The Journal of Foot & Ankle Surgery 54 (2015) 203–206

Contents lists available at ScienceDirect

The Journal of Foot & Ankle Surgery

journal homepage: www.jfas.org

Are Low-Energy Open Ankle Fractures in the Elderly the New Geriatric Hip Fracture?

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ARTICLE INFO

Level of Clinical Evidence: 4

Keywords:
geriatric
insufficiency fracture
morbidity and mortality
open fracture

ABSTRACT

As the geriatric population in the United States continues to increase, ankle fractures in the elderly are predicted to exponentially increase in the future. As such, these injuries will become a common injury seen by physicians in various fields. Currently, no studies discussing low-energy open ankle fractures in the elderly and/or the mortality rate associated with these devastating injuries have been published. The purpose of the present study was to retrospectively review the morality rate associated with low-energy open ankle fractures in the elderly. We retrospectively identified 11 patients >60 years old who had sustained low-energy open ankle fractures and been treated at our institution. The patient demographics, mechanism of injury, wound size, medical comorbidities, treatment, follow-up data, and outcomes were recorded. Low-energy falls were defined as ground level falls from sitting or standing. The mean age of the patients was 70.72 years, with a mean body mass index of 35.93 $\pm$ 10.24. Of the 11 patients, 9 (81.81%) had $\geq$3 comorbidities (i.e., hypertension, diabetes, coronary artery disease, congestive heart failure, and/or chronic obstructive pulmonary disease). The mean size of the medially based ankle wound was 14.18 $\pm$ 4.12 cm; 10 (90.90%) were Gustilo and Anderson grade IIIA open ankle fractures. In our study, low-energy open ankle fractures in the elderly, very similar to hip fractures, were associated with a high mortality incidence (27.27%) at a mean of 2.67 $\pm$ 2.02 months, and 81.81% of our patients had $\geq$3 medical comorbidities.

Ankle fractures are a common injury within the elderly population. Low-energy ankle fractures in the elderly have been increasing in incidence, with nearly 3 times more low-energy ankle fractures estimated to occur in 2030 (1). As the US elderly population continues to increase, low-energy ankle fractures are becoming an "epidemic" (2). Currently, a paucity of published data is available on the mortality associated with low-energy open ankle fractures in the elderly population.

The purpose of the present study was to review the low-energy open ankle fractures that occurred in patients >60 years old at our level 1 trauma center. Several studies have shown that geriatric hip fractures are associated with overall poor health status and increased mortality rates. We believe that elderly patients with overall poor health status can sustain low-energy open ankle fractures and, as a result, experience high morbidity and mortality.

Financial Disclosure: None reported.

Conflict of Interest: None reported.

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Patients and Methods

After obtaining institutional review board approval, we retrospectively identified 11 patients >60 years old who had sustained low-energy open ankle fractures treated at our level 1 trauma center from January 2004 to March 2014. A search of our trauma database using the ankle fracture "International Classification of Disease, 9th revision" codes (824.0, 824.2, 824.4, 824.6, and 824.8) yielded 685 consecutive ankle fractures. Furthermore, using the codes 824.1, 824.3, 824.5, 824.7, and 824.9, 102 open ankle fractures (14.89%) were identified. Of these 102 open ankle fractures, 11 (10.78%) had occurred in patients >60 years old and were secondary to a low-energy mechanism. Low-energy falls were defined as ground level falls from sitting or standing. Open ankle fractures resulting from high-energy mechanisms such as motor vehicle accidents, motorcycle accidents, or falls from heights were excluded. All 11 patients (100%) were treated by 2 orthopedic traumatologists (A.H. and C.P.) at our institution. The data were obtained from the electronic medical records for all 11 open ankle fractures using a defined protocol that included the history and physical examination, radiographic studies, operative notes, and clinic follow-up visits. The patient demographics, AO/Orthopaedic Trauma

1067-2516/$ - see front matter
http://dx.doi.org/10.1053/j.jfas.2014.10.015

Association (OTA) fracture classification, wound description, body mass index, medical comorbidities, follow-up data, and outcomes were recorded (Table).

Results

A total of 11 open ankle fractures in 11 patients >60 years old as a result of a low-energy fall during the 10-year study period met the inclusion criteria. Of the 11 patients, 3 (27.27%) were male and 8 (72.72%) were female. The mean patient age was 70.72 ± 9.83 years. The mean body mass index was 35.93 ± 10.24 kg/m^2. One of the ankle fractures (9.09%) was an isolated lateral malleolus fracture (AO-OTA 44-B1.2). Six (54.54%) were bimalleolar (AO-OTA 44-A2.3 in 1, 44-B2.2 in 2, 44-B2.3 in 1, and 44-B3.1 in 2). Four (36.36%) were trimalleolar (AO-OTA 44-B3.2 in 2 and 44-C2.3 in 2; Fig. 1). The mean size of the medially based ankle wound (Fig. 2) was 14.18 ± 4.12 cm. Ten patients (90.90%) had Gustilo and Anderson grade IIIA wounds, and one (9.09%) had a Gustilo and Anderson grade II wound. All patients received prophylactic intravenous antibiotics and were initially treated with thorough debridement and irrigation, followed by application of a uniplanar external fixator (Fig. 3). Of the 11 patients, 2 (18.18%) were treated definitively with external fixation and 9 (81.81%) underwent open reduction internal fixation when the soft tissues allowed (Fig. 4).

