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[]

: 가
Essex - Lopresti

Sanders

: 1993 1 2002 1

24 (26) 가

16 (17) Essex - Lopresti

17 Sanders , ,

Böhler , ,

Salama 가 ,

: 6 (12 ~8 8) , 9 ,

17 Sanders , 8 ,

9 Sanders IIA 5 , IIC 1 , IIIA 4 , IIIB 4 , IV 3

12 ,

5 .

가 1 Böhler
(Linear Regression, 7

correlation coefficient=0.40),

Sanders IIC 1

: 가 ,

: , ,

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* 2003

Table 1. Salama's Criteria of assessment

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
	Mild flat foot
Fair :	Patient not entirely satisfied (reserved)
	Pain after exertion
	Walking ability markedly reduced
	Limitation of tarsal movements
	Special shoes
Poor :	Patient not satisfied
	Pain even on slight effort
	Walking ability markedly reduced
	Severely limitation of joint movement
	Change of occupation

52.5 (27 ~74)

15 , 2 .

6 (1 ~8 8) .

Böhler 9.1° (-23°~32°) ,

12

1993 1 2002 1

Böhler 9.5° (-23°~32°) ,

5

Böhler 7.8° (0°~22°) .

6

2 ,

6

3

Essex-Lopresti⁹⁾

Sal-

(Table 1).

Zwipp ²¹⁾ Benirschke Sangeorzan²⁾

(extensile right-angle lateral incision)

ama¹⁸⁾ 가

Table 2. Essex-Lopresti classification and Sanders classification

Sanders	Essex-Lopresti	Tongue type	Joint Depression type	Total
IIA		1	4	5
IIC		1	0	1
IIIA		3	1	4
IIIB		2	2	4
IV		1	2	3
Total		8	9	17

Table 3. Postoperative mean after Treatment modalities according to Essex-Lopresti classification

Böhler angle	Fx type	Tongue type	Joint depression type
Mean angle after C/R & axial pinning*		22.2° (10°~32°)	26° (0°~39°)
Mean angle after O/R & I/F†		5°	38° (35°~40°)

(Kruskal-Wallis Test, $p>0.05$)

*Closed reduction and axial pin fixation by Essex-Lopresti method, †Open reduction and plate fixation by Zwipp method

Table 4. Results according to Böhler angle

Result	Excellent	Good	Fair	Poor	Total
Angle					
0°~10°	0	0	2	1	3
11°~20°	0	1	1	0	2
21°~30°	2	0	1	0	3
31°~40°	3	4	1	1	9
Total	5	5	5	2	17

(Linear Regression, correlation coefficient = 0.04)

3.5 mm (cannulated screw) 3.5 mm H-plate (Mathys®, Bettlach, Switzerland)

Epi info 2002 (CDC®) Win SAS
6.11 (Microsoft®)

1.

7

Sanders
IIA 1, IIC 1, IIIA 3, IIIB 6
2, 9
Sanders IIA 4, IIIA 1, IIIB 2, IV 2
(85.7%) 2 mm

Sanders III

5 (71.4%)

(Table 2).

Böhler

25.6° (0°~40°)

Böhler 22.2° (10°~32°),
1 5°

Böhler 26° (0°~39°),
3

Böhler 38° (35°~40°)

(Kruskal-Wallis test, $p>0.05$) (Table 3).

