Good prognosis after calcaneal fracture in childhood

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Fifteen children who sustained a displaced intraarticular calcaneal fracture, treated closed, were reexamined after 12 (1–29) years. All were satisfactory, although slight inconvenience was encountered as a result of the fracture. Immobilization and nonweight bearing from 4 to 6 weeks seem sufficient to treat a calcaneal fracture in children.

The prognosis for calcaneal fractures in children has received little attention (Schmidt and Weiner 1982, Starshak et al. 1984, Wiley and Profitt 1984). Follow-up examinations after a few years indicate that the prognosis is satisfactory following closed treatment (Chapman and Galway 1977, Jonasch 1979, Kurz et al. 1984, Matteri and Frymoyer 1973, Thomas 1969, Wiley and Profitt 1984). Some authors have found total restitution, whereas others found residual deformities or slight inconveniences (Thomas 1969, Wiley and Profitt 1984). In adults the final outcome can normally be observed after 2 years (Lindsay and Dewar 1958, Nade and Monahan 1973, Tanke 1982), whereas in children with immature bones, this may not be true. The need for long observation times was emphasized by Wiley and Profitt (1984).

Our purpose was to examine the long-term prognosis of displaced intraarticular calcaneal fractures acquired in childhood.

Patients and methods

To ensure that only patients with immature bone were included, the maximum age limit at the time of injury was chosen to be 15 years for boys and 12 years for girls. Twenty displaced intraarticular fractures were found among 80 fractures of the calcaneus in children identified through a review of our radiology department records from 1955 to 1984. Five patients were excluded, 2 because they had been visitors to the area and could not be recalled for examination, 2 because they had moved from the district, and 1 because he refused to participate in the reexamination. Four of these patients were interviewed by telephone. Three patients were asymptomatic, and 1 had a slight tendency to pain after activity. The mean age of the 15 reexamined patients (14 boys and 1 girl) at the time of injury was 8 (4–14) years.

Thirteen patients were treated nonoperatively with splintage and nonweight bearing for 4–12 weeks. Nine were admitted to the hospital, and the rest were treated as outpatients only. Two were not treated.

The primary radiographs showed four fractures of the tongue type and 11 of the joint depression type of Essex-Lopresti (1952). Measurement of the Böhler angle showed reduction ranging from 4° to 22° in 10 patients among the 12 patients in whom a comparison with the opposite side was possible. In 1 patient the joint was elevated instead of depressed, with a positive Böhler angle of 10° (Figure 1). The axial view showed bursting of the lateral cortex of the calcaneus in 7 patients, usually combined with a fracture dividing the calcaneus in an anterior-medial and a posterior-lateral part. In 10 patients the calcaneus was widened in 10 patients by 0.2–1.0 cm as compared with the opposite foot.

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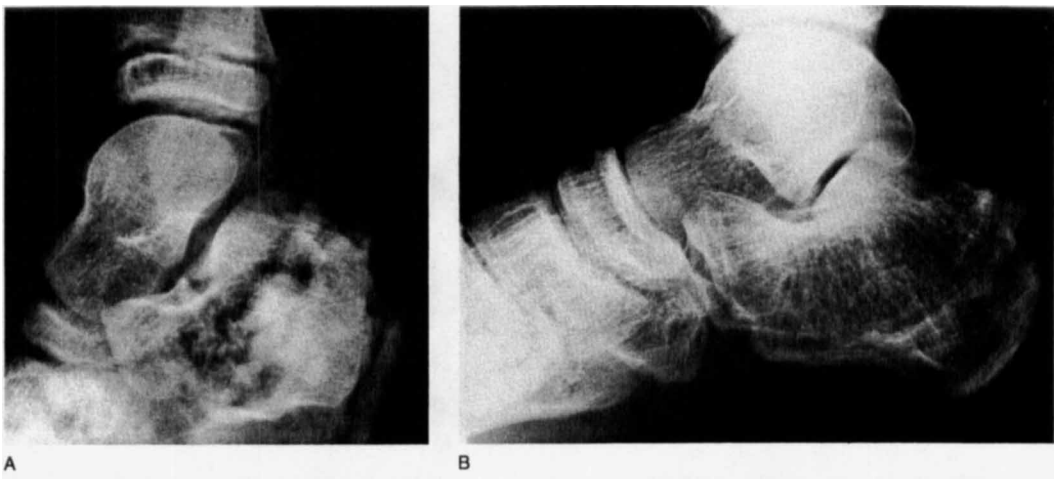


