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Conservative treatment of finger and metacarpal fractures: a narrative review

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Abstract: Background: Hand (finger and metacarpal) fractures are common in surgical practice, usually affecting adolescents and young adults. Treatment of these injuries is generally conservative, with generally good results. However, since the end of the 20th century, as a result of the offensive of manufacturers of implants, surgical treatment have attracted increasing popularity, although there was no scientific basis for it.
Objective of this study was literature review focused on outcomes of conservative treatment of hand (metacarpal and phalangeal) fractures.
Methods: Articles from PubMed and Medline databases on the methods and outcomes of conservative treatment of hand fractures published in last 10 years were reviewed.
Results. A total of 10 studies meeting inclusion criteria were identified. Three were focused on finger fractures, two — on metacarpal shaft fractures and five — on the fifth metacarpal neck fractures. Results of this review have demonstrated that vast majority of finger and metacarpal fractures can be successfully treated conservatively. Conservative treatment is preferably performed with a buddy taping or a splint allowing free mobilization of fingers. Treatment without any immobilization, according to special protocol is also an acceptable and safe option.

Keywords: phalangeal fractures, metacarpal fractures, conservative treatment, treatment outcomes.

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Introduction

Finger fractures are common in children and young adults, with an incidence of 100 to 1500 per 100 000 population, and account for up to 10% of all fractures. Furthermore, finger fractures represent up to one quarter of all missed fractures [1]. However, the true incidence of these injuries may be even higher, because most of them has been treated on an outpatient basis, resulting in

a general underestimation of frequency [2]. Most of phalangeal or metacarpal fracturs is only slightly displaced and stable, what means that can be effectively treated conservatively; fractures which are severely dislocated and/or unstable require rather operative treatment. The primary consideration in treating hand fractures, is whether conservative or surgical management will achieve the best functional outcome [3, 4]. The general aim is to restore normal range of motion of the fingers, strength and dexterity of the hand. However, the main challenge is presented by the contradiction between immobilization required for fracture healing and mobilization to achieve relevant function [4, 5].

Conservative treatment is associated with the risk of delayed bone union, healing in non-anatomical position (malunion) or joint stiffness from prolonged immobilization. Typical conservative treatment consists in immobilization of the hand or finger in a plaster or thermoplastic splint for 4–5 weeks [6]. Avoiding or minimalizing of immobilization of fingers in the course of fracture treatment may reduce risk of their subsequent stiffness. Several devices were described with dynamic finger positioning at rest or immobilized with the metacarpophalangeal joints (MCP) supported at 50–70° flexion and the proximal interphalangeal joint (PIP) supported at 0–15° flexion to minimize joint contracture (Figs. 1A, 1B). This position also enables intrinsic muscle relaxation and the extensors to act as a tension band over the proximal phalanx for stability. Active motion further compresses the fracture and stimulates periosteal callus formation promoting fracture healing [7, 8].

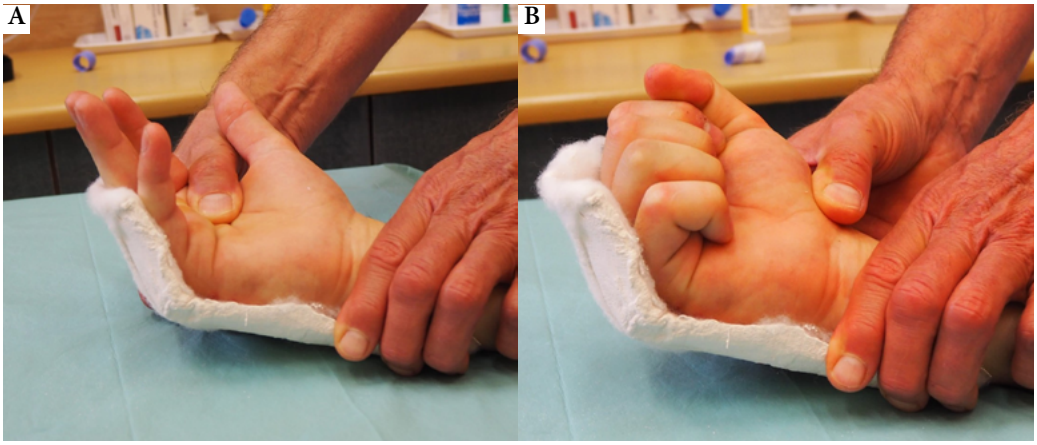

Fig. 1A. Dorsal plaster splint for the treatment of fracture of the base of the proximal phalanx of the little finger. Limited finger extension.
Fig. 1B. Dorsal plaster splint for the treatment of fracture of the base of the proximal phalanx of the little finger. Full finger flexion.

