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The Journal of the Korean Society of Fractures  
Vol.12, No.1, January, 1999

## Sauve-Kapandji Colles

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= Abstract =

### The Modified Sauve-Kapandji Procedure for Treatment of Malunited Colles' Fracture

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Distal radius fracture is one of the most common fracture of upper extremities including Colles' fracture. Since 1913, classic Darrach's technique which performed excision of the distal end of the ulna for distal radioulnar arthrosis have been introduced, many procedures have been described for the surgical management of painful disorders of the distal radioulnar joint. In 1936, Sauve and Kapandji first described the procedure that included an arthrodesis across the distal radioulnar joint and created a pseudarthrosis of the ulna, proximal to the fusion, to restore pronation and supination. The purpose of the present study is to evaluate clinical results of treatment for malunited Colles' fracture using modified Sauve-Kapandji procedure as an alternative salvage operation. From 1994 May, total nine patients were evaluated, average follow-up was twenty one months. There were four male patients and five female patients.

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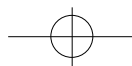
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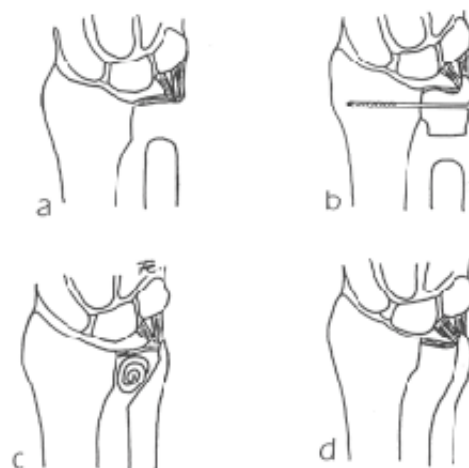
Radiographic measurement, pain of radiocarpal and radioulnar joint, range of motion of the wrist, grip strength, instability of the distal radioulnar joint were foci of this present study. We used modified Sauve-Kapandji procedure. The purpose of modification is to preserve the pseudoarthrosis and stabilize the ulna, proximal ulnar stump was stabilized with a strip of flexor carpi ulnaris and pronator quadratus was sutured to sheath of extensor carpi ulnaris. According to Fernandez Point-Score System, results showed excellent 6, good 2 and fair 1. But two patients complained continuous pain at vigorous range of motion. All of the patient showed improvment of arc of motion and rotation, especially pronation-supination and did not develop any instability. But radiographic measurement was not correlated with clinical symptoms. In conclusion, modified Sauve-Kapandji procedure is effective procedure for treatment of the malunited Colles ' fracture which have severe distal radioulnar disruption, ligament laxity, subluxation of the ulna, and ulnocarpal impingement. We should consider as alternative salvage operation options of malunited Colles ' fracture.

**Key Words :** Distal radioulnar joint, Malunited Colles ' fracture, Modified Sauve-Kapandji procedure

Colles

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**Fig 1.** Schematic of the various operative procedures for the distorted distal radioulnar joint ; (A) Darrach, (B) Sauve-Kapandji arthrodesis, (C) Bowers 'hemiresection interposition arthroplasty, (D) Watson matched ulnar resection.

1913 Darrach가

(Fig. 1),

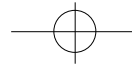
6,7,8,11)

Sauve-Kapandji

Colles

1.

1994 5

**Table 1.** Preoperative clinical data.

Case	Age/ Sex	Radiographic measurement*			Pain †	Deg. change ‡	ROM of wrist(deg) §				Grip strength (kgf) §
		Volar tilt	Ulnar tilt	Ulnar variance			Flex	Ext	Pron	Supin	
1	55/F	-24	16	14	+1/+3	severe	5/80	90/80	10/90	15/90	9/20
2	49/M	+34	30	1	+1/+2	severe	45/75	45/75	65/80	40/80	29/42
3	20/M	0	5	9	0/+1	mild	70/75	80/75	85/70	90/80	27/35
4	62/M	-18	13	2	+1/+3	mod	40/80	60/85	45/85	30/90	21/42
5	63/F	-30	10	9	+1/+3	severe	45/80	90/80	60/80	40/85	7/22
6	54/F	-8	18	6	0/+2	mild	30/75	15/70	45/85	45/90	10/30
7	67/F	-12	9	6	0/+3	mod	25/75	30/75	30/80	35/85	10/19
8	48/F	-15	15	5	+1/+3	mild	50/65	50/80	40/80	50/75	12/25
9	53/M	-5	12	0	0/+2	mild	80/70	30/70	50/90	40/80	21/47

\* : Volar tilt, ulnar tilt ; degree. Ulnar variance ; milimeter.