Three patients (27.27%) were smokers. Eight patients (72.72%) had diabetes. Nine patients (81.81%) had hypertension requiring ≥1 antihypertensive medications. Five patients (45.45%) had coronary artery disease, four (80%) of whom had undergone coronary artery bypass grafting or stent placement. Six patients (54.54%) had chronic obstructive pulmonary disease requiring maintenance medications or home oxygen therapy. Three patients (27.27%) had congestive heart failure. Finally, 9 patients (81.81%) had ≥3 of these comorbidities (i.e., diabetes, hypertension, coronary artery disease, chronic obstructive pulmonary disease, obesity, and/or congestive heart failure).

Three patients (27.27%) included in the present study died. The mean interval from injury to death was 2.67 ± 2.02 months. The mean follow-up duration for the remaining 8 living patients was 10.14 ± 11.63 months. One patient (9.09%) was lost to follow-up after the index procedure (debridement and irrigation, uniplanar external fixator). Of these 8 patients, 6 (75%) continued to require an assistive device with ambulation at the last follow-up visit, and all patients reported significant pain and a lack of ankle range of motion.

Discussion

According to the Centers for Disease Control, the US elderly population will nearly double to approximately 72 million by 2030. As such, nearly 1 in 5 Americans will be aged ≥65 years. The "graying" of the US population has been predicted to increase Medicare spending from $555 billion in 2011 to $905 billion in 2020 (3).

Ankle fractures are a relatively common injury within the elderly population. In Finland, the total number of closed low-energy ankle fractures in patients >60 years old increased 319% from 1970 to 2000 (from 369 to 1545). If this trend continues, the incidence of closed low-energy ankle fractures in 2030 will be about 3 times greater (1). In the United States, ankle fractures have been reported to occur in as many as 8.3 per 1000 Medicare recipients (4).

An abundance of published studies have discussed open fractures resulting from high-energy trauma. In 2012, a retrospective review of open fractures performed by Court-Brown et al (5) highlighted the importance and overall high incidence of open fractures in the elderly

Table
Patient demographics, injury description, fracture classification, complications, and mortality

Patient No.	Age (y)	Gender	Fracture	OTA Classification	Wound Size (cm), Description	Gustilo Class	BMI (kg/m^2)	Diabetes	Smoking	Medical Comorbidities	Complications	Mortality	Follow-Up Duration
1	63	Female	Lateral	44-B1.2	14, Medial ankle wound	IIIA	NA	Yes	No	Hepatitis C, CABG, CAD, hypothyroidism, esophageal varices	Pin site infection, calcaneus pin loosening, loss of reduction	Yes (4.5 mo after injury)	4 mo
2	73	Female	Bimalleolar	44-B2.2	18, Medial ankle wound	IIIA	35.94	Yes	No	Asthma, CAD, GERD, HTN, COPD	Placement in skilled nursing facility	No	6 mo
3	78	Female	Trimalleolar	44-B3.2	22, Medial ankle wound	IIIA	39.63	Yes	Yes	Atrial fibrillation, COPD, HTN	None	Yes (18 d after injury)	None
4	61	Female	Trimalleolar	44-C2.3	18, Medial ankle wound	IIIA	45.3	Yes	No	CABG, CAD, HTN, COPD, hypothyroidism	Ankle stiffness, equinus contracture	Yes (3 mo after injury)	1 mo (died at outside hospital)
5	61	Male	Bimalleolar	44-B2.3	10, Medial ankle wound	IIIA	34.3	No	No	Hepatitis C, HTN, GERD	Pin site infection, wound complications, osteomyelitis	No	3 y
6	82	Female	Trimalleolar	44-C2.3	15, Medial ankle wound	IIIA	50.02	Yes	No	COPD, CHF, CAD, PCI, RA	None	No	3 mo
7	63	Male	Bimalleolar	44-A2.3	14, Medial ankle wound	IIIA	22.48	Yes	Yes	HTN, COPD, Parkinson's disease	Wound complications	No	8 mo
8	65	Female	Bimalleolar	44-B3.1	8, Medial ankle wound	II	NA	Yes	No	HTN, peripheral neuropathy	Symptomatic hardware	No	6 mo
9	84	Female	Trimalleolar	44-B3.2	15, Medial ankle wound	IIIA	NA	Yes	No	CABG, CAD, HTN, CHF	Unknown	Unknown	Lost to follow-up
10	85	Female	Bimalleolar	44-B3.1	12, Medial ankle wound	IIIA	NA	Yes	No	CHF, chronic kidney disease	Pin site infection, calcaneus pin loosening, wound complications	No	9 mo
11	63	Male	Bimalleolar	44-B2.2	10, Medial ankle wound	IIIA	23.85	No	Yes	COPD	Wound complications (required pedicled fasciocutaneous flap for coverage)	No	3 mo

Abbreviations: BMI, body mass index; CABG, coronary artery bypass grafting; CAD, coronary artery disease; CHF, congestive heart failure; COPD, chronic obstructive pulmonary disease; GERD, gastroesophageal reflux disease; HTN, hypertension; NA, not applicable; OTA, Orthopaedic Trauma Association; PCI, percutaneous coronary intervention; RA, rheumatoid arthritis.