Immobilization of the hand should be as minimal as possible and confined only to fractured finger. Immobilization of the adjacent, non-injured finger is not accepted, except the "buddy taping" (Fig. 2). Mobilization of all fingers and making a fist as soon as possible is mandatory, because it prevents fingers stiffness and malrotation. But, even these relatively liberal rules regarding finger immobilization have recently been challenged, as the results of recent studies show that many of hand fractures may be successfully treated without immobilization at all (Figs. 3, 4). This treatment protocol called "functional" has been reported in literature [9, 10]. The essence of this theory

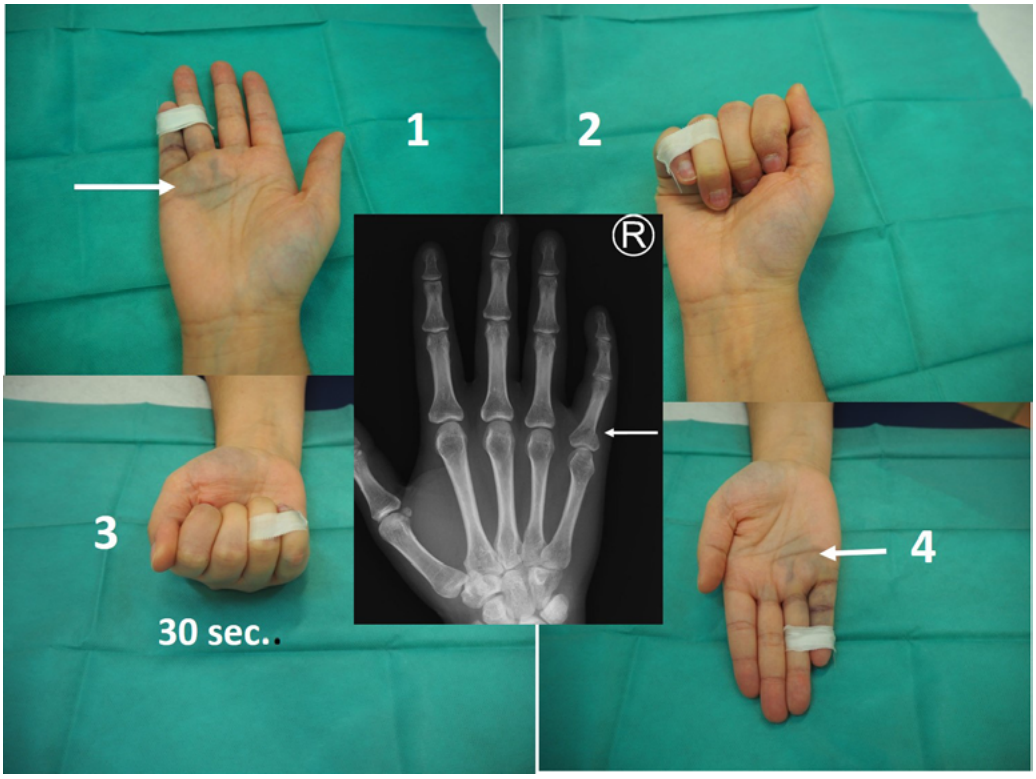

Fig. 2. Exercises protocol for the functional treatment of fracture of the base of the proximal phalanx of the little finger using only "buddy taping". Full range of motion of the fingers at 1 week.

is that finger movement does not disturb healing conditions and maintaining all fingers in flexion prevents malrotation of bone fragments and corrects it, when already occurred [9, 10]. Healing the fracture with malrotation (so called "scissoring") is a disturbing complication, impairing normal function of the hand, but functional treatment prevents development of scissoring. Patients quickly adapt to use the hand with broken finger or metacarpal bone in light daily activities and after 2–3 weeks they can do most daily life tasks without problems. Consolidation of the fracture occurs within 4–5 weeks and the patient can use his/her hand normally, having full finger movement and grasping ability from the beginning of the treatment [9].

