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Outcomes of treating hand fractures without using immobilization

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ABSTRACT
The results of functional treatment, without immobilization, in 7 patients with stable fractures of the metacarpal bones and phalanges is reported. Each patient was instructed to make a full flexion and extension of all fingers in 1 block (fingers kept close each other). No immobilization was used. The results were assessed at 1 month and 3 months from the beginning of therapy. All patients achieved consolidation of their fractures confirmed radiologically at 3 months. All patients achieved full finger movement and very good function of the hand. No change of treatment into operative was necessary. The results of this study demonstrate that the treatment of stable fractures of the metacarpal bones and phalanges according to the presented "functional" protocol is safe, well tolerated by the patients and gives good outcomes.
Keywords: phalangeal fracture; metacarpal fracture; functional treatment; outcome assessment.

INTRODUCTION

Hand fractures (metacarpal and phalangeal) are common injuries in adults. Most are just slightl displacements and are stable, which means they can be treated conservatively; fractures that are severely dislocated and unstable require operative treatment. Typical conservative treatment consists of immobilization of the hand or finger in plaster of Paris or in a thermoplastic splint for 4–5 weeks [1, 2]. Hand surgeons have developed several rules on how to manage such fractures, such as:

- most hand fractures heal well and spontaneously,
- the hand dislikes immobilization,
- slightly or non-displaced and stable fractures need only minimal immobilization, not necessarily in plaster, but which can be removed from time to time for relaxing the hand.

Immobilization of the hand should be as minimal as possible and confined to just the broken finger. Immobilization of the adjacent uninjured finger is not allowed, except when using the "buddy taping" method. Mobilization of all fingers in a full range of movement is obligatory as soon as possible, with the exception of the 1 joint closest to the fracture site.

Even these relatively liberal rules of immobilization are nowadays out of date, as the results of recent studies show that many hand fractures may be treated successfully without any immobilization. Such treatment is called "functional" and its use in daily practice is reported in literature [3, 4]. The essence of this treatment is that most hand fractures heal well and spontaneously, and that normal finger movement does not disturb the healing conditions, but can even improve it. Maintaining all fingers in flexion prevents malrotation of distal bone fragments and can correct it when present [3, 4].

In hand fractures, non-union is very uncommon, but malunion is more frequent. However, even in the case of malunion, when good finger movement is maintained, it does not significantly impair the functioning of the hand.

Malrotation of the finger (so called "scissoring") is one of the most disturbing results of hand fractures, significantly reducing the functioning of the hand. The functional treatment protocol prevents development of such a complication. Young patients quickly adapt to using the hand with a broken finger or metacarpal bone in light daily activities, and after 2–3 weeks can do most activities without problem. Consolidation of the fracture occurs in about 4–5 weeks, and the hand can be used normally with full finger movement and grasping ability from the beginning of the treatment.

The objective of this study was an assessment of the outcomes of treating hand fractures without using immobilization, according to the adopted "functional" protocol.

MATERIALS AND METHODS

Over the period 2020–2021, 5 patients with fractures of the metacarpal bone and/or phalanges were treated in the author's institution using the "functional" protocol, without immobilization. Two other patients with non-treated fractures who had been referred to the clinic at 3 weeks and 6 months post-injury were also included. The study group then consisted of 6 men and 1 woman ranging 23–41 years of age (mean 32 years). One patient had fractures of the proximal phalanges of 2 fingers, making the total number of treated fingers and metacarpals was 8. Of these, 3 were metacarpal fractures, 3 proximal phalanges fractures and 2 middle phalanx fractures (Fig. 1, 2). In 5 patients, the right hand was involved, and the remaining 2 were left hand injuries. All the fractures were displaced: 6 moderately and 2 severe. Five of the patients had fresh fractures and were seen from 2–5 days of the injury. One patient visited the clinic 3 weeks after the injury (Fig. 3) and 1 visited 6 months after the injury (Fig. 4a, b). The patients were informed about their injuries, as well as the conditions and goals of the functional treatment. After obtaining their informed consent, the treatment was started in the 5 patients with fresh fractures and in the 1 with the 3-week old fracture.

