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Case Based Review

First Metacarpal Screw Fixation Technique – Abductor pollicis longus Approach: Case-Based Review

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Abstract: Metacarpal fractures are the second and third most common upper extremity fractures after distal radius fractures, with varying fixation techniques. Intramedullary screw fixation is an increasingly preferred method. Intramedullary fixation of a comminuted sub capital metacarpal fracture using a headless compression screw was first described in 2010. The benefits include early range of motion, faster recovery, limited dissection, and reduced complications. Improper techniques that are readily avoidable can lead to suboptimal results. This study aimed to conduct a case-based review of outcomes following surgical treatment of metacarpal fractures. A comprehensive literature search was performed to identify relevant studies. Outcome measures included the mean follow-up, radiographic union, and functional outcomes. The treatment of the metacarpal fractures was good. Non-union is very rare, but malunion is common. Most metacarpal fractures are managed by closed reduction and immobilization and should be considered the primary approach, while open reduction should be reserved for cases where closed reduction is not feasible. This case-based review suggests that intramedullary fixation of metacarpal neck and shaft fractures using headless compression screws has thus far proven to be a safe and successful surgical treatment option, resulting in excellent clinical outcomes.

Keywords: Metacarpal Fracture; Radiographs; Treatment; Screw fixation

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Introduction

Metacarpal fractures typically occur secondary to a direct blow or fall directly onto the hand and comprise approximately 35.5% of cases in daily emergencies. This may be due to road traffic accidents (RTA), falls, and assaults, which commonly occur during athletic activities, particularly in contact sports. Almost one-fourth of cases occur during athletic events [1-3]. While a sporting injury is frequently the cause among younger patients, work-related injuries are often the cause in middle-aged patients, and falls are typically the cause in the elderly [4]. A direct blow over the dorsum often results in a transverse fracture, while axial and bending forces result in oblique and spiral fractures [5, 6]. If left untreated, it may result in structural deformity and may result in stiffness if it is over-treated [7-9]. First metacarpal (thumb) fractures account for approximately 25 per cent of all metacarpal fractures, placing them second only to fifth metacarpal neck (i.e., "boxers") fractures in terms of frequency.

Metacarpal fractures can be classified based on the fracture site and pattern. As per the anatomic site, it could be a metacarpal head, neck, shaft, or base fracture [7]. The description of the fracture pattern is the same as that of other long bones that may be open or closed, intra-articular or extra-articular, and oblique, spiral, transverse, or comminuted. Of the fractures of the first metacarpal, > 80 per cent involved the base.

The metacarpal head and base are primarily cancellous bones, and the metacarpal shaft is primarily cortical bone [10]. The blood supply of the metacarpals is rich and in general, enables the metacarpal to heal well after a fracture. The rate of healing is more efficient in the more cancellous bone of the metacarpal head and base compared with a shaft fracture, which involves the cortical bone [10]. The base of the first metacarpal is fractured with intraarticular extension due to the palmar ulnar fragment of the first metacarpal held in place by its ligamentous attachment to the trapezium (known as the anterior oblique ligament) during the axial loading with the rest of the metacarpal moving in the opposite direction and the main fracture line occurring along this point of weakness [11]. Because of this fracture, the first metacarpal shaft subluxes dorsally, proximally, and radially owing to the pull of the abductor pollicis longus (APL), extensor pollicis longus, extensor pollicis brevis, and adductor pollicus brevis, which remain attached to the fracture fragment.

The primary goals of treatment are to achieve an acceptable alignment, stable reduction, strong bony union, and unrestricted motion. To address metacarpal fractures, multiple techniques have been described in the literature, including close reduction and fixation with percutaneous intramedullary pinning/k-wires, open reduction and fixation with screws, plates (compression/locking), and external fixators [12]. Each technique has its pros and cons related to the type and site of fracture and involvement of soft tissue. Here, we describe the efficacy of the screw fixation technique using the APL approach in the management of first metacarpal fractures and their outcomes based on union and mobilization.

