in 9 (29%) patients, these included 3 (9.7%) wound infection, 2 (6.5%) cutaneous necrosis, who were treated satisfactorily by local wound cures and oral antimicrobials, without the need to remove the osteosynthesis material. The patients who suffered cutaneous lesion with necrosis coincided in the group of the 18 patients who had history of using anticoagulation therapy, which could be related to this complication. During the postoperative year, a total of three patients (9%) experienced loosening of the osteosynthesis material. However, this loosening did not have any adverse effects on bone consolidation. In order to address this issue, it was deemed essential to extract a portion of the osteosynthesis material. One patient at one year post-surgery, did not exhibit definitive radiological evidence of peroneal malleolus consolidation, but since this was a Danis-Weber type C (suprasyndesmotoc) fracture treated with a syndesmotoc screw, this delay did not influence the functional recovery of the joint and the patient (**Table 3**).

The non-surgical complications were developed in 8 patients (25.8%), these complications were urinary tract infection in 4 (12.9%) patients, three men and one woman, who had a preoperative bladder catheter placed at the direction of the anesthesiologist. All four patients were treated according to the usual protocols for this type of infection and their condition resolved. One patient developed pneumonia in the course of the year, which required a special care by physician, where he was discharged. Two patients had postoperative hypertensive crises, for which they were medicated by the internist; one presented a mediate type deep vein thrombosis in the postoperative period that was assessed and treated by the angiologist without major consequences, (**Table 3**). According to the AOFAS criteria, 11 patients (35.5%) were classified as excellent results, 16 (51.6%) as good results, which adds up to a high 87.2% of results considered excellent and good (27 patients out of 31). Three patients showed a regular result and only one was considered with a bad result according to these AOFAS criteria. Regarding pain, the evaluation of patients after one year after surgery for ankle fractures revealed a mean Visual Pain Scale of 3 ± 2 , which was considered as a very good result because they are older adult patients. Additionally, 87.1% of patients were able to carry out their activities of daily living, which reflects an excellent functional incorporation, (**Table 4**).

Table 1. Descriptive statistics of age and body mass index (BMI) of the studied group (N=31)

Variable	Mean	SD	95% CI
Age (year)	73.4	3.50	72.2 - 74.6
Body mass Index (kg/m ²)	26.0	3.71	24.7 - 27.3

95%CI: 95% confidence interval of mean

Table 2. Baseline characteristics of the studied group (N=31)

Variable		No.	%
Sex	Male	6	19.4
	Female	25	80.6
cognitive impairment (dementia)	Yes	12	38.7
	No	19	61.3
Anticoagulation therapy	Yes	18	58.1
	No	13	41.9
Medications before hip fracture	< 4	17	54.8
	≥ 4	14	45.2
Charlson comorbidity index (points)	3	9	29.0
	4	8	25.8
	5	4	12.9
	6	5	16.1
	7	4	12.9
	8	3	9.7
ASA Classification	I - II	10	32.3
	III - IV	20	64.5
	V	1	3.2
Type of fracture	Open	2	6.5
	Closed	29	93.5
Danis-Weber Classification	A	3	9.7
	B	19	61.3
	C	9	29.0

ASA: American Society of Anesthesiologists Classification

Table 3. Post-surgical complications

Complications		No.	%
Surgical	Wound infection	3	9.7
	Cutaneous necrosis	2	6.5
	Loosening of the osteosynthesis material	3	9.7
	Consolidation delay	1	3.2
	Total	9	29.0
Non-surgical	Urinary tract infection	4	12.9
	Pneumonia	1	3.2
	Hypertensive crises	2	6.5
	DVT	1	3.2
	Total	8	25.8

DVT: deep vein thrombosis

Table 4. Outcomes of treatment and obtained results

AOFAS criteria	No.	%
Excellent	11	35.5
Good	16	51.6
Regular	3	9.7
Bad	1	3.2
Mean Visual Pain Scale $\pm$ SD	3 ± 2	-
Able to carry out their daily activities	27	87.1

SD: standard deviation

4. DISCUSSION

What we found in this work is in relation to what Schray found in his work in relation to age and sex, which was 77.7 years as an average age with a ratio of 84% of women and 16% of men. In relation to the body mass index, what was found was very similar to what was reported by Schray. In Schray's work what was found regarding the use of previous medication was 57% of patients using anticoagulant therapy and 43% who required more than five medications

a day (1). Other studies present very similar results regarding the use of various medications in patients of this age group, as well as regarding the use of anticoagulant therapy (9-11). In Shen's meta-analysis there was a clear predominance of ASA II anesthetic risk (12). In Schray's work, the ASA II and III anesthetic risks predominated, with 88% of his patients located in those stages (1). Works of other reviewed authors, similarly report a greater predominance of Dannis-Weber type B transindesmal fractures in older adults.(13-15) It is necessary to mention the possibility of interobserver variations when classifying ankle malleolar fractures, as some authors have mentioned (16). For his part, Schray declared six patients with cutaneous necrosis who required debridement in the operating room and two other patients who required reintervention due to dislocation of the nails (1). For both authors, the general complications found in their respective series did not influence the functional results they achieved. Other authors, although in smaller series, found similar figures of complications (17-19). Bermejo, in his series of 41 patients, reported 11 patients classified with excellent results, 19 with good and nine regular results; only one bad according to AOFAS criteria (20). Other authors (12-14) place the figures of their results in values similar to those obtained in this work, all with a predominance of good results, superior to the results considered excellent (13,14). The study conducted by Anand and Klenerman demonstrated that the utilization of open reduction and internal fixation in older patients yields superior anatomical congruence and outcomes compared to non-surgical approaches (21). The geriatric patient has a higher tolerance for a less precise reduction, while optimal outcomes have been achieved through anatomical reduction (21). According to Pagliaro et al., the outcomes of surgical interventions for ankle fractures in senior individuals are similar to those observed in the general population. (22). The occurrence of osteoporosis frequently hinders the attainment of a secure fixation; yet, certain fractures exhibit a significant degree of instability, rendering conservative treatment ill-advised (23). Patients who are 65 years of age or older frequently present with a multitude of medical conditions, hence potentially elevating the probability of experiencing perioperative difficulties (24). Consequently, in the event that the surgical risk is elevated within this particular demographic, it becomes imperative to comprehend the potential advantages in order to facilitate informed decision-making for both the patient and the surgeon. The user's text is too short to rewrite in an academic manner (25). The results at one year of the

surgical intervention, in patients over 65 years of age diagnosed with ankle fracture, using as evaluators the criteria of the AOFAS, the visual pain scale and the incorporation to the activities of daily living, can be classified as good. The occurrence of complications was meager, some of them related to the surgical procedure (cutaneous necrosis and loosening of the osteosynthesis material) related to the morbid conditions associated with the age of the sample: previous anticoagulant therapy and osteoporosis. Unrelated complications with surgical intervention, although they can occur in patients of any age, they are more frequent in older adult patients.

5. CONCLUSIONS

The outcomes of surgical intervention for ankle fractures in individuals aged 65 years and older demonstrated favorable results, accompanied by a relatively low occurrence of sequel that could perhaps be attributed to pre-existing comorbidities.

Ethical Clearance:

Ethical issues were taken from the research ethics committee. Informed consent was obtained from each participant. Data collection was in accordance with the World Medical Association (WMA) declaration of Helsinki for the Ethical Principles for Medical Research Involving Human Subjects, 2013 and all information and privacy of participants were kept confidentially.

Conflict of interest: Authors declared none

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