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REVIEW ARTICLE

Radiological alignment versus functional outcomes in fifth metacarpal neck fractures – a narrative review

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Abstract

Introduction and Objective. Fifth metacarpal neck fractures are common, but optimal treatment remains controversial because anatomical reduction does not consistently predict functional recovery. The aim of the narrative review is to examine the relationship between radiographic deformity and patient-important outcomes and identified fracture characteristics relevant to treatment selection.

Review Methods. PubMed, Scopus, and Google Scholar were searched using terms related to fifth metacarpal fractures, radiographic alignment, treatment, and functional outcomes. Clinical studies and reviews reporting range of motion, grip strength, pain, DASH or QuickDASH scores, or return to activity, were qualitatively synthesized.

Brief description of the state of knowledge. Operative treatment achieved more accurate correction of angulation and fracture alignment but did not consistently improve functional outcomes, pain, or return to work. In selected simple, closed, extra-articular fractures without malrotation, substantial shortening, or instability, residual angulation of 30–70° was often well tolerated. However, no universal safe angulation threshold could be established. Malrotation, substantial shortening, instability, displaced intra-articular fractures, and symptomatic impairment were more consistently associated with adverse functional outcome.

Summary. Treatment decisions should integrate radiographic findings with clinical assessment rather than rely on angulation alone. Functional reduction – alignment sufficient to preserve pain-free motion, effective grip, and return to activity – should be the primary objective. Operative treatment is most justified when deformity has demonstrable functional consequences, whereas isolated angulation with preserved finger alignment and hand function does not automatically require surgery.

Key words

fifth metacarpal neck, fractures, treatment, radiological parameters, functional outcomes

INTRODUCTION

Metacarpal fractures are among the most common osseous injuries of the hand, accounting for approximately 40% of all hand injuries and 30–50% of all hand fractures [1]. The fifth metacarpal is most commonly affected, with fractures of this bone accounting for more than half of all metacarpal injuries and approximately 20% of all hand fractures [2]. Fifth metacarpal neck fractures represent a distinct subgroup, accounting for approximately 10% of cases. They are commonly referred to as 'boxer's fractures' because they most often result from a forceful impact with a clenched fist [3].

The injury mechanism involves an axial force transmitted through the metacarpal, producing apex-dorsal angulation due to traction by the interosseous muscles [4]. These injuries occur most commonly in young, working-age men, giving them both social and economic significance [5, 6]. Some fifth metacarpal fracture patterns may impair hand function, manifesting as reduced grip strength and restricted motion at the fifth metacarpophalangeal (MCP) joint [3]. Appropriate management is essential for the prompt restoration of hand function and an early return to work, thereby minimizing the indirect costs associated with work incapacity [7].

The AO Foundation/Orthopaedic Trauma Association (AO/OTA) classification categorizes metacarpal fractures according to their anatomical location, distinguishing fractures of the head, shaft, and base [8]. Based on articular surface involvement, fractures are classified as extra-articular, partial articular, or complete articular. According to fracture morphology, they are further categorized as simple (transverse, oblique, or spiral), wedge, or multi-fragmentary fractures [9]. The assessment of fifth metacarpal fractures primarily includes angulation, rotational deformity, and shortening. However, these abnormalities do not carry equal clinical significance, and their radiographic presence does not necessarily correspond to the degree of functional impairment of the hand [4, 6, 8, 9].

Most metacarpal fractures are managed non-operatively [7]. Non-operative management includes reduction and immobilization using various methods, such as soft dressings,

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splints, or orthoses [10]. Although conservative treatment often produces satisfactory outcomes, some fractures require surgical intervention [5]. Operative treatment is considered primarily for unstable or open fractures and for fractures associated with deformities that may substantially impair hand biomechanics. Available fixation techniques include Kirschner wires, plates and screws, intramedullary screws, external fixation, and tension-band wiring. It should be emphasized that operative treatment, despite allowing more accurate correction of deformity, carries additional risks [10]. Both non-operative and operative management may lead to complications. Excessively prolonged immobilization increases the risk of stiffness and joint contractures and may delay recovery; complications may also include malunion or non-union. Operative treatment additionally carries the risk of infection, bleeding, haematoma, soft-tissue necrosis, osteomyelitis, and adhesions [11]. Treatment outcomes are assessed using objective measures, such as range of motion and grip strength, as well as patient-reported outcomes, including pain intensity and questionnaires evaluating upper-extremity function [5, 12].