In contrast, unstable fractures are believed to require surgical treatment rather. Stable fractures may be broadly defined as those where the fracture ends are appropriately juxtaposed in relative anatomic position to foster healing and that the bone segments maintain that position at rest and in motion. Unstable fractures, by contrast, lack bony support due to comminution, angulation, or translational deformity. Most researchers believe that unstable fractures require surgical treatment, although this opinion is not entirely proven and there are many reports on successful conservative treatment.

Objective of this study was literature review focused on outcomes of conservative treatment of hand (metacarpal and phalangeal) fractures.

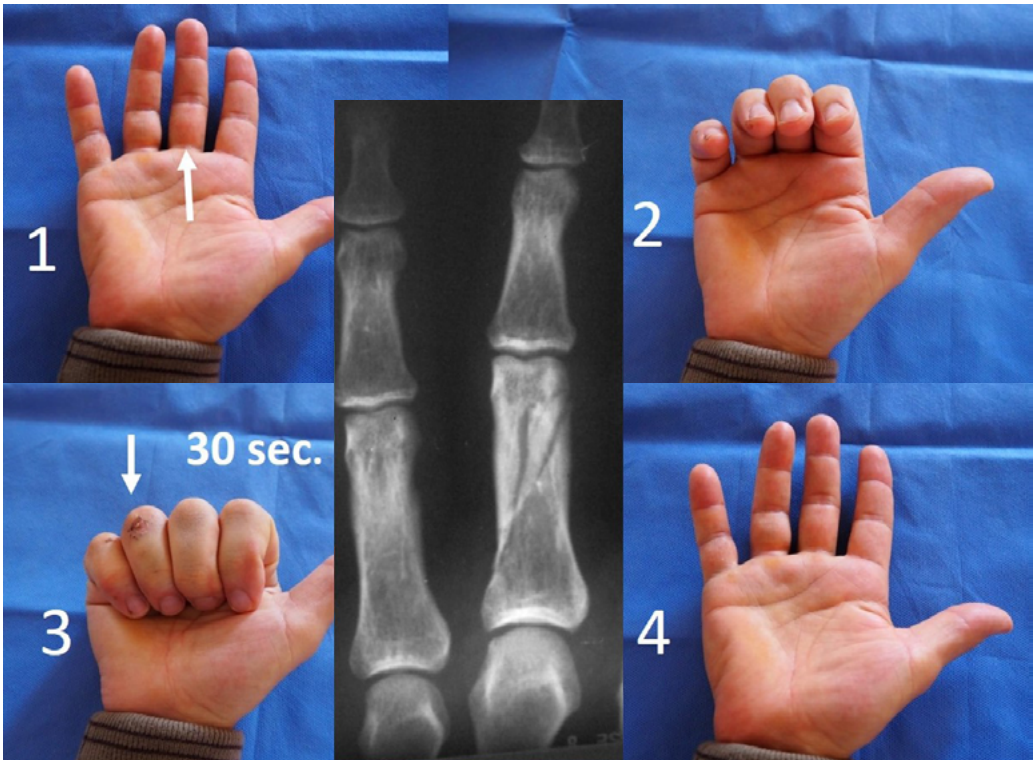

Fig. 3. Exercises protocol for the functional treatment of fracture of the proximal phalanx of the ring finger without any immobilization. Full range of motion of the fingers at 1 week.

Material and Methods

This article presents a review of literature from PubMed and Medline databases on the methods and outcomes of treating hand fractures with different methods published in last 10 years (from 2015 to 2024 year). A randomized clinical trials, systematic reviews, metanalyses and observational studies reporting on functional and radiological outcomes of finger and metacarpal fractures treated conservatively, or conservatively vs. operatively in adult patients were reviewed. Studies in a language other than English were not included. Keywords used at searching articles were: finger fractures, metacarpal fractures — treatment; conservative treatment, operative treatment, treatment outcomes, outcome assessment.

