

# Results of treatment of neglected finger stiffness with steroids and intensive exercises

Andrzej Żyłuk

Pomeranian Medical University in Szczecin, Department of General and Hand Surgery, Unii Lubelskiej 1, 71-252 Szczecin, Poland

ORCID: 0000-0002-8299-4525

✉ azyluk@hotmail.com

## ABSTRACT

**Introduction:** Finger stiffness following treatment for skeletal trauma to the hand is a common and challenging issue for hand surgeons. The primary causes of immobilization are fractures within the hand or wrist. Immobilization of the fingers is generally harmful and rarely necessary. The aim of this study was to evaluate the results of treating patients with neglected finger stiffness using a combination of steroids and intensive rehabilitation.

**Materials and methods:** Between 2020–2023, 11 female patients with post-traumatic finger stiffness were treated at the author's institution. On average, treatment began 5 months after the injury. All patients underwent a 5–7 day hospital stay, receiving drug therapy (8 mg of dexamethasone i.v.) combined with intensive, supervised hand rehabilitation.

**Results:** All but 1 patient achieved full finger flexion. One patient experienced a persistent flexion loss of 2 cm (initial loss was 7 cm). Grip strength showed slight improvement, and all patients regained the ability to grasp objects with the affected hand. Patient satisfaction with the treatment outcome was universally high.

**Conclusion:** The results of this study demonstrate the high effectiveness of the proposed treatment, which was safe, free of adverse effects, and enabled a rapid return of hand function for daily activities and work.

**Keywords:** finger stiffness; finger contracture; unnecessary immobilization; hand therapy; steroid therapy.

## INTRODUCTION

Posttraumatic finger stiffness is a relatively common condition that affects individuals after injuries treated with hand immobilization in a plaster splint or cast. Finger stiffness following skeletal trauma to the hand is a challenging problem frequently encountered by hand surgeons (Fig. 1, 2, 3). Immobilization is often used for fractures within the hand or wrist, most commonly for distal radial fractures (DRF). However, immobilizing the fingers is generally harmful and rarely necessary. According to recent recommendations, finger and metacarpal fractures can often be safely managed without immobilization, or with immobilization that allows full range of motion in the fingers. For conservative treatment of DRF, immobilization should be limited to the wrist, leaving the fingers free to move.

Unfortunately, clinical practice often deviates from these guidelines, and the majority of patients experience unnecessary finger immobilization throughout the treatment period, which can last 5–6 weeks. After such a prolonged period, regaining full mobility in the fingers becomes difficult, and even intensive rehabilitation may not yield the desired results (Fig. 1). Another contributing factor to finger stiffness is post-traumatic complex regional pain syndrome (CRPS), particularly its aftermath. During the acute phase of CRPS, finger mobility is severely restricted due to intense pain that accompanies any movement attempt (Fig. 4, 5). Once the acute phase subsides, either through treatment or spontaneously, the fingers often remain stiff, and while the CRPS symptoms may disappear, the patient's hand function remains significantly impaired.



**FIGURE 1.** Stiffness of healthy fingers in the right hand 4 months after conservative treatment of distal radial fracture. Note the full finger flexion in the unaffected hand



**FIGURE 2.** Slight loss of extension of the fingers in the right hand 3 months after operative treatment of a middle finger fracture



**FIGURE 3.** Considerable loss of flexion (stiffness) in the healthy fingers of the right hand 3 months after operative treatment of a middle finger fracture. Note the full finger flexion in the unaffected hand



**FIGURE 4.** Swelling and loss of extension in the fingers of the right hand during the course of complex regional pain syndrome



**FIGURE 5.** Considerable loss of flexion (stiffness) in the fingers of the right hand during the course of complex regional pain syndrome

Regardless of the cause, patients with stiffness in otherwise healthy fingers are frequently seen in rehabilitation offices, and the results of even long-term rehabilitation often remain unsatisfactory. This is largely due to fibrosis and contraction of the joint structures (joint capsule and ligaments), which, when mobilized, cause severe pain that is often intolerable for the patient. In such cases, rehabilitation that is carried out up to the point of pain leads to minimal progress. Surgical treatment of joint stiffness (arthrolysis), is rarely recommended nowadays due to its low

effectiveness and the risk of further deterioration. Other treatment modalities for finger stiffness include stretching, infrared or ultrasound heating therapy, passive motion training, neuromuscular electrical stimulation, and botulinum toxin injections [1, 2, 3].