Evaluation

Plain radiography remains the most common imaging technique for the diagnosis of first metacarpal fractures. Three views of the thumb were indicated to assess potential fractures of the thumb metacarpal. In addition to the lateral and oblique views, a true anteroposterior AP (Robert view) should be considered. This view, taken during maximum pronation, provides good visualization of the carpometacarpal (CMC) joint. A true lateral (Bett view) revealing a metacarpal fracture-dislocation can be obtained with the palm on the cassette, the hand pronated 15° to 20°, and the tube angled proximally at 15° lose inspection of an apparent extra-articular fracture is required to ensure that no portion of the fracture line involves the joint surface. Computed tomography scanning is helpful at times, particularly for impaction injuries, and to define the CMC joint and fracture fragment position in intra-articular injuries. Ultrasound is well-suited for investigating fractures in linear areas of the bone, such as the diaphyseal and metaphyseal regions of the metacarpals.

Treatment / Management

Splinting was used for the initial immobilization of the metacarpal fractures [13,14]. Intra-articular fractures of the first metacarpal should be managed initially using a thumb-spica splint with the interphalangeal (IP) joint free and the wrist in 30 degrees of extension, prior to being referred to orthopaedics within two to three days. These patients should aggressively ice, elevate their hands, and require adequate analgesia. Standard over-the-counter medication is generally sufficient for analgesia. Non-displaced extra-articular fractures of the first metacarpal should be placed in a short-arm thumb-spica splint with the wrist in 30° of extension and the splint extending to the IP joint and followed up for one week. If the fracture is oblique or the alignment is questionable, the patient should be seen back within three–five days. A residual angularity of up to 20–30° was tolerated without functional impairment due to the inherent mobility of the thumb. Extra-articular fractures with >30° angulation require reduction. The definitive treatment for extra-articular fractures is thumb spica cast (IP joint free) for four–six weeks [15]. Patients should be aware that significant swelling or overly aggressive icing on the radial side of the thumb can cause temporary palsy of the superficial radial nerve, resulting in numbness over the dorsum of the thumb.

There are many operative approaches for metacarpal fixation. There are two main techniques for this purpose. Closed reduction and percutaneous fixation with K-wires–the fracture is reduced and then held in place with temporary wires, which are removed in 3-4 weeks' time. Open reduction and internal fixation: An incision is made in the skin, and the fracture is reduced under direct vision; metal screws or plates are then used to hold the fracture in the correct place. All fixation methods have been shown to be effective in case reviews and series. Closed reduction with intermetacarpal fixation from the first to the second metacarpal and/or trapezium is usually effective in reducing the first metacarpal shaft subluxation. If it is decided to treat this fracture with open reduction, it is most commonly performed through a Wagner incision [11]. The decision to treat these fractures with either open or closed reduction is still a matter of debate.

There is debate in the literature regarding the amount of articular step-off at the fracture site that is acceptable in non-athlete populations. Some authors have found no correlation between articular reduction quality and radiographic or subjective outcomes [18,19]. It is therefore concluded that bony apposition of the fragments within 2 mm and correction of any joint subluxation will be tolerated without increasing the risk of posttraumatic arthritis.

High-level evidence is lacking regarding the management of metacarpal fractures. The majority of studies suggest that the fractures that are more ulnar and or more distal with minimal to no soft tissue involvement can be best managed by non-operative methods, i.e., close reduction and splintage [7,10]. Metacarpal neck fractures are the most common; closed reduction can be accomplished for fractures of the neck of the fifth metacarpal; a close reduction can be achieved with the Jahss maneuver [20]. For metacarpal shaft fractures, simple closed reduction and immobilization may be used to treat stable fractures. Metacarpal head fractures can also be managed non-operatively if the joint involvement is <20%. Patients were immobilized for three–four weeks in an ulnar or radial gutter splint, maintaining metacarpophalangeal joint (MCPJ) flexion. Percutaneous pinning can be performed if the reduced fracture is unstable [21].

