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= Abstract =

Treatment of the Posterior Malleolar Fracture

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Posterior malleolar fractures are usually caused by an abduction or external rotation injury. Indications for open reduction of the posterior malleolar fracture depend on its size and the amount of displacement. If the fragment of the posterior malleolus involves more than 25% to 30% of the articular surface, it should be treated by anatomical reduction and internal fixation. Authors analysed twenty-three patients of ankle fractures with the posterior malleolar fractures who were treated in Kangbuk Samsung Hospital between March 1993 and March 1997. Thirteen patients whose posterior malleolar fracture involved less than 30% of articular surface were treated conservatively (Group 1), while ten patients with involvement of more than 30% of articular surface were treated by open reduction and internal fixation. Among the ten patients treated by open reduction, the five patients were indirectly fixed through anterior approach (Group 2), another five patients were directly fixed through posterior approach (Group 3). In group 1, the patients whose posterior malleolus involved more than 25% of articular surface have unsatisfactory results compared to patients whose posterior malleolus involved less than 25% of articular surface ($P < 0.04$). The results of the treatment were better in those directly fixed through posterior approach than in those indirectly fixed through anterior approach regardless of size of the fragment ($P < 0.05$).

Key Words : Posterior malleolus, Ankle fracture, Direct fixation, Indirect fixation

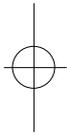
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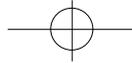
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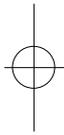




1 (5%)
 , pilon (mortise view) Lauge-Hansen⁷⁾
 가
 25-30%
 2mm 가 (tension-band wiring)
 9,10) (syndesmosis)
 1-
 2cm
 6) 1993 3 1997 3 (trans-fixation screw)
 30%
 가
 (1), 30%
 , 가
 3-4 , 6-
 8
 1.
 1993 3 1997 3
 24 15
 23
 13 1 ,
 5 2 ,
 5 3
 가 16 (71%), 가 7
 (29%) , 44.9 (20 - 70)
 , 17 (76%) 가
 , 4 (14%), 1 (5%),

Table 1. Criteria used in assessment of result (Meyer)

Result	Clinical
Excellent	No pain, full range of motion
Good	Pain after strenuous activity, less than 15° of motion lost
Fair	Pain with normal activity, 15-30° motion lost
Poor	Consistent pain, over 30° motion lost or ankle arthrodesis



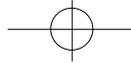


Table 2. Roentgenographic criteria used to evaluate the quality of reduction (Cedell)

Bone fragment	Rating	Criteria
Lateral malleolus	Good	No lateral or medial displacement ; dorsal or ventral displacement < 2mm
	Fair	Lateral displacement 2mm ; dorsal or ventral displacement 2-5mm
	Poor	Lateral displacement >2mm ; dorsal displacement >5mm
Medial malleolus	Good	No medial or lateral displacement ; dorsal, ventral, proximal, or dorsal displacement < 2mm
	Fair	No medial or lateral displacement ; dorsal, ventral, proximal, or distal displacement 2-5mm
	Poor	Displacements same as for fair rating but larger ; also lateral displacement, angulation or rotation
Posterior malleolus	Good	Proximal displacement < 2mm
	Fair	Proximal displacement 2-5mm
	Poor	Proximal displacement > 5mm and talus displaced posteriorly
Talus & medial side of the mortise	Good	No displacement of talus or medial widening
	Fair	Widening of mortise medially < 2mm
	Poor	Widening of mortise medially 2mm
Reduction of the syndesmosis	Good	2.5 - 4mm wide or equal to normal (on follow-up stress roentgenograms)
	Fair	2mm wider than normal
	Poor	> 2mm wider than normal

(Table 2)

, , 20
(mortise view)

(gap)

Magnuson⁸⁾

1

(tibial plafond) 1cm

(incisura fibularis tibiae)

(Fig 1).

(arthrosis)

(Table 3).

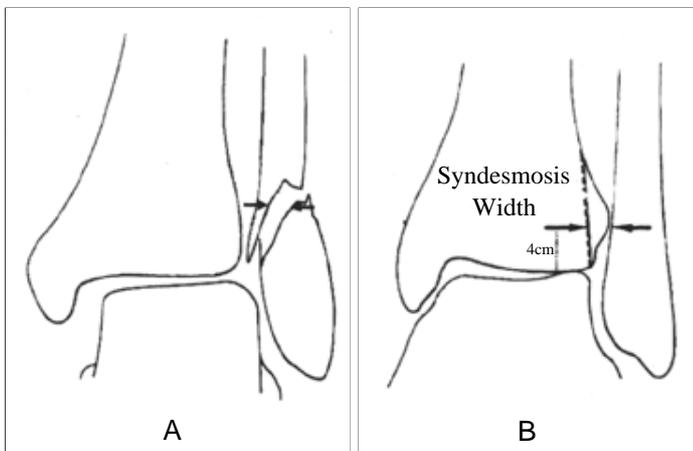


Fig 1. Technique used to measure the width of the syndesmosis, the displacement of the lateral malleolus.

