

T

가

[]	
:	T
:	가
,	
T	1 가
19	가 Green
O'Brein	가
:	
	8.8 mm (±4.8 mm) 11 mm (±3 mm)
,	15° (±5.7°) 20° (±5°) , -11° (±13°)
7° (±4°) ,	4 mm (±3 mm) 0 mm (±1 mm) ,
	9 , 7 , 2 , 1 .
1	
:	
	,
:	,

mann AO/ASIF Fryk-

2.

(Flexor carpi radialis)

(Pronator quadratus)

가

T (Radial styloid process), (Lunate fossa)

, S (Sigmoid notch)

7,17,18)

가 가 가

15,16,19,25,28)

(Ulnar styloid pro-

cess) (Triangular

fibrocartilage complex, TFCC)

(Radial and Ulnar deviation stress test

view) 2 mm

가

1. 1999 1 2001 3

(Fig. 1).

가 4

(Fig. 3).

T 2

1 가 가 19 1

: 301-723, 520-2
가
: 82-42-220-9530, Fax: 82-42-221-0429
e-mail: weonkim@kornet.net

27 85 59.1 (± 14.7)

, 6 , 13 , , K -

가 4

3.

가 가 .
가

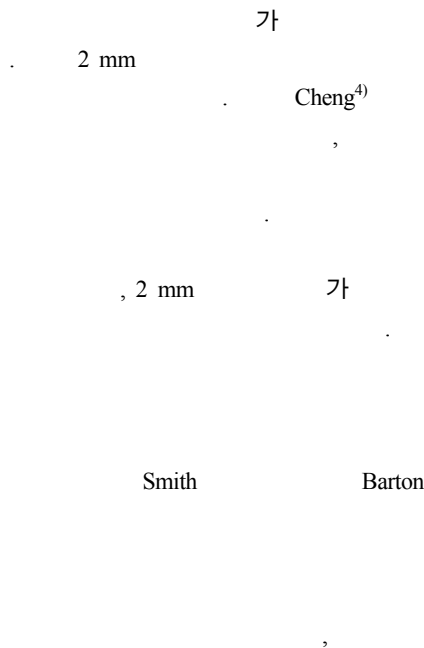
(Radial length), (Radial in-
clination), (Volar tilt), (Ulnar
plus variant) , Green



Fig. 2A-B. A 60-year-old woman with a severely comminuted intraarticular fracture; AO/ASIF classification type C3, Frykman type 7. (A) The preoperative radiographs showed dorsally displacement of distal fragment with distal radioulnar joint involvement, combined ulnar metaphyseal fracture without ulnar styloid involvement. (B) The reduction was achieved with open reduction and internal fixation using volar plating and multiple K-wires. A long transfixing K-wire, which penetrates the distal radio-ulnar joint, is seen.



Fig. 3A-B. (A) 73-year-old woman with severely comminuted and displaced distal radius fracture; AO/ASIF classification type C2, Frykman type 6. (B) The postoperative radiographs shows restoration of radiocarpal and radioulnar joint anatomy.



