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	106.2 ± 10.07,
	104.48 ± 10.1
	0.568 ± 0.076,
0.038	0.637 ± 0.037,
	0.648 ±
	(P>0.05).
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2 (Table 1)
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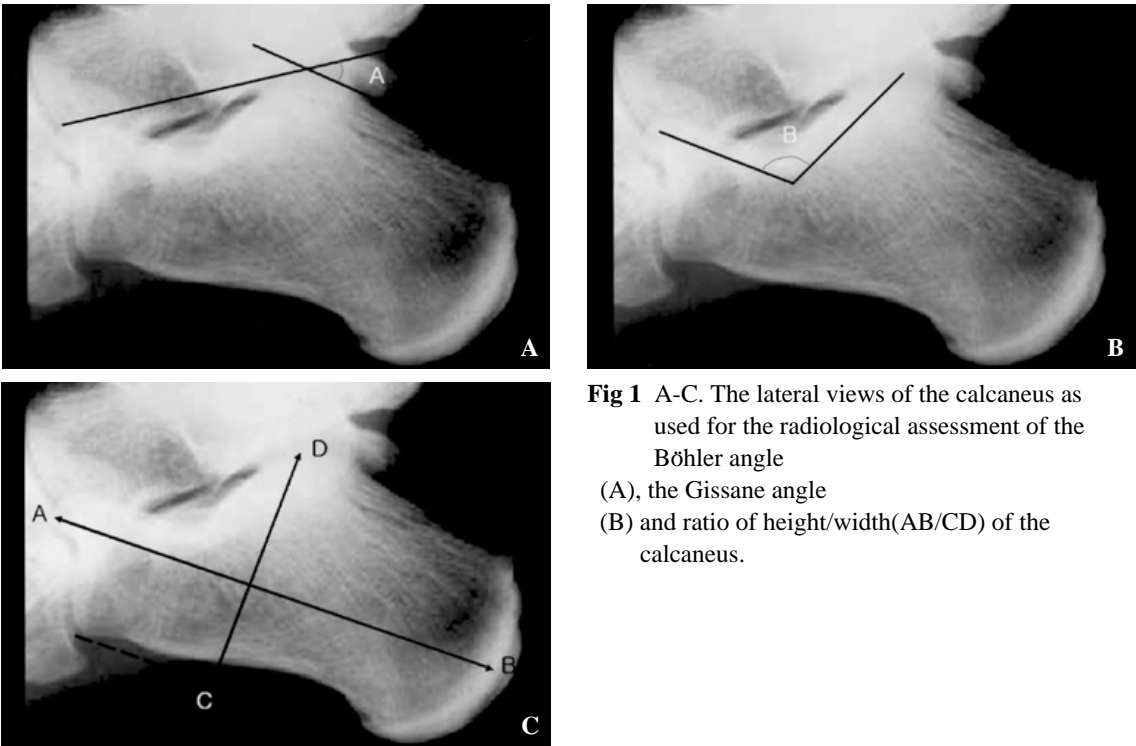


Fig 1 A-C. The lateral views of the calcaneus as used for the radiological assessment of the Böhler angle (A), the Gissane angle (B) and ratio of height/width(AB/CD) of the calcaneus.

Table 1. All case study

Böhler angle			Gissane angle			Height/width ratio		
Preop	Postop	Follow-up	Preop	Postop	Follow-up	Preop	Postop	Follow-up
-7 ± 18	21 ± 7	19 ± 7	104 ± 17.87	106.2 ± 10.07	104.48 ± 10.097	0.568 ± 0.076	0.637 ± 0.037	0.648 ± 0.038

Table 2. Fracture pattern

Fracture pattern	Böhler angle			Gissane angle			Height/width ratio		
	Preop	Postop	Follow-up	Preop	Postop	Follow-up	Preop	Postop	Follow-up
Depression type	-9 ± 17	19 ± 6.1	18 ± 7	107 ± 18	107 ± 11.2	105 ± 11.1	0.554 ± 0.083	0.63 ± 0.036	0.641 ± 0.044
Tongue type	-1 ± 20	25 ± 9	23 ± 7	97 ± 15	105 ± 7.1	103 ± 7.1	0.6 ± 0.046	0.651 ± 0.04	0.661 ± 0.025

가). 1 104 ± 17.87 (70 , 148
2), 106.2 ± 10.07 (85 , 135),
(P>0.05). 104.48 ± 10.1 (80 , 132)

1.72 25 ± 9 , 23 ± 7 .
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(P>0.05). / 0.568 ± 0.076 (107 ± 11.2 , 105 ± 11.1
 0.384 , 0.672), 0.637 ± 0.037 (0.564 , , 97 ± 15 , $105 \pm$
 0.704)), 0.648 ± 0.038 (0.587 , 7.1 , 103 ± 7.1 .
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(P<0.05). 0.554 ± 0.083 , 0.63 ± 0.036 , $0.641 \pm$
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3. , , , 1 ± 16 , 26 ± 7.7 , 28 ± 5
1) (Table 2) , K- -
 5 ± 17 , 19 ± 6.9 , 18 ± 7
 5 ± 17 , 19 ± 6.1 , 18 ± 7 H- 116
, , -1 ± 20 , ± 25 , 118 ± 13 , 113.3 ± 14.17

