No advantage from splinting the wrist after open carpal tunnel release

A randomized study of 82 wrists

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To study the value of postoperative splinting after open carpal tunnel surgery, we randomly selected 82 wrists for 4 weeks of postoperative immobilization or no immobilization.

The distributions of scar discomfort or pain and "pillar pain" were equal in the two groups both at 6 weeks and 6 months. Median sick leave was 6 weeks in both groups. Median VAS values for persistent discomfort and pain at 2 weeks, 6 weeks and 6 months were similar in the two groups.

Grip strength was reduced compared to preoperative values by about 20% and keypinch strength by about 10% in both groups at 6 weeks and had returned to normal by 6 months. Pinch between the thumb and the tips of fingers 4 and 5 was considerably reduced postoperatively, but similar in both groups.

We conclude that 4 weeks of postoperative immobilization confers no detectable benefit.

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Although carpal tunnel release is a common procedure, controversy persists as to the need for postoperative immobilization. Richman et al. (1989) reported an average anterior dislocation of the contents of the carpal canal of 3.5 mm after sectioning the carpal ligament. Some authors recommend immobilization to reduce the risk of bowstringing of the flexor tendons or subluxation and tethering of the median nerve in the scar (MacDonald et al. 1978, Inglis 1980, Gelberman et al. 1987, Omer 1992, Weirich and Gelberman 1993). Others recommend early movement of the wrist to promote longitudinal gliding of the nerve through the surgical bed (Nathan et al. 1993). Recent editions of two major textbooks advise immobilization, without stating the reason (Eversmann 1993, Wright 1998). Duncan and coworkers (1987) reported that most American hand surgeons splint the wrist for 1–4 weeks postoperatively.

We knew of no report that documents the value of postoperative immobilization and therefore performed this prospective randomized study. On the hypothesis that even subclinical bowstringing of the flexor tendons might lead to reduced power in the hand, we placed particular emphasis on strength measurements.

Patients and methods

74 patients who were operated on with open carpal tunnel release were included in the study. In 8 cases, both hands were operated on, and 82 wrists were thus studied. In most cases, the diagnosis was based on a typical history and clinical findings. The patients were referred for nerve conduction study only when the clinical findings were equivocal. None of the patients had diseases or recent injuries that would interfere with strength measurements of the hands.

The operations were performed with local anesthesia under tourniquet control on an outpatient basis. The incision paralleled the thenar crease and extended 1–2 cm proximal to the wrist crease. The median nerve was localized in the proximal part of the wound and the carpal ligament was sectioned along its ulnar aspect. An experienced hand surgeon either performed the operation himself or assisted.

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After obtaining informed consent, the patients were randomized to one of two postoperative treatment regimens. Randomization was performed by adding up the 11 digits in the patient's social security number. When the sum was an odd number, he was allocated to one study group, when it was even, he was allocated to the other. All were given a bulky compression dressing after the operation, that was removed after 2 days. At this time, one group was given very light dressings and told to move the wrist and fingers as much as comfort allowed, but avoid heavy lifting for the first 6 postoperative weeks. The other group received a well-padded plaster of Paris splint with the wrist in slight dorsiflexion. After 2 weeks, the sutures were removed and the plaster replaced with a simple rigid orthosis for a further 2 weeks. Both the plaster and the splint allowed full finger movement. Physiotherapy was usually not prescribed. Patients who were operated on bilaterally had one regimen for the first hand and the other for the second.

The mobilized group consisted of 11 men and 34 women with a mean age of 48 (26–80) years. 1 patient retained a bulky postoperative dressing for 3 weeks by mistake.

The immobilized group consisted of 11 men and 26 women with a mean age of 51 (21–86) years. 3 patients were immobilized for only 2 weeks, 1 for 3 weeks and 2 for 5 weeks, instead of the stipulated 4 weeks. Protocol deviants were retained in their allotted groups.

1 patient in the mobilized group had a superficial hematoma and another had some discharge from the wound. Both complaints resolved spontaneously.

Patients were evaluated preoperatively and 6 weeks and 6 months postoperatively. At each review, the grip strength, keypinch strength and pinch strength between thumb and fourth and fifth fingers (4/5-pinch) were measured in both hands with Jamar dynamometers. The patients made 3 attempts at each test as forcefully as possible and the median value was recorded. The two surgeons (VF and HR) made the preoperative evaluations, while postoperative follow-ups were performed by the neurophysiologist (KA). To detect any systematic difference in the strength measurements due to this, the strength of the contralateral hands in unilaterally operated patients was also recorded.

Table 1. Median (95% CI in brackets) visual analogue scores for pain and discomfort preoperatively and at 2- and 6-week and 6-month reviews. 0 no pain, 100 unbearable pain

	Preop	2 weeks	6 weeks	6 months
Immobilized	56 (46–65)	6 (4–17)	6 (4–20)	3 (2–8)
Mobilized	51 (38–57)	5 (2–11)	2 (2–4)	2 (0–4)

At the preoperative reviews, the patients indicated on a visual analogue scale (VAS) the intensity of their discomfort during the previous week. At the postoperative reviews, they were asked to disregard any discomfort or pain which had arisen after the operation and give a VAS evaluation only of remaining discomfort of the type they had had preoperatively. All VAS recordings were converted to point scores, where 0 indicated no discomfort and 100 indicated unbearable pain and discomfort. To check the patients' pain tolerance, they were also asked to give a VAS evaluation of the pain and discomfort which the operative procedure itself had entailed.

Statistical evaluation was done with nonparametric tests and p-values below 0.05 were assumed to indicate significant differences.

The study was approved by the regional ethics committee.

