

12, 2, 1999 4

The Journal of the Korean Society of Fractures
Vol.12, No.2, April, 1999

= Abstract =

External fixation versus percutaneous pinning for unstable Colles' fracture

Suk-Woong Yoon, M.D., Tae-Sung Hwang, M.D., Jong-Haeng Lee, M.D.

Department of Orthopaedic Surgery, Seoul Red Cross Hospital, Seoul, Korea.

The twenty-three cases of unstable Colles fracture were treated from Jan. 1994 to May 1998 at the department of orthopaedic surgery of Seoul Red Cross Hospital. Among them, the sixteen cases were treated with closed reduction with percutaneous pinning, others were treated with external fixator(Ace colles quadrilateral devices, USA). A retrospective study was made and evaluated using the Modification of Gartland and Werley's scoring system.

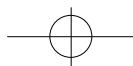
The result of this study were as follow:

1. The ratio of male to female was 9 cases(39%) to 14 cases(61%).
2. The causes were falling down from a height 12 cases(50%), slip down 8 cases(35%) and traffic accident 3 cases(13%).
3. The reduction loss did not occur with the patients treated external fixation using Ace colles quadrilateral device, however three cases of the reduction loss have occurred with the patients using percutaneous pinning.
4. According to the Modification of Gartland and Werley's scoring system, the results of

:

164 (110-102)

Tel : (02) 398 - 9441 Fax : (02) 398 - 9439



external fixation were excellent 4 cases(58%), good 1 case(14%), fair 1 case(14%) and poor 1 case(14%). and for percutaneous pinning, excellent 6 cases(38%), good 4 cases(25%), fair 2 cases(12%) and poor 4 cases(25%).

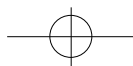
5. The complications of cases using external fixation were pin site infection 1 case and wrist stiffness 1 case, but for percutaneous pinning, reduction loss 3 cases. pin site infection 2 cases, wrist stiffness 2 cases, and decreased external rotation of forearm 3 cases.

Key Words : Colles ' fracture, external fixation, percutaneous pinning.

8)	1.5	colles quadrilateral device	16	7	Ace
10%	90%	가	1.		
35)	20%	가	Colles	50	50-
26)	22)	가	60 가 12 (52%)	가	
		가	가 9 (39%),	가 14 (61%)	가
		가	13		
50		가	2.		
		가	2.5cm		
,가	K-	Werley	14)		Gartland & (Table 1).
	1,11,21)	Werley	3 (intra-articular , displaced)		Gartland and
23	50	Ace Colles	3.		
K-			Gartland & Werley	3	
quadrilateral frame devices			23 가 12 (52%)	가	
			8 (35%),	가 3 (13%)	
1994 1	1998 5				
	가 가	50			
23		K-			

Table 1. Classification of Gartland & Werley

Stage	
1	extra-articular, displaced
2	intra-articular, undisplaced
3	intra-articular, displaced

**Table 2.** Degree of final range of motion

Op. method	Ace colles quadrilateral device (degree)	Percutaneous pinning(degree)
Dorsiflexion	60.2(35-70)	57.8(35-70)
Plantar flexion	53.4(35-70)	50.3(30-60)
Pronation	66.5(40-80)	65.6(40-80)
Supination	65.2(40-80)	63.5(40-80)
Ulnar deviation	18.8(15-20)	18.2(15-20)
Radial deviation	21.7(15-30)	18.3(15-25)

Table 3. Average of final range of motion (percentage of unaffected side)

Op. method	Ace colles quadrilateral device (degree)	Percutaneous pinning (degree)
Dorsiflexion-		
palmar flexion	77	75
Pronation-supination	86	81
Ulnar-radial deviation	89	86

Table 4. 3 cases treated with percutaneous pinning of alignment loss between Postop. and final follow up is shown in reontgenogram.

Cases	dorsal angle (degree)			radial angle (degree)			radial length (mm)		
	Postop.	final	change	Postop.	final	change	Postop.	final	change
case 1	4	3	1	19	15	4	10	6	4
case 2	3	2	1	18	13	5	9	6	3
case 3	5	3	2	22	15	8	11	8	3

4.

