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Ankle fractures in the elderly: Treatment and results in 477 patients

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ABSTRACT

Introduction: In the elderly, ankle fractures are likely to cause specific complications and have a major impact on their autonomy. The goal of this multicentre study was to assess these outcomes in a geriatric population treated operatively.
Material and methods: This retrospective study included 477 patients with ankle fractures treated surgically between 2008 and 2014. The minimum age was 60 years for women and 70 for men. Patients with a tibial pilon fracture or less than 3 months' follow-up were excluded. Functional (autonomy and comorbidities) and radiological assessments were performed before surgery and at the review.
Results: The cohort was 81% female (384 women, 93 men) and had median age of 74 years. The preoperative autonomy was 7.8 points on average using the Parker score. Most of the fractures were either Weber type B ($n = 336$) or type C ($n = 114$). At the follow-up, the mean autonomy score was 7.3 points. The fibula was fixed with a plate and screws in 69% of cases ($n = 325$), with additional internal malleolar fixation was carried out in some cases. A satisfactory result, defined as 2 points or less reduction in the Parker score, was found in 89.9% of patients; 71.8% had not lost any autonomy. The main risk factors for loss of autonomy were being more than 80 years of age (OR = 2.93, $P < 0.001$), poor surgical reduction (OR = 2.8, $P < 0.01$), the presence of two or more comorbidities (OR = 2.71, $P < 0.001$), being female (OR = 2.19, $P < 0.043$) or having a Weber type C fracture (OR = 2.05, $P = 0.023$).
Discussion: The functional results are satisfactory overall following standard surgical treatment consisting of internal malleolar and fibular fixation for ankle fractures in the elderly. We identified five factors that greatly impact functional recovery.
Level of evidence: IV.

1. Introduction

The incidence of fractures in the elderly has been increasing over the last 40 years, resulting in a greater financial burden in developed countries [1,2]. Proximal femur fractures, vertebral compression fractures and distal radius fractures are the most common, with osteoporosis being a major risk factor [3]. The ankle is the third most common site for fractures in the elderly, although paradoxically the incidence does not increase with age [4,5]. The occurrence of ankle fractures is predictive of other osteoporotic fractures [6], but a clear link between osteoporosis and ankle fractures has not been found [7]. Being overweight appears to be a major risk factor, which suggests that torsional forces play a significant role [7].

Generally, the goal of treating these fractures is complete restoration of the anatomy of the tibiotalar mortise [8]. If the fracture is not displaced, non-operative treatment consisting of 6 weeks of cast immobilization is generally indicated. For displaced fractures, surgical treatment is typically recommended, with better outcomes being achieved despite a higher complication rate [9–11].

In the elderly, the anatomical reduction objective may be less important when the local conditions expose the patient to a higher risk of complications. The main issue is ensuring that the patient can gain regain their prior level of autonomy. The primary aim of this study was to evaluate functional recovery following operative treatment of ankle fractures in geriatric patients. The secondary aim was to define risk factors that prevent a patient for regaining their prior level of autonomy.

2. Material and methods

2.1. Study population

This was a retrospective study conducted by six university hospitals in Western France that included elderly patients operated

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between January 1, 2008 and September 30, 2014 due to an ankle fracture. The main inclusion criteria were age of at least 60 years or women and at least 70 years for women, along with at least 3 months' follow-up. Patients with tibial pilon fractures, defined as diaphyseal–epiphyseal discontinuity, were excluded. The patient records were selected using each hospital's computer systems.

2.2. Data collection

Data were collected in a computer file by assigning a random code to anonymize each included record. Epidemiological and morphological parameters such as gender, age, weight and height were recorded. Any comorbidity that could affect the post-operative course (e.g., peripheral arterial disease, diabetes, kidney failure, smoking, alcoholism, peripheral neuropathy or immuno-suppression) was recorded. A patient's preoperative autonomy was evaluated using the Parker score [12]; the extent of any open fractures was graded with the Gustilo–Anderson score [13]. The presence of any pre-existing local cutaneous problems and any initial dislocation were documented. Anteroposterior and lateral X-rays were used to classify the fractured ankles using Weber's classification. The condition of the medial collateral ligament (MCL), presence of a tear or fracture of the medial malleolar was noted.