Although restoration of appropriate fracture fragment alignment remains one of the goals of treatment, the relationship between the quality of radiographic reduction and final hand function remains unclear. In particular, it has not been established which deformities require complete correction and which may be functionally well tolerated. This uncertainty warrants an analysis of the clinical significance of individual radiographic parameters in relation to actual clinical outcomes [7, 13, 14].

The aim of this review was to analyze the relationship between radiographic parameters and functional outcomes following fifth metacarpal neck fractures and to clarify the relative importance of angulation, rotational deformity, shortening, instability, and intra-articular displacement in treatment selection.

MATERIALS AND METHOD

A narrative literature review was conducted using PubMed, Scopus, and Google Scholar. The study selection process is presented in Figure 1.

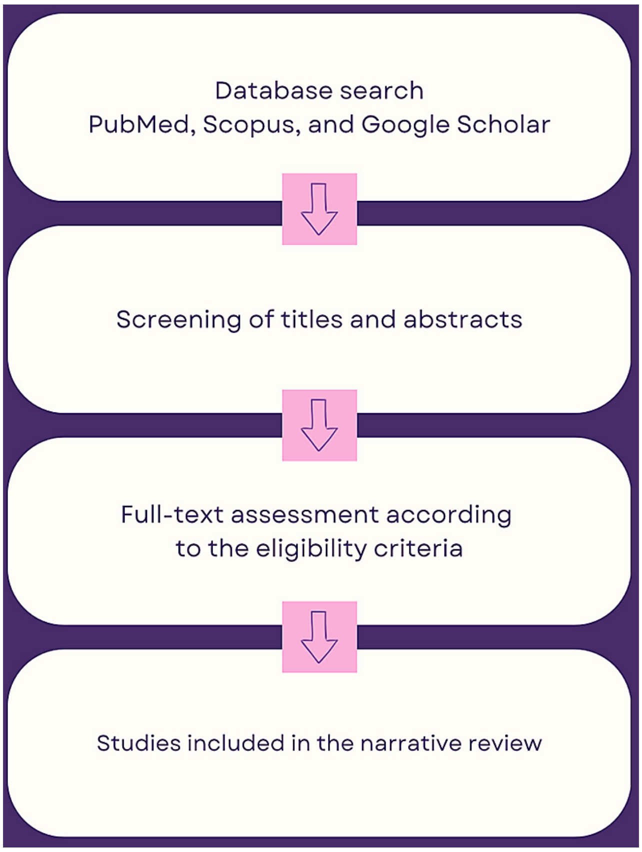

Figure 1. Study selection process

The search was conducted using combinations of key words and the Boolean operators AND and OR. Terms describing fracture location and type were combined with terms related to treatment modality, radiographic parameters, and functional outcomes. Examples of search strings used in PubMed included: ('fifth metacarpal neck fracture' OR 'fifth metacarpal fracture' OR 'boxer's fracture') AND ('functional outcome' OR 'hand function' OR DASH OR QuickDASH OR 'grip strength' OR 'range of motion' OR 'pain'). To identify publications comparing treatment approaches, the following combination was also used: ('fifth metacarpal neck fracture' OR 'boxer's fracture') AND ('conservative treatment' OR 'non-operative treatment' OR 'operative treatment' OR 'surgery' OR 'fixation' OR 'reduction' OR 'buddy taping'). Additional searches included terms related to angulation, rotation and malrotation, metacarpal shortening, fracture instability, range of motion, grip strength, pain, and return to work. Analogous combinations of terms were used in Scopus and Google Scholar and adapted to the syntax of each database.

Publications were manually screened and selected based on their titles, abstracts, and full texts. The analysis included clinical studies, observational studies, randomized comparative trials, systematic reviews, meta-analyses, and review articles containing data relevant to the epidemiology, classification, treatment, and functional outcomes of fifth metacarpal fractures. Particular attention was given to studies evaluating the relationship between radiographic parameters and range of motion, grip strength, pain intensity, DASH or QuickDASH scores, and return to activity. Publications whose scope did not correspond to the objective of the review or that did not contain data relevant to the topic were excluded.

