Functional splinting versus plaster cast for ruptures of the ulnar collateral ligament of the thumb

A prospective randomized study of 63 cases

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In a prospective randomized study that included 63 consecutive thumbs with injuries of the ulnar collateral ligament of the metacarpophalangeal (MCP) joint of the thumb, plaster cast immobilization was compared with functional treatment with a splint. The splint allowed flexion and extension of the MCP joint, but prevented ulnar and radial deviation of the thumb. The study included both operated on and nonoperated on cases where surgery was performed only when the torn ligament was regarded as displaced. Of 40 thumbs treated nonsurgically, 21 were treated with a cast and 19 with a splint. Of 23 thumbs treated surgically, 10 were immobilized postoperatively in a plaster cast and 13 were treated with the splint. At the follow-up examination after 15 (11–41) months, there was no difference between the treatment groups as regards stability, range of motion, strength of the injured thumb, and length of sick leave. However, the patients considered the splint more comfortable than plaster cast immobilization.

We conclude that immobilization of the thumb after a ligamentous injury with a movable splint is strongly preferred by the patients and that the functional results of this technique are equal to plaster cast immobilization after both surgical and nonsurgical treatment.

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Good results after functional bracing of ligamentous injuries of the metacarpophalangeal (MCP) joint of the thumb have recently been reported (Pichora et al. 1989). We have compared functional treatment of ulnar collateral ligament injuries of the MCP joint of the thumb with conventional plaster cast immobilization.

Patients and methods

Between June 1986 and May 1988, 62 patients were referred from the emergency unit to the Section for Hand Surgery at Lund University Hospital because of a fresh rupture of the ulnar collateral ligament of the MCP joint of the thumb. The diagnosis was established after clinical and radiographic examination by experienced orthopedic specialists, who in all the cases concluded that surgical treatment might be indicated. There were 19 women and 43 men with a mean age of 32 (11–62) years. Because 1 patient was injured bilaterally, our study included 63 thumbs. According to the principles presented in a previous study (Abrahamsson et al. 1990), operative treatment was performed only in those cases presenting displacement of the torn ligament. If it was possible, 23 cases were operated on with reattachment of the ligament with a pull-out wire or an end-to-end suture. The remaining 40 cases were treated nonsurgically. All the cases were randomized using a random table to either immobilization in a plaster cast or a functional splint (Table 1). The splint was designed with a stiff part constructed of Hexalite®, immobilizing the wrist and the thumb base, and a movable part, constructed of Orthoplast®, including the proximal phalanx of the thumb. The movable part was attached to the fixed one with a hinge, permitting 50° of flexion-extension in the MCP joint, but preventing ulnar and radial deviation (Figure 1). The patients were encouraged to undertake active flexion-extension exercises with the injured joint, but extreme loading of the thumb and removal of the splint were prohibited. One patient with bilateral injuries did not follow these instructions properly. In the plaster cast group, the thumb and wrist joints were immobilized in a plaster cast that left the tip of the

Table 1. Patient material, MCP joint range of motion (ROM), strength of the pinch grip, and length of sick leave

	Surgical treatment		Nonsurgical treatment	
	Plaster cast	Splint	Plaster cast	Splint
Thumb injuries (n 63)	10	13	21	19
Reexamined (n 59)	10	12	18	19
Male/female ratio	6:4	6:6	12:6	15:4
ROM (degrees)	53	52	58	51
range	25–65	20–65	40–70	30–70
Strength (kPa)	57	56	56	54
range	40–72	42–80	45–70	42–80
Sick leave (weeks)	4.6	4.6	2.2	2.3
range	0–12	0–9	0–10	0–8

thumb free for pinching. Immobilization with the plaster cast or the splint was continued for 5–8 weeks followed by training activities. A follow-up study was performed 15 (11–41) months after the injury, which included subjective and objective parameters and a notation of the length of sick leave. The comfort of the bandage regarding possibility to perform ADL tasks, experienced pain during pinching activites, and any complaints or preferences were rated by the patients on a five-grade scale ranging from "bad" to "excellent." The clinical examination included stability tests where the radial deviation of the MCP joint was recorded in a loaded situation. Measurements of range of motion were performed with the aid of a goniometer, and strength of the pinch grip was measured with a Martin vigorimeter. Four patients refused to participate in the follow-up study, which left 58 patients with 59 thumb injuries for analysis (Table 1). The statistical analysis was performed using nonparametric tests, such as the Mann-Whitney test and the Spearman rank-sum test.

Results

There were no differences as regards range of motion, strength of the pinch grip, or the length of sick leave between patients treated with the plaster cast when compared with those treated with the splint (Table 1). The length of sick leave was analyzed separately in 32 patients that had heavy manual work, and no differences were found between the plaster cast and splint.

There were 7 thumbs with an ulnar deviation of the MCP joint exceeding 15°: 6 in the nonoperatively treated groups with an equal distribution between plaster cast and splint immobilization and 1 in the surgically treated group with plaster cast immobilization postoperatively. Only 1 thumb showed instability exceeding 20°, and it was assessed as unstable during loading. This thumb was treated nonsurgically with a splint, and belonged to the patient with bilateral injuries who had not followed the instructions.