Operative management will be required if there is shortening, rotation, and angulation in different planes [7]. Other indications for operative intervention include unstable fracture, irreducible open fractures, fractures with segmental bony loss, multiple fractures, fractures associated with significant soft-tissue injury, more than 25% involvement of the articular surface of the metacarpal head, and displaced fractures of the metacarpal base with dislocation or subluxation of the CMCJ [22].

Prognosis

The range of motion exercises may begin 5 to 10 days post-screw fixation [23]. Non-displaced fractures and fractures with good initial reduction should be observed and reimaged within 7–10 days. Patients with oblique fractures or questionable reduction require reimaging within three–five days. If follow-up films reveal an angulation greater than 30°, repeat reduction or referral is indicated. Fractures that retain a stable position at follow-up should be placed in a short-arm thumb spica cast or a custom orthosis with the wrist in 30 °of extension and the interphalangeal joint free. Radiographs were repeated at two-week intervals and immobilization was continued for a total of four–six weeks. Following immobilization, patients should begin performing active range of motion exercises. The total healing time is six to eight weeks. Occupational therapy can be employed as needed to help patients regain motion and strength [16].

Thumb Metacarpal Fractures

The thumb metacarpal deserves special consideration, given the relative lack of interossei and deep intermetacarpal ligament support [2]. Fractures deform dictated by the three muscles providing the deforming forces at the base of the thumb [24].

- The abductor pollicis longus (APL) - pulls the shaft in proximal, dorsal, and radial deformities.
- Extensor pollicis longus (EPL) - same as APL
- Adductor pollicis - pulls the shaft into supination and adduction

The radial articular fragment and the remaining first metacarpal shaft are displaced dorsally and radially because of the deforming forces applied. Brown and Rust [25] described these as the abductor pollicis longus (APL) proximally imparting a radial force; the adductor pollicis resulting in first metacarpal adduction; and the extensor pollicis longus leading to dorsal translation. Cooney [26] demonstrated in a cadaveric biomechanical model that most of the force during pinching is transmitted in a proximal and dorsoradial fashion.

Surgical technique

Pain was analyzed using the visual analog scale (VAS) at the time of presentation. The fixation of the first metacarpal were managed with 2.4 or 3.0 mm as per templating partially threaded intramedullary headless screw fixation with the length of the screw varying from 30 mm to 50 mm. All procedures were performed under general anesthesia. The senior surgeon preoperatively determined the diameter of the medullary canal and analyzed the diameter of the screw to be placed. The fragment must be sufficiently large so that at least two 2.0 mm lag screws can be inserted without fracturing this fragment. This approach is indicated for fractures of the first metacarpal. The distal part of the thumb metacarpal is adducted and supinated by the adductor pollicis. The metacarpal is also displaced proximally by the adductor pollicis longus muscle. The goals of treatment are to reposition the thumb metacarpal in the carpometacarpal joint and restore the articular surface. The patient was positioned supine on the operating table with the arm placed in supination on an arm table at the level of the shoulder joint. Therefore, the use of a tourniquet is recommended. A fluoroscope was positioned opposite the surgeon to allow for intraoperative radiological examination. A longitudinal incision was made, and blunt hooks were used to spread the soft tissue mantle. After repositioning the hook, the base of the first metacarpal bone was visible. The thenar musculature was dissected. The periosteum was split with a scalpel and detached from the base of the first metacarpal, revealing the fracture zone. The thumb was supinated, which opened up and allowed for visualization of the skull area.