The level of evidence provided by the included publications was assessed qualitatively, considering study design, sample size, the presence of a comparison group, duration of follow-up, and consistency of findings across studies. The greatest evidentiary weight was assigned to systematic reviews, meta-analyses, and randomized comparative trials. Findings from retrospective studies, small case series, and narrative reviews were interpreted more cautiously. Because of the narrative nature of the review, no formal risk-of-bias assessment or numerical quality scoring of individual studies was performed.

The analysis included both publications forming the basis of current knowledge on the topic and the most recent scientific evidence available in the literature. Articles published within the preceding six years accounted for 75% of the included references, allowing current evidence to be incorporated and ensuring that the review reflects the contemporary state of knowledge regarding the treatment of fifth metacarpal fractures.

STATE OF KNOWLEDGE

Overview of hand qanatomy. The human hand contains 27 bones, which are divided into three groups: the carpal bones, metacarpals, and phalanges [15]. The metacarpal skeleton comprises five long bones, each supporting one digit. The first metacarpal supports the thumb, whereas the fifth supports the little finger. Metacarpals II–V are closely linked anatomically and functionally, meaning that isolated fractures in this region generally retain a degree of intrinsic stability. At the same time, the rich vascular supply of the bones of the hand promotes efficient healing. Exceptions include crush injuries and fractures with substantial fragment displacement, in which healing may be prolonged. Each metacarpal consists of a head, neck, shaft, and base [3]. The metacarpal neck is the narrowed region distal to the shaft and immediately proximal to the head. This is the most common site of so-called boxer's fractures [3, 16].

Classification of fractures. Classification systems play a crucial role in standardizing the terminology used for fracture assessment and clinical discussion, making them particularly important in scientific research. They facilitate comparative analyses and provide a basis for prognostic assessment. Optimal classification systems should demonstrate high reliability and reproducibility. In clinical practice, the AO classification and anatomical classification are widely used to identify fracture types and guide treatment decisions [8]. The structure of the AO/OTA classification is presented in Table 1.

Table 1. AO/OTA classification of bone fractures. AO/OTA-AO/OTA Fracture and Dislocation Classification [8]

	Level	Designation	Description
Localization	Bone	Dice number	Identification of the specific bone
	Segment	1,2,3	1 – proximal end 2 – shaft 3 – distal end
Morphology	Type	A,B,C	A – simple B – wedge C – multi-fragmentary
	Group	1, 2, 3 (within each Type)	A Detailed description of the fracture morphology
	Subgroup	Further subdivision	A Detailed description of the fracture morphology
	Qualifications and Universal modifiers	Further subdivision	Universal modifiers and qualifications are applied when appropriate

Metacarpal and phalangeal fractures are among the most common injuries of the upper extremity. The classification of fifth metacarpal fractures is based primarily on anatomical criteria, including whether the fracture involves the head, neck, shaft, or base of the bone. The metacarpal fracture classification developed by the AO Foundation and the Orthopaedic Trauma Association (AO/OTA) distinguishes three principal anatomical segments: the head, shaft, and base. Fractures in the region of the metacarpal head are further classified as subcapital or intra-articular [9]. Another important criterion is the extent of articular surface involvement, based on which fractures are classified as extra-articular, partial articular, or complete articular. The classification also considers fracture morphology, distinguishing simple fractures (transverse, oblique, or spiral), wedge fractures, and multi-fragmentary fractures [4]. The anatomical classification of metacarpal fractures, together with data on their frequency and the corresponding AO/OTA categories, is presented in Table 2. It should be noted, however, that not all fracture types can be unequivocally assigned to specific subgroups within these classification systems [8].

