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Low energy open ankle fractures in the elderly: Outcome and treatment algorithm

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ABSTRACT

Background: With an aging but still active population, open ankle fractures are increasingly presenting as low energy fragility injuries, sharing many characteristics with that of hip fractures. Yet, there is little in the literature on the management and outcome of these fractures. The primary aim of this study was to describe the outcome following open, ankle fragility fracture. Our secondary aim was to identify potential factors that improved outcome.

Methods: All consecutive, low energy open ankle fractures treated at a Level I Trauma Centre over a five-year period were included. The method of fracture fixation, soft tissue closure, patient demographics, complications and mortality were recorded. Functional outcome was assessed using the Enneking Scoring system.

Results: The cohort comprised 61 patients with a mean age of 73 years (range 27–100); 50 (82%) were females and all patients requiring operative intervention. The overall rate of complication was 24.5% (n = 15), with reoperation due to loss of reduction, non-union, infection or amputation required in 7 cases (11.5%). The one-year mortality was 23%. The mean Enneking score, measuring functional outcome, was 36 out of 40 (SD: 6, range: 16–40). It was significantly higher for those treated with internal fixation (37, SD: 5 range: 16–40) than those with external fixation (31, SD: 6 range: 21–38) (p = 0.01). Similarly, definitive wound closure – primary closure (37, SD: 5) or flap with split thickness skin graft (SSG) (36, SD: 6) – led to better outcomes than non-definitive closure (31, SD: 8).

Conclusions: The high morbidity associated with low energy ankle fractures is likely to reflect the hosts' reserves and is comparable to other fractures seen in the elderly. It is evident that definitive fracture fixation providing absolute, rather than relative stability; and definitive wound cover, with either primary closure or flap and SSG, enable early mobilization and shorter hospital stays with improved overall functional outcomes.

Introduction

Open ankle fractures pose a significant clinical challenge, with high rates of infection and complication [1,2]. They have traditionally occurred as a result of significant trauma [3,4] with much of the literature regarding their management based on young, male populations who have sustained injury through high-energy mechanisms [3,5,6].

With an aging but still active population, the mean age of injury has risen significantly over the last three decades [1,4,7]. Contemporary studies find the highest incidence of open ankle fractures is now in women over the age of 60 years [1,7] with the most common mechanism of injury being a simple fall from standing height [7]. Yet studies examining low energy open ankle fractures in the elderly remain sparse.

With low energy ankle fractures in the elderly projected to rise three-fold by the year 2030 [8], it is likely that open ankle fractures will increasingly present as low energy fragility fractures of the elderly [9]. Fragility fractures of the hip were initially associated with overall poor health and high mortality rates [2], however the standardisation of care has significantly improved outcomes [10]. Thus, understanding how to best manage this complex injury in an increasingly morbid and frail population is vital to achieving a successful outcome.

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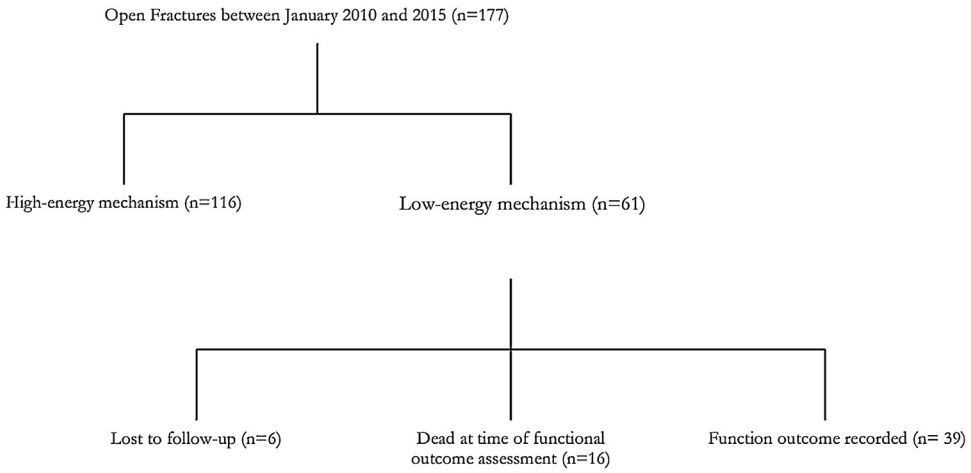

Fig. 1. Flow diagram of the study population.

The primary aim of this study was to describe the outcome following open ankle fragility fracture. Our secondary aim was to identify potential factors that improve outcome in this cohort.

The study was registered and approved by the institution at which it was undertaken.

Material and methods

This was a retrospective consecutive case series. The study center was the John Radcliffe Hospital in Oxford, United Kingdom. It is the only hospital receiving major adult trauma for the Thames Valley region supporting a population of approximately 650,000 people drawn from Oxfordshire and the neighbouring counties of Buckinghamshire and Wiltshire [11]. The trauma unit of the hospital operates on over 2400 trauma patients per annum [12] with eight full time Consultant Trauma Surgeons who provide a 24-h resident Consultant-led service. Plastic surgery services are provided from a department based on the same site.

All patients presenting to the study centre following significant traumatic injury, including all open fractures, are prospectively entered into the national Trauma Audit Research Network (TARN) database. This database was used to identify the subjects for the study. A search was run to identify all patients admitted with open ankle fractures classified under the category of a 'fall less than 2 m' between January 2010 and December 2015. During the five-year study period 177 patients presented to the study center with open ankle fractures. Of these, 61 patients sustained the injury following a low energy injury (Fig. 1). The mean age was 73 years (range 27–100); 50 (82%) were females and 11 were male.

The TARN database provided the demographic data; patient injuries according to the injury severity score (ISS); the OPCS (Office of Population, Censuses and Surveys Classification) procedure codes and the time to theatre. A senior Consultant Trauma Surgeon assessed radiographs from admission and classified the injury using the Association for the Study of Internal Fixation classification system (AO score) [14]. A retrospective review of medical and operative records of all patients identified cases that were rapid transfers from other centers; the Gustillo classification of open injury (I–III); the mechanism of injury; the presence of a consultant at all operative procedures; input from the Plastic Surgeons; the size and site (medial, lateral or circumferential) of soft tissue injury; use of an initial external fixator; previous fragility fracture and diabetic status.

A standardised treatment protocol following the national guidelines for the management of open lower limb fractures was used during the study period [13]. Wound debridement and fracture stabilisation by internal or external fixation was performed within 24 h of admission, on a trauma list led by a Consultant Trauma surgeon. Fifty (82%) of the fractures were stabilised with immediate internal fixation whilst 11 underwent initial stabilisation using an external fixator. Of these 11 cases that received an external fixation, three went onto have an open reduction and internal fixation and 8 were treated definitively with external fixation.

Wounds were closed primarily after debridement if the tissue bed was considered to be clean and skin closure could be achieved without significant tension (n = 39). If this could not be achieved then the wound was covered with a sterile dressing and secondary closure was carried out in a planned manner in consultation with the Reconstructive Plastic Surgeons. All patients with adequate vascular status regardless of age were offered a flap reconstruction if primary closure could not be achieved. Secondary wound closure

Table 1
Definitive methods fracture stabilisation and soft tissue closure.

		Frequency	Percent
Fracture Stabilsation	Open Reduction and Internal fixation	53	86.9
	External Fixator	8	13.1
Soft Tissue Closure	Primary Closure	39	63.9
	Free flap with SSG	10	16.4
	SSG	6	9.8
	Healing by secondary intention	6	9.8