

The “susper” lesion, a specific entity in open calcaneal fractures

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The limited soft tissue covering makes the treatment of open calcaneal fractures especially difficult. The most important objectives in open fracture management are to avoid infection, to obtain fracture healing and to restore function. Low-velocity open fractures with a medial skin split, the so-called “susper” lesions, represent a distinct fracture group in which standard operative treatment is not contraindicated. The medial skin split is caused by the sustentaculum fragment which perforates the medial skin during landing on the everted and externally rotated heel.

INTRODUCTION

Open fractures of the calcaneus are rare ; they represent only 10% of all calcaneal injuries (12). Follow-up results of open fractures of the calcaneus are seldom found in the literature. Siebert *et al* found 48% poor and no excellent results using the Modified Merle d’Aubigné Score (14). The limited soft tissue covering makes the treatment of open calcaneal fractures especially difficult. We present a two-year follow-up of a specific group of isolated open calcaneal fractures, characterised by a medial longitudinal penetration wound, the so-called “Susper” lesion (fig 1).

PATIENTS AND METHODS

From September 1995 through October 2000, six open calcaneal fractures in six patients were treated in our hospital and were reviewed (table I) following the rational scoring system proposed by Kerr and Atkins (table I) (10).



Fig. 1. — Open calcaneal fracture with a medial “susper” lesion

All but one of the patients had an isolated medial skin split wound as seen on fig 1. Soft tissue involvement was classified according to Gustilo and Anderson (6). There were five grade II open fractures and one grade IIIa open fracture.

The classification of the calcaneal fractures followed the Sanders classification. Type I is a non-displaced fracture, type II is a 2-part (split) fracture, type III is a 3-

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Table I. — Calcaneal Fracture Scoring System proposed by Kerr *et al* (10).

Maximum 100 points	
1. Pain (36 points)	
At rest	On activity
None 18	None 18
Slight 12	Slight 12
Moderate 6	Moderate 6
Severe 0	Severe 0
2. Work (25 points)	
No change in job : 25	
Modification of job : 16	
Enforced change of job : 8	
Unable to work : 0	
3. Walking (25 points)	
No change in walking ability : 25	
Minimal restriction : 16	
Moderate restriction : 8	
Severe restriction : 0	
4. Walking aids (14 points)	
None : 14	
Occasional cane : 10	
Constant cane : 6	
Two canes : 3	
Crutches : 0	

part or split-depression fracture and type IV is a comminuted calcaneal fracture (13). We found three type II fractures, two type III fractures and one type IV.

There were four men and two women with an average age of 46 years. The mean follow-up time was 24 months. The mechanism of injury in four patients was a low-velocity trauma (fall from a height), one patient had a high-velocity trauma (motor vehicle accident) and one patient had a crush injury of the hindfoot, combined with a displaced Lisfranc fracture-dislocation.

All patients were treated with extensive debridement and open reduction internal fixation (ORIF) through a standard lateral approach. This was done immediately and in one surgical session. Very aggressive washout at the time of surgery was routinely done, using high-pressure pulsed lavage in every case. The calcaneus was redislocated to debride the bone which had been exposed at the time of injury. The medial wound was closed only after 48 hours. Only one patient with an open crush injury required skin covering with a free flap.

RESULTS

The mean score at follow-up was 63.50 points out of a possible maximum of 100 points.

Two patients had no pain at rest, three had slight pain and one had moderate pain at rest. Four had slight pain on activity, and two had moderate pain on activity.

No patient was unable to work. One patient was forced to change his occupation. His walking capability was also severely restricted. Two patients had a minor adaptation of their original occupation.

Three patients had a moderate restriction in walking, two had a minimal restriction. No patient needed walking aids.

The worst result was seen in a workmen's compensation case, following a motor vehicle accident : the patient was severely restricted in walking and was forced to change his occupation.

The relevant data are summarised in tables II and III.

DISCUSSION

Low-velocity open fractures of the calcaneus with a medial skin split, the so-called "susper fractures" represent a distinct group of lesions in which the standard principles of management of open fractures should be applied and operative treatment is not contra-indicated. In contrast, in high-velocity injuries, additional surgical damage to the soft tissue envelope may be detrimental.