Table 2. Main locations and classification of metacarpal fractures. AO/OTA-AO/OTA Fracture and Dislocation Classification

Location	Frequency / Characteristics	Anatomical fracture types	AO/OTA classification
Head	Rare [8]	Epiphyseal, avulsion, comminuted	Sub-capital, intra-articular [8,9]
Neck	Most common (especially 4th and 5th ray) approx. 20% of hand fractures (boxer's fractures) [8]	Neck fractures	Subcapital/neck fractures [9]
Shaft	Common	Transverse, oblique, spiral, comminuted [8]	Shaft fractures [9]
Base	-	Base fractures	Base fractures [9]

Functional assessment and relationship between radiological parameters and hand function. The assessment of treatment outcomes following fifth metacarpal fractures should not be based solely on radiographic parameters, because achieving anatomical reduction does not always translate into better hand function [17]. In recent years, increasing emphasis has been placed on actual impairment of hand function, rather than solely on the post-treatment radiographic appearance, as the outcome of greatest clinical importance in fifth metacarpal neck fractures [10]. Functional assessments most commonly include range of finger motion (ROM), grip strength, pain intensity measured using the visual analogue scale (VAS), and DASH or QuickDASH scores [17]. It therefore remains essential to determine whether more accurate correction of radiographically visible deformity results in measurable improvements in range of motion, grip strength, pain intensity, and patient-reported function. It is equally important to identify which fracture characteristics can be safely observed and managed functionally, and which require reduction or operative fixation because of the risk of permanent impairment of hand biomechanics.

Hand range of motion (ROM). Range of motion in the finger joints is one of the principal measures used to assess functional outcomes following fifth metacarpal fractures [17]. Mobility of the fifth metacarpophalangeal joint is particularly important because it contributes to normal hand closure and effective grip. Restricted ROM may result from both residual osseous deformity after fracture healing, and secondary stiffness caused by immobilization or soft-tissue injury [3]. However, the available evidence suggests that moderate angular deformity does not always result in a clinically relevant limitation of hand mobility [10]. A randomized trial comparing functional treatment with immobilization demonstrated that satisfactory clinical outcomes and good range of motion could be achieved even with angulation of up to 70°. The authors also emphasized that reduction of fractures with angulation below 70° did not significantly affect the final ROM of the metacarpophalangeal joint [18].

The meta-analysis by Wormald et al. [17] found no significant differences in final range of motion between operative and non-operative treatment. This may suggest that improved radiographic parameters following operative treatment do not necessarily translate into better long-term hand mobility [10,19].

Furthermore, in the study by Wong et al. [19], more accurate correction of deformity with dorsal plate fixation was associated with greater improvement in ROM than tension-band wiring. However, the functional differences were not proportional to the improvement in radiographic parameters. These findings indicate that improved osseous alignment alone is not a sufficient predictor of complete recovery of range of motion. Final mobility is also influenced by the condition of the soft tissues, duration of immobilization, presence of tendon adhesions, and the possibility of initiating early mobilization.

Grip strength assessment. Grip strength is one of the most important functional parameters of the hand because it reflects the ability to perform activities of daily living and manual work. Fracture malunion may reduce grip strength by altering the biomechanics of the muscles and tendons of the hand [3]. Rotational deformity and substantial metacarpal shortening have the greatest adverse effect on grip function [19]. Evidence concerning spiral and oblique metacarpal shaft fractures suggests that metacarpal shortening may reduce the strength of an individual finger, even when overall grip strength and patient-reported hand function remain relatively preserved. However, these findings should be extrapolated to fifth metacarpal neck fractures with caution because of differences in fracture location and biomechanics [4].

In contrast to rotational deformity, moderate angular deformity is often functionally well tolerated because of the considerable mobility of the fifth carpometacarpal joint [10]. A review of randomized trials found no significant differences in final grip strength between operative and non-operative treatment [17]. Similar conclusions were reported in a review published in *PRS Global Open*, in which most treatment methods provided comparable long-term functional outcomes [10]. Nevertheless, some studies suggest that more stable fixation may accelerate the recovery of grip strength and enable an earlier return to activity. In a study comparing Herbert screws with Kirschner wires, greater grip strength was achieved with intramedullary screw fixation [1]. Taken together, these findings demonstrate that not all radiographic deformities have the same prognostic significance. Isolated angulation may be partially compensated for and does not necessarily reduce grip strength, whereas malrotation and substantial shortening directly alter.