The required instruments were the reduction forceps, the sharp hook, the 2.0 1.5 mm double drill sleeve, the 2.0 mm and 1.5 mm drill bits, the depth gauge, and the 2.0 mm star drive screwdriver shaft with a handle. The fracture was stabilized with two lag screws inserted using the inside-out drilling technique. This indicates that gliding holes were drilled from the fracture surface of the shaft fragment to the dorsal side of the first metacarpal base. Following the anatomic reduction of the shaft fragment onto the metacarpal fragment, a thread hole in the metacarpal fragment was drilled using a standard technique. Care was taken to ensure that the direction and distance between the two gliding holes were such that the screw tips were sufficiently separated in the metacarpal fragment. The first gliding hole was drilled with a 2 mm drill bit beginning at the fracture surface and aiming in the dorsal radial direction at a 90-degree angle to the fracture surface. The second gliding hole was drilled distal to the first hole, in the same manner. The fracture was reduced by pulling the thumb and rotating the first metacarpal in pronation onto the metacarpal fragment. The fragment was then stabilized using small, pointed reduction forceps. The reduced articular surface was rechecked for smoothness. Pronation of the first metacarpal bone exposed the superficial branch of the radial nerve and the dorsal exit points of both gliding holes. The 1.5 mm drill guide was inserted into the first gliding hole. The 1.5 mm thread hole was drilled along the same axis into the metacarpal fragment. The depth was measured. A self-tapping 2.0 mm screw was inserted as the lag screw. However, the screw was not completely tightened during this stage. A second lag screw was inserted into the second gliding hole. Because of the cancellous bone structure, countersinking was unnecessary. The depth was measured, and a screw was inserted. Good compression of the fracture can be achieved by alternately tightening both screws. The reduction forceps were removed. By turning the first metacarpal bone back into the first gliding hole, the tips of both the screws become visible. They protrude from the far cortex in one to two turns of the thread. The reduced articular surface was smooth. Immediately postoperatively, a temporary plaster splint was applied, which immobilized not only the first carpometacarpal joint but also the first metacarpophalangial joint and wrist joint. After the pain and swelling had reduced, a custom thermoplastic splint was applied for four weeks. In compliant patients with stable fixation, the splint can be removed under the supervision of a physical therapist, and early active motion exercises can be started after a few days. We reviewed the patients 2–6 months after surgery and performed a repeat radiograph before weaning the thermoplastic orthosis.

Expected Outcomes

There are problems inherent to K-wire fixation. Infection rates in left wires can be as high as 17.6% compared with 8.7% in buried wire-buried wires; however, secondary surgery is required prior to mobilization [27]. The technique of dual-construct fixation technique obviates the risk of pin site infection inherent to proud K-wire fixation and allows for earlier mobilization and desensitization. Suspensory fixation directly opposes the radial pull of the APL, which is a primary deformation force. Suspensory fixation has been previously used to stabilize joints in the hand, with Shah et al [17] reporting on the use of the Tight Rope to augment the dorsal ulna ligament in a patient with recurrent thumb carpometacarpal joint instability following attempted ligament reconstruction via a tendon graft and Shenouda et al [28] incorporating suspensory fixation in the management of a complex trapezial fracture. Although no cost analysis has been performed, it is likely that there are higher operative costs with the use of adjunct suspensory fixation than with closed reduction and percutaneous pinning. However, this may be offset by a potential earlier return to work, and future comparative studies are required to elucidate financial differences.

Post-therapy pain was a common factor in all operative interventions, and the incidence was similar between operative and non-operative interventions. Griffiths and Cannon et al. reported a significant reduction in abduction in a significant proportion of patients [29]. The majority of studies, except for Cannon et al. [18] reported good opposition. Fracture healing was in varus alignment in the studies by Griffiths [30] and Cannon et al. [18] in a number of patients; however, these did not correlate with pain or post-traumatic arthritis. Robinson [31] pointed out that observer variation can be substantial and should be considered when radiological diagnostic methods are considered; in many cases, the dissimilarity between observers outweighs the difference between techniques. In these studies, there was no mention of whether the assessors who interpreted the X-rays received formal training.