- A. The lateral displacement of the distal fibular fragment is measured as the widest horizontal dimension of the gap between the fragment (arrow).
- B. The width of the syndesmosis is the horizontal distance from the tibial incisura line (notch) to the medial border of the fibula measured one centimeter proximal to the joint surface of the tibia.

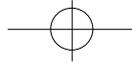


Table 3. Stages of ankle arthrosis (Magnuson)

Stage	Description
0	Normal articulation
+	Isolated osteophytes, no irregularity of the articulation The patients of stages 0 and 1 are pain-free and show a full function including sport activities in younger patients
++	Irregularities of the joint space, plain osteophytes, subchondral bone sclerosis Clinically, these patients were often pain-free or had mild changing complains; their walking range was rarely reduced. This moderate arthrosis appeared to be caused by some imperfection of the operative technique.
+++	Severe posttraumatic arthrosis ; near obliteration of the articular space. Clinically, these patients had severe pain, limitation of walking distance, ankle edema.

SPSS (independent 2mm sample test) 2 3 가 , 3 2

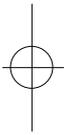
Mann-Whitney P test . Magnuson⁸⁾ (Table 3)

1 +1 6 , +2 7 2
+1 2 , +2 3 , 3
5 +1 .

23 12 5 Meyer¹¹⁾

(Table 1). 1 13 7 1
(54%) , 36 - 4
가 25% (Supination-External Rotation Stage IV)
가 6 가 30%
(P<0.04). 15 10 (fair)
2 5 2 (40%) +2 (Fig 2-A,B,C).
3
5 4 (80%) 2
(P<0.05). 44 - 3
Cedell⁴⁾

(Table 2) . 1 40%
25% . 14



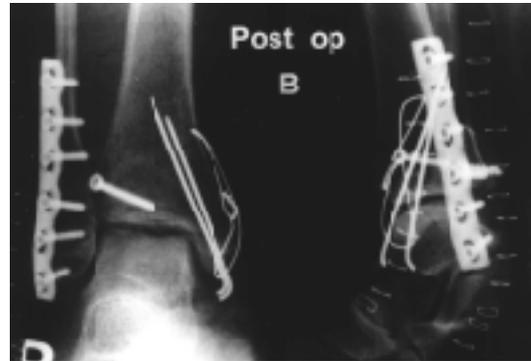
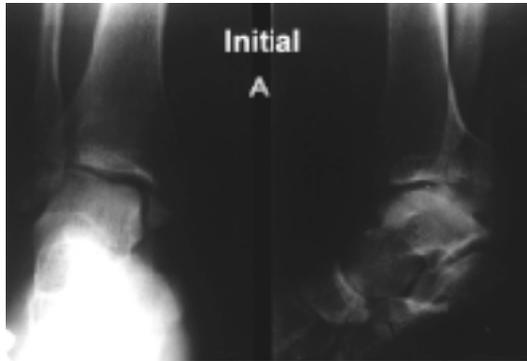
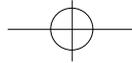


Fig 2-A. Supination-External rotation type : stage 4.
 B. The posterior malleolar fracture was fixed with one screw by anterior fixation indirectly.
 C. Postoperative 15 months after fractures, posterior malleolus showing with irregularities of the joint space and ++arthrosis.

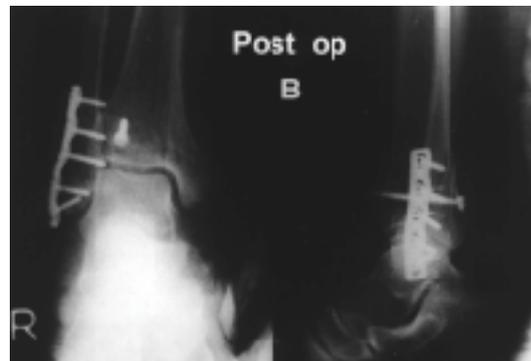
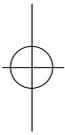


Fig 3-A. Supination-External rotation type : stage 3.
 B. The posterior malleolar fracture was fixed with one screw by posterior fixation directly.
 C. Postoperative 18 months after fractures, posterior malleolus showing with solid union and +arthrosis.