FIGURE 1. Fracture of the base of the proximal phalanx of the little finger

FIGURE 2. Oblique fracture of the 3rd metacarpal bone

FIGURE 3. Neglected fracture in the middle phalanx of the index finger

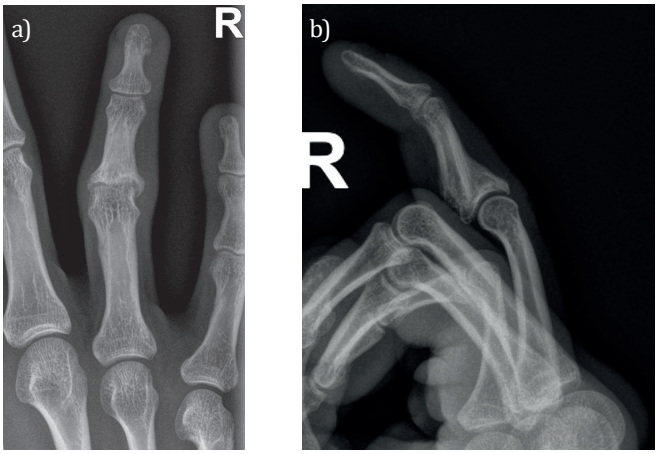

FIGURE 4. Malunited fracture of the middle phalanx of the ring finger: a) p-a view; note ulnar deviation of the finger; b) lateral view

Treatment protocol

Treatment of 6 of the patients was carried out according to the following protocol, irrespective of the presented displacement:

— each patient was instructed to make full flexions and extensions with all fingers together (fingers kept close each other) – Figures 5a, 6a,

— the full flexion should be maintained for about 30 s before extending the fingers,

— these exercises to be performed 6 times a day, in 10 full cycles (flexion-extension).

The patients were recommended to use their hands in light daily activities and at work, e.g. with a computer, handwriting, or carrying light objects.

The treatment instructions took about 30 min on average and then the patients were released. The essence of this protocol consists of the awareness that holding the fingers in full flexion prevents and corrects malrotation, and that light finger movements do not disturb bone union, but can even improve it. In 2 patients, "buddy taping" of the fractured finger with the adjacent healthy finger was employed for 2 weeks along with the above protocol (Fig. 5b, 6b).

The results were provisionally examined at 1 month with a final assessment at 3 months. The following variables were assessed: range of motion of the affected finger (or finger representative for the broken metacarpal bone), deformation of the finger, and the presence of scissoring. The patients were also asked about any pain when using the hand. Finally, the healing of the fracture and the presence of any displacement were examined in X-ray images.

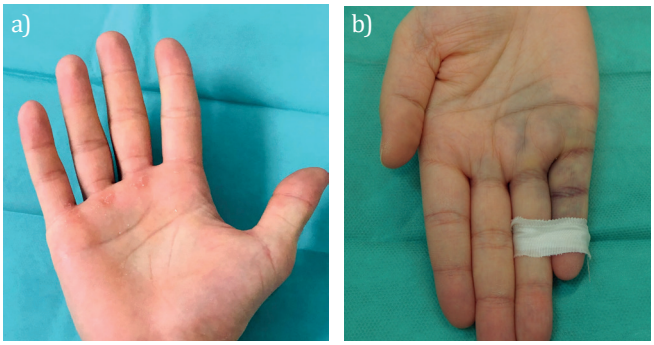

FIGURE 5. Normal appearance of the hand of the patient with: a) metacarpal fracture from Figure 2; b) fractures of the proximal phalanges of the ring and little fingers; note the "buddy taping" in the broken fingers

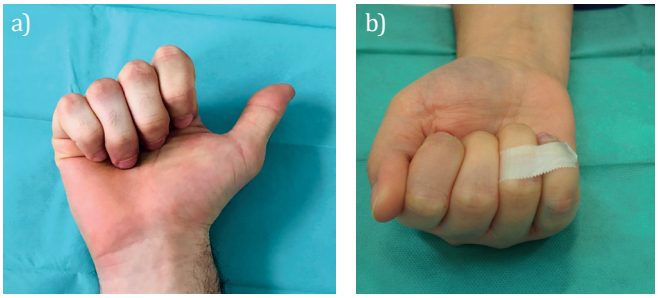

FIGURE 6. Full finger flexion in the patient from: a) Figure 5a; b) Figure 5b

RESULTS

The final follow-up assessment was performed at 3 months. X-ray images showed a solid union of all fractures. In 5 of the patients, the fractures had united with minimal displacement, while 2 of the patients had moderate displacements, but roughly the same as in baseline X-ray images (Fig. 7). Three patients complained of mild pain in the hand when doing heavy physical work (4–5 points in numeric scale, range 0–10). All the patients retained full finger flexion (Fig. 8, 9). One patient with the united fracture of the ring finger had a moderate ulnar deviation of this finger, but without malrotation (Fig. 10, 11). None of the patients reported any loss of grip strength. None of the patients reported any functional or cosmetic problems related to shortening of the injured finger/fingers. There were no complications with the treatment.