Post-traumatic arthritis was not found in two studies in which operative intervention was performed. However, in the study by Bruske et al. [29], where percutaneous K-wire was used, a significantly higher percentage of patients developed osteoarthritis. There was no significant difference in the occurrence of posttraumatic osteoarthritis in patients managed operatively or nonoperatively. Cannon et al. In a previous study [18], the fracture was managed by closed reduction, and the position was maintained by a plaster of Paris cast. The predominant malunion was varus deformity. Reoperation is expensive, in both monetary and personal terms. Time to union and return to normal activity has been mentioned in a few studies. Most fractures healed within 4-6 weeks.

Griffiths [30], involving 21 patients treated with manipulation and cast application, reported seven patients with residual pain and one patient with arthritis. In a study by Cannon et al. [18] included 21 patients with plaster following manipulation and presented two patients with post-traumatic arthritis and two patients with residual pain after a 10-year follow-up.

Intramedullary screw placement offers many advantages over established surgical techniques. The threads of the screw allow compression across the fracture site and are thought to provide friction adhesion, which contributes to some degree of rotational stability. Avery et al. reported that 3.5-mm-diameter headless compression screws have a significantly higher peak load to failure in three-point bending and axial loading than 1.1-mm Kirschner wires for fixation of metacarpal neck fractures in a cadaveric model [32]. However, in a study comparing 3.0-mm-diameter by 40-mm intramedullary screws to locking and non-locking plates for fixation of unstable metacarpal shaft fractures, compression screws had a significantly lower load to failure and stiffness in a four-point bending model of human cadaver models [33]. Therefore, plate-and-screw fixation should still be considered for unstable and complex fractures of the metacarpal.

As mentioned previously, most metacarpal fractures are seen in young men aged 20-to 40-year age range [34,35]. Couceiro et al. compared outcomes between intramedullary screws and Kirschner wiring and found no significant difference in functional outcomes; however, patients who received intramedullary screws had a significantly shorter mean cast time (4.4 days versus 27.7 days) and return-to-work time (0.92 months versus 1.86 months). Thus, the first direct evidence that intramedullary screws offer faster recovery than Kirschner wires is presented [36]. There is a common theme of allowing active range of motion as soon as possible, with most studies allowing active range of motion as early as 1 week postoperatively and removing all splinting devices as soon as possible. Therefore, the main advantage of intramedullary screw fixation is faster recovery to daily living and work-related activities, which offers advantages to the most common population of patients with metacarpal fractures, men of working age. However, a prospective study comparing the duration of immobilization and return to work among intramedullary screws, plating, and Kirschner wiring would need to be performed to truly evaluate this point. However, there are a few concerns regarding this surgical technique.

One potential consequence of the need to disrupt the articular cartilage for retrograde screw insertion is disruption of the metacarpophalangeal joint cartilage and eventual arthritis. However, ten Berg et al. identified that the head of 2.4- and 3-mm-diameter compression screws occupied only 4 and 5 per cent, respectively, of the articular cartilage surface area during full hyperextension-flexion of the metacarpal head, and 8 and 9 per cent, respectively, during adduction and abduction in the neutral position [37]. Furthermore, this technique has excellent reported outcomes in fractures of proximal and middle phalanges, in which retrograde or anterograde insertion of screws also disrupts articular cartilage. Giesen et al. reported 31 consecutive phalangeal fractures with a 100 per cent union rate, mean total active motion of 222°, and no major complications at an average follow-up of 16 weeks [38]. Of the 169 fractures reported in this study, only two were removed for evidence of intraarticular protrusion (one of which was a comminuted sub capital ring finger fracture requiring Y-strutting technique [39], and the other a very proximal shaft fracture) [40]; however, both patients were asymptomatic. Next, the utility of intramedullary screw placement in osteoporotic bone or across growth plates has yet to be addressed and likely would not be adequate for these patient populations, as the threads of the screw have a higher chance of stripping in osteoporotic bone and can potentially prevent longitudinal growth of premature bone [41].