DASH and QuickDASH functional outcome scores. Various clinical tools are used to assess hand function after fractures of the fifth metacarpal bone, including the DASH (Disabilities of the Arm, Shoulder, and Hand), QuickDASH, PRWE (Patient-Rated Wrist Evaluation), and the MAYO scale. However, the DASH and QuickDASH questionnaires were most frequently used in the analyzed studies, and were therefore included in this study as the primary tools for assessing functional outcomes [17]. They allow for the assessment of the impact of the injury on daily activities from the patient's perspective [20]. Most of the analyzed studies did not demonstrate significant differences in DASH scores between surgical and conservative treatment in the long-term follow-up [17]. This indicates that a more anatomical reduction achieved during surgery does not always improve the patient's subjective assessment of hand function [10]. In a randomized study by van Aaken et al. [20], functional treatment using buddy taping yielded QuickDASH scores comparable to reduction and plaster immobilization. The authors also found no significant correlation between the degree of angulation and the duration of work absence or the final functional outcome [20]. In short-term follow-up, some studies indicated better QuickDASH results after surgical treatment, but this advantage was not maintained in the follow-up [10].

The study results indicate that the difference visible in the radiographic examination may not have a noticeable impact on the patient's daily functioning. Therefore, the assessment of treatment effectiveness should not be limited to the degree of angulation correction, but should include the ability to perform daily activities, manual work, and return to activity.

Pain assessment using the Visual Analogue Scale (VAS). Pain assessment using the VAS is an important component of functional evaluation following the treatment of hand fractures [19]. Pain may secondarily restrict both range of motion and grip strength [3]. In most of the analyzed studies, final pain intensity was low regardless of the treatment method used [10,17]. A study comparing soft wrapping and buddy taping with reduction and cast immobilization found no significant differences in VAS scores between the groups [20]. The absence of significant differences in final pain intensity despite differences in reduction quality, indicates that radiographic correction of angulation is not the sole determinant of pain outcomes [17]. Pain may also be influenced by soft-tissue injury, joint stiffness, hardware irritation, and the duration of immobilization.

Radiological–functional correlation. The principal clinical issue is not the presence of a radiographic deformity itself, but whether that deformity results in actual impairment of hand function. From a practical perspective, the assessment should distinguish among four possible management strategies: observation, early mobilization and exercises, reduction, and operative treatment. The choice among these strategies should depend on the type of deformity and its effect on function rather than solely on an abnormal radiographic appearance [10]. The available evidence indicates that the relationship between the extent of radiographic correction and functional outcome is not linear. In fifth metacarpal neck fractures, angulation of approximately 30–70° is often not associated with clinically relevant impairment of hand function, particularly in the absence of malrotation, substantial shortening, or fracture instability [18]. This is attributable to the considerable mobility of the fifth carpometacarpal joint, which partially compensates for deviation of the metacarpal axis. This mechanism may explain why residual angulation visible on radiographs does not always result in restricted range of motion or reduced grip strength. Biomechanical studies suggest that greater degrees of angulation may be required before grip mechanics are adversely affected [10]. However, many studies have not demonstrated a clear relationship between improved radiographic parameters following operative treatment and better functional outcomes assessed using ROM, DASH scores, or grip strength [17]. In

Table 3. Comparison of radiological and functional outcomes after conservative and operative treatment of fifth metacarpal neck fractures