At the author's institution, an original method of treating early CRPS was developed 30 years ago, using a combination of steroids and mannitol along with intensive exercises, despite the presence of pain [4]. The effects of the drugs reduced pain and swelling, allowing well-motivated patients to regain full finger mobility within a week, thus restoring grip ability and improving hand dexterity (Fig. 6). A similar approach was applied to patients who no longer had CRPS symptoms but suffered from finger stiffness, as well as those with stiff fingers due to unnecessary immobilization.

The aim of this study was to evaluate the results of treating patients with neglected finger stiffness using a combination of steroids and intensive rehabilitation.



**FIGURE 6.** Almost full finger flexion in the patient shown in Figures 4 and 5, 1 week after therapy with steroids and intensive exercises

## MATERIALS AND METHODS

Between 2020–2023, 11 female patients with an average age of 54 years (range 39–67) were treated for post-traumatic finger stiffness at the author's institution. The causes of the condition included DRF in 8 patients, metacarpal bone fractures in 2 patients, and an unconfirmed suspicion of a scaphoid bone fracture in 1 patient. The time from injury to the start of treatment averaged 5 months (range 3–9 months), with an average of 4 months of ineffective rehabilitation before treatment. Baseline (pre-treatment) measurement results are presented in Table 1.

**TABLE 1.** Results of baseline and follow-up assessment of 11 patients in the study group

Variable	At baseline		Post-treatment	
	mean	range	mean	range
Pain (NRS)	3	2–6	2	2–5
Deficit of finger flexion (cm)	5 cm	3–7 cm	0.2 cm	0–2 cm
Grip strength (kg)	7 kg	2–12 kg	10 kg	5–18 kg

NRS – numeric rating scale

## Treatment method

All patients were treated in an in-patient setting for a period of 5–7 days, with a combination of pharmacotherapy and intensive hand rehabilitation. Patients received 4 mg of dexamethasone i.v. once daily and 50 mg of amitriptyline once daily at night. Two patients with moderately swollen hands received an additional 250 mL of 15% mannitol i.v. once daily.

The author instructed patients on how to exercise their fingers. They were advised to passively bend their fingers at all joints until they felt pain, then push past the pain limit and continue bending until they could no longer bear it. They were instructed to maintain the bend for about 1 min before slowly straightening the finger. Each finger was exercised separately, with particular focus on flexion in the metacarpophalangeal (MCP) joints, which are typically the stiffest. Patients were advised to perform these exercises 4 times a day for approx. 20–30 min. Additionally, patients were encouraged to take ownership of their progress (“this is your hand, and it’s up to you to make use of it”).

The progress of the treatment was monitored daily. In cases of severe post-exercise pain, emergency painkillers were administered, typically 1 g of metamizole i.v. or 50 mg of tramadol subcutaneously. Patients rated their maximum pain during exercise at 9–10 on the numeric rating scale (NRS), which demonstrated their full commitment to the therapy.

The results of the treatment were assessed immediately after completion, before discharge from the hospital, and after 2 months via telephone interviews.

## RESULTS

Treatment outcomes are summarized in Table 1. All but 1 of the patients achieved full flexion of their fingers. In 1 patient, a flexion loss of 2 cm persisted (initial loss was 7 cm). Before treatment, the patients experienced minor pain, which remained at a similar level after treatment. Grip strength showed slight improvement, and all patients regained the ability to grasp objects with the affected hand, such as a glass, cup, or cutlery – an ability they lacked prior to treatment. Despite the intense pain experienced during therapy, all patients were very satisfied with the treatment outcomes.

### Follow-up examination 2 months after completion of the treatment

Two months after completing treatment, all patients were contacted via phone for a follow-up. They all maintained the full range of finger mobility achieved during their clinic stay. One patient, who had a minor flexion deficit, did not show further progress in rehabilitation. Among the 8 patients who were working and on sick leave due to hand dysfunction, 4 had returned to work, while the remaining patients expressed their intention to do so.

