

Tibial shaft fractures in amateur footballers

B Lenehan, P Fleming, S Walsh, K Kaar

Br J Sports Med 2003;**37**:176–178

See end of article for authors' affiliations

Correspondence to:
Mr Lenehan, 7 Weston
Green Lucan, Co Dublin,
Republic Of Ireland;
brian@blenehan.com

Accepted 29 April 2002

Background: Footballers constitute a unique group of patients with tibial shaft fractures. They tend to have excellent general health and well developed musculature in the leg, and their fractures are generally closed injuries caused by low velocity trauma. However, little has been reported on the outcome after tibial shaft fractures in this group.

Objective: To identify patterns of injury, response to treatment, and functional outcome in such a group.

Method: Fifty consecutive tibial shaft fractures in adult footballers treated at Merlin Park Regional Hospital over a five year period were analysed.

Results: Most of the fractures were type A injuries (AO/ASIF classification). The incidence of complications was low. All patients reported good or excellent satisfaction with their outcome. However, only 54% of patients returned to playing competitive football.

Conclusion: Tibial shaft fractures in amateur footballers are associated with good results when traditional outcome criteria are used, but many patients do not regain their previous level of function.

Although the surgical treatment of tibial shaft fractures has changed considerably over the past 20 years, their management continues to be greatly influenced by the type of fracture, the surrounding soft tissues, the general health of the patient, the motivation and compliance of the patient with rehabilitation, and the expectations of the patient.¹ For these reasons, footballers constitute a unique group of patients. They tend to have excellent general health, well developed musculature in the leg, and a high level of function, which they may reasonably expect to regain after successful treatment.

We reviewed 50 consecutive tibial shaft fractures in adult footballers treated at our hospital over a five year period, and attempted to identify patterns of injury, response to treatment, and functional outcome.

PATIENTS AND METHODS

All patients treated at our hospital for a tibial shaft fracture sustained playing amateur football, between January 1995 and December 1999, were included in this study. Patients were

playing either association football (soccer) or gaelic football when injured. Case notes and radiographs were reviewed to establish the mechanism of injury, the type of fracture and mode of treatment, and the incidence of complications. Follow up data were collected by telephone questionnaire. Patients were asked to describe their level of satisfaction with the outcome (poor, moderate, good, or excellent), and whether they had returned to playing competitive football.

RESULTS

Fifty male amateur footballers with a tibial shaft fracture were treated at our hospital during the period of the study. Their mean age was 20.8 years (range 16–33). The right tibia was fractured in 76% of cases (38 patients) and the left in 24%. In most cases (68%), the mechanism of injury included a tackle or kick by another player (table 1). Fewer than 40% of players were wearing shinguards.

Most of the fractures (82.5%) in our series were type A (table 2) when classified by the AO/ASIF system (table 3). Only five fractures (12.5%) were type B, and two (5%) were type C.

There was one compound fracture (Gustilo grade 1; table 4).

All patients were admitted to hospital for management. The mean hospital stay was 5.3 days (range 1–23). Half were

Table 1 Mechanism of injury

	Soccer	Gaelic
Tackle	9	9
Kick	16	6
Total	25	15

Table 2 Type of fracture

	Soccer	Gaelic
A1	3	2
A2	7	2
A3	11	8
B1	3	2
B2	1	1
Total	25	15

Table 3 AO/ASIF classification of tibia shaft fractures²

Type	Fracture	Subclassification
A	Simple	A1 – spiral A2 – oblique A3 – transverse
B	Wedge	B1 – spiral wedge B2 – bending wedge B3 – fragmented wedge
C	Complex	C1 – spiral C2 – segmental C3 – irregular

AO/ASIF, Arbeitsgemeinschaft Osteosynthesefragen/Association for the study of Internal fixation.

Table 4 Classification of open fractures³

Grade	Wound
I	<1 cm
II	1–10 cm
IIIa	>10 cm coverage available, segmental form, high velocity gunshot wound
IIIb	Periosteal stripping, requires coverage procedure
IIIc	With vascular injury requiring repair

treated by closed manipulation and immobilisation in an above knee cast. Above knee casts were applied by qualified plaster technicians, and a standardised regimen was followed. The casts were maintained for eight weeks, and patients remained non-weight bearing throughout. The casts were then removed, and patellar bearing casts were applied for four to six weeks or until union was achieved. Partial weight bearing was allowed (10% of body weight) during this time, and patients were instructed by a physiotherapist. Some 44% (22 patients) were treated by reamed Russel Taylor intramedullary nail fixation. Partial weight bearing (10% of body weight) was permitted for the first six weeks, progressing to full weight bearing thereafter as tolerated.

Open reduction and internal fixation with plate and screws was performed in three patients (6%). These patients remained non-weight bearing for six weeks; partial weight bearing (10% of body weight) was then allowed, progressing to full weight bearing at 10–12 weeks.

A review of the patients' charts showed that eight had serious complications related to their injury and treatment (table 5). Three patients developed a compartment syndrome requiring fasciotomy. Two patients had respiratory complications related to fat embolism, and required observation and supportive care in a high dependency unit. One wound infection occurred at the site of the distal locking screw in a patient

who was treated by intramedullary nailing. Only one fracture did not unite after primary conservative treatment, and required open reduction and internal plate fixation.

Forty of the 50 patients were available for follow up interview. The mean follow up period was 30 months (range 11–57). All patients reported good or excellent function in the injured limb, but only 54% returned to playing competitive football and only 44% returned to playing football at their previous level of competition. The average length of time before patients returned to sport was 11.6 months (range 6–18). The likelihood of returning to football was not significantly related to the age of the patient, the type of fracture, or the particular football code.

