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AOC3 Pilon
- hybrid -

= Abstract =

Operative Results in AO Type C3 of Tibial Pilon Fracture

- Limited Internal Fixation and Hybrid External Fixation -

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The intraarticular fractures of the distal tibia has been the most difficult problem due to severe comminution of itself, little bone mass and poor circulation of soft tissue. Recently limited internal fixation with hybrid external fixation has been reported to provide a good clinical results for the severely comminuted or open pilon fractures as a AO type C3.

From February 1994 to February 1996, the authors analyzed the clinical and radiological results of 2 year follow-up in 7 cases of the AO type C3 pilon fractures who were treated with combination of limited internal fixation and hybrid external fixation.

6 cases had good or excellent clinical and radiological results without any serious

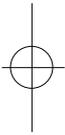
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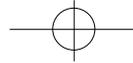
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complications such as skin sloughs, skin infection, malunion and nonunion, but one case had a nonunion who were treated with internal fixation and autogenous iliac bone graft.

We believe that the combination of limited internal fixation and hybrid external fixation that does not cross the ankle joint, provides the good clinical results in AO type C3 pilon fractures by early ankle joint motion.

Key Words : Tibia, Pilon fracture, Limited internal fixation, Hybrid external fixation

2 3

pilon

1911 Destot¹²⁾

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1994 2

1996 6

6,11,17,24)

pilon

23

AO

pilon

A

4

, B

8

C (C1 2 , C2 2 , C3 7) 11

가

hybrid

C3

2

8,9,15,20,26)

Ruedie

Allgower^{21,22)}

가

7

2 1

, 3 7

가가

2 3

23

27

68

45.6

가15

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, C3

7

38

60

47.6

18). 1993

Tometta

26)

가4

, 가3

1994 Karas

Weiner¹⁴⁾

pilon

23

13

가

hybrid

가4

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14,18,20-22,26)

3

AO

pilon

AO

C3

C3

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C1, C2

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AO

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14,18,20-22,26)

1994 2

1996 6

7

AO

C3

pilon

hybrid

hybrid

Ilizarov

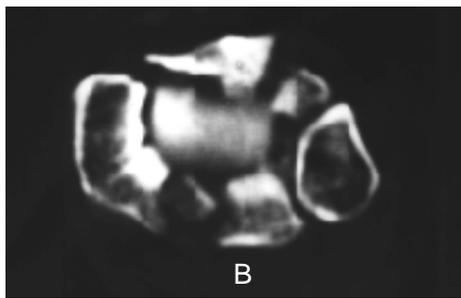
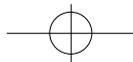


Fig 1-A. The plain roentgenogram of a 58-year-old man with AO C3 pilon fracture.
B. The CT roentgenogram shows severe intraarticular fracture of distal tibia.
C. Postoperative roentgenogram taken after limited internal fixation using malleolar and cannulated screws, hybrid external fixation and bone graft.
D. The plain roentgenogram taken 1 year 5 months after operation shows bone union and no evidence of arthrosis.

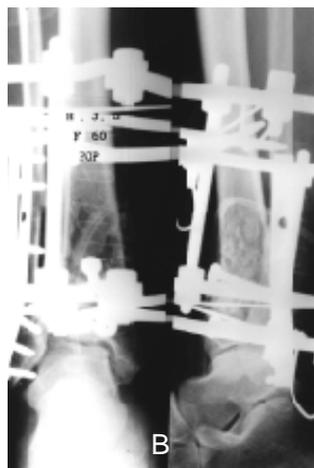
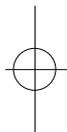


Fig 2-A. The plain roentgenogram of a 60-year-old woman with open AO C3 pilon fracture.
B. Postoperative roentgenogram taken after limited internal fixation using plate and screws, hybrid external fixation and bone graft.
C. The plain roentgenogram taken 1 year 7 months after operation shows bone union and no evidence of arthrosis.



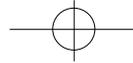
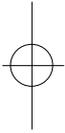


Table 1. Datas of 7 cases of AO C3 type pilon fracture

case	age/sex	cause	associated Injury	lateral malleolar fracture	bone graft	bone union	removal of ext. fixator
1	60 / F	motor vehicle accident	open fracture	+	+	17wks	18wks
2	58 / M	fall down	spine fracture	-	-	13wks	14wks
3	38 / M	fall down	distal radius intraarticular fracture	+	+	nonunion	
4	41 / M	fall down	calcaneal fracture	+	+	16wks	17wks
5	52 / F	motor vehicle accident	open fracture	+	+	15wks	16wks
6	45 / M	fall down	spine fracture	+	+	12wks	14wks
7	39 / F	fall down	open fracture	+	+	13wks	15wks



100kg
 7cm
 Schanz 1.8mm
 2-3cm 2
 K- 가 K- Schanz 1
 4-0
 K- cannulated screws 가 가
 가
 " hybrid " - - 1 가
 2
 K- Ilizarov 가 가 가
 K- 1.8mm 가 Burwell Chanley¹⁰⁾ 가
 5-10mm (displacement), (anatomic), (fair), (poor)