Results

An extensive literature search was conducted which yielded 10 studies meeting inclusion criteria for this review. Three of them reported results of the treatment of finger fractures, two — metacarpal shaft fractures and five studies — the fifth metacarpal neck fractures. Baseline characteristics and main outcomes reported in these studies are summarized in Table 1.

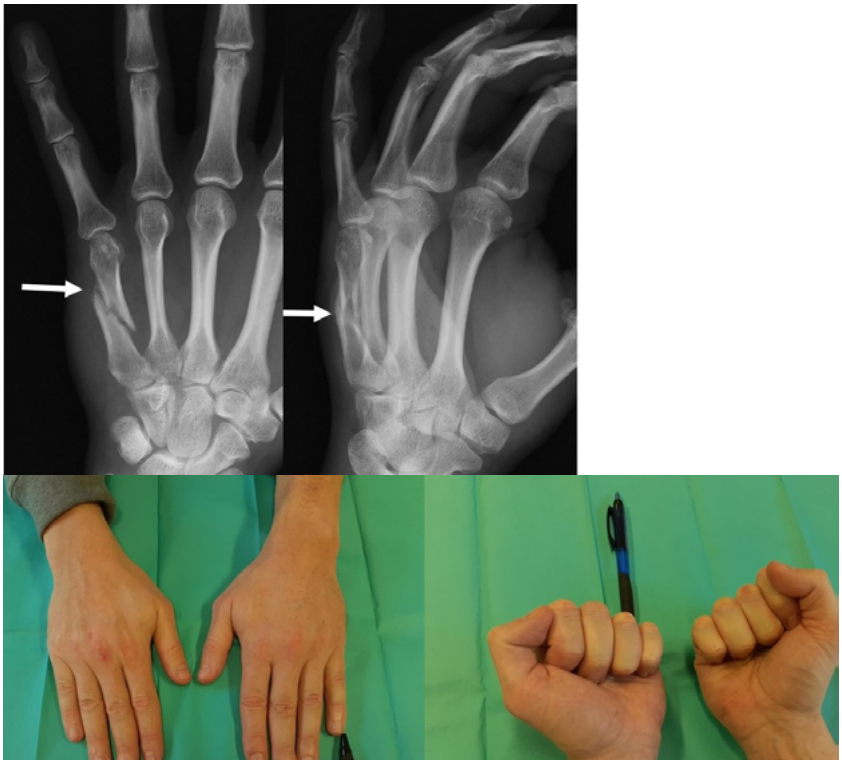

Fig. 4. X-ray and range of motion of fingers in the patient 2 weeks after spiral fracture of the fifth metacarpal bone.

Finger fractures

Out of 3 papers on finger fractures, 2 were meta-analyses and one was an observational study. Two studies reported results of conservative treatment, and one results of a comparison of conservative vs. operative management. Two studies included fractures of the proximal phalanx and one fractures of the proximal and middle phalanges. The overall conclusions from these 3 studies indicate that conservative treatment gives optimal results in the treatment of these fractures, providing good hand function and allowing for a quick return to normal activity and work (Figs. 5A, 5B). Surgical treatment is rather reserved for specific and complex fractures. More detailed description of the results of these studies is presented below.

Verver *et al.*, (2017) reported results of systematic review of randomized studies investigating treatment outcomes of extra-articular finger (proximal and middle phalanges) fractures. The authors identified 16 studies that met the inclusion criteria, involving a total of 513 fractures. Of this number, 118 fractures (23%) were treated conservatively, 188 (37%) operatively by K-wire pinning and 207 (40%) by fixation with screws or plates. Primary outcome measure was hand function as assessed by quickDASH questionnaire in most papers. Based on the results of this review, the authors conclude that most of closed, displaced extra-articular finger fractures can be effectively treated conservatively with splint or brace allowing free mobilization of the fingers

Table 1. Baseline characteristics of studies included into an analysis.

