

Posttraumatic carpal instability

A 9-year follow-up of 18 patients

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We present a 9 (1-20) year follow-up of 18 cases of carpal instability. Excluding 4 arthrodeses, 12 cases

were satisfactory in terms of pain and grip strength in spite of persisting radiographic instability in 9.

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Treatment of posttraumatic carpal instability may be difficult due to lack of confirmatory diagnostic tests, confusion about instability types, and insufficient or contradictory management recommendations. Often care comes late because pathology is missed at the time of injury, and the chance for restoration of normal function is lost. We have analyzed the clinical and radiographic findings and consequences for employment after wrist trauma resulting in carpal instability.

Patients and methods

From 1982 to 1991 172 patients with wrist trauma were seen at our hospital where they underwent extensive clinical and radiographic examinations to reveal a possible carpal instability. A substantial difference in carpal bone angles (> 5 degrees), on standardized lateral radiographs of the wrist (Larsen et al. 1991b), or dynamic instability, demonstrated with cineradiography, was found in 22 patients in whom the diagnosis of carpal instability was established. Patients with malunion of distal radius fractures or scaphoid fractures combined with carpal instability were excluded from the study.

At follow-up, 1 patient had emigrated, 1 patient was dead, and 2 patients refused to participate. Thus, there were 18 patients available for follow-up on average of 9 (1-20) years after the injury (Table 1). There were 9 men and 9 women with a median age of 34.5 (14-64) years at the time of injury.

A classification of CI by Dobyns (1990) was used in this study. The proximal row is considered the central link in a 3-link system of rows in the wrist (radius and ulna, proximal carpal row, distal carpal row with metacarpals). Normal balance, as visualized on lateral radiographs of the wrist, is addressed by the co-linear

alignment of these rows. The asymptomatic wrist was used as a reference in the assessment of carpal bone angles.

The terminology for the collapse patterns are DISI (dorsal intercalated segment instability), and VISI (volar/ventral intercalated segment instability). A collapse pattern with dissociation between the proximal carpal bones is called CID (CI dissociative). Collapse patterns where the carpal bones are still strongly attached to each other are called CIND (CI nondissociative).

Treatment consisted of closed reduction and plate fixation in 7 cases, percutaneous K-wire fixation in 2, open reduction and ligament reconstruction in 3, and no treatment in 6 cases (Table 1).

At follow-up the patients were interviewed regarding subjective complaints and employment consequences and a clinical rating was given to each patient (Cooney et al. 1987). A clinical evaluation and standardized radiographs of both wrists (Larsen et al. 1991a) and cineradiography (Larsen 1991) were performed in all patients except Case 7, where the radiographic examination was limited to a minimum due to her pregnancy, and those patients who had been treated with an arthrodesis (Cases 1, 5, 6, 19). Cases 9 and 16 had bilateral CI; grip strength in those patients was estimated. Radiographic arthrosis grading (Table 2) was based on the follow-up radiographs.

Results

4 patients had had an arthrodesis due to progressive arthrosis. In 12 of the remaining 14 patients were satisfactory as regards pain, function, range of motion, and grip strength. However, 9 patients had an instability pattern on cineradiography, and borderline changes

Table 1. Observations in 18 cases of posttraumatic carpal instability

Case	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R
1	30	M	4	1	3	8/8	4	2	5	4	-	-	-	-	-	-	-	4
2	18	5	1	1	3	9/8	1	1	1	2	1	1	1	47	2	45	3	1
3	64	M	9	1	2	20/6	4	2	2	3	1	1	1	54	14	40	3	2
4	62	F	1	1	3	10/10	1	5	1	1	1	1	1	52	2	50	3	2
5	36	M	3	1	4	10/10	2	2	5	3	-	-	-	-	-	-	-	5
6	19	F	7	4	6	3/3	2	2	5	3	-	-	-	-	-	-	-	4
7	19	F	4	3	2	15/8	2	1	1	1	2	2	1	28	-12	40	-	1
8	14	F	1	1	3	10/10	1	3	1	1	1	1	1	52	-12	64	2	1
9	40	M	1	1	1	5/5	1	1	1	1	1	1	1	48	8	40	2	0
10	34	M	2	1	5	10/10	1	2	2	3	1	1	1	70	10	60	3	1
11	53	F	2	1	3	12/10	1	1	1	1	1	1	1	60	0	60	3	1
12	22	F	3	1	1	12/9	1	2	1	1	1	2	2	50	0	50	3	0
13	55	F	9	1	2	12/10	1	5	3	5	1	1	1	64	20	44	3	3
14	35	F	4	1	3	7/7	1	1	2	3	1	1	1	48	8	40	3	1
15	39	M	2	5	5	10/10	4	2	3	3	1	1	1	46	4	42	3	2
16	14	F	3	1	4	9/9	2	1	1	1	2	2	2	42	12	30	2	0
17	41	M	5	2	3	4/4	4	4	5	5	-	-	-	-	-	-	-	5
18	25	M	6	1	1	1/1	2	1	1	1	1	2	2	50	-2	53	2	0