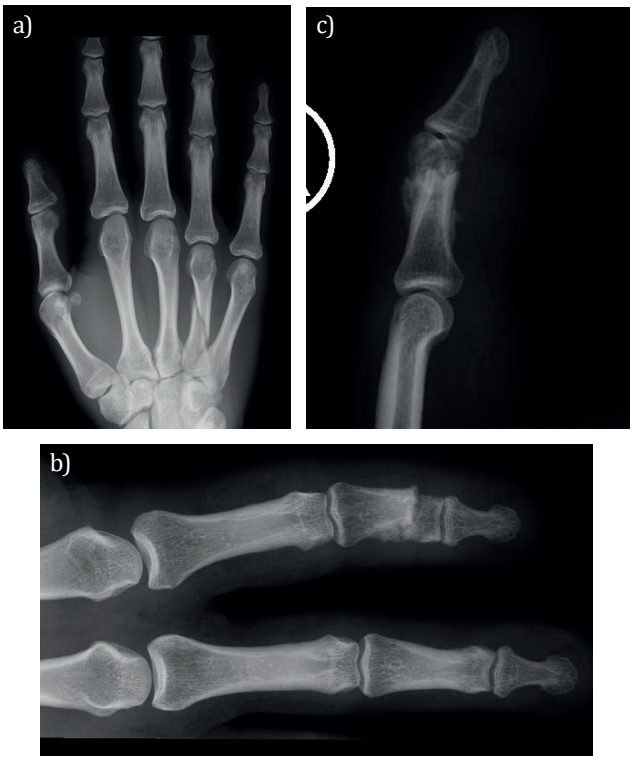

FIGURE 7. United fracture of the: a) 4th metacarpal bone at 5 weeks; b) and c) middle phalanx of the index finger at 5 weeks from Figure 3

FIGURE 8. Minimal deformity of the index finger at 3 months in the patient from Figures 3, 7a, b

FIGURE 9. Full finger flexion in the patient from Figure 8

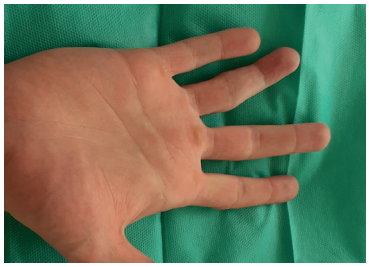

FIGURE 10. Slight ulnar deviation of the ring finger in the patient form Figures 4a, b

FIGURE 11. Full finger flexion without scissoring in the patient from Figure 10

DISCUSSION

The treatment of hand fractures has changed considerably over the last 2 decades, from long plaster of Paris splints, extending from the fingertips to the elbow, to "functional" treatment with no immobilization at all. Obviously, not all fractures can be managed using the "functional" protocol; typical indications would include stable, oblique and spiral fractures of the shafts of the metacarpal bones and phalanges, with minimal or moderate displacement. But unstable, severely displaced and intra-articular fractures require operative treatment. Thus, it can be confidently stated that when the fracture does not need surgery, it can be safely treated without immobilization. As mentioned earlier, nonunion in hand fractures occurs very seldomly, and full range finger movement does not disturb bone union, but even stimulates it. Likewise, in most stable fractures, the finger movements make no risk of dislocation of the fracture [3, 4]. In spiral and oblique metacarpal fractures, it even prevents malrotation and shortening of the bone

because the deep portion of the transverse metacarpal ligament, the structure which extends between the metacarpal heads and the distal parts of the shafts, plays an important role in stabilising the distal fragment of the bone, thus limiting both metacarpal malrotation and shortening. This occurs particularly when the fingers are held in full flexion, making a fist [4]. Moreover, maintaining the fingers in one block (likewise with "buddy taping") prevents malrotation of the bone fragments.