Study and methodology	Number of patients	Follow-up period	Type of fracture	Treatment methods	Primary outcome measure	Results of the treatment	Conclusion
Verver *et al.*, (2017) Meta-analysis	513	3–12 months	Isolated proximal and middle phalanx	118 conservative 395 operative (1)	quickDASH score in most studies	Conservative treatment optimal	Conservative treatment of extraarticular finger fractures provides the best functional outcomes and allows for a quick return to normal activity in young patients. Surgical treatment is indicated for specific and complex fractures
Bryne *et al.*, (2020) Observational	101	7 weeks	Isolated stable proximal phalanx	Conservative	Pain, finger TAM	Good	The patients achieved a mean TAM of 253° and minimal pain.
Zhang *et al.*, (2024) Meta-analysis	356 pts 389 fx	3 months	Isolated stable proximal phalanx	Conservative	Finger AROM, bone union	Good	A weighted mean AROM was 250° and all except 2 fractures united (99,5%). The authors conclude that these results support conservative approach to these fractures
Zong *et al.*, (2016) Meta-analysis	288	3–12 months	Isolated fifth metacarpal	Conservative vs. operative (2)	Complication risk	Conservative treatment optimal	Conservative treatment had the lowest, and transverse K-wire pinning the highest risk of complications.
Peyronson *et al.*, (2023) RCT	42	1 year	Metacarpal shaft (oblique and spiral)	20 conservative 22 operative (3)	Grip strength	Good after both methods	Functional results slightly better after conservative treatment. Favouring points: lower costs, shorter sick-leave, no complications
Kahn and Giddings (2015) Observational	25 pts 28 fx	1 year	Metacarpal shaft (oblique and spiral)	Conservative functional, no immobilization	AROM Grip strength	Good	23 patients had excellent outcome and two had good outcomes. All the fractures united with some minimal shortening. All patients achieved full fingers movement and good grip strength.

Study and methodology	Number of patients	Follow-up period	Type of fracture	Treatment methods	Primary outcome measure	Results of the treatment	Conclusion
Pellat *et al.*, (2019) RCT	97	3 months	Isolated fifth metacarpal neck	Conservative 48 buddy taping 49 plaster cast	quickDASH score	quickDASH score 0 in both groups	A minimal intervention such as buddy taping is optimal for uncomplicated sub-capital fifth metacarpal fractures
Martinez-Catalan *et al.*, (2020) RCT	70	9 weeks	Isolated fifth metacarpal neck	Conservative 37 buddy taping 33 plaster cast	The DASH score	Functional results favour buddy taping	No differences in other outcome measures, more complications in the cast group. Similar residual palmar angulation on X-ray in both groups. Sick leave shorter of 28 days with buddy taping.
Mohamed *et al.*, (2022) Meta-analysis	454	3–12 months	Isolated fifth metacarpal neck	Conservative: buddy taping vs plaster cast	The DASH score	The DASH and satisfaction scores similar in both groups	The authors recommend the use of buddy taping rather than plaster and immobilization.
Lixa *et al.*, (2024) Observational	60	3 months	Isolated fifth metacarpal neck	32 conservative 28 operative (4)	quickDASH score and neck angulation	quickDASH scores similar. X-ray better after K-wiring	Surgically treated patients reported more pain and less aesthetic satisfaction. The mean neck angulation 28° in the surgical group and 38° in the conservative group.

(1) Operative treatment: 188 (37%) by K-wire fixation and 207 (40%) by fixation with screws or plates.
(2) Operative treatments: antegrade K-wire intramedullary nailing, transverse K-wire pinning and plate fixation.
(3) Operative treatment: K-wire fixation.
(4) Operative treatment: K-wire fixation.

Fig. 5A. (1) Multifragmental, spiral, slightly displaced fracture of the proximal phalanx of the little finger at presentation. (2) The same fracture at 6 weeks. Note greater displacement of the fracture.

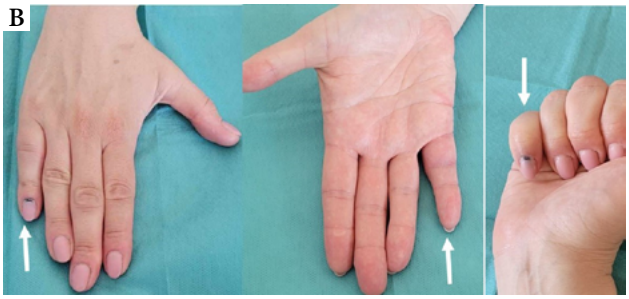

Fig. 5B. Full range of motion of the affected little finger at 6 weeks, in the patient from Fig. 5A.

and wrist. Displaced fractures with complex pattern can also be treated in this way, provided that reduction is possible and maintained. Conservative treatment was associated with many benefits such as faster recovery, shorter sick-leave period and less complications. With regard to operative treatment, extra-articular K-wire pinning provides better functional results than trans-articular pinning. When open reduction is necessary, lag screw fixation is preferable to plate fixation. The authors conclude that conservative treatment of extraarticular finger fractures is an optimal method that provides the good functional outcomes and allows for a quick return to normal activity, while surgical treatment is indicated only for specific and complex fractures [11].