Ace Colles quadrilateral frame device

12 pound 5-10

8-

C-arm

K-

1.3mm 1.6mm

K- 가가 . K- 2-3

30

K- ulnar pinning . K -

3

. Colles frame

60-90

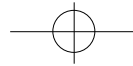
7-8cm 2 C-arm

C-arm

10-20 U 가

3-4 6-7

2-3 . 6-8 K-

**Table 5** Modified Gartland and Werley scoring system to evaluate Colles' fracture

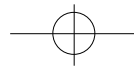
Result	Points
Residual deformity	1
Residual dorsal tilt	2
Radial deviation of hand	2-3
Maximum	6
Subjective evaluation	
Excellent - no pain, disability, or motion limitation	0
Good - occasional pain, slight limitation, no disability	2
Fair - occasional pain, some limitation, some disability	4
Poor - pain, limitation of movement, marked disability	6
Maximum	6
Objective evaluation	5
Loss of dorsiflexion < 45 °	3
Loss of ulnar deviation < 30 °	2
Loss of supination < 50 °	1
Loss of palmar flexion < 30 °	1
Loss of radial deviation < 15 °	1
Pain in the distal radioulnar joint	1
Maximum	14
Complications	
Arthritic change	
Minimal	1
Moderate	2
Severe	3
Nerve complications	1-3
Poor finger function	1-2
Grip strength < 50% normal side	1
Poor finger function	1-2
Maximum	14
Point range on a deduction scale	
Excellent	0-2
Good	3-8
Fair	9-20
Poor	21 +

Table 6. Overall results of treatment with external fixation & percutaneous pinning for Colles' fracture

Result(Op. method)	Ace Colles quadrilateral device	Percutaneous pinning
Excellent	4	6
Good	1	4
Fair	1	2
Poor	1	4

(Table 2,3).

Ace Colles quadrilateral devices

**Table 7.**

	ACQD*	Percutaneous pinning	Total
Reduction loss		3	3
Pin site infection	1	1	2
Wrist stiffness	1	2	3
Decreased external rotation of forearm		2	3
Total	2	9	11

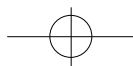
* Ace Colles quadrilateral device

60.2° (35-70), 53.4° (35-70), 66.5° (40-80), Ace Colles quadrilateral devices
 65.2° (40-80), 18.8° (15-20), 20.6° (16-25°),
 21.7° (15-30) K- 8.3° (5.2-14.1), 9.3° (-12-16)
 57.8° (35-70), 50.6° (30-65), 65.6° (40-80), K-
 63.5° (40-80), 18.2° (15-20), 20.6° 19.2° (14-27), 8.5mm (4.8-14.5),
 (15-25) . Gartland 8.8° (-14 - 17) .
 Werley¹⁴⁾, Van Der Linden Ericson³⁴⁾ Ace Colles
 quadrilateral devices
 K- 3



Fig 1. Closed unstable distal radius fracture of 61-year-old male.

- A.** Preoperative anteroposterior and lateral radiographs of the distal radius.
B. Postoperative radiographs showing the reduced fracture with external fixator.
C. Postoperative 11 months radiographs showing union of fracture.



466 •

/ 12 2

(Table 4).

(Table 6).

Modification of Gartland and Werley's scoring system

가	(Table 5).	가
0-2	, 3-8	, 9-20
21		
colles quadrilateral device		4 (58%),
1 (14%),	1 (14%),	1 (14%),
	6 (38%),	4 (25%),
2 (12%),	4 (25%)	
quadrilateral device		가 1
가	가	

ulnar pinning

가

가

Gartland Werley¹⁴⁾

Ace colles quadrilateral devices

1 , 1

K-

3 , 1 , 2

가 3 .

(Table 7).

8) 1814

가



Fig 2. Closed unstable distal radius fracture of 61-year-old female.

A. Preoperative anteroposterior and lateral radiographs of the distal radius.

B. Postoperative radiographs showing the reduced fracture with external fixator.

C. Postoperative 8 weeks radiographs showing union of fracture.

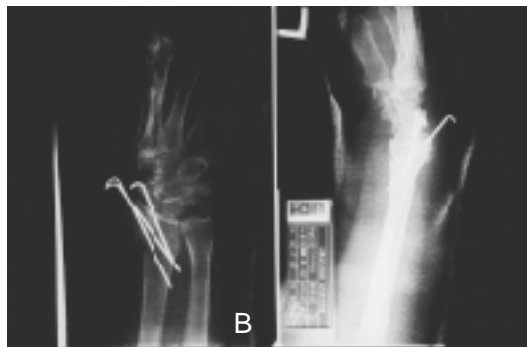
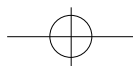


Fig 3. Closed unstable distal radius fracture of 71-year-old female.