A Age at injury	5 open reduction, capsulodesis	1 100 percent
B Sex	6 open reduction, ligament repair/reconstruction	2 75-99 percent
C Cause of injury		3 50-74 percent
1 fall on the same level	F Follow-up in years (time from injury/ time from initial evaluation)	4 25-49 percent
2 fall to another level		5 0-24 percent
3 lifting heavy article	G Pain	K Scapholunate gap
4 bicycle accident	1 no pain	1 no
5 car accident	2 mild, occasional	2 yes
6 blow against wrist	3 moderate, tolerable	L Cortical ring sign
9 unknown	4 severe to intolerable	1 no
D Injury (refer to text for definitions)	H Functional status	2 yes
CID Carpal instability, dissociative	1 returned to regular employment	M Foreshortened scaphoid
CIND Carpal instability, nondissoc.	2 restricted employment	1 no
1 proximal carpal row CID	3 able to work, unemployed	2 yes
2 radiocarpal CIND	4 unable to work because of pain	N Scapholunate angle
3 midcarpal CIND	5 student or pensioner	O Radiolunate angle
4 combined radiocarpal/midcarpal	I Range of motion (percent of uninjured wrist)	P Radioscaphoid angle
5 perilunate instability. Combined CID/CIND	1 100 percent	Q Instability on cineradiography
E Initial treatment	2 75-99 percent	1 absent
1 none	3 50-74 percent	2 borderline
2 brace	4 25-49 percent	3 present
3 closed reduction and plaster	5 0-24 percent	R Arthrosis grading (Table 2)
4 closed reduction, K-wire and plaster	J Grip strength (percent of uninjured wrist)	- No data available

Table 2. Radiographic arthrosis grading on the basis of the standardized radiographs taken of both wrists at follow-up

0 No arthrosis
1 Joint space narrowing more than one third of the other wrist
2 1 + Osteophyte formation
3 Obliterated joint space
4 Partial synostosis
5 Synostosis

Case history

Case 10 had a scapholunate dissociation (Figure 1). Ligamentous repair with a free tendon laced through drill holes between the scaphoid, lunate, and distal radius was performed. Postoperatively pain was reduced, and a clicking of the wrist no longer occurred. The changes on cineradiography were marginal. At the follow-up the cineradiography did not reveal any changes compared to the postoperative examination, and wrist radiographs showed scapholunate dissociation and arthrosis Grade 1. The patient had no pain, had slightly reduced ROM and grip strength, and had resumed his regular job, albeit with a lower load on his wrist.

were seen in 4 other patients. There were signs of moderate-to-severe arthrosis in 4 patients (Table 1).

Case 10.



The wrist following open reduction and ligament repair/ reconstruction.

The wrist after 10 years.

Discussion

The importance of an early diagnosis of posttraumatic carpal instability and intervention for restoration of wrist alignment have been well established (Linscheid et al. 1972, Palmer et al. 1978, Goldner 1982, Taleisnik 1980). Often ligamentous disruption demonstrates only subtle changes in radiographs, causing these injuries to pass undiagnosed. In a previous study we used an algorithm to evaluate acute wrist trauma in order to make an early diagnosis (Larsen et al. 1992). Among 641 patients with an acute wrist trauma only 1 patient with carpal instability was diagnosed. Standardized radiographic lateral projections are essential for evaluation of alignment of the carpal bones (Larsen et al. 1991a), but a fluoroscopic or cineradiographic examination is necessary to demonstrate any dynamic instability. In some patients, posttraumatic instability will develop progressively over months and years (Sebald et al. 1974, Hockley 1979, Jonsson and Sigfusson 1983) making an early diagnosis impossible.

The problems in management are, first to recognize the instability, and second, to correct it (Palmer et al. 1978). Treatment is given according to the pathological changes and their causes and in our study we used the following guidelines. An injury not older than 4 weeks is treated with closed reduction and plaster fixation for 8 weeks (Palmer et al. 1978). When an adequate reduction cannot be achieved or maintained during cast support, or the diagnosis is made after 4

weeks, open repair with ligamentous reconstruction (Palmer et al. 1978, Glickel and Millender 1984), is recommended. However, this is a technically difficult procedure. In patients with failed ligamentous reconstructions or repairs, persistent carpal collapse deformities, and painful arthritis involving 1 or 2 radiocarpal or intracarpal joint surfaces, a limited arthrodeses of the wrist joint is indicated (Uematso 1979, Watson 1980, Taleisnik 1984, Trumble et al. 1988). In cases with more advanced degenerative changes, wrist fusion (Allende 1988), proximal row carpectomy (Green 1987) or wrist arthroplasty (Ferlic 1987) should be considered. More than 2/3 of the patients in our study had a clinically satisfactory result, even with persistent radiographic instability, as shown in Figure 1. It seems likely that arthrosis will occur sooner or later in patients with carpal instability. An evaluation of the relative value of conservative versus operative management of CI cannot be based on the current literature. The main reason is the lack of an accepted and usable classification which can assist in the diagnosis, give guidelines for treatment, and ensure unity when reporting results of treatment.

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