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= Abstract =

Result of Surgical Treatment of Calcaneal Fractures Using Extensile Lateral Approach

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Thirty-eight calcaneal fractures were treated with open reduction and internal fixation using extensile lateral approach from Jun. 1993 to Dec. 1996 and were followed more than a year. According to the Essex-Lopresti classification, there were 28 cases of joint depression type and 10 cases of tongue type. According to the Sanders classification, there were 20 cases of type II, 13 cases of type III and 5 cases of type IV.

The purpose of this study is to analyze the results of surgical treatment of calcaneal fractures using extensile lateral approach and its complications. The results were as follows;

1. Böhler angle was improved from -2.4° to 20.5° and Gissane angle was improved from 114.5° to 120.4° after the operation. The height of the calcaneus was improved from 75% to 95% and the width of the calcaneus was reduced from 119% to 106% of contralateral side.
2. The postoperative reduction status of the articular surface was analyzed by computed tomography(CT) in 18 patients and was found to be less than 2 mm of step-off in 10 cases, between 2 and 5 mm in 7 cases and more than 5 mm in 1 case.

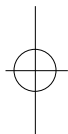
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3. Based on the assessment criteria of Salama et al., the functional results were excellent in 10 cases, good in 14 cases, fair in 10 cases, and poor in 4 cases. Unsatisfactory results were correlated with severity of articular comminution and failure to obtain accurate reduction of the articular surface.

4. Fourteen cases (36.8%), developed postoperative complications such as heel pain, causalgia and numbness, subtalar arthritis, marginal necrosis of wound, lateral subfibular impingement and heel bulging.

In conclusion, Because of high incidence of postoperative complications, careful and meticulous exposure technique in doing extensile lateral approach are necessary for a satisfactory outcomes.

Key Words : Calcaneal fracture, Extensile lateral approach

가 12 가
34 38 가 4 (11.8%) 가
30 (88.2%), 가 18 55
가 42 , 23
(61%), 15 (39%) , 4 (12%)
1,2,4,10-12, 22), 가 29 (85%)
가 , 11
(32%) 가 , ,
Benirschke²¹⁾가 Essex-Lopresti⁷⁾ 38
28 , 10 ,
Sanders²⁰⁾ 20 (가
A , 13 ; B , 5 ; C , 2), 13 (가
AB , 4 ; BC , 4 ; AC , 5), 5
10-12cm L
가
가
K- (Fig.
1). K-
1993 6 1996 12 H-
L- (cervical plate) (reconstruction plate)

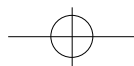


Fig 1. Extensile lateral approach. Two K-wires were inserted into the talus and reflected the skin flap completely to expose the subtalar joint.

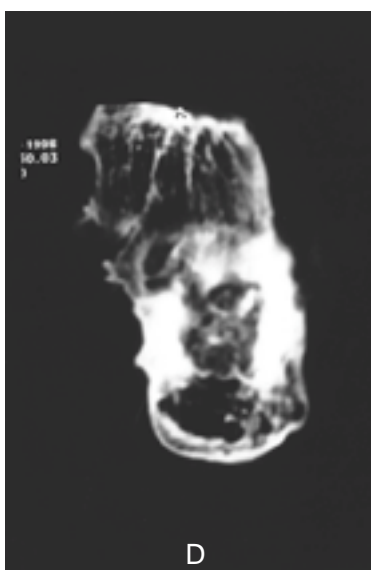
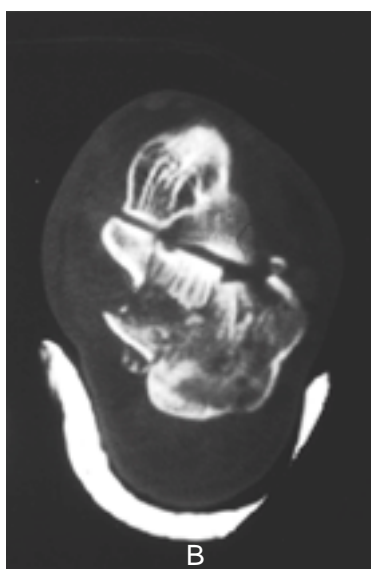
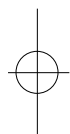


Fig 2-A,B. Initial lateral radiograph & CT film of 43 years old male showed joint depression, Sanders type IV fracture.
C,D. The lateral radiograph & CT film taken at 1 year 5 months (after removal of implant) showed the arthritic change of the subtalar joint.