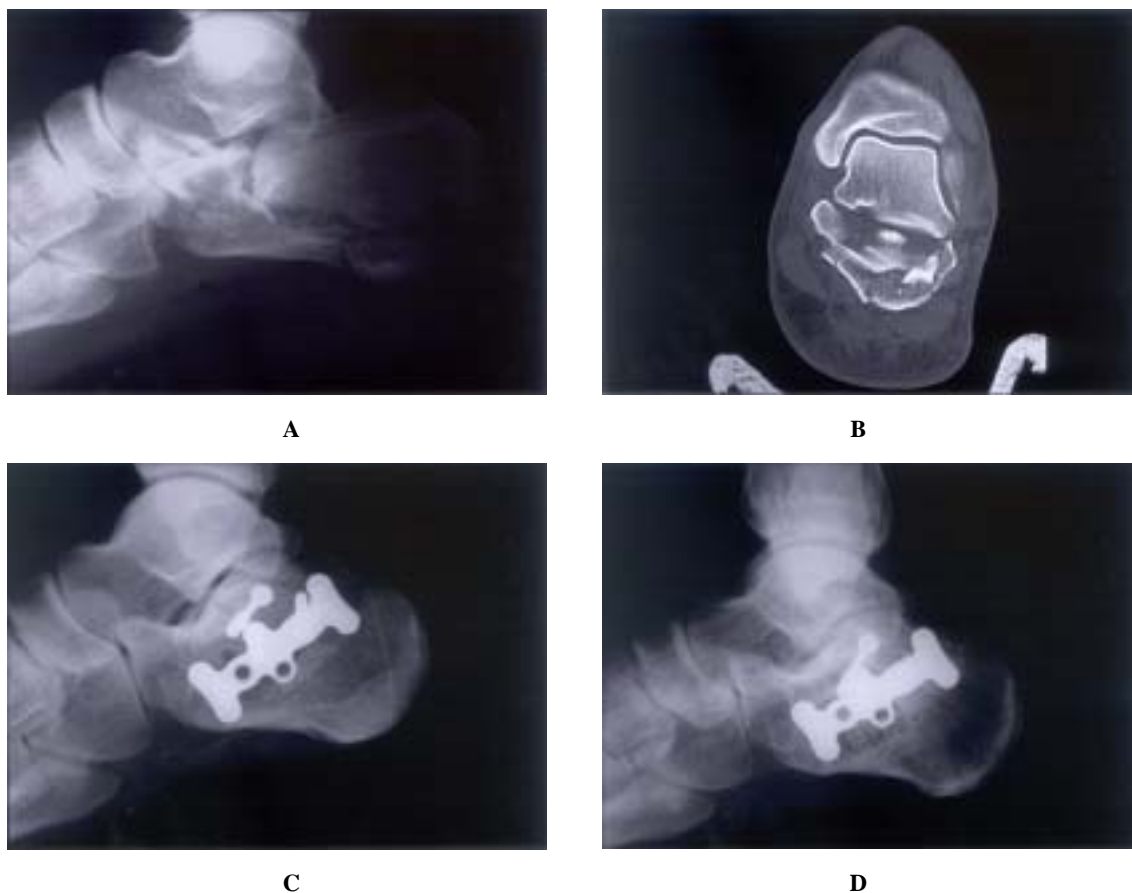


Fig. 1. 51 years olds female suffered fall down injury
A. Preoperative radiography: Essex-Lopresti tongue type with -16° in Böhler angle.
B. Preoperative CT scan: classified to Sanders type IV
C. Immediate postoperative plain radiography after open reduction and internal fixation: Böhler angle was restored to 34°
D. After 1 year 6 months, Böhler angle was not depressed and clinical outcome was good grade.

2. (Kruskal-Wallis test, $p>0.05$), Böhler
 (Linear Regression, correlation coefficient = 0.40)가 (Table 4).
 Sanders IV
 Böhler 34°
 (Fig. 1).
 Sander
 Böhler 32°

