



Utility of follow-up radiographs in conservatively managed acute fifth metatarsal fractures



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ABSTRACT

Fifth metatarsal fractures are the most common fracture of the foot, with the majority being managed conservatively. A variety of treatment methods are described in the literature. Follow-up radiographs are taken to identify fracture displacement, and subsequently to assess for bony union throughout treatment. We assessed the utility of serial radiographic assessment in management of these fractures. Clinical notes and radiographs of 79 patients with fifth metatarsal fractures were analysed retrospectively. Serial radiographs were studied to identify displacement and the last X-ray was reviewed for evidence of fracture union. 96% of fractures were managed conservatively. 29% showed radiological healing at last clinic visit, the rest being discharged as were considered clinically healed. Similar fracture types were managed differently. 3 fractures were surgically treated after failed conservative management. 1 fracture showed displacement from initial radiographs, and was successfully managed conservatively.

Without clear guidelines, these injuries are managed differently from a radiological perspective. Follow-up radiographs taken before 6–8 weeks do not appear to alter patient management. Based on the current study we present our recommendations for radiographic assessment of acute fifth metatarsal fractures.

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1. Introduction

Metatarsal fractures are amongst the most common foot injuries. Of all metatarsal fractures, those of the fifth metatarsal are the most common, contributing to over 50% [1,2]. 60–80% [1] of fifth metatarsal fractures involves the proximal part. The majority of fifth metatarsal fractures are managed conservatively [3–6]. The treatment in accident and emergency departments is varied and can involve the use of supportive shoes, elastic tubular bandaging or casting. Mobilisation protocols vary markedly and range from non-weight bearing, through to fully weight bearing as able. Follow-up radiographs are usually taken to identify fracture displacement at the early stages, and then to assess fracture healing in the later stages of treatment. We retrospectively reviewed the radiographs and clinical notes of all the patients presenting to Accident and Emergency department of Royal Aberdeen Infirmary with isolated base of 5th metatarsal fractures. We analysed the use of the various management options employed and the utility and extent of radiography throughout treatment.

2. Materials and methods

All foot and ankle X-rays taken in the accident and emergency department between 1st March and 31st August 2012 were scrutinised in the Picture Archiving and Communications System (PACS) (KODAK, USA), and those with isolated fifth metatarsal fractures were segregated. Patients with multiple fractures, skeletally immature patients, and those with stress fractures were excluded. A&E and fracture clinic notes of these patients were reviewed. Information pertaining to injury date, presentation date, mechanism of injury, initial treatment regime, any change in regime throughout course of follow-up, number of fracture clinic appointments, duration of immobilisation (if any) and duration of treatment was recorded. The endpoint was either discharge from clinic or decision for operation. The last clinic letter/discharge letter was reviewed to find out the rationale for discharge/operation. Fractures were classified on initial X rays and any displacement documented. Serial radiographs were studied to identify any displacement as compared to previous radiographs and the last radiographs obtained were specifically reviewed for evidence of fracture healing. All radiographs were reviewed by first and second authors and any dispute was settled by mutual agreement. Total number of X-ray series (dorsal–plantar, oblique ± lateral) per patient was noted.

Most fifth metatarsal fracture classification systems focus on proximal metatarsal fractures as the majority of fractures are

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Fig. 1. Proximal fifth metatarsal fracture classification as described by Dameron et al. [4,7,8].



Fig. 2. Anatomic classification of fifth metatarsal fractures used in current study.

located in this area [1]. Anatomic classification divides proximal fifth metatarsal into three different types/zones [4,7,8]. Type I corresponds to cancellous tuberosity. Type II is distal to Type I with fracture line extending into 4th–5th intermetatarsal articulation. Type III is the area of proximal 1.5 cm of the diaphysis (Fig. 1). We extended this classification to Type IV, which includes shaft fractures distal to Type III, and subcapital fractures as Type V. In addition, Type I fractures proximal to metatarsal cuboid articulation (extra articular fractures) were classified as I (E) to see if they behave differently as compared to fractures more distally (Fig. 2). The fractures were classified on oblique foot X-ray. The fractures were also classified as undisplaced, minimally displaced (<2 mm) or displaced (>2 mm) (Table 1). Displaced fractures were further evaluated for displacement, angulation (in coronal and saggital plane) and shortening.

3. Result

80 patients with acute fifth metatarsal fracture presented to A&E during this 6 month period. One patient with a displaced fracture

Table 1
Total number of patients in each classification group.

Type	Total	Undisplaced	Minimally displaced	Displaced
I	31	21	2	8
I(E)	12	5	5	2
II	8	7	1	
III	2	1	1	
IV	7	4		3
V	16	6	4	6
Total	76	44	13	19

Table 2
Number of patients in each treatment method group.

Type	Slipper cast	Below knee cast	Supportive shoe/Tubigrip
I	9	12(2D)	10
I(E)	5	3(1D)	4(1D)
II	2	6	
III	1	1	
IV	2(1D)	4(2D)	1
V	6(2D)	5(2D)	5
Total	25(3D)	31(7D)	20(1D)

D: displaced.

refused proposed surgery and did not attend further follow-up and was excluded. Of the 79 remaining fractures, 3 were managed surgically after a period of conservative treatment. 76 patients were treated non-operatively.

Non-operative group

All patients were treated in A&E initially with a variety of treatment options being employed including supportive shoes, slipper casts and below knee casts (Table 2). Subsequent follow up was in fracture clinic (except three who were initially reviewed in A&E department return clinic) after 1–28 days (mean 12.8 days). In all patients the radiographs were repeated at first clinic visit except in those who were reviewed within next 48 h (3 patients). From the time of initial A&E visit, the first follow-up radiographs were obtained at an average 1.9 weeks \pm 0.6 SD from injury, and further X-rays again at 4.8 weeks \pm 2.45 SD. A Third follow up X-ray was obtained in 21 patients at 7.5 weeks average (3–16 weeks). At each visit, 2 or 3 views were taken. Total number of X-ray series per patient ranged from 2 to 5, with an average of 3.12 ± 0.77 SD and the number of clinical visits per patient ranged from 1 to 5, with an average of 2.35 ± 0.92 SD (Table 3). 10 patients were initially mobilised non-weight bearing for variable lengths of time.

Rationale for discharge – All patient were mobilising full weight bearing with no or minimal discomfort and no or mild tenderness at the fracture site at the time of discharge. This correlated with radiological healing in 22 patients (32%), 12 of which showed on radiographs taken at 6 weeks or less (18%). The remaining patients were discharged as they were considered to be healed clinically.

Two patients had a protracted recovery. First patient had a Type IV displaced fracture, treated initially in BK cast with toe extension and non-weight bearing for 6 weeks. At 16 weeks, radiographs showed some callus formation but the patient was still in pain. Subsequent CT scan confirmed fracture union. The second patient had a Type V displaced fracture, treated in extended slipper cast for 11 weeks. At last visit (17 weeks), patient had minimal tenderness at the fracture site and was comfortably mobilising fully weight bearing. Radiographs at 17 weeks showed some evidence of healing but fracture line could still be seen.

Little change in displacement was noted. One patient with an initially undisplaced Type I fracture (1.5% of all patients), showed 2–3 mm lateral opening of fracture at 2 weeks, but healed

Table 3
Average X-ray series and clinic visits per patient.

Type	Total	Average X rays series	Average visits
I	31	3.09	2.35
I(E)	12	2.75	2
II	8	2.74	1.87
III	2	4	3
IV	7	3.71	2.86
V	16	3.12	2.68

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