



## Proximal row carpectomy : A volar approach

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We retrospectively evaluated 14 patients who underwent proximal row carpectomy through a volar, instead of the routine dorsal approach. The patients were screened for range of motion, grip strength, VAS pain score, and responded to a DASH questionnaire. At a mean follow-up of 16 months, range of motion and grip strength were satisfactory. The disability score was improved, however the pain score was slightly higher than the preoperative score. We conclude that proximal row carpectomy through a volar approach gives comparable results to those reported with the dorsal approach.

**Keywords :** proximal row carpectomy ; volar approach.

### INTRODUCTION

Resection of the proximal carpal row, i.e. removal of the scaphoid, lunate and triquetrum, is an accepted motion sparing procedure for a variety of painful conditions of the wrist (5). Generally this procedure is performed through a dorsal approach (1,3,4,7,9,10,14). However, Luchetti *et al* (11) achieved excellent results in nine cases using a volar approach. The rationale for this approach was that many patients operated on using the dorsal approach experienced flexion limitation and suffered from disabilities caused by extensor retinaculum insufficiency and by adhesions of the dorsal wrist capsule and the extensor tendons. The volar approach is easily performed and excellent exposure of the carpal bones is attained following opening of the carpal tunnel.

Since 2004, the volar approach is used for proximal row carpectomies (PRC) in our institution. We report here the results obtained in 14 patients operated through the volar approach by the same surgeon.

### PATIENTS AND METHODS

#### Patients

All adult patients who underwent a proximal row carpectomy between January 2004 and December 2005 were retrospectively analysed. Fourteen patients are included in this study : four males and ten females with an average age of 51 years (range : 31 to 78) were available for follow-up at a mean of 16 months (range : 5 to 27). The dominant hand was involved in seven cases. Surgery was performed at our University Hospital by one surgeon. The indication was wrist pain secondary to advanced scapholunate collapse (SLAC) in four patients, to scaphoid non-union advanced collapse (SNAC) in

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Table I. — Patient details

Patient	Age	Sex	Hand involved	Dominant hand	Diagnosis	Occupation
1	34	M	L	R	Kienböck's disease (stage III)	Bus driver
2	34	F	L	R	Kienböck's disease (stage III)*	Teacher
3	69	M	R	R	SLAC	Retired
4	58	M	R	R	SLAC	Silversmith
5	50	F	R	R	Kienböck's disease (stage III)	Office worker
6	49	F	R	R	Kienböck's disease (stage III)	Hairdresser
7	38	F	R	R	SNAC	Housewife
8	48	F	L	L	Kienböck's disease (stage III)	Housewife
9	78	F	L	R	SLAC	Housewife
10	49	F	L	L	SNAC	Cleaner
11	31	F	L	R	Kienböck's disease (stage III)	Teacher
12	56	F	L	R	Degenerative changes scaphoid/ lunate	Housewife
13	61	F	L	R	Kienböck's disease (stage III)	Housewife
14	63	M	L	R	SLAC	Retired

\* Previous surgery: scaphoid-trapezium-trapezoid arthrodesis.

two, to Kienböck's disease (lunatomalacia) stage IIIA or IIIB in seven, and to degenerative changes in scaphoid and lunate in one patient. Exclusion criteria were capitolunate arthritis or osteoarthritis of the lunate fossa.

Patients' demographics are shown in table I.

## Methods

The hand function of the patients was assessed by hand therapists pre- and postoperatively. The range of extension, flexion, ulnar deviation and radial deviation of both wrists was measured. Grip strength was measured in kg with the Jamar dynamometer in position 2. Pain was evaluated by the patients using a visual analogue scale (VAS), on a scale from 0 (no pain) to 10 (unbearable pain). Limitations in daily life were evaluated by the Official Dutch Language Version of the Disabilities of Arm, Shoulder, and Hand (DASH) questionnaire (2,16). The questionnaire consists of a standard list of 30 questions concerning symptoms and various physical activities. Depending on their ability patients assigned scores from 1 to 5 per question. Subsequently, the total score was converted to a score ranging from 0 (no limitations in daily functioning) to 100 (severe disability).

In our survey the postoperative data were complete for all 14 patients, although preoperative data were not available for five patients. In retrospect, these patients had not appeared at the pre-operative screening.