Results

Both patient groups rated the pain of the operative procedure at a median VAS of 8. The VAS values for preoperative pain and persistent pain at 2, 6 and 26 weeks were also almost identical in the two groups (Table 1). The postoperative VAS values indicated that all patients had benefited from the procedure.

Pain, tenderness, burning or dysesthesia in the scar were common after 6 weeks and still persisted in some patients after 6 months. However, the distribution was fairly even between the two treatment groups (Table 2). There were 13 patients who complained of thenar or hypothenar pain

Table 2. Subjective complaints at review. Some patients had more than one complaint

	6 weeks		6 months	
	Immob	Mob	Immob	Mob
No. of patients evaluated	36	45	37	44
Scar discomfort/pain	16	21	6	6
Hypothenar pain	5	5	3	1
Thenar pain	2	1	1	1

("pillar pain") after 6 weeks, and 6 after 6 months. These complaints also were evenly distributed between the treatment groups (Table 2).

In the mobilized group, the 28 patients who had been gainfully employed before operation were sicklisted for a median of 6 weeks (95% CI: 5–6 weeks) postoperatively. In the immobilized group, 19 patients were sicklisted, also for a median of 6 weeks (95% CI: 4–7 weeks).

There was a considerable loss of strength in the operated hand, compared to preoperative values at 6 weeks for all 3 parameters (Table 3). The reductions in grip and keypinch strength were almost identical in the two treatment groups. At 6 months, the grip strength had returned to preoperative values in both groups and the keypinch strength had improved considerably. Again the values in the two groups were almost the same. 4/5 pinch strength was also significantly reduced in both groups at 6 weeks. It had improved after 6 months, but was still around 20% lower than preoperatively. Patients in the immobilized group were slightly weaker than the others, but the difference was not statistically significant.

Median strength values for the opposite hand in unilaterally operated patients showed an apparent increase in grip strength postoperatively of 7% and a reduction in keypinch strength of 6%, at 6 weeks and 6 months.

Discussion

All patients reported a significantly lower VAS score after operation and it can therefore be concluded that they all benefited from the procedure, and that the preoperative diagnosis in this sense was probably correct. The median VAS value for discomfort during the operative procedure was the same in the two groups, indicating that there was no systematic difference in the way the two groups reported VAS values for pain. Thus immobilization confers no advantage with regard to regress of the original complaints postoperatively. Nor did immobilization reduce the frequency of common complications, such as scar or pillar pain.

Nathan et al. (1993) reported a much shorter delay before return to work than we found among our patients. They also found that the period of sick leave depended on the patients' type of insurance. All our patients belong to the same national health insurance scheme that refunds the full normal salary after more than 14 days' absence from work. This may partly explain the long median sick leave among our patients. One might expect that some patients in the immobilized group would oppose return to work before the splint was removed and that the median sick leave time

Table 3. Median strength at review expressed as percentage of preoperative value (95% CI)

	6 weeks			6 months		
	Grip	Key-pinch	4/5-pinch	Grip	Key-pinch	4/5-pinch
Immobilized	76 (71–85)	86 (80–92)	67 (50–75)	104 (94–115)	93 (83–100)	78 (60–88)
Mobilized	78 (70–86)	83 (76–92)	74 (60–83)	108 (100–116)	92 (84–100)	83 (73–100)
Unoperated	107 (104–110)	94 (89–100)	100 (100–109)	107 (104–111)	94 (91–100)	100 (89–113)

might be longer in this group. We did not find this, which may be due to the fact that the surgeon and patient together estimated the required period away from work when the patient had the stitches removed at 2 weeks. There was no incentive for the patients to return to work before the estimated time was up.

To reduce bias, the investigator who had seen the patient preoperatively, and in many cases done the operation, did not perform the postoperative follow-ups. However, this somewhat reduces the reliability of the strength measurements. The slight fall in keypinch power and increase in grip power in the unoperated hands at 6 weeks and 6 months is most likely due to a systematic error in our measurements. Our findings therefore probably indicate that the preoperative power has been regained after 6 months. Gellman et al. (1989) and Young et al. (1992) found that this occurred after 3 months, while Leach et al. (1993) found a return of preoperative values for grip strength after 6 months and for keypinch strength after 1 year. However, among our patients, there was no difference between the two groups. The median values at both 6 weeks and 6 months were almost exactly the same.

We also measured the pinch strength between the thumb and fourth and fifth fingertips. Although this test has not previously been described as a strength test and in spite of it being a highly unusual grip in daily life, we chose to include it, since we felt that, to a greater extent than the other tests, it relies on the integrity of the carpus and its ligaments. This seems to be borne out by our findings. Strength in this test did not return to preoperative values after 6 months. However, there was no statistically significant difference between immobilized patients and controls. In fact, the immobilized patients fared slightly worse.

After we had started our investigation, Cook and co-workers (1995) published a similar study of 50 patients, where half had been immobilized for 2 weeks postoperatively. They found that the immobilized patients fared significantly worse than the controls with regard to the prevalence of scar tenderness and return to activities of daily living and work. They also reported more pain and lower grip and keypinch strength 2 and 4 weeks postoperatively, but not at 3 and 6 months.

We chose to immobilize the wrists for 4 weeks since we felt that this interval would probably be needed to allow sufficient healing of the carpal ligament to prevent bowstringing of the flexor tendons. This is longer than usually recommended, but it seems unlikely to influence our outcome parameters negatively. On the contrary, one might expect the somewhat longer than usual period of immobilization to reduce, if anything, preoperative and surgery-related symptoms, in addition to preserving power in the hand. This was not the case. We were not able to detect any bad effect of a splint, but agree with Cook et al. (1995) that it gives no advantage.

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