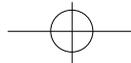


Table 2. Radiographic criteria of reduction (by Burwell and Chanley¹⁰⁾)

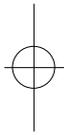
Anatomic			
No medial or lateral displacement of the medial and lateral malleoli	No angulation	No more than 1 mm longitudinal displacement of the medial and lateral malleoli	No more than 2 mm proximal displacement of a large posterior fragment
No displacement of the talus	Fair		
	No medial or lateral displacement of the medial and lateral malleoli	No angulation	2-5 mm posterior displacement of the lateral malleolus
	2-5 mm proximal displacement of a large posterior fragment	No displacement of the talus	
poor			
Any medial or lateral displacement of the medial and lateral malleoli	More than 5 mm posterior displacement of the lateral malleolus or more than 5 mm displacement of the posterior malleolus		Any residual displacement of the talus

(excellent),	(good),	(fair),	(poor)
1	6	14.3	(12
- 17)		15.7	(14 - 18)
가 Burwell	Charnley ¹⁰⁾	가(Table 2)	
가 Tometta ²⁶⁾	가(Table 3)	5	
1	1	3	
1	6	가	
	4	가	가
	.3		
1			

Table 3. Criteria for clinical results. (by Tornetta²⁶⁾)

Grade	Pain	Range of Motion	Angulation
Excellent	None	D > 5 P > 40	< 3
Good	Intermittent, relieved by NSAID	D = 0-5 P = 30-40	3-5 valgus <3 varus
Fair	Pain activities of daily living relieved by narcotics	D = -5-0 P = 25-30	5-8 varus 3-5 varus
Poor	Intractable	D < -5 P < 25	>8 valgus >5 varus

pilon	(Axial compression)
14,18)	
25)	
Ruedi	Allgower ²²⁾
5%, Bone ⁶⁾	1%
19,22)	1% - 10%
Weiner ¹⁴⁾	Mast ¹⁸⁾ Karas



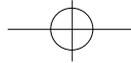


Table 4. Radiographic and clinical results and evaluations

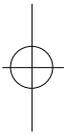
case	age/sex	*radiographic reduction	**clinical results and evaluation				
			pain	range of motion	angulation	cx	evaluation
1	60 / F	anatomic	none	D = 7 P = 45	0°	none	excellent
2	58 / M	anatomic	none	D = 10 P = 40	2° valgus	pin tract infection	excellent
3	38 / M	fair	intermitent relieved by NSAID	D = 0 P = 25	5° varus	nonunion	fair
4	41 / M	anatomic	none	D = 8 P = 43	0°	none	excellent
5	52 / F	anatomic	none	D = 7 P = 42	2° varus	pin tract infection	excellent
6	42 / M	anatomic	none	D = 8 P = 43	0°	pin tract infection	excellent
7	39 / F	anatomic	intermitent relieved by NSAID	D = 5 P = 34	2° valgus	none	good

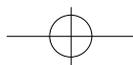
* by Burwell and Chanley¹⁰⁾

** by Tornetta²⁶⁾

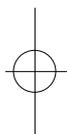
(rotational force)

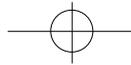
5가
2,3,4
Ruedi
AO
Ovadia Beals²⁰⁾
Allgower²²⁾ 2
pilon
type A, B, C
1,2,3
Lauge-Hansen¹⁶⁾ 6)
type A,
type B,
type C
1
Ruedi Allgower²²⁾
가
2
가
3
C1,
C2,
C3
pilon
가
Ovadia Beals²⁰⁾
Ruedi Allgower²²⁾





3 13) 6,14,26) 가
 3 cannulated screw 가
 buttress plate 14) Salter 23) 가
 , Kellam Weddell¹⁵⁾
 8,11,17,24), 1969 가 Ruedi Allgower²¹⁾ 5가 . 1993
 Tometta ²⁶⁾ Ruedi 3 hybrid 69%
 1994 Karas "biologic principles"
 Weiner¹⁴⁾ pylon hybrid
 buttress plate 70%-80%
 pylon 15,19-22) AO C3 hybrid C3 pylon 6
 Mast ¹⁸⁾ , 1
 37 pylon 78% Bourne ⁹⁾ 19 가
 Ruedi 3 44% Teeny Wiss²⁵⁾ Ruedi 3 4
 75% Ruedi 3 14.3 (12 -17) 15.7
 (14 -18) 3) 5)
 1965 Scheck²⁴⁾ 4 가 5 가
 가 pylon 가 ,4-6 hybrid
 Waddell¹⁵⁾ half-pin (ligamentotaxis) pylon
 가 가 AO C Tometta ²⁶⁾ 1 8,18,26) 1

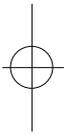


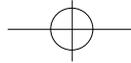


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 hybrid
 AO C3 pilon
 1994 2 1996 2 AO
 Type C3 pilon 7 " biologic principle "
 hybrid
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 가 6 , 1 , 가
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 6 14.3
 15.7 .
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 hybrid
 AO C3 pilon

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