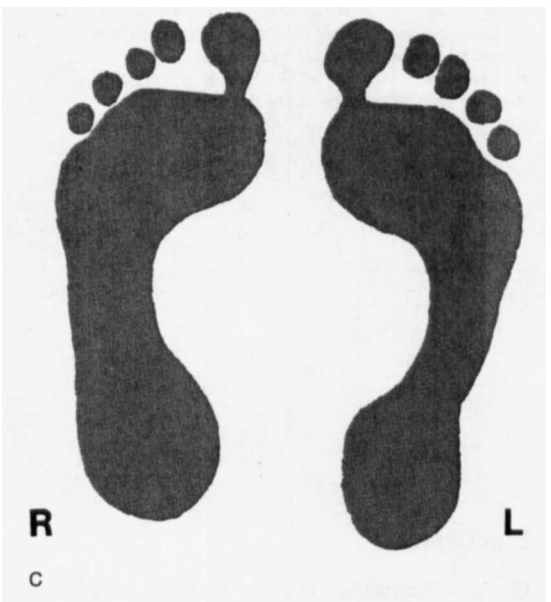


Figure 1. Case 5. A 7-year-old boy with trauma to the right foot in a traffic accident.
A. The calcaneus is fractured with superior displacement of the articularis talaris posterior.
B. Ten years later, the right calcaneus is shortened with reduction of the Böhler angle of 10° as compared with the left side.
C. The prints of the feet at follow-up show widening of the right heel.

The follow-up examination was conducted 12 (1–29) years after the injury. A history of past and present discomfort was obtained. The feet were examined for deformity, range of motion, swelling, and muscular atrophy. The length, width, and height of the feet were measured, and the gait was evaluated. Lateral, axial, oblique, and Brodén (1949) 1 and 2 radiographic projections of the affected foot were obtained. Lateral and axial views were obtained of the opposite foot.

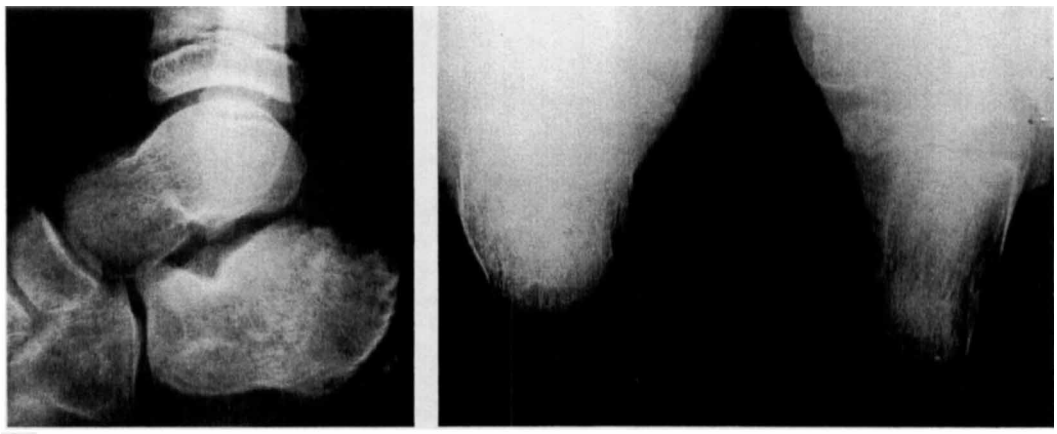
Results

Six patients had not experienced any discomfort. Two patients had problems with shoe fitting because the fractured foot was smaller than the contralateral one, and 1 patient had uneven wear of his shoes on the fractured side. Four patients suffered from pain – 2 only when playing soccer, 1 when exposed to cold, and 1 generally.

The dorsal flexion was reduced by 5° in 4 patients, and the subtalar movement was reduced by 25 percent in 2 other patients. In 9 patients, motion was equal on both sides.

Two patients had heel tenderness, and the heels were broadened with swelling in 3 patients. The grooves of the calcaneal tendons were not eliminated in any of the patients. None of the patients had calf atrophy exceeding 1 cm on the fractured side. The heel width below the malleoli was increased by more than 0.5 cm in 2 patients. Prints with full weight bearing showed gross widening in 1 patient (Figure 4). None of the patients had lengthening of the fractured foot of more than 1 cm.

In 12 patients the Böhler angle was reduced by 8° (5°–15°). The patient with an increased Böhler angle on the primary radiographs had a reduction of 10° after 10 years (Figures 2 and 3).



A

B

Figure 2. Case 11. A 9-year-old boy who fell from a height.
A. Calcaneal joint depression fracture. The axial view shows a displaced fracture of the right calcaneus.
B. Twenty-nine years later. The Brodén projection reveals an irregular articular surface of the right calcaneus.

The tuber facet angle was found to be altered more than 5° in 3 patients. The calcaneal inclination angle was reduced in 1 patient, consistent with a reduction of the height of the foot. The width of the calcaneus was found to be increased in 9 patients and reduced in 1 patient. The articulating facet of the subtalar joint showed irregular surfaces in the Brodén projection in 4 patients (Figure 7) and slight arthrosis in 2. Three of these patients had sustained a tongue-type fracture of the calcaneus.