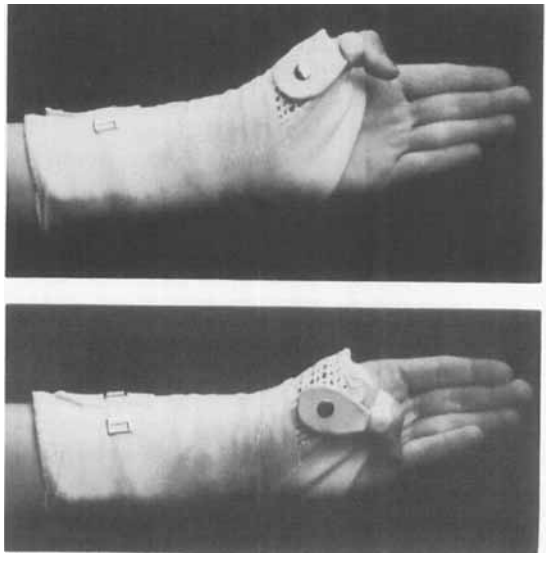

Figure 1. Functional splint immobilizing the wrist joint and preventing ulnar and radial deviation of the MCP joint of the thumb. The splint permits 50° of flexion/extension of the MCP joint of the thumb.

The range of motion of the injured MCP joints was on an average 54°; the mean difference compared with the uninjured thumb was 7°, without any significant difference between the treatment groups. There were only 4 thumbs with a range of motion less than 40°, equally distributed between the two treatment groups.

The comfort of the bandage was favored by the patients in the splint group compared with those in the plaster cast group. On the five-grade rating scale, 17 of 31 patients in the splint group rated the splint as "excellent" compared with 6 of 28 in the plaster cast group, and 11 of 31 patients in the splint group rated the splint as "good" compared with 4 of 28 in the plaster cast group.

Discussion

The mechanism of injuries to the ligamentous structures around the MCP joint of the thumb has been described in detail in the classical work of Stener, in which he also emphasized the importance of a proper

immobilization of the thumb (Stener 1963). All kinds of immobilization of the hand and fingers, however, have the potential risk of producing stiffness and swelling. From this point of view, a splint that immobilizes only the traumatized part of an injured joint but permits movements, and hence the functional activity of the joint, is in theory superior to a plaster cast.

In our study, no case of permanent joint stiffness was observed in either of the treatment groups, and thus we have not been able to show the clinical implication of this theory. However, the patient's preference in favor of the splint instead of the cast was in many cases due to the ability to use the hand more normally in spite of an immobilizing bandage.

It has been suggested that early motion enhances osteogenesis, promotes revascularization of the damaged tissue, and improves the biological healing process (Latta et al. 1980, Sarmiento and Latta 1981). Many studies have shown a difference in the functional result after fractures and joint injuries between plaster cast immobilization and functional splints that was in favor of the splints, especially in terms of the earlier normalization of strength and range of motion (Sarmiento et al. 1975, Arafa et al. 1986, deBruijn 1987, Abbaszadegan et al. 1989). In our study, we have not been able to analyze functional parameters during the healing process. After the mean follow-up period of 15 months, there was no difference in hand function between plaster cast and splint immobilization, neither in the nonoperatively treated patients nor in the surgically treated patients.

Pichora et al. (1989) had three failures in his study of 32 functionally treated Stener lesions. We recorded one failure in 31 cases with splint immobilization. This patient, who had bilateral thumb injuries, removed his splints too prematurely and sustained a bad end result, with functional instability of the MCP joint. Treatment with a splint, which is easily removed as compared with a plaster cast, should thus be reserved for cooperative patients.

The patients in our study of 63 cases were selected from all the thumb injuries treated at our hospital. The selection was done by the orthopedic surgeon on call, who in all the cases after a radiographic and a clinical examination assessed the injuries as ruptures of the ulnar collateral ligament needing surgical treatment. Surgery was, however, performed only when the ligament was displaced outside the adductor aponeurosis, assessed by palpation. This method of detecting displacement of the torn ligament has previously been shown to be reliable (Abrahamsson et al. 1990), and the frequency of surgical treatment in that study was 33 percent compared with 36 percent in the present study. The overall result in our study compares well with other studies in which liberal indications for surgical intervention have been used (Moutet et al. 1989), indicating that nonoperative treatment is justified when the ulnar collateral ligament is not displaced.

We recorded no complications from splinting with controlled early motion of thumb injuries in terms of pain and swelling, nor were any pressure sores observed, which have been reported in other studies (Geiger and Karpman 1989). Apart from that patient who did not follow instructions, all the patients were satisfied with the splint.

We conclude that functional splinting produces equally good end results as plaster cast immobilization in both surgically and nonoperatively treated cases, and that it is preferred by the patients because of its superior comfort.

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