Byrne *et al.*, (2020) reported results of conservative treatment in dorsal splint (Figs. 1A, 1B), with immediate mobilization of 101 patients with isolated stable or initially unstable proximal phalangeal fractures. The initially displaced fractures were reduced under local anaesthesia. The patients were followed-up for a mean of 7 weeks (range 3–15) and primary outcome measures were pain level in the Visual Analogue Scale (VAS) and the Total Active Motion (TAM) of the affected finger. At final assessment, the patients achieved almost normal range of motion of injured fingers (a mean TAM of 253°) and experienced minimal pain (VAS 2–3) at finger movement. The authors conclude that a conservative treatment is safe and effective in patients with isolated proximal phalangeal fractures without finger rotation or substantial angulation [12].

Zhang *et al.* (2024) reported results of a systematic review of conservatively managed, isolated, extra-articular fractures of the proximal phalanges. They found 7 studies that met inclusion criteria, involving a total of 389 fractures in 356 patients. There were 6 prospective case series and one comparative cohort study. Treatment methods consisted in immobilization in a plaster or orthotic device associated with timely rehabilitation by controlled MCP joints flexion and extension or free

mobilisation of the interphalangeal joints. The results were assessed after a mean of 3 months by measurements of active range of motion (AROM) of the involved fingers and bone union assessed on an X-ray. A mean AROM was 250° (92% of normal range of motion) and all except 2 fractures united (99.5%). The authors conclude their review cautions against definitive recommendations on conservative treatment of proximal phalanx fractures due to limitations of the available literature. However, their findings tentatively supports non-operative approaches as an good alternative to surgery [13].

Metacarpal shaft fractures

Two studies were identified, one RCT comparing results of conservative vs. operative treatment, and one case series study on functional treatment of these fractures, without any immobilization. Results of both studies favour conservative treatment with unrestricted finger mobilization (Fig. 6). More detailed description of the results of these studies is presented below.

Peyronson *et al.*, (2023) reported results of a prospective, randomized study comparing outcomes of conservative versus operative treatment for displaced metacarpal shaft fractures. Twenty patients were treated conservatively with unrestricted mobilization, and 22 received open surgery with lag screw fixation. The patients were followed-up for 1 year, and the primary outcome measure was grip strength in the injured hand. A mean grip strength was 104% (range 89%–120%) in the conservative treatment group and 96% (range 89%–103%) in the operative group. Although the difference was not statistically significant, this result show slightly better functional outcomes

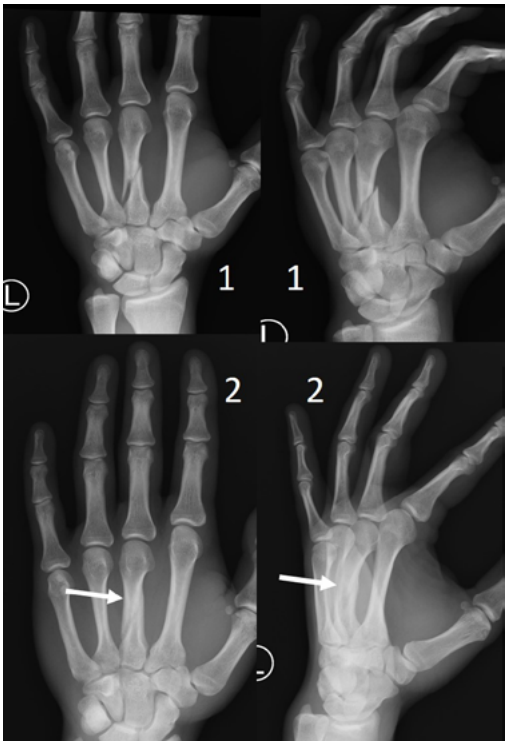

Fig. 6. (1) Spiral fracture of the third metacarpal bone at presentation, treatment without any immobilization. (2) X-ray of the patient at the 12 months. Note excellent union of the fracture.