Complications as infection, instability or ulnar translation of the carpus were accurately recorded in patients' charts.

## Operative technique

A carpal tunnel-type incision was made over the volar wrist fold with a proximal extension across the wrist into the distal forearm (7). The median nerve and the flexor tendons were identified and retracted radially. The volar articular capsule was opened with an inverted T-incision with the transverse limb at the radius and the longitudinal limb centred over the capitate. The lunate, triquetrum and scaphoid were exposed. During dissection, great care was taken to avoid damage to the intact articular cartilage of the capitate and lunate fossa. The lunate and triquetrum were excised one after the other, as a whole or piecemeal. To remove the scaphoid, the flexor carpi radialis tendon was identified and retracted ulnarward together with the other flexor tendons and median nerve. Subsequently, a mid-substance incision of the radio-scapho-capitate (RSC) ligament was made and the scaphoid was excised. The RSC ligament was carefully repaired with two resorbable 3.0 sutures. Skin closure was followed by immobilisation of the wrist in neutral position with a plaster splint for four weeks, after which an intensive rehabilitation programme was started under supervision of hand therapists. The post-operative procedure was no different from that used in patients operated through a dorsal approach.

## RESULTS

Pre- and postoperative data are summarised in tables II and III. Seven patients (50%) had a good

Table II. — Postoperative range of motion, grip strength, pain and DASH score

Patient	Follow-up (months)	Extension (°)	Flexion (°)	Radial deviation (°)	Ulnar deviation (°)	Grip strength (kg)	Pain (VAS)	DASH questionnaire
1	15	20	50	12	20	27	7	20
2	5	5	0	0	30	3	7	43
3	7	30	45	14	12	33	0	8
4	5	35	45	2	12	45	1	7
5	15	30	25	10	10	16	6	54
6	22	20	10	2	12	17	8	34
7	27	38	46	16	10	24	1	23
8	23	30	30	8	18	16	9	72
9	24	48	30	6	14	17	2	33
10	9	40	30	6	12	17	8	41
11	14	50	90	14	38	18	0	34
12	23	53	50	8	32	23	0	2
13	12	10	30	0	12	15	0	53
14	22	30	30	13	24	20	7	17

Table III. — Pre- and postoperative values

	Preoperative*	Postoperative*
Extension (°)	45 (24 – 55)	31 (5 – 53)
Flexion (°)	36 (-5 – 70)	37 (0 – 90)
Radial deviation (°)	14 (7 – 30)	8 (0 – 14)
Ulnar deviation (°)	17 (7 – 28)	18 (10 – 38)
Grip strength (Jamar, kg)	21 (4 – 49)	21 (3 – 45)
Pain (VAS)	3.5 (1 – 6)	3.9 (0 – 9)
DASH	39 (14 – 77)	31 (2 – 72)

\* Mean (range) in degrees.

result, indicating no or relatively mild pain (VAS 0-2), a low DASH score and preserved motion and grip strength. The average change in range of motion was -14° of extension, +1° of flexion, -6° of radial deviation and +1° of ulnar deviation. Grip strength was preserved at 21 kgf. Although the pain score slightly deteriorated (0.4 point), the DASH score improved from 39 to 31.

One patient needed an additional radial styloidectomy due to pain caused by impingement (patient 14). One patient (patient 10) developed a complex regional pain syndrome (CRPS), which affected her result. The patient who had a previous scaphoid-trapezium-trapezoid arthrodesis (patient 2) continued to have residual pain and was not satisfied with her hand function. Another patient (patient 8) suffered from severe and unexplained pain. The last two patients eventually underwent

total wrist arthrodesis with a beneficial effect on pain. Although the remaining three patients experience moderate to severe pain with a VAS of 6 to 8, the overall range of motion is satisfactory and the DASH score (20-54) reasonable.

No infection, instability or ulnar translation of the carpus was seen at follow-up.

## DISCUSSION

This study evaluated function, pain and disability following PRC by means of a volar approach. It was our clinical experience that many of the patients operated through the generally used dorsal approach suffered from a limited flexion, caused by adhesions of the dorsal wrist capsule, extensor tendon adhesions and extensor retinaculum insufficiency. The volar approach for proximal row carpectomy, as reported by Luchetti *et al* (11), achieved excellent results, as seven of the nine patients were pain free after an average follow-up of 20 months. Patients resumed previous work at an average of 2 months. The range of motion and grip strength were also satisfactory (table III). These excellent results urged us to perform PRC by means of a volar approach.