REFERENCES

- 1) **Axelrod TJ and McMurtry RY:** Open reduction and internal fixation of comminuted, intraarticular fractures of the distal radius. *J Hand Surg*, 15-A: 1-11, 1990.
- 2) **Bradway JK, Amadio PM and Cooney WP:** Open reduction and internal fixation of displaced, comminuted intra-articular fracture of distal end of radius. *J Bone Joint Surg*, 71-A: 839-847, 1989.
- 3) **Carter PR, Frederick HA and Laseter GF:** Open reduction and internal fixation of unstable distal radius fractures with a low-profile plate: A multicenter study of 73 fractures. *J Hand Surg*, 23A: 300-307, 1998.
- 4) **Cheng SL and Axelrod TS:** Management of complex dislocations of the distal radioulnar joint. *Clin Orthop*, 341: 183-191, 1997.
- 5) **Cooney WP III, Dobyns JH and Linscheid RL:** Complications of Colles' fractures. *J Bone Joint Surg*, 62-A: 613-619, 1980.
- 6) **Cooney WP III, Linscheid RL and Dobyns JH:** External pin fixation for unstable Colles' fractures. *J Bone Joint Surg*, 61-A: 840-845, 1979.
- 7) **Falch JA:** Epidemiology of fractures of the distal forearm in Oslo, Norway. *Acta Orthop Scand*, 54: 291-295, 1983.
- 8) **Fernandez DL:** Radial osteotomy and Bowers arthroplasty for malunited fractures of the distal end of the radius. *J Bone Joint Surg*, 70-A: 1538-1551, 1988.
- 9) **Gartland JJ and Werley CW:** Evaluation of healed Colles' fractures. *J Bone Joint Surg*, 33-A: 895-907, 1951.
- 10) **Green DP and O'Brien ET:** Open reduction of carpal dislocation: Indication and operative techniques. *J Hand Surg*, 3: 250-265, 1978.
- 11) **Green DP:** Pin and plaster treatment of comminuted fractures of the distal end of the radius. *J Bone Joint Surg*, 57-A: 304-310, 1975.
- 12) **Howrad PW, Stewart HD, Hind RE and Burke FD:** External fixation or plaster for severely displaced comminuted Colles's fractures? *J Bone Joint Surg*, 71-B: 68-73, 1989.
- 13) **Kamano M, Honda Y, Kazuki K and Yasuda M:** Palmar plating for dorsally displaced fractures of the distal radius. *Clin Orthop*, 379: 403-408, 2002.
- 14) **Kambouroglou GK and Axelrod TS:** Complications of the AO/ASIF titanium distal radius plate system (π plate) in internal fixation of the distal radius: A brief report. *J Hand Surg*, 23A: 737-741, 1998.
- 15) **Kang ES, Kang HJ and Lee KC:** Clinical study of intra-articular fracture of distal radius. *J of Korean Orthop Assoc*, 25: 764-771, 1990.
- 16) **Kim KY and Jung DE:** Treatment of unstable Colles' fracture. *J of Korean Orthop Assoc*, 21: 869-876, 1986.
- 17) **Knirk JL and Jupiter JB:** Intra-articular fractures of the distal end of the radius in young adults. *J Bone Joint Surg*, 68-A: 647-659, 1986.
- 18) **Lee LW and Putnam MD:** Unstable fractures of the distal radius: an algorithmic method of treatment. *Orthop Trans*, 12: 357-541, 1988.
- 19) **Leung KS, Shen WY, Tsang HK, Chiu KH, Leung**

- PC and Hung LK:** An effective treatment of comminuted fractures of the distal radius. *J Hand Surg*, 15A: 11-17, 1990.
- 20) **Lipton HA and Wollstein R:** Operative treatment of intraarticular distal radius fractures. *Clin Orthop*, 327: 110-124, 1996.
- 21) **Lucas GL and Sachtjen KM:** An analysis of hand function in patients with Colles' fracture treated by Rush rod fixation. *Clin Orthop*, 155: 172-179, 1981.
- 22) **Lucas GL and Fejfar ST:** Complications in internal fixation of the distal radius. *J Hand Surg*, 23A: 1117, 1998.
- 23) **May MM, Lawton JN and Blazar PE:** Ulnar styloid fractures associated with distal radius fractures: incidence and implications for distal radioulnar joint instability. *J Hand Surg*, 27A: 965-971, 2002.
- 24) **Palmer AK and Werner FW:** Biomechanics of the distal radioulnar joint. *Clin Orthop*, 187: 26-35, 1984.
- 25) **Putnam MD and Fischer MD:** Treatment of unstable distal radius fractures: Methods and comparison of external distraction and ORIF versus External distraction-ORIF neutralization. *J Hand Surg*, 22A: 238-251, 1997.
- 26) **Ring D, Jupiter JB, Brennwald J, Buchler U and Hastings H II:** Prospective multicenter trial of a plate for dorsal fixation of distal radius fractures. *J Hand Surg*, 22A: 777-784, 1997.
- 27) **Schneeberger AG, Ip WY, Poon TL and Chow SP:** Open reduction and plate fixation of displaced AO type C3 fractures of the distal radius. *J Orthop Trauma*,

15(5): 350-357, 2001.

- 28) **Schuind F, Donkerwolcke M, Rasquin C and Burny F:** External fixation of fractures of the distal radius: a study of 225 cases. *J Hand Surg*, 14A: 404-409, 1989.
- 29) **Taleisnik J and Watson HK:** Midcarpal instability caused by malunited fractures of the distal radius. *J Hand Sug*, 9-A: 350-357, 1984.
- 30) **Trumble TE, Culp R, Hanel DP, Geissler WB and Berger RA:** Intra-articular fractures of the distal aspect of the radius. *J Bone Joint Surg*, 80A: 582-600, 1998.
- 31) **Weber ER:** A rational approach for the recognition and treatment of Colles fractures. *Hand Clin*, 3: 13-21, 1987.