## DISCUSSION

Stiffness of the fingers resulting from unnecessary immobilization is a relatively common issue that impacts hand function and

delays the return to normal daily and professional activities. This problem particularly affects middle-aged and older women being treated for DRF. Despite years of education through courses, textbooks, and training platforms, awareness of the harmful effects of finger immobilization remains insufficient. In clinical practice, more than half of patients treated for DRF (whether conservatively or surgically) experience varying degrees of finger mobility limitation – even though the fingers themselves were not injured. This issue is even more prevalent following the treatment of hand bone fractures, including operative procedures, where finger immobilization is not required.

To address this, the author’s institution introduced a novel method for treating certain fractures without any immobilization, allowing for full flexion and extension of the fingers from the first day after injury [5]. Unfortunately, ignorance of the harmful effects of unnecessary immobilization of healthy fingers is widespread, contributing to the problems discussed in this study.

For patients with stiff fingers after hand injury treatment, the most frequently recommended approach is formal physical therapy (rehabilitation) at specialized centers. However, this is only effective in some cases, and many patients seek further medical consultation after 3–4 months of ineffective therapy. The proposed treatment method – a combination of pharmacotherapy and intensive exercise, despite pain – offers a viable solution to restore hand function and mitigate the negative consequences of unnecessary immobilization. It is also safe, as short-term steroid therapy has no adverse effects.

The role of steroids in this therapeutic regimen is to reduce the inflammatory response caused by intense exercise. Without the protective effects of the steroid, such exercises would lead to significant swelling, redness, and soreness, which could hinder the continuation of intensive rehabilitation exercises.

### Literature review

The literature offers only a limited number of studies addressing finger stiffness caused by unnecessary immobilization. Most research focuses on treating posttraumatic stiff fingers. It is well established that preventing finger stiffness through careful and early mobilization of the joints is preferable, as it helps to avoid the need for more complicated treatments once stiffness has developed [6]. Surgical procedures for stiff fingers include capsulotomy, collateral ligament release, and other soft tissue releases of the MCP and proximal interphalangeal (PIP) joints [2, 3, 6, 7, 8].

Non-operative treatments for stiff fingers include exercise, joint mobilization, continuous passive motion, casting, and splinting [1, 2, 3]. Splints are used to apply stress to the affected joints and stimulate the lengthening of shortened soft tissues, thereby improving the passive range of motion. Various types of splints are applied in treating hand diseases and injuries, some of which are designed to position the MCP or IP joints at their available end range of motion. These splints can be categorized as static, serial static, static progressive, or dynamic.

The outcomes of rehabilitation using exercises and splints are generally satisfactory to some extent, but a proportion of patients fail to improve with conventional therapy and may require further interventions [1, 2].

Surgical treatment for stiff fingers can yield modest improvements in some patients, but results are often disappointing. This has been demonstrated in studies involving patients with digital stiffness caused by tendon repairs, surgeries for Dupuytren's disease, soft tissue trauma, burns, bone fractures, and dislocations. Existing research often focuses on surgical releases of specific joints (MCP, PIP), limiting the applicability of the data to patients with multiple joint involvement [6, 7, 8]. However, some studies provide encouraging outcomes for surgical interventions in stiff fingers. Lutsky et al. reported the results of surgical release in 18 patients (12 women and 6 men, average age 40 years), all of whom had metacarpal and finger fractures. Sixteen patients underwent surgery, while 2 were treated with splinting. Despite an average of 6 months of unsuccessful hand therapy, surgical treatment, including capsulectomy, collateral ligament release, or tenolysis, resulted in an improvement in total active motion (TAM) from a mean of 150–191° postoperatively. Early post-surgery rehabilitation was critical for optimal results: patients who began therapy more than 7 days after surgery lost motion relative to their preoperative range of motion, while those who started within 3 days gained motion [6].

In older studies, Gould and Nicholson reported 15–18° of improvement in MCP and PIP joints after capsulectomy in 18 patients with finger stiffness [7]. Similarly, Young et al. found that most of their 61 patients, who had 135 stiff joints, gained more than 30° of motion following surgical release [8]. However, both studies lacked data on the outcomes of multiple finger joint releases in the same patient.