We did not obtain the high percentage of good results as reported : 50% of our patients, as compared to 78% in Luchetti's series (11). We feel that our indication field for motion sparing procedures

Table IV. — Comparison of reported postoperative results

Approach	Author	Extension (degrees)	Flexion (degrees)	Radial deviation (degrees)	Ulnar deviation (degrees)	Grip strength * (kgf)
Volar	Amerongen, 2008	31	37	8	18	63
	Luchetti, 1998	45	36	19	28	77
Dorsal	Alnot, 1996	31	30	10	20	80
	Green, 1987	43	39	5	31	83.5
	Imbriglia, 1990	≥ 30	≥ 30	0 - 5	23	20-75
	Culp, 1993	35	28	9	23	67
	DiDonna, 2006	36	36	9	31	91
	De Smet, 2005	41	35	16	25	63
	Jebson, 2003	40	36	12	22	83

\* (% of the contralateral side).

might be broader and other surgeons would possibly have performed an immediate arthrodesis in some of our cases. Another possible explanation to the difference in results could also be caused by the large spreading and the small number of patients in both studies.

Rettig and Raskin (12) attained similar results using a combined dorsal and volar approach. However, the indication for surgery, chronic perilunate dislocation, was different from our indications and therefore the results are not comparable with ours.

The RSC ligament is a strong secondary stabiliser of the scapholunate articulation (7,13-15). Hence, when performing a PRC by means of the volar approach, the sectioned RSC ligament must be carefully reconstructed after removal of the carpal bones (7,14). We did not see the development of ulnar translation of the carpus after volar PRC and we believe that a strong RSC ligament has possibly prevented this complication.

The final range of motion in our series corresponded well to the ROM obtained in series where the dorsal approach was used. Table IV shows an overview of the data found in the literature concerning the hand function after proximal row carpectomy. This demonstrates an overall comparable range of motion, with a flexion and extension range in the order of 30° to 40°.

Grip strength and pain scores, on the other hand, were measured in different ways, which makes

comparison difficult. Alnot *et al* (1) described 45 proximal row carpectomies by means of a dorsal approach; the procedure failed for three patients resulting in total wrist arthrodesis, 8 had pain or intermittent pain and 34 had minimal or no pain. Of the 15 operated patients reported by Green (7), two were failures, three had moderate pain, six had mild discomfort and only four were pain free. Imbriglia *et al* (8) presented 27 patients, of which 26 had a 'satisfactory relief of pain' as none required pain medication or splints. Culp *et al* (3) presented a multicenter study of 17 non-rheumatoid patients with a mean follow-up of three and a half years. Seventy-six percent of the patients had little or no pain and 18% had severe pain. DiDonna *et al* (6) presented a long term report of 22 patients who underwent a PRC with a minimum follow-up of ten years. There were four failures, resulting in total wrist arthrodesis. The wrist was not painful in 9 patients, mildly painful in 4 and moderately painful in 5. De Smet *et al* (4) described 19 patients with a minimum follow-up of 24 months: 16 patients noted a decrease in pain; pain was absent or mild in 13 wrists, moderate in 3 and severe in 5. Jebson *et al* (9) presented 20 patients with a follow-up of 13 years. Two patients complained of persistent pain requiring radio-capitate arthrodesis. One of the remaining 18 patients had persistent pain and was not satisfied but did not want additional surgery. Seventeen patients had minimal or no pain and were satisfied.

We have demonstrated a well preserved range of motion and grip strength for 13 of the 14 patients. The mean DASH score improved. Half of the patients had low pain scores, reflecting minimal or no pain. We cannot entirely explain why the mean postoperative VAS score was slightly higher in comparison with the preoperative score in our patients.

In our study, the results of the volar approach of the PRC are comparable, but not superior to the published results of the dorsal approach (table IV).

We believe that PRC performed through a volar approach is an easily performed motion sparing procedure to consider for a variety of painful conditions of the wrist. However, further research is necessary, since only two studies in support of the volar approach are available and the number of cases is limited.

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