after conservative treatment. Secondary outcomes were the DASH score, finger range of motion, metacarpal shortening on X-rays, complications, sick leave duration, patient satisfaction and costs. There were no differences in hand function as assessed by DASH score and finger range of motion. Mean metacarpal shortening was 5.3 mm in the conservative group and 2.3 mm in the operative group, difference statistically significant favouring the operative group. Four minor complications and 3 reoperations were found only in the operative group. Sick leave duration was significantly shorter in the conservative treatment group (a mean of 12 vs. 35 days, stat. sign.) and costs were substantially higher (2.8 times, stat. sign.) in the operative treatment group. The authors conclude that although results after both treatments are comparable and overall good, conservative treatment offers noticeable benefits and seems more suitable for this type of fractures [14].

Kahn and Giddins (2015) reported the outcome of treatment of 25 patients with 28 spiral and oblique metacarpal fractures according to functional protocol without any immobilization. The patients were instructed to make a full flexion of all fingers drew up in one block (make a fist) and maintain it for about 30 seconds and then start to extend the fingers (Fig. 3). These exercises had to be performed 4 times a day, of 10 full flexion-extension cycles. The patients were allowed to use their hands in light daily activities and at work, i.e. with computer, hand writing or carrying light objects. At a mean of one-year follow-up, 23 patients had an excellent outcome and two had good outcomes. All the fractures united with some minimal shortening. All patients achieved full fingers movement and good grip strength. Only two patients reported mild dysfunction: one had a residual malrotation of 5° and some awkwardness on playing the guitar, whereas other one had some discomfort when boxing. All the patients in paid employment returned to work within 4 weeks [10].

The fifth metacarpal neck fractures (boxer's fracture)

The most, as many as 5 studies, were devoted to fifth metacarpal neck fractures. This injury is called "boxer's fracture", because it often arises in fights, as a result of hitting the opponent's jaw with a fist. In essence, it should be rather called a "streetfighter" fracture, because a true "boxer's fracture" is a fracture of the base of thumb metacarpal bone, which occurs in professional boxers, fighting in boxing gloves. It is a common injury in surgical practice, usually more or less displaced, and recommendations as to the method of its treatment (conservative or surgical, rigid immobilization or buddy taping) are not clearly defined. The results of all 5 studies indicate conservative treatment as giving better functional results than surgery, allowing for a faster return to full activity and burdened with a low risk of complications. The results indicate also that avoiding rigid immobilization and use i.e. buddy taping provides very good results. More detailed description of the results of these studies is presented below.

Zong *et al.*, (2016) reported results of a network meta-analysis of randomized controlled trials estimating the comparative efficacy of different interventions for metacarpal neck fractures. They identified 6 RCTs registering a total of 288 patients. All studies were two-arm controlled trials comparing active intervention. Primary outcome measure was rate of complications after each of the treatments. Results of this review showed that among four treatments: conservative (by metacarpal cast or brace with early mobilization), antegrade K-wire intramedullary nailing, transverse K-wire pinning and plate fixation — conservative management had the lowest risk of complications, followed by plate fixation, antegrade K-wire nailing and transverse K-wire pinning. The authors conclude that — considering the low risk of complications — conservative treatment is the best option for the fifth metacarpal neck fractures [15].

Pellat *et al.*, (2019) reported results of the RCT comparing treatment of fifth metacarpal neck fractures with either buddy taping the ring and little fingers or standard plaster casting. A total of 97 patients were randomly allocated: 48 to the buddy taping and 49 to plaster casting. The results were assessed at 3 months and primary outcome measure was hand function assessed by the quickDASH score. Secondary outcome measures were time off work, pain, satisfaction, and the Euro Quality of Life 5-Dimension score (measure of overall health). At the 3 months follow-up, a median quickDASH scores were the same for both groups (buddy taping 0, plaster cast 0). Patients in the buddy taping group missed a median 0 days (range 0 to 7) of work compared with the plaster group's 2 days (range 0 to 14). Other secondary outcome measures were the same in both groups. The authors advocate a minimal intervention such as buddy taping for uncomplicated fifth metacarpal neck fractures [16].