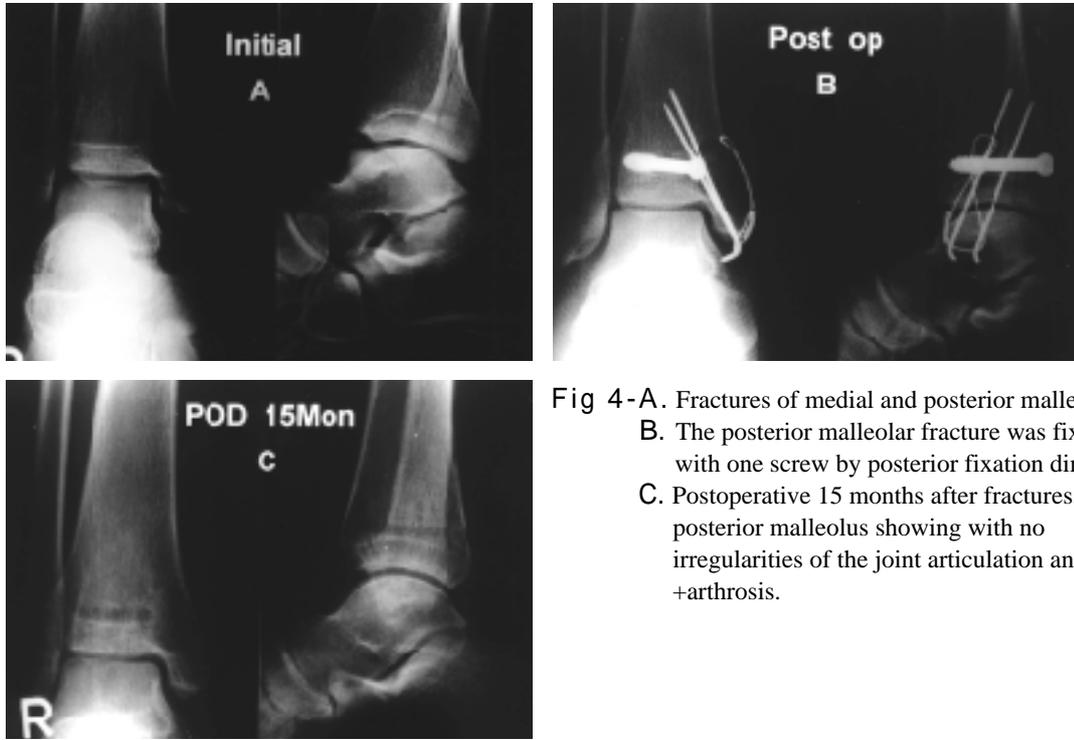
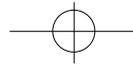
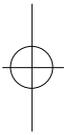


Fig 4-A. Fractures of medial and posterior malleolus.
 B. The posterior malleolar fracture was fixed with one screw by posterior fixation directly.
 C. Postoperative 15 months after fractures, posterior malleolus showing with no irregularities of the joint articulation and +arthrosis.



18 (good)
 +1 (Fig 3-A,B,C).
 3
 29
 35%
 10
 15
 (excellent) +1
 (Fig 4-A,B,C).

Lauge-Hansen⁷⁾
 가 -
 -
 - 14 가 , - 9

(static incongruity)
 (dynamic incongruity),

1940 Nelson Jensen¹³⁾

1/3
 (classical fracture) , 1/3
 (minimal fracture)

1/3

12)

1959 McLaughlin¹⁰⁾



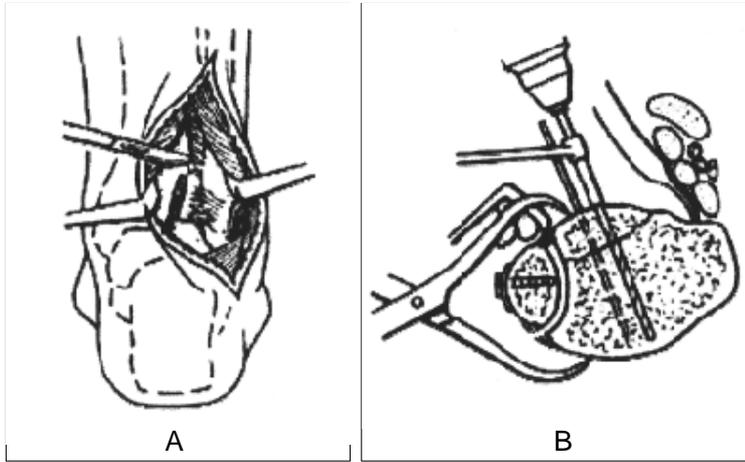
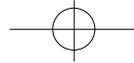
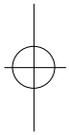


Fig 5. Direct screw fixation.
 A. Access between the Achilles and the flexor tendons, exposure of the fragment. The peroneal and flexor tendons are retracted laterally, the Achilles tendon medially.
 B. Cross sectional view of the direct screw fixation.



10%
 , 10 - 25%

가 20%

가 25%

가 and Wilson⁹⁾ 25%

가 , Harper⁵⁾ 25%

가 , Warner¹⁵⁾ (transfibular approach)

가 . McDaniel 2

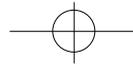
가 가 3

가 (Fig 5). Heim⁶⁾ 가

가 , 25% , 2mm 가 가

가 가 Yablon¹⁴⁾ (lag screw)

가 가 가 가



Chamley³⁾ 100% 가 Bruwell 가 25% 가 1993 3 1997 3 23

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