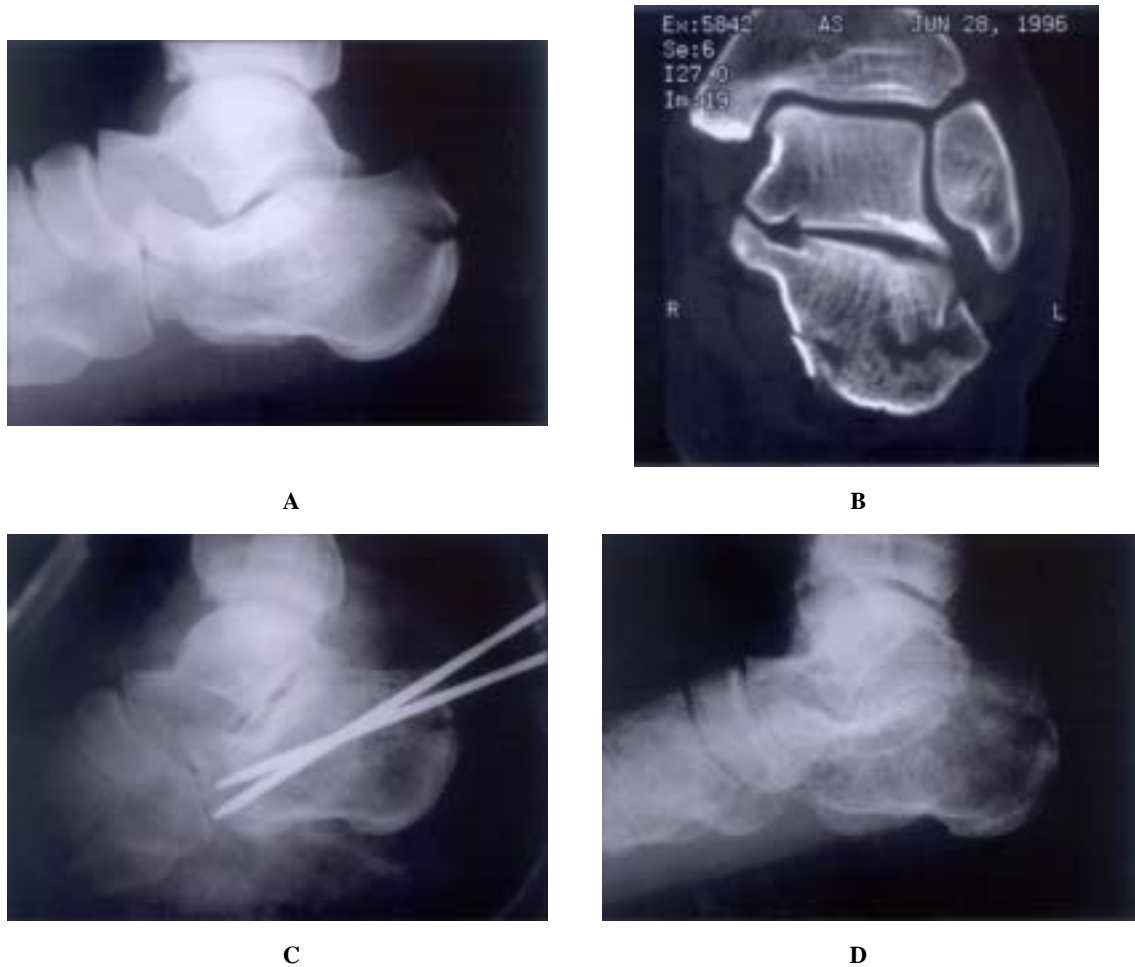


Fig. 2. 27 years olds male suffered fall down injury.

A. Preoperative radiography: Essex-Lopresti tongue type with 5° in Böhler angle.

B. Preoperative CT scan: classified to Sanders type IIA

C. Immediate postoperative plain radiography after Closed reduction and axial pin fixation: Böhler angle was restored to 32°

D. After 2 years Böhler angle was decreased to 8° and clinical outcome was poor grade.

Böhler 8° Kang ¹¹⁾ 90%

(Fig. 2).

1952 Essex-Lopresti⁹⁾

가

Burkley Meek⁴⁾

가

Cave⁷⁾

가

75%

Sanders¹⁹⁾

Kim¹²⁾ Böhler
, Loucks Burckely¹⁴⁾
Essex-Lopresti Böhler
가
Böhler 가
Koh Kim¹³⁾ 27 14
Essex-Lopresti 77.7% bner¹⁰⁾ Böhler
가
, Park¹⁵⁾ 103 , Böhler
가
70.9% Böhler
Tornetta¹⁷⁾ 가
Essex-Lopresti ,
Sanders IIC San-
, Essex-Lopresti Sanders IIC ders IIC 14.3%
가 Sanders III 71.4%
Kang¹¹⁾ Sanders II II
Essex-Lopresti 가
Burckley Meek⁴⁾ 가
가 가
가
1~3,20) Burdeaux³⁾ 가
가
Carr⁶⁾
가

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Abstract

Usefulness of CT Scan in Treatment of Calcaneal Fracture

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Purpose: Accurate fracture classification is difficult because of its complex bony architecture and there is no definitive treatment modality according to fracture pattern or classification. We evaluated the fracture pattern using simple radiography and CT scan simultaneously and then the result according to treatment modalities and fracture classification.

Materials and Methods: We evaluated 24 patients (26 cases) who suffered intraarticular calcaneal fracture were treated with closed reduction and axial pinning or open reduction and plate fixation. There were had taken CT scan. Fractures were classified with two different manner using both plain radiography and CT scan. Essex-Lopresti classification was made with plain radiography and Sanders classification was made with CT scan. Radiographic results were measured of preoperative and postoperative Böhler angle on plain x-ray. 16 patients (17 cases) were analyzed for clinical outcomes by Salama's criteria focused on pain, patients' satisfaction, walking abilities and usage of orthosis.

Results: Mean followed-up period was 6 years (range 1~8.8 years). 8 cases were classified into tongue type intraarticular calcaneal fractures by plain radiography and 9 cases into joint depression type. According to Sanders classification by CT scan, 5 cases were classified into type IIA, 1 case IIC, 4 cases type IIIA, 4 cases IIIB and 3 case type IV. 12 fractures were reduced by closed reduction and axial fixation and 5 cases by open reduction and internal fixation. There was no correlation between clinical outcomes and treatment modality but there was linear correlation between clinical outcomes and postoperative Böhler angle (correlation coefficient = 0.04). In 8 cases of tongue type by plain radiography, sander type IIC was only 1 case which calcaneal tuberosity connected to articular facet but articular involvements were observed in remaining cases.

Conclusion: Accurate evaluation of articular facet in calcaneal fracture by CT scan is necessary to determining to select the treatment option.

Key Words: Calcaneal fracture, Intraarticular fracture, CT scan

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