Martinez-Catalan *et al.*, (2020) reported results of RCT comparing effectiveness of the treatment of the fifth metacarpal neck fractures in 72 patients, either with buddy taping or a cast after closed reduction. The primary outcome measure was hand function as assessed with the DASH questionnaire at 9 weeks. Secondary outcomes included the DASH score at 1 year, range of motion of the fifth MCP joint, pain, grip strength, return to work, radiographic angulation, and complication rate. At 9 weeks assessment function of the hand was better in the buddy taping group: the DASH score lower of a mean of 6 points, and range of motion of the fifth MCP joint greater of a mean of 12°. These differences were neither statistically or clinically significant (did not exceed the minimally clinically important difference). There were no differences in other outcome measures, however more complications were seen in the cast immobilization group. With regard to radiological outcomes, an equivalent residual palmar angulation of a mean of 15° was observed at 9 weeks in both groups. Duration of time off from work was 28 days shorter with buddy taping compared with cast treatment (stat. sign.). The authors conclude that reduction and cast immobilization of fifth metacarpal neck provides no benefit comparing with buddy taping and early mobilization which gives good clinical results as well as significant improvement in time lost from work [17].

Mohamed *et al.*, (2022) reported results of a meta-analysis of the efficacy of buddy taping vs. reduction and casting in the management of fifth metacarpal neck fractures. The authors identified 7 RCT involving a total of 454 patients. The follow-up period was from 3 to 12 months. The primary outcome measures were hand function as assessed with the DASH questionnaire. Secondary outcome measures included satisfaction score, pain, the little finger range of motion and a grip strength. Results of this meta-analysis show that buddy taping was effective for improving range of motion and strength of the affected hand. The DASH score and satisfaction score didn't show any significant difference between the groups. Thus, the authors recommend the use of buddy taping rather than rigid immobilization for the management these fractures [18].

Lixa *et al.*, (2024) reported results of the retrospective study of 60 patients with a fifth metacarpal neck fracture who were allocated to either conservative or operative by K-wire fixation treatment. The patients treated conservatively underwent reduction of fracture displacement and then were treated in a plaster cast. The results were assessed at 3 months and outcome measures included function of the hand with the quickDASH questionnaire and angulation of the end of the fifth metacarpal on X-ray. The mean initial angulation was 53° in the surgical group and 45° in the conservative group. The mean final angulation was 28° in the surgical group and 38° in the conservative group (stat. sign). The quickDASH scores did not differ between groups, but surgically treated patients reported more pain and less aesthetic satisfaction. The authors conclude that

their study corroborates the growing evidence favouring expanding conservative treatment of fifth metacarpal neck fractures [19].

Discussion

This review outlines the evidence for conservative modalities for extra-articular finger and metacarpal fracture management, including those which are initially displaced or unstable. This result is also comparable to surgical fixation, highlighting how even inherently unstable can be managed non-operatively provided that adequate reduction can be achieved and maintained. Next finding is that these fractures can be treated using less restrictive and more comfortable orthotic devices or buddy tapping rather than in a plaster cast, without compromising safety. Patients who are allowed free finger mobilisation are noted to have increased final range of motion and higher satisfaction. Buddy tapping provides analgesia and encourages finger tracking during exercise to prevent secondary displacement. Conservative treatment has demonstrably fewer complications and allows bone healing and rehabilitation to occur simultaneously, reducing the work-off period and minimise the societal financial-economic burden. It also reduces the adverse effects associated with surgery and anaesthesia such as adhesions or risk of infection. Although none of the studies in this review considered this aspect, many others have shown that conservative treatment is significantly cheaper than surgery. Considering all these circumstances, it seems justified and important to treat phalangeal and metacarpal fractures using conservative modalities whenever it is appropriate and feasible to do so.

Conclusion

Results of this review have demonstrated that closed, extraarticular, non-displaced and displaced finger and metacarpal fractures can be treated conservatively, provided that reduction is possible and maintained. Conservative treatment is preferably performed with a buddy taping or orthosis allowing free mobilization of fingers. Treatment without any immobilization, according to special protocol is also an acceptable and safe option.

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