The fixation methods used were recorded – lateral malleolar: locking plate or conventional plate, K-wires, screws, percutaneous fixation, retrograde fibular nail; medial malleolar: screws, K-wires, tension-band wiring, MCL suturing. The degree of reduction and its persistence were evaluated on follow-up X-rays using the Skinner test [14]; these X-rays were also used to assess bone union. The postoperative Parker score was determined during the final follow-up visit.

2.3. Primary endpoint

Loss of autonomy was defined as the difference between the pre-operative and postoperative Parker scores. The outcome was satisfactory if the score had decreased by 2 points or less. The outcome was excellent if the postoperative score was the same as the preoperative score.

2.4. Statistical analysis

The statistical analysis was carried out using the R 2.15 software package (R Foundation for Statistical Computing). The variables collected were described using the typical values (mean, median, standard deviation, quartiles). Qualitative variables were analysed with Fisher's exact test. Multivariate analyses were performed using a logistic regression model.

3. Results

3.1. Patient population

This study included 477 patients consisting of 384 women (81%) and 93 men (19%) with a mean follow-up of 222 days; there was a significant difference between centres ($P = 0.025$) (Table 1). The median age at the time of surgery was 74 years. The preoperative autonomy was 7.8 points on average. There was very strong correlation between preoperative autonomy and age ($P < 10^{-14}$). The mean autonomy score was 1.9 points lower in patients above 80 years of age than in younger patients. The most common comorbidity was diabetes ($n = 137$; 29%), followed by alcoholism ($n = 69$; 14%) and smoking ($n = 79$; 17%). One hundred seventy-nine patients (38%) had more than two comorbidities. Twenty-five patients (5%)

Table 1
Patient characteristics.

Epidemiological and morphological data	Value (%) or average	Dispersion (interquartile range)
Number of patients	477	
Men	93 (19)	
Women	384 (81)	
Age at surgery (years)	74	
Men	76	73–80
Women	73	66–80
Body mass index (kg/m^2)	27.3	24.2–29.7
Preoperative autonomy (points)	7.8	
60–69 years	8.7	
70–79 years	8.1	
80–89 years	6.7	
> 90 years	4.9	
Fracture classification		
Weber A	25 (5)	
Weber B	336 (71)	
Weber C	114 (24)	
Skin damage (Gustilo–Anderson)		
Closed	419 (88)	
I	27 (6)	
II	27 (6)	
III	4 (1)	
Comorbidities		
PAD	67 (14)	
Cancer	52 (11)	
Chemotherapy	36 (8)	
Corticosteroids	36 (8)	
Diabetes	137 (29)	
Kidney failure	37 (8)	
Smoking	79 (17)	
Alcoholism	69 (14)	
Neuropathy	41 (9)	
Immunosuppressant use	13 (3)	
Others	76 (19)	
Multiple comorbidities		
0	195 (41)	
1	103 (22)	
2	82 (17)	
3	45 (9)	
4	33 (7)	
5 or more	19 (4)	
Follow-up (days)	222	132–366

PAD: peripheral artery disease.

had Weber type A fractures, 336 patients (71%) had type B fractures, and 114 patients (24%) had type C fractures. There were 58 open fractures: 27 were grade 1, 27 were grade 2 and 4 were grade 3 in the Gustilo–Anderson classification.

3.2. Surgical treatment

The lateral malleolus fracture was fixed in 90.4% of cases ($n = 431$), with a lateral plate being used in 69% of cases ($n = 325$) (Table 2). The medial malleolar was also fixed in 58.5% of cases ($n = 279$). Suture repair of a torn MCL was carried out in 3.8% of cases ($n = 18$). Postoperative reduction was deemed satisfactory in 82.4% of cases ($n = 423$). All patients underwent 6 weeks of immobilization and then rehabilitation with a physical therapist.

3.3. Autonomy and risk factors

The autonomy score at the follow-up was 7.28 on average for the entire population. A satisfactory outcome was achieved in 89.9% of patients [95% CI: 0.87, 0.93] and 71.8% of patients had an excellent outcome [95% CI: 0.67, 0.76]. A univariate analysis identified several significant predictors of loss of autonomy (Table 3): age above 80 years, female gender, poor postoperative reduction, Weber type