Discussion

Our study confirms that the prognosis for calcaneal fractures in childhood is satisfactory with regard to function, although slight discomforts can be encountered (Chapman and Galway 1977, Hahn and Stock 1984, Jonasch 1979, Kurz et al. 1984, Matteri and Frymoyer 1973). The osseous structure of the fractured calcaneus will mature to a normal size, but with variable deformity depending on the initial dislocation (Schedl and Spangler 1979, Thomas 1969). The subcutaneous tissue of the heel and ankle is restored. This may partially explain why the prognosis for calcaneal fractures in children is better than in adults (Lindsay and Dewar 1958, Tanke 1982).

Our study suggests that arthrosis may supervene especially following tongue-type fractures. The prognosis after 3 or 4 decades may be less favorable than this and other studies suggest.

Table 1. Clinical data and outcome after a calcaneal fracture in 15 children

A	B	C	D	E	F	G	H	I	K	L	M	N	O	P	Q	R
1	M	4	L	a(2)	j	5	+	a(4)	17	1	–	–			–	–
2	F	4	L	a(2)	t	18	–	non	21	–	–	–			9	+
3	M	6	L	a(2)	j	6	+	b(6)	11	1, 2	a	+			8	–
4	M	6	R	a(1,5)	j	–	–	c(12)	28	2	a	–			5	+
5	M	7	R	b	t	10a	+	d(8)	17	3	a	+	+		10	+
6	M	7	L	a	j	–	+	d(8)	17	1	–	–			0	–
7	M	7	R	c	j	6	+	c(6)	21	1	–	–			5	–
8	M	8	R	c	j	0	+	a(8)	32	–	–	–			11	+
9	M	9	R	a(4)	j	10	+	a(8)	23	2	–	–			8	+
10	M	9	L	a(0,5)	j	–	+	a(7)	29	–	–	–			8	–
11	M	9	R	a(3,5)	t	20	+	a(4)	38	–	–	–	+		5	+
12	M	10	R	a	j	22	–	c(12)	20	1 3	s	+		+	15	+
13	M	13	L	a(2)	j	5	–	a(8)	16	–	–	–			11	–
14	M	14	R	a(2)	t	9	–	c(8)	15	–	–	–			9	+
15	M	14	L	?	j	8	+	non	31	1	a, s	–		+	0	+

A case number.
B sex.
C age.
D side.
E trauma: a free fall from height (m), b traffic accident, c fall on stairs.
F–H radiography at injury.
F type: j joint depression, t tongue-type (Essex Lopresti).
G reduction of Böhler angle (degrees): a increased angle.
H broadening.
I treatment: a plaster of Paris (wk), b Thomas splint (wk), c cast (wk) immediate weight bearing in cases 1 and 8, d nonweight bearing (wk).
K–R follow-up.
K age.
L discomfort: 1 pain, 2 problem with shoe fitting, 3 tenderness.
M reduced motion: a ankle, s subtalar joint.
N swelling.
O broadening > 0.5 cm.
P reduction of height > 1 cm.
Q–R radiography at follow-up.
Q reduction of Böhler angle (degrees).
R broadening.

References

Brodén B. Roentgen examination of the subtaloid joint in fractures of the calcaneus. Acta Radiol 1949;31: 85–91.

Chapman H G, Galway H R. Os calcis fractures in childhood. J Bone Joint Surg (Br) 1977;59:510.

Essex-Lopresti P. The mechanism, reduction technique, and results in fractures of the os calcis. Br J Surg 1952;39:395–419.

Hahn M, Stock H J. Fußwurzel und Mittelfußfrakturen bei Kindern. Diagnostik, Behandlung, Ergebnisse. Zentralbl Chir 1984;109(1):23–8.

Jonasch E. Fersenbeinbrüche bei Kindern. Hefte Unfallheilkd 1979;134:170.

Kurz W, Gündel T, Hardtmann H. Fußwurzelfrakturen im Kindesalter. Zentralbl Chir 1984;109(15):984–90.

Lindsay W R N, Dewar F R. Fractures of the Os Calcis. Am J Surg 1958;95:555–75.

Matteri R E, Frymoyer J W. Fracture of the calcaneus in young children. Report of three cases. J Bone Joint Surg (Am) 1973;55(5):1091–4.

Nade S, Monahan P R. Fractures of the calcaneum: a study of the long term prognosis. Injury 1973;4(3): 200–7.

Schedl R, Spangler H. Beitrag zur kindlichen Fersenbeinfraktur. Aktuel Traumatol 1979;9:247–50.

Schmidt T L, Weiner D S. Calcaneal fractures in children. An evaluation of the nature of the injury in 56 children. Clin Orthop 1982;(171):150–5.

Starshak R J, Simons G W, Sty J R. Occult fracture of the calcaneus-another toddler's fracture. Pediatr Radiol 1984;14(1):37–40.

Tanke G M. Fractures of the calcaneus. A review of the literature together with some observations on methods of treatment. Acta Chir Scand 1982;505(Suppl): 1–103.

Thomas H M. Calcaneal fracture in childhood. Br J Surg 1969;56(9):664–6.

Wiley J J, Profitt A. Fractures of the os calcis in children. Clin Orthop 1984;(188):131–8.