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< >  
:  
: 1990 3 2000 12 211 230 Fernandez  
4 (4, 5) 22  
16 18 (10 38) .  
demerit point rating system 가 ,  
: Demerit point rating system 가  
22 16 (72.7%) , 16 7 (43.8%)  
가  
0.6 mm, 0.4 mm ,  
2.3 , 1.5 , 2.5 , 2.2 (p < 0.05).  
9 4 ,  
1 2 , 2 .  
: Fernandez 4 (4, 5) ,  
:  
2001 ( )

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Fernandez

(Table 1)

. Fernandez

가

Fernandez 1

가 2

3

가

가

K-

4  
K-

1)

가

5 (high-velocity)

K-

Fernandez

<sup>5)</sup>4 (4 -22 , 5 -16 ) 38

(ligamentotaxis)

16 (4 -9 , 5 -7 )(42.1%),

22 (4

-13 , 5 -9 )(57.9%)

demerit point rating

system<sup>10)</sup>(Table 2)

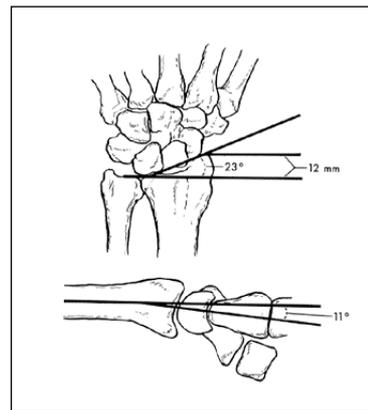
. Demerit point rating

system

1990 3 2000 12  
211 230 Fernandez 4 (4  
,5 )  
22 16  
18 (10 38 )

**Table 1.** Fernandez

1	
2	
3	
4	,
5	(high-velocity)



**Figure 1.** The three parameters and normal average values of volar tilt, radial inclination, radial length

**Table 2.** Demerit point rating system of Gartland and Werley modified by Sarmiento

	Point
Residual Deformity	
Prominent ulnar styloid	1
Residual dorsal tilt	2
Radial deviation of hand	2 to 3
	Point range 0 to 3
Subjective Evaluation	
Excellent: no pain, disability, or limitation of motion	0
Good: occasional pain, some limitation of motion, no disability	2
Fair: occasional pain, some limitation of motion, feeling of weakness in wrist, no particular disability if careful, activities slightly restricted	4
Poor: pain, limitation of motion, disability, activities more or less markedly restricted	6
	Point range 0 to 6
Objective Evaluation	
Loss of dorsiflexion	5
Loss of ulnar deviation	3
Loss of supination	2
Loss of palmar flexion	1
Loss of radial deviation	1
Loss of circumduction	1
Pain in distal radio-ulnar joint	1
Grip strength - 60% or less of opposite side	1
Loss of pronation	2
	Point range 0 to 5
Complications	
Arthritic change	1
Minimum	3
Minimum with pain	2
Moderate	4
Moderate	3
Moderate with pain	5
Severe	1 to 3
Severe with pain	1 to 2
Nerve complications (median)	
Poor finger function due to cast	
	Point range 0 to 5
End-Result Point Ranges	
Excellent	0 to 2
Good	3 to 8
Fair	9 to 20
Poor	21 and above

가  
(Table 2).

(Fig 1).  
가  
Fernandez 4  
Wilcoxon score system (SAS window v 6.0)  
가  
Fernandez 4 38 30  
가8 가  
20 40 가 31 (81.6%)  
가20 (52.6%) 가  
가9 (23.7%) Demerit point  
rating system  
22  
16 (72.7%)  
16 7 (43.8%) (Table 3).

**Table 3.** Analysis for results by treatment method

Method/Result	Excellent	Good	Fair	Poor	total
ORIF	2	5	6	3	16
ORIF & EF	7	9	6	0	22

\* ORIF : open reduction and internal fixation  
\* EF : external fixation

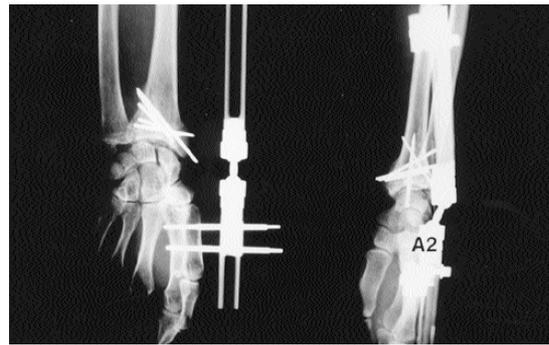
**Table 4.** Results by radiologic assessment

	ORIF	ORIF & EF
Radial shortening (mm)	0.6	0.4
Radial inclination (degree)	2.3	1.5
Volar tilt (degree)	2.5	2.2

\* ORIF : open reduction and internal fixation  
\* EF : external fixation

0.6 mm, 0.4 mm  
2.3 , 1.5  
2.5 , 2.2 (p <  
0.05)(Table 4).  
4 , 1  
2 , 2  
K-

가 . Cooney<sup>3,4)</sup>  
20  
10mm  
가  
가20 , Weber Szabo<sup>11)</sup>  
90  
가가  
가  
가  
가  
Fernandez 4  
38  
가  
가  
가  
Horesh<sup>7)</sup>



**Figure 2.** A 56 year-old man with Fernandez type fracture of Lt. distal radius by traffic accident. End result point of range is good.