Lastly, there are concerns about shortening the metacarpal length with the compressive act of the screw and procedural difficulty if screw removal is necessary in the setting of infection or malfunctioning hardware. This is especially important as one of the most common causes of metacarpal fracture in contact with a hard surface, such as in a fistfight or punching something in the context of anger, and thus can occur more than once in a person's lifetime. Therefore, repeated fractures following intramedullary screw placement need to be studied further to address complication rates in this setting. Taken together, more studies are needed to assess long-term outcomes, including the complexity of hardware removal, metacarpophalangeal joint arthritis, and metacarpal shortening, and to identify which patient populations are the ideal candidates for this technique.

Case Studies

Case 1 Illustration

A 27-year-old man visited the emergency department with a history of a fall directly landing on the thumb for more than 10 days and did not seek any medical advice at that time. He presented with progressive pain at the site, limited functionality of the thumb, and an inability to fully move it. Plain radiography revealed a fracture of the proximal shaft of the first metacarpal with angulation. The patient was advised to undergo surgery due to limited thumb movement. (Figures 1a to 1c) The patient underwent percutaneous fixation at the radial dorsal base by APL approach protecting cutaneous nerves and tendons. The CMC joint was identified via needle, closed reduction was performed, and the guided wire was passed from the entry point under the c arm, followed by 36 mm partially threaded and fixed with a 2.4 mm cannulated headless compression screw. (Figures 1D to 1I) The patient was discharged on the same day with the advice of limb elevation, analgesic intake, dressing once every 3 days, not lifting weights for 4 weeks, and tolerable mobilization of the thumb. The patient recovered uneventfully and was managed with a forearm-based thumb spica thermoplastic orthosis until week 6. Three months after the surgery, the patient reported no pain and was able to return to all activities. Radiographs taken at three months revealed satisfactory positioning and healing. (Figures 1J and 1K) Informed consent was obtained for the publication of the patient results and images.

Case 2 Illustration

A 36-year-old man presented to the emergency department with a history of falling off a heavy object on his left hand and wrist. Upon clinical examination, pain and an open wound over the dorsum of the left thumb base with moderate swelling were observed. Plain radiographs revealed a displaced comminuted fracture of the first metacarpal bone, a non-displaced scaphoid fracture at the distal end of the radius involving the radial styloid process reaching the intra-articular surface, and no other fracture was observed on radiographs. (Figure 2A to 2C) Wound management was initially carried out in the form of copious washing with normal saline and approximation followed by slab application. The patient underwent surgery on the following day. The patient's left hand was prepped and draped aseptically. The wound was debrided and extended proximally in a curved incisional pattern to expose the distal radius, and metacarpals to expose the dorsal radius. A 6 cm incision was made over the APL tendon extension and extended proximally and distally to expose the distal radius and metacarpals. Dissected superficially and cauterized were used for coagulation. Deeply dissected until fracture was reached, and anatomical reduction was performed using K-wires. Reduction was performed using the first metacarpal with two nos. of 2.2 mm cannulated screw of 40 mm, radial styloid with one 2.2 mm cannulated screw of 30 mm, and scaphoid with one 2.2 mm cannulated screw of 24 mm. (Figure 2D to 2 J) The wound was inspected after 48 hrs of surgery and administered intra venous antibiotics for 3 days. The patient was discharged with the advice of range of motion training, not to lift the weight for 4-6 weeks with a back slab for 3 weeks. The patient's recovery was uneventful. Three months after surgery, the patient had satisfactory positioning, and no pain or healing was recorded with return to all activities. (Figure 2K and 2 L) Informed consent was obtained from the patient for publication of results and images.