† : Radiocarpal/radioulnar pain. 0 ; none, +1 ; mild, +2 ; moderate, +3 ; severe

‡ : Radiographic degenerative change. Severe ; narrowing of the joint space, subchondral sclerosis, formation of osteophytes, subluxation, and incongruity of the joint. Moderate ; narrowing of the joint space, subchondral sclerosis, and incongruity of the joint. Mild ; minimum narrowing of the joint space. None ; none of the this radiographic findings.

§ : Affected/normal

**Table 1.** Postoperative clinical data.

Case	F/U (m)	Radiographic measurement*			Pain †	Deg. change ‡	ROM of wrist(deg) §				Grip strength (kgf) §
		Volar tilt	Ulnar tilt	Ulnar variance			Flex	Ext	Pron	Supin	
1	12	2	9	2	0/+1	mild	45/80	80/80	75/90	70/90	15/25
2	19	13	34	-1	0/0	mild	50/75	70/75	90/80	85/80	37/42
3	34	5	0	0	0/0	none	80/75	80/75	90/70	90/80	35/40
4	25	6	21	0	0/0	none	75/80	70/85	70/85	75/90	30/39
5	17	-3	18	2	+1/0	mod	70/80	70/80	75/80	80/85	15/20
6	23	7	19	0	0/0	none	60/75	75/70	80/85	85/90	23/32
7	22	0	15	1	0/0	mild	55/75	70/75	70/80	65/85	12/18
8	14	4	22	1	0/0	none	65/65	80/80	75/80	80/75	25/27
9	27	3	25	0	0/0	none	80/70	80/70	80/90	80/90	30/45

\* : Volar tilt, ulnar tilt ; degree. Ulnar variance ; milimeter.

† : Radiocarpal/radioulnar pain. 0 ; none, +1 ; mild, +2 ; moderate, +3 ; severe

‡ : Radiographic degenerative change. Severe ; narrowing of the joint space, subchondral sclerosis, formation of osteophytes, subluxation, and incongruity of the joint. Moderate ; narrowing of the joint space, subchondral sclerosis, and incongruity of the joint. Mild ; minimum narrowing of the joint space. None ; none of the this radiographic findings.

§ : Affected/normal

**Fig 2.** Schematic representation of modified Sauve-Kapandji procedure. The ulnar head is secured with two screws or k-wires. The proximal ulnar stump is stabilized with a strip of the flexor carpi ulnaris(FCU). The pronator quadratus(PQ) is sutured to the sheath of the extensor carpi ulnaris(ECU).

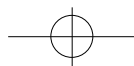
4. (postoperative care)

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(dorsal approach)