A. Preoperative anteroposterior and lateral radiographs of the distal radius.

B. Postoperative radiographs showing the reduced fracture with percutaneous pinning.

C. Postoperative 7 weeks radiographs showing reduction loss and union of fracture.

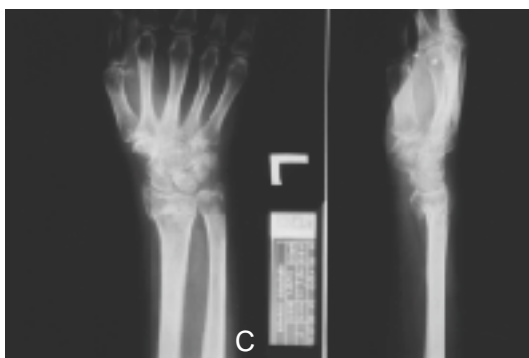
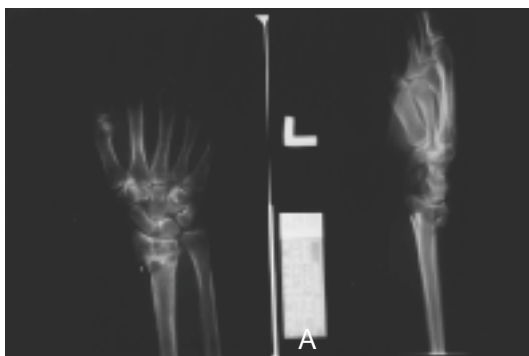
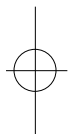


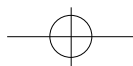
Fig 4. Closed unstable distal radius fracture of 51-year-old female.

A. Preoperative anteroposterior and lateral radiographs of the distal radius.

B. Postoperative radiographs showing the reduced fracture with percutaneous pinning.

C. Postoperative 2 months radiographs showing reduction loss and union of fracture.





468 • / 12 2

3 , 가

Frykman¹³⁾

Melone²⁴⁾ K- ,^{6,31)}

4 (Subchondral bone grafting)²³⁾

가

Ace colles quadrilateral device

1 , 1 가 , K-

2 , 1 ,

23 ,29) Sudek 's atrophy 1 , 2 ,

2

3,4,18,19) 가 2,3,5,15,20)