Parameter	Conservative treatment	Operative treatment
Type of treatment	Buddy taping, soft wrap, splinting, cast immobilisation, functional treatment with early mobilization [20, 18, 20]	K-wire fixation, intra-medullary fixation, dorsal plating, tension band wiring, screw fixation [10, 27, 21]
Indications	Stable fractures without rotational deformity, significant shortening, instability, or functional impairment [10, 18, 20]	Open fractures, rotational deformity with clinical scissoring, significant shortening, instability, displaced intra-articular fractures, multiple fractures, symptomatic deformity [10, 19]
Advantages	Lower complication rate, lower cost, avoidance of surgical trauma, earlier return to daily activities [18, 21]	Better radiological correction, restoration of alignment, correction of rotational deformity, stable fixation [10, 19]
Limitations	Residual angulation may persist without clinically relevant functional impairment in appropriately selected fractures [18, 20]	Surgical morbidity, implant-related complications, increased treatment costs [10, 19]
Complications	Residual deformity, stiffness after prolonged immobilization [8, 20]	Infection, hardware irritation, tendon adhesions, stiffness, secondary procedures [10, 17, 19]
DASH / QuickDASH	Comparable long-term outcomes in most studies [17, 20]	Slight short-term advantage in selected studies, limited long-term superiority [10, 19]
ROM	Generally satisfactory ROM, even with moderate angular deformity [18, 20]	Improved ROM in some studies, although not consistently superior in long-term follow-up [17, 19]
Grip strength	Comparable long-term grip strength outcomes [10, 17]	Potentially faster recovery of grip strength with stable fixation [1, 10]
VAS	Low pain scores at final follow-up [18, 20]	Similar pain scores despite improved radiological alignment [17, 19]
Return to work	Often earlier return to work with functional treatment protocols [18, 20]	May facilitate early recovery in selected cases but can be associated with longer overall treatment burden [10, 17]
Overall interpretation	Frequently sufficient when deformity does not impair hand function [18, 20]	Provides superior radiological alignment, but this advantage does not consistently translate into better long-term hand function [10, 17]

Legend: **DASH** – Disabilities of the Arm, Shoulder and Hand; **QuickDASH** – Quick Disabilities of the Arm, Shoulder and Hand; **ROM** – Range of Motion; **VAS** – Visual Analogue Scale.

contrast to angular deformity, rotational displacement of the fracture fragments is considered to have a clinically important effect on hand function. Even minor malrotation may result in clinical finger scissoring and impaired grip mechanics. Rotational deformity therefore remains one of the most important indications for operative treatment [3].

Substantial metacarpal shortening and fracture instability may likewise be clinically relevant [19]. The available evidence therefore suggests that not every radiographic deformity requires complete operative correction. The clinical relevance of a radiographic abnormality should be assessed in terms of its effect on finger tracking, grip mechanics, range of motion, pain, and the ability to perform activities of daily living. The absence of perfect anatomical alignment alone should not be considered a treatment failure [3, 17, 21].

The current literature indicates that radiographic correction achieved through operative treatment does not always translate into better functional outcomes. Therefore, the advantage of surgery in restoring fracture fragment alignment is not equivalent to clinical superiority. To better illustrate the differences between non-operative and operative treatment of fifth metacarpal fractures, the principal characteristics of these treatment approaches and the functional outcomes reported in the analyzed studies are summarized in Table 3.

The largest body of evidence concerning the relationship between radiographic alignment and hand function relates to angular deformity. In simple, closed, extra-articular fractures without rotational deformity, residual angulation may be functionally well tolerated. Therefore, the studies comparing the extent of angulation correction with treatment outcomes are discussed below [14, 18, 20, 22–24].

In a randomized trial, Martínez-Catalán et al. [22] compared buddy taping with closed reduction and cast immobilization in adult patients with fifth metacarpal neck fractures, palmar angulation below 70°, and no rotational deformity. The assessed outcomes included DASH scores, metacarpophalangeal joint range of motion, pain, grip strength, time to return to work, and radiographic angulation. Reduction and immobilization provided no significant functional advantage over buddy taping. Importantly, the correction of angulation achieved after reduction was not maintained during follow-up, and final angulation was similar in both groups. Patients treated with buddy taping returned to work, on average, 28 days earlier. This finding challenges the assumption that routine radiographic correction of angulation below 70° is necessary to achieve a good functional outcome in patients without malrotation [22].

Similar conclusions can be drawn from the study by Zawam et al. [23], which compared non-operative treatment using an ulnar gutter slab with percutaneous transverse pinning in active adults. Patients with angulation of 30–70° were included, whereas those with rotational deformity were excluded. At the one-year follow-up, no significant differences were found between the groups in union time, QuickDASH scores, total active motion, or return to preinjury activity. This indicates that in simple, extra-articular fractures without malrotation, operative stabilization and more accurate restoration of fracture fragment alignment, may not provide a measurable functional benefit. Radiographic superiority alone therefore does not constitute sufficient justification for surgical intervention [23].