20.5o , Gissane 114.5o
120.4o .
den , Br 75% 95% ,
119% 106%
(Table 1). 가
18 2mm 가 10
, 2-5mm 가 7 , 5mm 가 1 ,
, 2 Sanders Type II 2mm
, 가 Type IV
, 8 2mm 가 (Table
12 2).
2.
Salama¹⁹⁾ 가 (Table
3) . Essex-Lopresti
15 (53.6%), 9 (90%)
(Table 4), Sanders
II 18 (90%), III 6
, IV
(Table 5).
B hler Gissane , 가 18
, B hler -2.4o 가 18

Table 1. Radiologic results (*simple X-ray*)

Parameter	Preoperative	Postoperative
Böhler angle (degree)	-2.4	20.5
Gissane angle (degree)	114.5	120.4
Height (cm)	3.4 (75%*)	4.4 (95%*)
Width (cm)	4.5 (119%*)	4.0 (106%*)

* Compared with contralateral side

Table 2. Radiologic results (*Postop. CT Scan, n=18*)

	Articular incongruity (mm step-off)			Total
	< 2	2 - 5	> 5	
Type II*	8	2		10
Type III	2	3		5
Type IV		2	1	3
	10	7	1	18

* Sanders classification

Table 3. Criteria used in assessment of result(Salama)

Excellent :	Patient satisfied Normal mobility of joint Asymptomatic broadening of the heel No pain
Good :	Patient satisfied but occasional pain Walking ability unaffected Slight limitation of inversion-eversion Mild flat foot
Fair :	Patient not entirely satisfied(reserved) Pain after exertion Walking ability reduced Limitation of tarsal movements Special shoes
Poor :	Patient not satisfied Pain even on slight effort Walking ability markedly reduced limitation of joint movement Change of occupation

**Table 4.** Clinical results (*Essex-Lopresti classification*)

	Excellent	Good	Fair	Poor	Total
Joint depression	5	10	9	4	28
Tongue	5	4	1	0	10
Total	10 (26.3%)	14 (36.8%)	10 (26.3%)	4 (10.5%)	38 (100%)

Table 5. Clinical results (*Sanders classification*)

	Excellent	Good	Fair	Poor	Total
Type II	9	9	2		20
Type III	1	5	6	1	13
Type IV			2	3	5
Total	10	14	10	4	38

Table 6. Clinical results (*according to postop. CT Scan, n=18*)

	Excellent	Good	Fair	Poor	Total
<2mm	5	3	2		10
2-5mm	1	2	3	1	7
>5mm				1	1

가 2mm 8 (80%), 2-5mm 3
(45%), 5mm
(Table 6). ,

가

.

3.

14 (36.8%)

, lateral
subfibular impingement . Sanders IIA 1 ,

AC 1

2

4

가
hler

25).

가

Böhler

B
가

B hler

가

,

가

Crosby

5)

Böhler

Gissane

가

,

가

, B hler

-2.4o

,



20.5o , Gissane 114.5o
 120.4o , 8,16)
 96% , 106% .
 , 80%
 , Stephenson²⁴⁾
 , 가
 13,18,23) . Ross
 Sowerby⁷⁾ 가
 ,
 ,
 15,16)
 McReynolds¹⁴⁾ 가
 가 , 2 (Fig. 2).
 (lateral bulging)
 staple 9,17,23,24)
 82%
 Paley Hall¹⁶⁾, Ross Sowerby¹⁸⁾
 ,
 가 23,24)
 , 10
 가 Benirschke²¹⁾
 Palmer¹⁷⁾
 .
 (calcaneocuboid joint)
 L- ,
 , Edwin⁶⁾
 ,
 (calcaneofi-
 bular ligament)
 가 Barnard³⁾
 , 가 ,

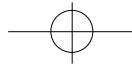
Figure 1 is a 3D scatter plot illustrating the relationship between three variables: tuber angle (in degrees), heel bulging (in mm), and lateral subfibular impingement (in mm). The tuber angle ranges from 0 to 10 degrees, heel bulging from 0 to 5 mm, and lateral subfibular impingement from 0 to 2 mm. The plot shows a positive correlation between tuber angle and heel bulging, and a negative correlation between heel bulging and lateral subfibular impingement.

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