Solgaard,³³⁾ Villar³⁵⁾ Abbaszadegen¹⁾

1994 1 1998 5 4 5

50

23 Ace Colles

quadrilateral devices K-

(reflex sympathetic Sarmiento Modification of Gartland

dystrophy) 7,30) K- and Werley 's scoring system 가

Green¹⁶⁾

, Habernek , Pritchett and Lenoble

1. Gartland Werley 가

Ace Colles quadrilateral 3

(57%), 가2 (29%), 1 (14%), 1

(14%) K-

7 (44%), 4 (25%), 2 (12%),

3 (19%) Ace Colles quadrilateral devices

가

2. Ace Colles quadrilateral devices

1 , 1

K-

3 , 1 , 2

가3

50

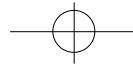
가 Ace Colles

quadrilateral device K-

Modification of Gartland and Werley 's

3

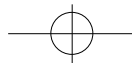
Fernandez and Jupiter¹²⁾



scoring system 7†

REFERENCES

- 1) **Abbaszadegan H, Jonsson U, Von Sivers K.** Prediction of instability of Colles ' fractures. *Acta Orthop Scand.*, 60 : 646-50, 1989.
- 2) **Agee JM**, Distal radius fractures: multiplanar ligamentotaxis. *Hand Clin.*, 9 : 577-585, 1993.
- 3) **Agee JM, Szabo RM, Chidgey LK, King FC, Kerfoot C.** Treatment of comminuted distal radius fractures: an approach based on pathomechanics. *Orthopedics.*, 17 : 1115-1122, 1994.
- 4) **Axelrod TS, McMurty RY.** Open reduction and internal fixation of comminuted, intraarticular fractures of the distal radius. *J Hand Surg*, 15A : 1-11, 1990.
- 5) **Bassett RL.** Displaced intraarticular fractures of the distal radius. *Clin Orthop.*, 214 : 148-152, 1987.
- 6) **Braun RM, Gellman H.** Dorsal pin placement and external fixation for correction of dorsal tilt in fractures of the distal radius. *J Hand Sur.*, 19A : 653-655, 1994.
- 7) **Clyburn TA.** Dynamic external fixation for comminuted intra-articular fractures of the distal end of the radius. *J Bone Joint Surg(Am)*, 69 : 248-54, 1987.
- 8) **Colles, A.** On the fracture of the carpal extremity of the radius. *Edinb Med Surg J.*, 10 : 182-186, 1814.
- 9) **Cooney WP.** Extrenal fixation of distal radial fractures. *Clin Orthop.*, 180:44-49, 1983.
- 10) **Cooney, WP , Dobyns JH, Linscheid, R.L.** Complication of Colles ' fracture. *J. Bone Joint Surg.*, 62A : 613, 1980.
- 11) **Editorial.** Differentiated treatment of Colles ' fracture. *Acta Orthop Scand* 60 : 511-2, 1989.
- 12) **Fernandez D L. Jupiter J B.** Fractures of the distal radius. Springer Verlag., New York 1996.
- 13) **Frykman, G.** Fracture of the distal radius including sequelae--shoulder-hand-finger syndrome, disturbance in the distal radio-ulnar joint and impairment of nerve function: a clinical and experimental study. *Acta Orthop. Scand*, 108(suppl) : 1-153, 1967.
- 14) **Gartland, J.J. and Werley, C.W.** Evaluation of healed Colles ' fractures. *J. Bone Joint Surg.*, 33 A: 895, 1951.
- 15) **Geissler WB, Fernandez DL.** Percutaneous and limited open reduction of the articular surface of the distal radius. *J Occup Trauma.*, 5 : 255-264, 1991.
- 16) **Green, D P.** Pins and plaster treatment of comminuted fractures of the distal end of the radius. *J Bone Joint Surg(AM)*, 57 : 304-10, 1975.
- 17) **Habernek H, Weinstabl R. Fialka C, Schmid L.** Unstable distal radius fractures treated by modified Kirschner wire pinning: Anatomic considerations. technique. and results. *J Trauma.*, 36 : 83-88, 1994.
- 18) **Jupiter JB.** Current concepts review: fractures of the distal end of the radius. *J Bone Joint Surg.*, 73A : 461-469, 1991.
- 19) **Jupiter JB, Lipton H.** The operative treatment of intraarticular fractures of the distal radius. *Clin Orthop*, 292 : 48-61, 1993.
- 20) **Kaempffe FA, Wheeler DR, Peimer CA, Hvidsak KS, Ceravolo J, Senall J.** Severe fractures of the distal radius: effect of amount and duration of external fixator distraction on outcome. *J Hand Surg*, 18A : 33-41, 1993.
- 21) **Kaukonen JP, Karaharju E, L thje P, Porras M.** External fixation of colles ' fracture. *Acta Orthop Scand.*, 60 : 54-6, 1989.
- 22) **Lenoble E, Dumontier C, Goutallier D. Apoil A.** Fracture of the distal radius. *J. Bone Joint Surgery (Br)* 77(4) : 562-7, 1995.
- 23) **Leung KS, Shen WY, Tsang HK, Chiu KH, Leung PC, Hung LK.** An effective treatment of comminuted fractures of the distal radius. *J Hand Surg.*, 15 : 11-17, 1990.
- 24) **Melone, C.P., Jr.** Articular fractures of the distal radius. *Orthopedic Clinics of North America.*,



- Vol.15, No. 2, April 1984.
- 25) **Pritchett J W.** External fixation or closed medullary innig for unstable Colles fractures? *J BoneJoint Surg(Br)*, 77 : 267-9, 1995.
 - 26) **Saffar P, Cooney WP.** Fractures of the distal radius. Martin Dunitz, London 1995.
 - 27) **Sahlin Y.** Occurrence of fractures in a defined population: a 1-year study. *Injury* 21 : 158-160, 1990.
 - 28) **Samriento. A.: Pratt, GW., Berry, NC, et al.:** Colles 'fractures. Functional bracing in supination. *j. Bone Joint Surg.*, 57A: 311, 1975.
 - 29) **Scheck, M.** Long-term follow-up of treatment of comminuted fractures of the distal end of the radius by transfixation with Kirschner wires and cast. *J Bone Joint Surg*, 44A : 337-351, 1962.
 - 30) **Schuind F, Donkerwolcke M, Rasquin C. Burny F.** External fixation of fractures of the distal radius: a study of 225 cases. *J Hand Surg(Am).*, 14 : 404-7, 1989.
 - 31) **Seitz WH Jr, Froimson AI, Leb R, Shapiro JD.** Augmented external fixation of unstable distal radius fractures. *J Hand Surg.*, 16A : 1010-1016, 1991.
 - 32) **Sommerkamp TG, Seeman M, Silliman J, Jones A. Patterson S, Walker J, Semmler M, Browne R, Ezaki M.** Dynamic external fixation of unstable fractures of the distal part of the radius. *J Bone Joint Surg(Am).*, 76(8) : 1149-61, 1994..
 - 33) **Solgaard S.** Classification of distal radius fractures. *Acta Orthop Scand.*, 56 : 249-52, 1985.
 - 34) **Van Der Linden, W. and Ericson, R.:** Colles fracture. How should its displacement be measured and How should it be immobilized? *J. Bone Joint Surg.*, 63-A: 1285-1288, Oct. 1981.
 - 35) **Villar RN, Marsh D, Rushdon N, Greatorex R A.** Three years after colles fracture. A prospective review. *J Bone Joint Surg(Br)*, 69(4) : 635-8, 1987.
 - 36) **Wilson, J.N.:** Watson-Jones, Fracture and Joint injuries. 6th Ed. pp. 690, Beccles and London, Churchill Livingstone. 1982.