One problem raised in some studies is metacarpal shortening occurring along the oblique-shaped fracture site. It has been considered to lead to weakness and a reduced range of motion. One biomechanical study suggested that a shortening of 3 mm or more leads to a weakness in flexion strength. A more recent biomechanical study has shown no such loss of strength even with up to 5 mm of shortening [5]. The results achieved in our study fit well to these later findings.

One patient in our series presented with a neglected fracture of the middle phalanx of the index finger (Fig 3). Until his referral to the clinic, the finger had been immobilized in a Zimmer splint. Removal of the splint and introducing functional treatment allowed a solid bone union and full finger movement within 5 weeks. One patient with a malunited fracture of the middle phalanx of the ring finger was referred to the clinic for corrective osteotomy (Fig 4). This fracture had not been treated at all but had eventually united spontaneously, although with moderate displacement. This did not affect the finger and hand function, so the corrective operation was cancelled (Fig. 10, 11). This case was included in the study as an example of a good outcome achieved when the finger fracture was left without treatment.

Literature review

The author found only 1 article fitting the topic "functional treatment of hand fractures". The results of that study prompted the author to conduct the present trial. Khan and Giddins reported the outcome of treatment of 25 patients with 28 spiral and oblique metacarpal fractures, according to the same protocol used in the present study. At a mean of one-year follow-up, 23 patients had an excellent outcome and 2 had a good outcome. All the fractures united with minimal shortening. All patients achieved full fingers movement and good grip strength. Only 2 patients reported mild dysfunction: one had a residual malrotation of 5° and some awkwardness while playing the guitar, and the other had some discomfort during boxing. All the patients in paid employment had returned to work within 4 weeks [4].

Al-Qattan reported good outcomes of conservative treatment of spiral and oblique metacarpal fractures in a palmar wrist splint for 2 weeks, following by immediate mobilization of the fingers [6]. In another study, this authors reported the outcomes of surgical treatment of fractures with cerclage wire fixation and immediate post-operative mobilisation of the fingers in a wrist splint [7]. A total of 43 patients were included in both studies. The results of both treatments were comparable, excellent in total, and roughly similar to those reported by Khan and Giddins, except the longer time to return to work and significant scar (cosmetic) problems following surgery, especially in the women [7].

The results of this study demonstrate that treatment of stable fractures of the metacarpal bones and phalanges according to presented "functional" protocol is safe, well tolerated by the patients, and yields good outcomes. The main weakness of this study is the limited number of patients included, thus the results should be treated as a preliminary report. Nevertheless, the consistency of results of this study with the outcomes of the other authors provides an argument confirming the accuracy of the presented method.

REFERENCES

1. Żyluk A, Budzyński T. Leczenie złamań kości śródręcza i paliczków – przegląd piśmiennictwa. Chir Narz Ruchu Ortop Pol 2006;71:299-308.
2. Żyluk A, Budzyński T. Porównanie wyników leczenia zachowawczego i operacyjnego (zespolenie drutami K) izolowanych złamań kości śródręcza – prospektywna, randomizowana próba badawcza. Pol Przegl Chir 2009;81(5):399-411.
3. Giddins GE. The non-operative treatment of hand fractures. J Hand Surg Eur Vol 2015;40(1):33-41.
4. Khan A, Giddins G. The outcome of conservative treatment of spiral metacarpal fractures and the role of the deep transverse metacarpal ligaments in stabilizing these injuries. J Hand Surg Eur Vol 2015;40(1):59-62.
5. Wills BPD, Crum JA, McCabe RP, Vanderby R Jr, Ablove RH. The effect of metacarpal shortening on digital flexion force. J Hand Surg Eur Vol 2013;38(6):667-72.
6. Al-Qattan MM. Outcome of conservative management of spiral/long oblique fractures of the metacarpal shaft of the fingers using a palmar wrist splint and immediate mobilization of the fingers. J Hand Surg Eur Vol 2008;33(6):723-7.
7. Al-Qattan MM, Al-Lazzam A. Long oblique/spiral mid-shaft metacarpal fractures of the fingers: treatment with cerclage wire fixation and immediate post-operative finger mobilisation in a wrist splint. J Hand Surg Eur Vol 2007;32(6):637-40.