Abstract**Anterior Approach and Volar T-plate fixation of Distal Radius Fracture**

**Woo-Sung Choi, M.D., Weon-Yoo Kim, M.D., Dong-Won Choi, M.D.,
Yun-Hack Shin, M.D., Jin-Young Kim, M.D.**

*Department of Orthopaedic Surgery, Daejeon St. Mary's Hospital, College of Medicine,
the Catholic University of Korea, Daejeon 301-723, Korea*

Purpose: To analyze the radiologic and clinical results of open reduction and volar plating through anterior approach for distal radius fracture.

Materials and Methods: We retrospectively analysed that 19 distal radius fracture, which would not be reduced by closed reduction or too comminuted to maintain reduction or articular surface incongruency, were treated by open reduction and volar plating through anterior approach. The results were evaluated by preoperative and immediate postoperative radiographics and clinical results were analysed using Green and O'Brien scoring system at final follow up.

Results: All cases achieved anatomical articular surface reduction postoperatively. In terms of radiologic analysis, mean radial length ($8.8 \text{ mm} \pm 4.8 \text{ mm}$ vs. $11 \text{ mm} \pm 3 \text{ mm}$), radial inclination ($15^\circ \pm 5.7^\circ$ vs. $20^\circ \pm 5^\circ$), volar tilt ($-11^\circ \pm 13^\circ$ vs. $7^\circ \pm 4^\circ$) and ulnar plus variant ($4 \text{ mm} \pm 3 \text{ mm}$ vs. $0 \text{ mm} \pm 1 \text{ mm}$) were improved. The clinical evaluation revealed 9 excellent cases, 7 good cases, 2 fair cases and 1 poor case. The reduction loss and flexor pollicis longus rupture was occurred in one patient, who had severely displaced comminute fracture in initial injury.

Conclusion: Using volar plating, authors gain good radiologic and clinical results. But, additional external fixation is recommended to prevent further collapse in severely comminuted fractures.

Key Words: Distal radius fracture, Anterior approach, Volar plating, External fixator

Address reprint requests to _____

Weon-Yoo Kim

Department of Orthopedic Surgery, Daejeon St. Mary's Hospital,

Dachung-Dong, Jung-Gu, Daejeon 301-723, Korea

Tel : 82-42-220-9530, Fax : 82-42-221-0429

E-mail : weonkim@kornet.net

Table 1. Summary of cases

No	Sex	Age	Fracture AO/ASIF	Type of Frykman	Preoperative				Postoperative				Result of Green & O'Brien	Remark
					RI (°) [*]	RL (mm) [†]	VT (°) [‡]	UV (mm) [§]	RI (°) [*]	RL (mm) [†]	VT (°) [‡]	UV (mm) [§]		
1	F	68	A2	2	23	10	-34	2	25	17	9	0	Excellent	
2	F	52	A2	1	25	14	-2	8	18	8	2	0	Excellent	
3	F	74	A2	1	17	8	-20	0	23	11	0	0	Good	
4	F	62	A3	2	18	1	10	8	18	10	10	0	Fair	FPL rupture, collapse
5	M	64	A3	2	5	22	4	5	18	14	7	0	Good	
6	M	33	A3	1	16	11	10	7	23	11	10	0	Excellent	
7	F	49	C1	3	15	8	-18	5	20	8	5	1	Good	
8	F	65	C1	4	15	8	5	4	17	8	6	0	Excellent	K-wires fixation
9	F	73	C1	3	10	5	-15	2	25	12	8	0	Excellent	Ext. fixator
10	M	27	C1	3	17	12	-17	3	25	15	8	0	Excellent	
11	F	76	C1	4	15	12	-10	3	20	12	10	1	Excellent	Ext. fixator
12	F	60	C1	4	20	14	-6	0	10	6	5	2	Poor	Scaphoid fracture
13	F	53	C2	3	10	7	-4	8	24	12	4	0	Fair	Ext. fixator
14	M	53	C2	4	24	6	-34	8	22	14	8	2	Excellent	
15	F	85	C2	3	20	4	-26	2	23	11	5	0	Good	
16	M	50	C2	3	6	4	-12	5	14	8	10	0	Good	K-wires fixation
17	M	47	C2	3	14	9	-13	5	20	14	15	0	Excellent	
18	F	73	C2	6	10	5	-2	2	15	7	13	0	Good	Ext. fixator
19	F	60	C3	7	12	7	-23	3	12	7	7	0	Good	K-wires fixation
					15±5.7	8.8±4.8	-11±13	4±3	20±5	11±3	7±4	0±1		

^{*}RI = Radial Inclination, [†]RL = Radial Length, [‡]VT = Volar Tilt, [§]UV = Ulnar plus Variant, Result after tendon repair