Table 3. Fixation method

Fixation method	Böhler angle			Gissane angle			Height/width ratio		
	Preop	Postop	Follow-up	Preop	Postop	Follow-up	Preop	Postop	Follow-up
H-plate	1 ± 16	26 ± 7.7	28 ± 5	116 ± 25	118 ± 13	113.3 ± 14.17	0.637 ± 0.061	0.649 ± 0.038	0.676 ± 0.045
K-wire	-5 ± 17	19 ± 6.9	18 ± 7	104 ± 15.7	105.3 ± 9.14	103 ± 9.54	0.567 ± 0.065	0.635 ± 0.037	0.646 ± 0.039
S-P	-25 ± 17	25 ± 9	18 ± 6	96 ± 24	103 ± 9	104 ± 8.6	0.515 ± 0.12	0.635 ± 0.042	0.64 ± 0.021

Table 4. Age

Age	Böhler angle			Gissane angle			Height/width ratio		
	Preop	Postop	Follow-up	Preop	Postop	Follow-up	Preop	Postop	Follow-up
< 40 years	-8 ± 20	22 ± 8	20 ± 7	104 ± 19	106 ± 11	104 ± 12	0.551 ± 0.076	0.624 ± 0.036	0.634 ± 0.035
> 40 years	-5 ± 15	19 ± 6	18 ± 8	104 ± 17.5	106 ± 9	105 ± 7.2	0.591 ± 0.073	0.655 ± 0.031	0.667 ± 0.033

Table 5. Sex

Sex	Böhler angle			Gissane angle			Height/width ratio		
	Preop	Postop	Follow-up	Preop	Postop	Follow-up	Preop	Postop	Follow-up
Male	-7 ± 18	20 ± 7	19 ± 7	105 ± 18	107 ± 11	105 ± 11	0.563 ± 0.08	0.635 ± 0.039	0.648 ± 0.04
Female	-6.6 ± 17	23 ± 10	22 ± 9	99 ± 16.7	103 ± 7.3	104 ± 7.9	0.593 ± 0.054	0.649 ± 0.025	0.649 ± 0.027

, K- ± 11 , 99 ± 16.7
104 ± 15.7 , 105.3 ± 9.14 , 103 , 103 ± 7.3 , 104 ± 7.9 .
± 9.54 . / H- /
0.637 ± 0.061, 0.649 ± 0.563 ± 0.08, 0.635 ± 0.039, 0.648 ± 0.04
0.038, 0.676 ± 0.045 , K- , 0.593 ± 0.054, 0.649
0.567 ± 0.065, 0.635 ± ± 0.025, 0.649 ± 0.027 .
0.037, 0.646 ± 0.039 .
(P>0.05).
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0.551 ± 0.076, 0.624 ± 0.036, 25),
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0.591 ± 0.073, 0.655 ± 0.031, 0.667 ± 가
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Abstract

The Radiologic Evaluation of Treatment Outcome in Intra-articular Calcaneal Fracture by Open Reduction without Bone Graft

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Purpose : The purpose of this study was to investigate the efficacy of bone graft use in the treatment of displaced intra-articular calcaneal fractures.

Materials and Methods : We analysed retrospectively 40 displaced intra-articular calcaneal fractures, which had undergone open reduction and internal fixation without bone graft from June 1989 to July 1998. Radiological assessments were made from the lateral view of the affected calcaneus, recording the Böhler angle, the Gissane angle and ratio of height/width of the calcaneus. Matching criteria included Essex-Lopresti classification, method of fixation, age, and sex.

Results : The mean preoperative Böhler angle was -7° (standard deviation [SD] 18°), postoperative Böhler angle was 21° (SD 7°), last follow-up Böhler angle was 19° (SD 7°). Böhler angle increased a mean 28° (maximum 70° ; minimum 2°). The preoperative Gissane angle was 104° (SD 17.87°), postoperative Gissane angle was 106.2° (SD 10.07°), last follow-up Gissane angle was 104.48° (SD 10.1°). The preoperative ratio of height/width of the calcaneus was 0.568 (SD 0.076), postoperative ratio was 0.637 (SD 0.037), last follow-up ratio was 0.648 (SD 0.038). There was no significant differences in fracture pattern, method of fixation, age, and sex ($P>0.05$).

Conclusion : The result of this study showed that there was no significant change in serial radiologic evaluation. Bone graft was not served to the effectiveness or security in the treatment of displaced intra-articular calcaneal fractures.

Key Words : Calcaneus, Displaced intra-articular calcaneal fracture, Bone graft

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