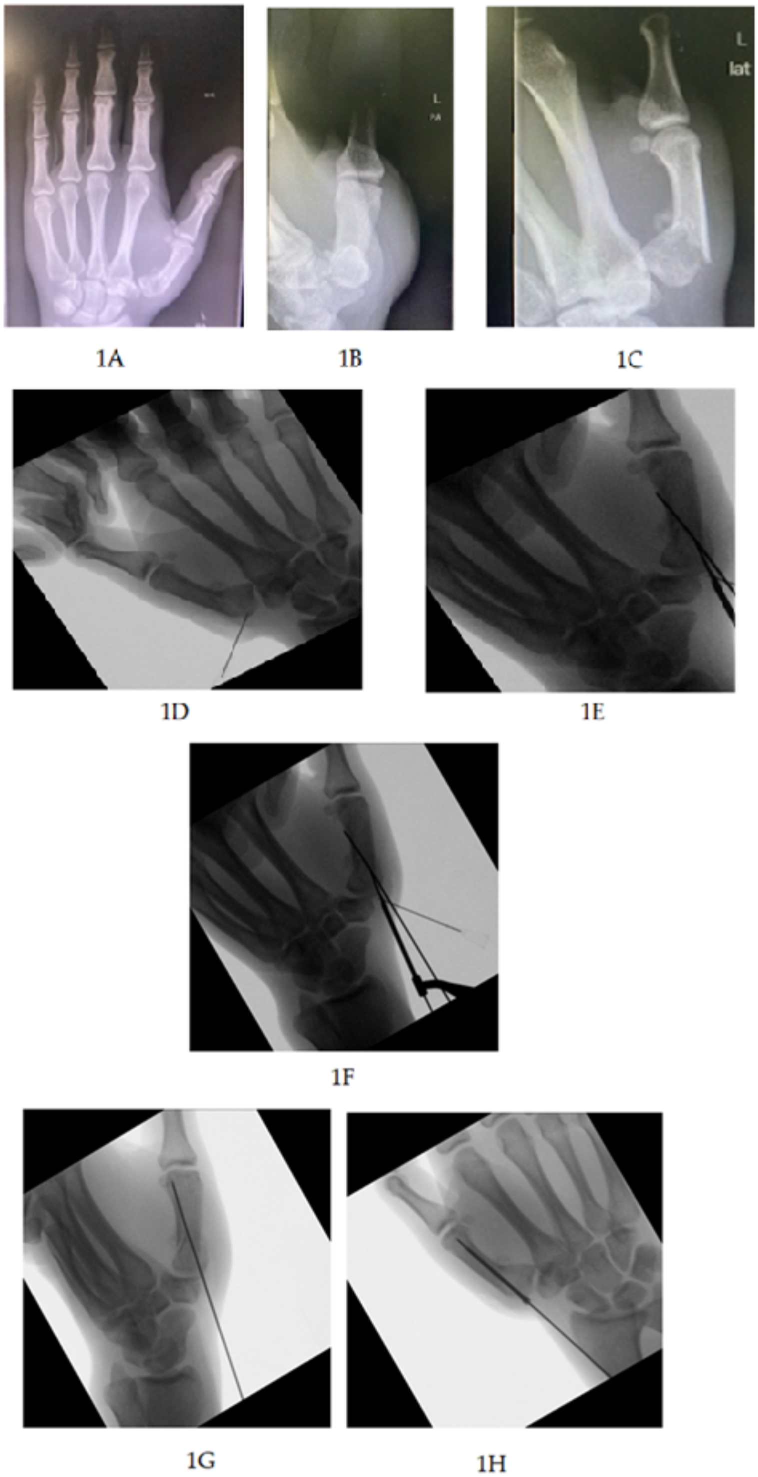

Figure 1. 1A - 1C Preoperative radiographs, 1D -1H post-operative radiographs and 1I, 1K radiographs 3 months after surgery