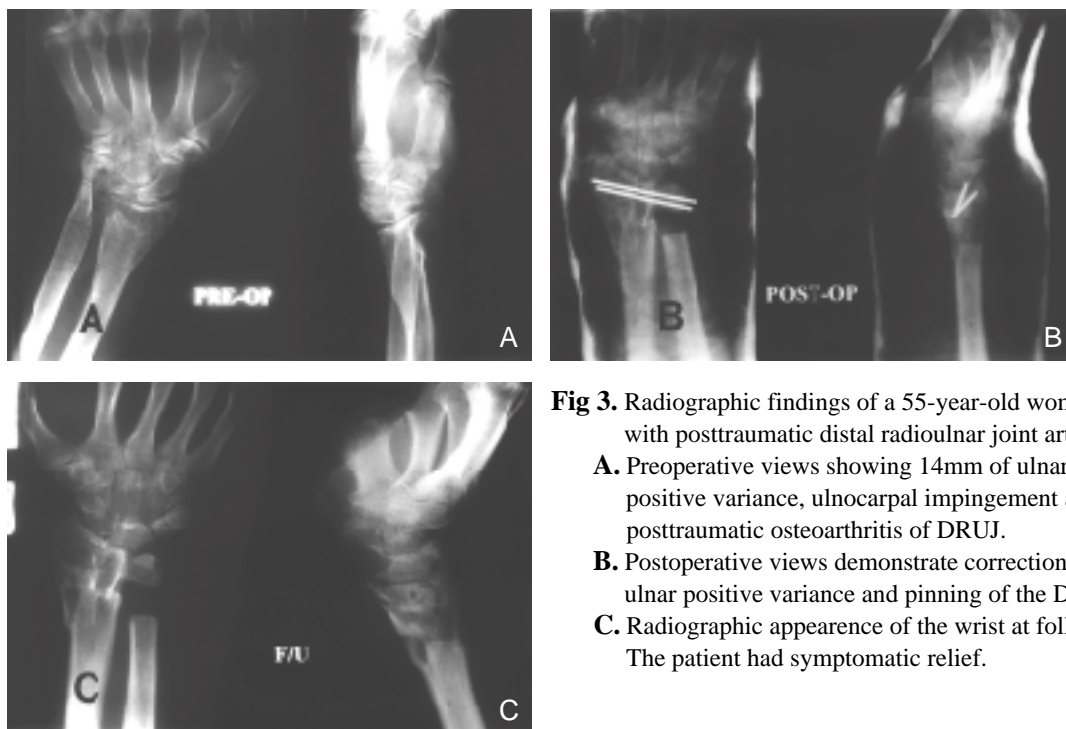
(EPL) tethering



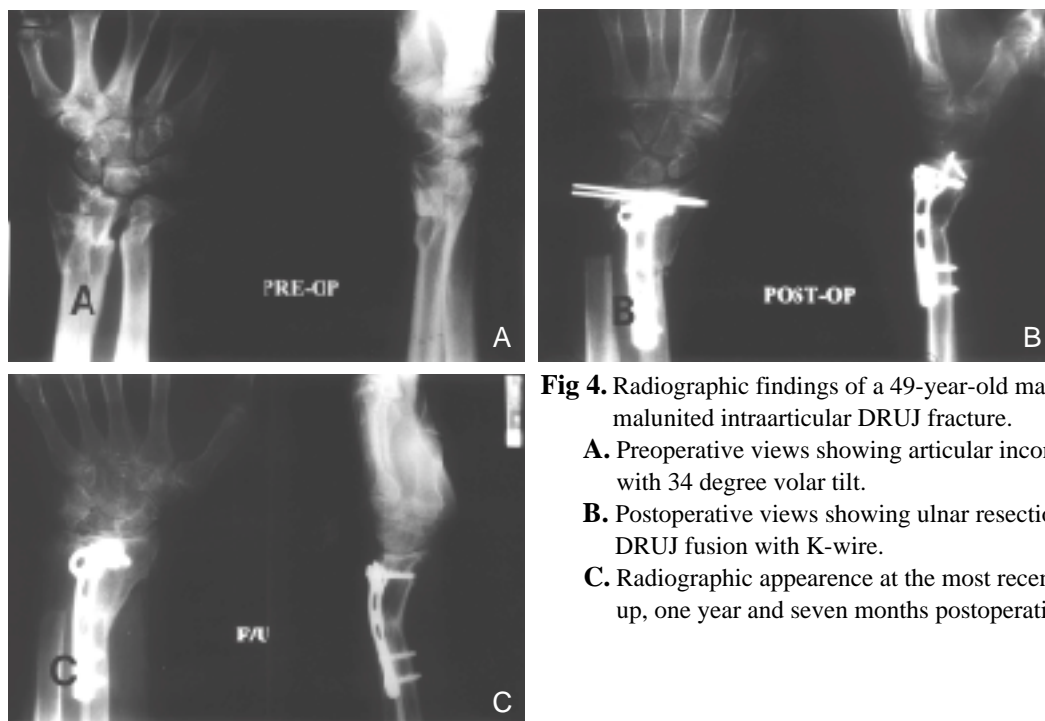
9 12  
 , Fernandez point-score system  
 (excellent) 6 (67%), (good) 2 (22%), (fair) 1  
 (11%) , (poor) 9  
 8 (89%) . 2  
 . volar tilt, ulnar tilt ulnar  
 variance 4.1 , 18.1 , 0.55mm -8.7 ,  
 14.2 , 5.8mm 12.8 , 3.9 , 5.2mm  
 . 139.4 , 157.2 97.8 , 90.6  
 41.6 , 66.6 .  
 (grip strength score) 50%  
 76% 26% .  
 (instability)