DISCUSSION

Footballers constitute a well defined subgroup of patients with tibial shaft fractures, differing from many other patients in areas that are relevant to recovery from their injury. These injuries are common,^{4,7} and a typical fracture pattern occurs in most cases which can be classified as type A2 or A3 in the AO/ASIF classification system (table 3). This is consistent with the mechanism of injury (low velocity impact or rotational torque) and with previous attempts in the literature to define a "footballer's fracture".⁴ We had hypothesised that rotational injuries would be more common in soccer than in gaelic football, because pivoting knee movements are more common in the former, but this proved not to be the case. Nor did shin pads, worn predominantly by the soccer players, prevent tibial fractures, although the direct impact mechanism caused fewer fractures in this group.

We had also hypothesised that this group of patients would have a more developed leg muscle mass than other patients with tibial shaft fractures, and thus may have a higher incidence of compartment syndrome and other soft tissue complications. Three patients (6%) developed compartment syndrome, but in two of these the problem developed 24 hours after intramedullary nailing and appeared to be a complication of the surgical procedure rather than of the fracture itself.

Table 5 Complications of tibial shaft fractures

Patient no	Sport	Classification	Treatment	Complication
16	Gaelic	42-A3	IM nailing	Infection
26	Soccer	42-A1	Conservative	Non-union
32	Soccer	42-A2	IM nailing	Compartment syndrome
34	Gaelic	42-A1	IM nailing	Compartment syndrome
37	Soccer	42-A3	Conservative	Fat embolus
42	Gaelic	42-A3	Conservative	Fat embolus
48	Gaelic	42-A3	IM nailing	DVT
49	Soccer	42-A2	IM nailing	Compartment syndrome

IM, Intramedullary; DVT, deep vein thrombosis.

Table 6 Gurd's criteria for the diagnosis of fat embolism syndrome

Gurd's major criteria:	Axillary or subconjunctival petechia Occurs transiently (4–6 hours) in 50–60% of the cases Hypoxaemia ($\text{PaO}_2 < 60$ mm Hg; $\text{FiO}_2 \leq 0.4$) Central nervous system depression disproportionate to hypoxaemia, and pulmonary oedema
Gurd's minor criteria:	Tachycardia (more than 110 beats/min) Pyrexia (temperature higher than 38.5°C) Emboli present in retina on fundoscopic examination Fat present in urine Sudden unexplainable fall in packed cell volume or platelets Increasing sedimentation rate Fat globules present in sputum

The diagnosis of fat embolism syndrome requires at least one sign from the major criteria and at least four signs from the minor criteria category.

Table 7 Stated reason for not returning to football

	Soccer	Gaelic
Lack of interest	3	2
Subjective feeling of impairment	3	2
Intermittent pain	2	1
Fear of refracture	3	1
Total	11	6

All three patients had direct intracompartmental pressure measurements recorded using a Stryker measurement device. Two patients developed a fat embolism syndrome requiring active supportive measures. Diagnosis was made using Gurd's criteria⁵ (table 6). Each patient had at least one major criterion and four minor criteria. This rate (4%) is lower than that reported by Ganong,⁶ who found that 19% of patients in his study of young otherwise healthy skiers with isolated tibial shaft fractures developed fat embolism syndrome. The low incidence of non-union (2%) is probably attributable to the low velocity fracture pattern, the preponderance of closed injuries, the low mean age of the study population, and the well developed soft tissue envelope in these patients.

It is noteworthy that only 54% of patients returned to playing competitive football after their injury, with only 44% returning to their previous level. The reasons for this were varied (table 7). However, most patients were satisfied with the outcome of their treatment. Shaw *et al*⁷ reported a 93.2% return to sport, with 74% reporting unimpaired function, but did not differentiate amateur from professional footballers. Professional footballers have additional incentives to return to

Take home message

Our findings suggest that tibial fractures in amateur footballers have a good outcome when assessed by traditional criteria (early morbidity, complication rate, time to union, and patient satisfaction) but not in terms of returning to sport. Doctors and patients should be aware of this when discussing treatment and rehabilitation.

playing at a high level, and perhaps have access to more intensive rehabilitative programmes than their amateur counterparts.

Authors' affiliations

B Lenehan, P Fleming, S Walsh, K Kaar, Department of Orthopaedic Surgery, Merlin Park Regional Hospital, Galway, Ireland

REFERENCES

- 1 Heckmann JD, Buckolz RW (eds). *Rockwood and Green's fractures in adults*. 4th ed. Philadelphia: Lippencott-Raven, 1996; 2:2127-300.
- 2 Muller ME, Nazarin S, Koch P, et al. *Comprehensive classification of fracture of long bones*. Berlin: Springer-Verlag, 1990.
- 3 Gustilo RB, Mendoza RM, Williams DN. Problems in the management of type III (severe) open fractures: a classification of type III open fractures. *J Trauma* 1984;**24**:742-6.
- 4 Cattermole HR, Hardy JR, Gregg PJ. The footballer's fracture. *Br J Sports Med* 1996;**30**:171-5.
- 5 Gurd AR, Wilson RI. The fat embolism syndrome. *J Bone Joint Surg [Br]* 1974;**56**:408-16.
- 6 Ganong RB. Fat emboli syndrome in isolated fractures of the tibia and fibula. *Clin Orthop* 1993;**291**:208-14.
- 7 Shaw AD, Gustilo T, Court-Brown CM. Epidemiology and outcome of tibial diaphyseal fractures in footballers. *Injury* 1997;**28**:365-7.