A broader perspective is provided by the meta-analysis by Chong et al. [24], which compared non-operative and operative treatment of fifth metacarpal neck fractures. The authors found no significant differences between non-operative and operative treatment in QuickDASH scores, grip strength, total active motion, or VAS pain scores. Although surgical intervention provided more effective correction of angular deformity, the improved radiographic appearance was not associated with a clear functional advantage. Therefore, persistent residual angulation, particularly in simple fractures without malrotation or clinically relevant instability, does not necessarily result in substantial impairment of hand function [24].

These findings are supplemented by the study by France et al. [14], which evaluated patients treated non-operatively despite fracture healing with angulation exceeding 70°. The mean angulation was 73°, and the mean follow-up was 32 months. Despite the marked angular deformity, all patients achieved a 'very good' rating on the Functional Hand Scale, and 80% had a QuickDASH score of 0. This study should be interpreted cautiously because of its retrospective design and small sample size; nevertheless, it supports the observation that angulation alone does not necessarily determine a poor functional outcome. These findings do not justify routinely accepting severe deformity, but they demonstrate that even marked angulation is not an independent and reliable predictor of poor hand function [14].

The studies discussed above indicate that the relationship between radiographic angulation and hand function is not linear. Residual angular deformity may remain clinically well tolerated, particularly in the absence of malrotation [14, 17, 20, 22–24]. Rotational deformity, however, has greater functional significance because it may cause finger scissoring, abnormal finger tracking, and impaired grip mechanics [3, 6] (Tab. 4).

Table 4. Association between radiological alignment and functional outcomes in selected studies on Fifth Metacarpal Neck Fractures

Study	Radiological characteristics	Functional outcomes assessed	Radiological–functional relationship
[20]	Volar angulation<70°, no rotational deformity; buddy taping vs closed reduction and castimmobilisation	DASH, ROM, pain, grip strength, return to work	Closed reduction and immobilisation did not provide functional superiority over buddy taping; the initial correction of angulation was not maintained during follow-up
[21]	Palmar angulation 30–70°, no malrotation; conservative treatment vs transverse pinning	QuickDASH, TAM, TAF, union, return to activity	Conservative and operative treatment provided comparable functional outcomes in simple extra-articular fractures
[22]	Conservative vs operative treatment; assessment of palmar angulation	QuickDASH, gripstrength, TAM, VAS	Operative treatment was associated with better radiological alignment, but did not provide clearly superior functional outcomes
[23]	Angulation >70° after non-operative treatment	Functional Hand Scale, QuickDASH, SF-12	In selected patients, even severe residual angulation was associated with acceptable patient-reported functional outcomes

DASH – Disabilities of the Arm, Shoulder and Hand; **QuickDASH** – Quick Disabilities of the Arm, Shoulder and Hand; **ROM** – Range of Motion; **TAM** – Total Active Motion; **TAF** – Total Active Flexion; **VAS** – Visual Analogue Scale; **SF-12** – 12-Item Short Form Health Survey

When interpreting radiographs, the type of deformity should carry greater weight than the magnitude of angulation alone. Importantly, rotational deformity is not always clearly visible on standard radiographic projections; therefore, its assessment remains primarily clinical. A normal or acceptable radiographic appearance does not exclude functionally significant malrotation, and clinical examination during finger flexion remains essential.

From a clinical perspective, deformities that are merely visible radiographically should be distinguished from those that impair hand biomechanics. Contemporary management of metacarpal fractures recognizes that treatment selection should not be based solely on a single radiographic parameter. Therapeutic decisions should consider fracture morphology, rotational alignment, degree of shortening, stability, articular surface involvement, impairment of hand function, and the individual needs of the patient. Most stable fractures can be managed non-operatively, whereas operative treatment should be considered when the injury characteristics create a risk of poorer patient-important outcomes [25].

Isolated, stable angulation without functional impairment may justify observation and early mobilization. A deformity that can be corrected by closed reduction may require reduction and short-term immobilization, whereas malrotation, instability, substantial shortening, or clinically relevant intra-articular displacement more often support operative treatment. Other important factors may include shortening, instability, displaced intra-articular fractures, multiple fractures, and pseudo-clawing [3, 6, 10]. Indications for operative treatment should therefore not be based solely on the degree of angulation. They primarily include open fractures, rotational deformity with clinical finger scissoring, substantial shortening, instability, displaced intra-articular fractures, multiple fractures, and cases in which the deformity causes symptomatic functional impairment. The decision to perform surgery should thus be based on a combination of radiographic findings and clinical examination rather than on angulation as an isolated criterion (Tab. 4).