1. ○  
 55 , (pronation-supination  
 limitation) 20  
 1  
 (tingling sensation)  
 25  
 .  
 volar tilt -24 , ulnar tilt 16 , ulnar positive variance 14  
 mm ,  
 (ulnocarpal impingement)  
 가 (Fig. 3).  
 (open wedge radial osteotomy)  
 , T K  
 가

145



**Fig 3.** Radiographic findings of a 55-year-old woman with posttraumatic distal radioulnar joint arthrosis.  
**A.** Preoperative views showing 14mm of ulnar positive variance, ulnocarpal impingement and posttraumatic osteoarthritis of DRUJ.  
**B.** Postoperative views demonstrate correction of the ulnar positive variance and pinning of the DRUJ.  
**C.** Radiographic appearance of the wrist at follow-up. The patient had symptomatic relief.



**Fig 4.** Radiographic findings of a 49-year-old man with malunited intraarticular DRUJ fracture.

**A.** Preoperative views showing articular incongruity with 34 degree volar tilt.

**B.** Postoperative views showing ulnar resection and DRUJ fusion with K-wire.

**C.** Radiographic appearance at the most recent follow-up, one year and seven months postoperatively.

(Fig. 1),

,  
Fernandez<sup>6,7,8)</sup>

(ulno-carpal impingement), (dorsal  
subluxation or instability of ulnar head)

(incongruity of the surface of the radioulnar joint)

Darrach

가

3,6,13,16)

Bowers<sup>3)</sup>

Watson

22,23)

TFCC

resection)

Sauve

Kapandji<sup>20)</sup>

(partial

Sauve-Kapandji

가

(congruity)

(intact)

TFCC,

(ECU)

(ulnocarpal ligament),

2. ○

49

1

(incongruity)

, volar tilt +34 , ulnar

tilt 30 , ulnar positive variance 1mm

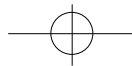
(Fig.

4). K

1913 Darrach가

, Sauve-Kapandji , Watson matched

distal ulnar resection, Bowers hemiresection-interposition  
arthroplasty

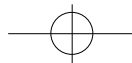


Sauve-Kapandji

Colles

• 159

14,15). abutment) 가 가  
 , Watson  
 3,21),  
 2  
 . Lichtman 14) Darrach  
 ulnar variance가 Sauve-Kapandji  
 (ligament incompetence) 가  
 , Sauve-Kapandji  
 (ulnocarpal abutment) (ligament (Table 1,2).  
 laxity) Jupiter Ring<sup>12)</sup> (articular  
 malreduction) (dorsal angulation) 20  
 (poor bone stock)  
 가  
 4,5,10,20). Field 9) Darrah  
 36 , 50%  
 . Bell 1) 11 가 (Table 1),  
 , Bieber 2)  
 Darrach 가  
 . Sauve-Kapandji  
 9 8  
 11,15,17,18,19,20). Mikkelsen 15)  
 . Sauve-Kapandji 12 2  
 , Fernandez<sup>8)</sup>  
 (incongruity)가 , Sanders 19) 10 6  
 2  
 . Kapandji<sup>20)</sup> 가  
 sigmoid notch  
 , (pseudoarthrosis) 가  
 (oblique) 가  
 1 . Fernandez<sup>8)</sup> Nakamura 17) 가 가  
 (impingement)가 (grip strength) 가  
 (chondromalacia) (axial force)  
 TFCC (ulcer)  
 , 가  
 . volar tilt (FCU)  
 가 가 (ECU)  
 , 2  
 Bowers<sup>3)</sup> positive ulnar variance가 2mm  
 hemiresection arthroplasty  
 가 Mikkelsen 15) 12  
 Lichtman 14) 가 1mm negative ulnar 53% 76% , Taleisnik<sup>21)</sup>  
 variance 17 11 , 5  
 Bowers (ulno-carpal 70%, 1 50%



, 50% 76% 26% .

1994 5  
, Colles

1 가가 9

가 .

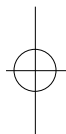
Sauve-Kapandji

(ulnocarpal impingement)

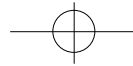
, (salvage operation)

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