**A1:** Preoperative radiograph.

**A2:** Postoperative radiograph after ORIF and external fixator.

**A3:** Radiograph of postoperative 17 months, fracture is well united. radial length - 12 mm radial inclination - 20 degrees volar tilt - 0 degrees

91%

Zagorski<sup>12)</sup>

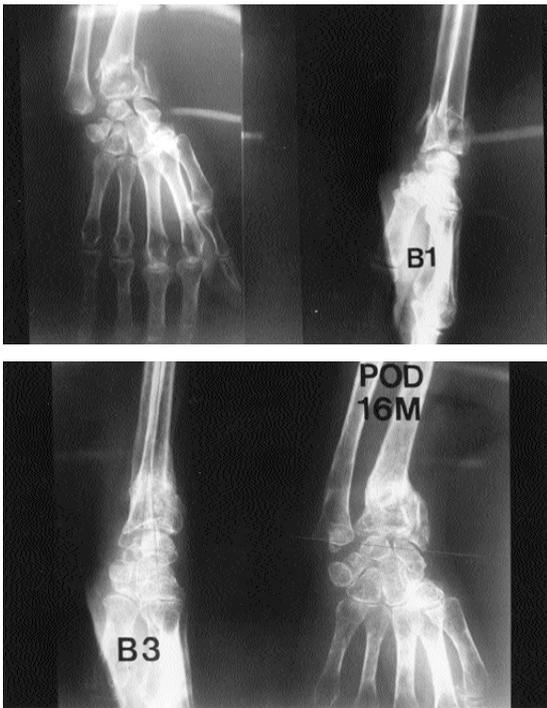
8).

가 K-screw 가  
Fernandez 4 Fernandez 4  
22 16

(Fig. 2) 0.6 mm, 0.4 mm  
(Fig. 3) 2.3, 1.5, 2.5, 2.2  
(p < 0.05). Sarmiento  
10) demerit point rating system 가

Lidstrom<sup>9)</sup>  
, Frykman<sup>6)</sup> 가  
, Knirk Jupiter  
가 11%

가  
. Cooney<sup>3,4)</sup> Horesh<sup>7)</sup>  
80 90%  
7 (43.8%) 16  
(72.7%) 22 16



**Figure 3.** A 71 year-old woman with Fernandez type fracture of Lt. distal radius by fall-down. End result point of range is poor.

**B1:** Preoperative radiograph.

**B2:** Postoperative radiograph after ORIF

**B3:** Radiograph of postoperative 17 months, fracture is well united. radial length - 3 mm radial inclination - 8 degrees volar tilt - 0 degrees

pin , , pin , 가 , 2). Fernandez 4 (4 , 5 ) , .

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## Abstract

## Surgical treatment using external fixator for unstable intra-articular fracture of distal radius

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**Purpose:** To analyze the results of surgical treatment using external fixator for unstable intra-articular fracture of distal radius.

**Material and methods:** We investigated 38 cases of distal radius fracture from Mar. 1990 to Dec. 2000. The patients were followed up for average 18 months postoperatively. We compared the results of 22 cases, treated with open reduction and internal fixation (ORIF) to the results of 16 cases, treated with ORIF and external fixation. We evaluated the results of the mean loss of radial length, radial inclination, volar tilt and traumatic arthritis according to demerit point rating system above the Fernandez classification .

**Results:** According to demerit point rating system, excellent to good results were obtained in 72.7% at ORIF and external fixator, compared to 43.8% at case of ORIF only. In the last follow up, the mean loss of radial length was 0.6mm in case of ORIF, but 0.4 mm in case of ORIF and external fixator, the mean loss of radial inclination was 2.3 and 1.5 degrees, the mean loss of volar tilt was 2.5 and 2.2 degrees, respectively ( $p < 0.05$ ). Postoperative complications were developed in 9 cases. Malunion was in 4 cases of ORIF and external fixator, in 2 cases of ORIF. Metacarpal bone fracture was in 1 case of ORIF and external fixation. Traumatic arthritis was in 2 cases of ORIF.

**Conclusion:** Open reduction and internal fixation combined with external fixation was thought to be a better method than open reduction and internal fixation for the treatment of unstable intra-articular fractures of the distal radius of the Fernandez classification and , because that was more comfortable and convenient to patients and was useful to prevent late displacement.

**Key Words:** Radius, Unstable intraarticular fracture of distal radius, External fixator.

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