Acupotomy, an alternative treatment derived from traditional acupuncture, is another option for treating stiff fingers. This technique uses a thick, flat-head needle to release tissue adhesions, promote blood circulation, and facilitate recovery around joints. Yoon et al. reported successful outcomes in 2 patients treated with acupotomy for interphalangeal joint stiffness following tendon repair surgery and cast immobilization. Both patients saw significant improvements after 6 sessions, with ranges of motion reaching 60° for the thumb interphalangeal joint and 90° for the index PIP joint at 6 months post-treatment [9].

Manual rehabilitation by physiotherapists remains the standard for treating stiff fingers. However, with technological advancements, robot-assisted hand rehabilitation or assisting devices have attracted a lot of interest and have been proven to be good or even better than conventional therapy because of providing high intensity and repetitive movements [10, 11]. With a robot's assistance the patients can practice more easily at their own will, and handle functional daily living tasks with ease. Results of experimental studies show that a robot has adaptability to different subjects and has achieved nearly the maximum finger bending angle of a healthy adult person [10]. It will be easy to customize a distinct finger model by calibration

for the individual patient, individual finger, or during different therapy stages, to satisfy rehabilitation requirements [10, 11].

The most important prerequisite in the prevention of finger stiffness is immediate mobilization and allowing finger movement in a full range of motion. Nevertheless, in the conservative treatment of hand fractures, some kind of immobilization is necessary. The recommended position for immobilizing the hand is the "safe position", which maintains the wrist in 30° of extension, the MCP joint in 70–90° of flexion, and the PIP joint in full extension. This positioning minimizes contracture by stretching the MCP joint collateral ligaments and straightening the PIP joint's volar plate. Immobilizing the PIP joint in extension is advised since it is easier to restore flexion than extension after a PIP joint contracture [2, 12].

In conclusion, the results of this study show high effectiveness of the recommended treatment for neglected finger stiffness using a short course of steroids and intensive exercises. This therapy was safe, had no adverse effects, and facilitated a rapid return of hand function, allowing patients to resume daily activities and work. The author found no similar reports in the literature, which motivated the writing of this paper.

## REFERENCES

- Rongièrès M. Management of posttraumatic finger contractures in adults. *Hand Surg Rehabil* 2018;37(5):275-80.
- Yang G, McGlenn EP, Chung KC. Management of the stiff finger: evidence and outcomes. *Clin Plast Surg* 2014;41(3):501-12.
- Houshian S, Jing SS, Chikkamuniyappa C, Kazemian GH, Emami-Moghaddam-Tehrani M. Management of posttraumatic proximal interphalangeal joint contracture. *J Hand Surg Am* 2013;38(8):1651-8.
- Zyluk A, Puchalski P. Treatment of early complex regional pain syndrome type 1 by a combination of mannitol and dexamethasone. *J Hand Surg Eur Vol* 2008;33(2):130-6.
- Zyluk A. Outcomes of treating hand fractures without using immobilization. *Pomeranian J Life Sci* 2022;68(3):1-4. doi: 10.21164/pomjlifesci.825.
- Lutsky KF, Matzon JL, Dwyer J, Kim N, Beredjiklian PK. Results of operative intervention for finger stiffness after fractures of the hand. *Hand (N Y)* 2016;11(3):341-6.
- Gould JS, Nicholson BG. Capsulectomy of the metacarpophalangeal and proximal interphalangeal joints. *J Hand Surg Am* 1979;4(5):482-6.
- Young VL, Wray RC Jr, Weeks PM. The surgical management of stiff joints in the hand. *Plast Reconstr Surg* 1978;62(6):835-41.
- Yoon SH, Cha J, Lee E, Kwon B, Cho K, Kim S. Acupotomy treatment for finger joint contracture after immobilization: a case report. *Medicine (Baltimore)* 2021;100(10):e24988.
- Dai Y, Ji J, Yang G, Yang Y. A novel robotic exoskeleton for finger rehabilitation: kinematics analysis. *Appl Bionics Biomech* 2022;2022:1751460. doi: 10.1155/2022/1751460.
- Carpi F, Frediani G, Gerboni C, Gemignani J, De Rossi D. Enabling variable-stiffness hand rehabilitation orthoses with dielectric elastomer transducers. *Med Eng Phys* 2014;36(2):205-11.
- Neumeister MW, Winters JN, Maduakolum E. Phalangeal and metacarpal fractures of the hand: preventing stiffness. *Plast Reconstr Surg Glob Open* 2021;9(10):e3871.