More accurate radiographic correction, particularly of angulation, is not consistently associated with better outcomes assessed using DASH or QuickDASH scores, range of motion, grip strength, pain intensity, or time to return to work.

Radiographic assessment remains essential for the diagnosis and treatment planning of fifth metacarpal neck fractures, but its findings should not be interpreted in isolation from hand function. In simple, closed, extra-articular fractures without malrotation, residual angulation may be functionally well tolerated. Perfect reduction on radiographs is therefore not an absolute prerequisite for a good functional outcome. Greater importance should be placed on a comprehensive fracture assessment that considers not only angulation but also rotational alignment, shortening, stability, articular surface involvement, and actual impairment of hand function. Radiographic correction should therefore be regarded as a means of preserving or restoring function rather than as an independent treatment objective.

To clearly distinguish radiographic outcomes from functional outcomes, the principal studies are additionally summarized in Table 5. This comparison allows assessment of whether improved fracture fragment alignment on radiographs translates into better hand function.

Limitations of the study. Because of the narrative nature of this literature review, not all procedures expected of a systematic review were applied. No formal, standardized risk-of-bias assessment or numerical quality appraisal of individual publications was performed. Articles were screened manually. Furthermore, the complete search strategies used for each database, the exact search dates, and the numbers of records excluded at successive stages of selection were not reported. These limitations reduce the reproducibility of the search process and prevent the complete exclusion of subjective study selection and the possible omission of relevant publications.

The included studies demonstrated substantial heterogeneity in study design, sample size, treatment methods, duration of follow-up, methods used to measure angulation, and functional outcome measures, including DASH, QuickDASH, range of motion, grip strength, and VAS pain scores. This heterogeneity limits direct comparison of results and precludes the determination of a reliable angulation threshold beyond which clinically relevant deterioration in hand function should be expected. Some studies included small patient groups, were retrospective, or had relatively short follow-up periods, increasing the risk of selection bias and limiting confidence in conclusions regarding long-term outcomes. Larger multicentre prospective studies using standardized methods of deformity measurement, consistent outcome measures, and long-term follow-up are therefore required.

CONCLUSIONS

Treatment success following fifth metacarpal fractures should not be judged solely by the quality of radiographic reduction. Although operative treatment generally provides more anatomical fracture fragment alignment, the available evidence does not demonstrate a consistent corresponding advantage in patient-reported function, range of motion, grip strength, or pain. In uncomplicated fifth metacarpal neck fractures without malrotation, clinically relevant shortening, instability, or intra-articular displacement, residual angular deformity within the ranges evaluated in the available studies – commonly 30–70° – may be functionally well tolerated. However, the heterogeneity of the evidence does not permit the definition of a universal safe angulation threshold. Isolated angulation should therefore not automatically prompt operative treatment when clinical examination confirms preserved finger alignment and hand function.

Operative treatment is more strongly supported when the deformity has demonstrable biomechanical or functional consequences, particularly in cases of malrotation with clinical finger scissoring, substantial metacarpal shortening, fracture instability, displaced intra-articular involvement, or symptomatic functional impairment. The therapeutic objective should therefore be functional reduction: alignment sufficient to preserve or restore pain-free motion, effective grip, and return to work and daily activities, rather than radiographic perfection as an end in itself. Treatment decisions should integrate radiographic findings with clinical examination, fracture morphology and stability, and the individual functional demands of the patient. Future prospective studies using standardized radiographic measurements and patient-important outcome measures are needed to determine which radiographic abnormalities reliably predict clinically relevant impairment.

Role of artificial intelligence in creating content. Artificial intelligence (ChatGPT, OpenAI) was used solely to assist with language editing and manuscript formatting. All AI-generated suggestions were carefully reviewed, verified, and revised by the authors. The authors take full responsibility for the accuracy, originality, and integrity of the manuscript, including all data, analyses, interpretations, and references

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Supplementary material. None.

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