The most important objectives in the management of open fractures are to avoid infection, to obtain fracture healing and to restore function (7). Appropriate antibiotic use, extensive surgical debridement and irrigation are recommended (1, 15). Infection is the most common complication leading to non-union, malunion and loss of function.

The medial skin split is caused by the sustentaculum fragment which perforates the medial skin. Fracture of the sustentaculum tali is the result of two forces : landing on the heel combined with acute eversion of the foot (fig 2, 3). The so-called "susper"lesion, a contraction of "sustentaculum tali" and "perforation", is uncommon. Lance *et al* reported only eight such cases in 303 calcaneal fractures (11) ; Essex-Lopresti reported only one in 180 fractures (5). Using the standard lateral approach in these low-velocity open fractures, postope-

Table II. — Follow-up results

1. Pain (36 points)				
	N° of patients			
At rest			On activity	
None	2		None	0
Slight	3		Slight	4
Moderate	1		Moderate	2
Severe	0		Severe	0
2. Work (25 points)				
		N° of patients		
No change in job		3		
Modification of job		2		
Enforced change of job		1		
Unable to work		0		
3. Walking (25 points)				
		N° of patients		
No change in walking ability		0		
Minimal restriction		2		
Moderate restriction		3		
Severe restriction		1		
4. Walking aids (14 points)				
		N° of patients		
None		6		
Occasional cane		0		
Constant cane		0		
2 canes		0		
Crutches		0		

Table III. — Patient data and results

Patient N°	Gender	Age (y)	Follow-up (months)	Gustilo classification	Sanders classification	Cause of injury
N° 1	F	41 y	36	II	III	fall from a height
N° 2	M	45 y	28	II	II	fall from a height
N° 3	M	41 y	9	II	IV	motor vehicle acc.
N° 4	M	45 y	32	II	III	crush injury
N° 5	F	38 y	30	II	II	fall from a height
N° 6	M	68 y	9	IIIa	II	fall from a height
Patient N°	Pain at rest	Pain on activity	Work	Walking restriction	Walking aids	Score
N° 1	slight	slight	no change	moderate	none	71/100
N° 2	slight	moderate	modification	minimal	none	64/100
N° 3	moderate	moderate	enforced change	severe	none	34/100
N° 4	slight	slight	modification	moderate	none	50/100
N° 5	none	slight	no change	minimal	none	85/100
N° 6	none	slight	no change	moderate	none	77/100



Fig. 2. — CT-scan of an open calcaneal fracture with medial skin perforation caused by the sustentaculum fragment.

rative swelling is surprisingly low (2, 3, 4, 9). This is probably due to the evacuation of the fracture haematoma through the medial wound immediately after injury.

Myerson and Quill conclude that in cases with failure of the primary treatment, secondary operations should be done immediately to avoid further loss of time (12).

Excellent results were not achieved in our study group. This is in agreement with Siebert *et al*, who reported their experience with 35 cases, the largest study on open articular fractures of the calcaneus (14). They found 48% poor and no excellent results using the Modified Merle d'Aubigné Score (14). Two of our patients had a score of 50/100 or less, using the rational scoring system proposed by Kerr and Atkins (10). Both scoring systems are functional scoring systems based among other criteria on pain, walking ability and the need for walking aids (10, 14).

In Siebert's study on open calcaneal fractures, the most favourable results were seen after non-operative fracture management, but the primary fracture treatment was carried out outside the referral hospital in 29 out of 35 patients, and there was



Fig. 3. — Radiograph of a patient with open calcaneal fracture

no specific treatment protocol for open fractures. We think that in high-velocity open calcaneal fractures, it is probably wiser to have the initial debridement and wound treatment followed by a secondary minimally invasive open reduction (7).

CONCLUSION

The main source of disability in open calcaneal fractures is closely related to the soft tissues. This explains the very unfavourable results found in the literature. However low-velocity open calcaneal fractures with a medial longitudinal skin split, the so-called "susper fractures" are not a contra-indication to internal fixation. After meticulous debridement, our six low-velocity fractures with a medial skin split were treated using a minimal or extended lateral approach. Aggressive debridement and early plastic surgeon's advice are essential to obtain an acceptable end result. Applying a strict treatment protocol (aggressive wound debridement, pulsed

lavage, delayed wound closure, wound closure over gentamycine swabs, immediate surgical stabilisation) improves the functional and soft tissue outcome of these devastating injuries.

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