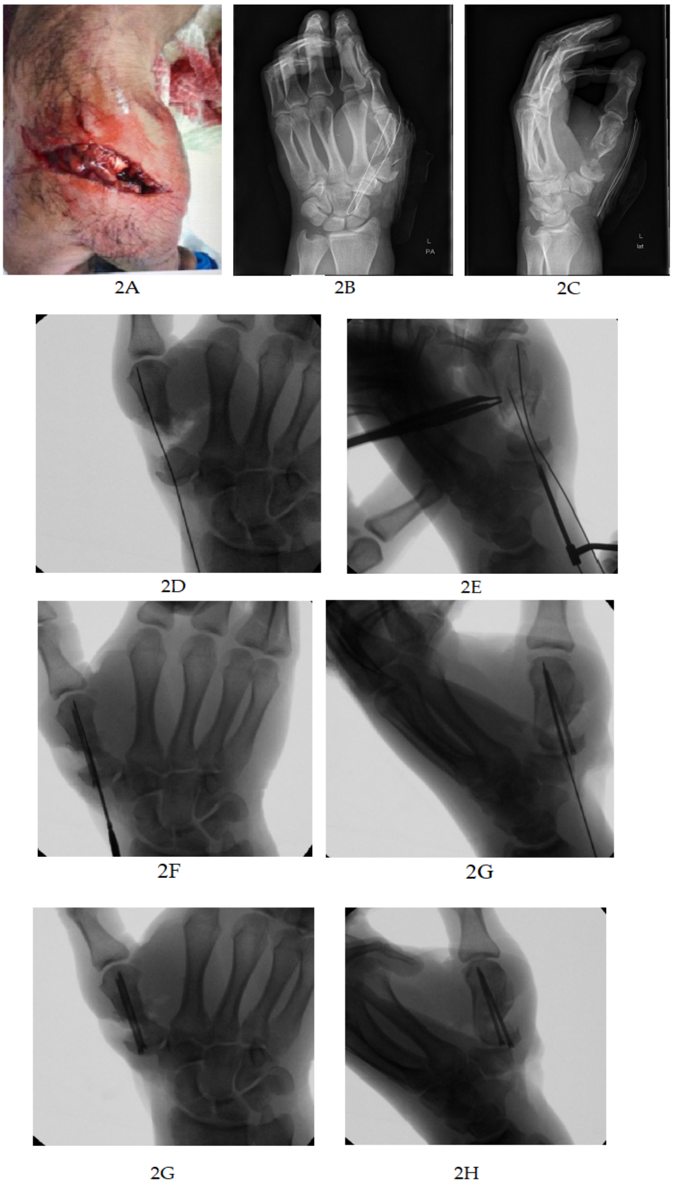

Figure 2. 2A Clinical photograph, 2B, 2C Preoperative radiographs, 2D – 2J post-operative radiographs and 2K, 2L radiographs 3 months after surgery

Case 3 Illustration

A 30-year-old man presented to the emergency department with a tyre burst injury to the shoulder and hand caused by the metal rim of the tyre while repairing the tyre. Clinical examination revealed tenderness and deformity along the wrist, 1 cm laceration along the 2nd metacarpal bone. Further to radiograph images it was observed comminuted intra-articular impacted fractures involving the base of the 2nd and 3rd metacarpal bones, an angulated fracture involving the shaft of the 1st metacarpal bone and an angulated fracture involving the neck and hit head of the 2nd metacarpal bone. (Figure 3A to 3D) The patient underwent staged surgery keeping in view of the severity of the injury. No compartment release surgery was performed, and the patient was monitored for any other compartment signs. He underwent debridement with plate fixation for the 3rd and 4th metacarpal fractures as the first step of surgery. Four days after the first surgery, a 2nd surgery was performed, with fixation of the 1st metacarpal with scaphoid and distal radius fixation. The patient was followed up with strict postoperative limb elevation. (Figures 3E to 3L) Analgesics and antibiotics were given and monitored for compartment syndrome with dressing once in 3 days. A splint was applied for 2 weeks with the advice of mobilization of the fingers and hand, as tolerated by the patient. The patient was discharged 1 week after surgery. Six months after the surgery, the patient reported no pain and was able to return to all activities. His ability to move the arms and shoulders was satisfactory. (Figures 3M to 3O). Informed consent was obtained for the publication of the patient results and images.

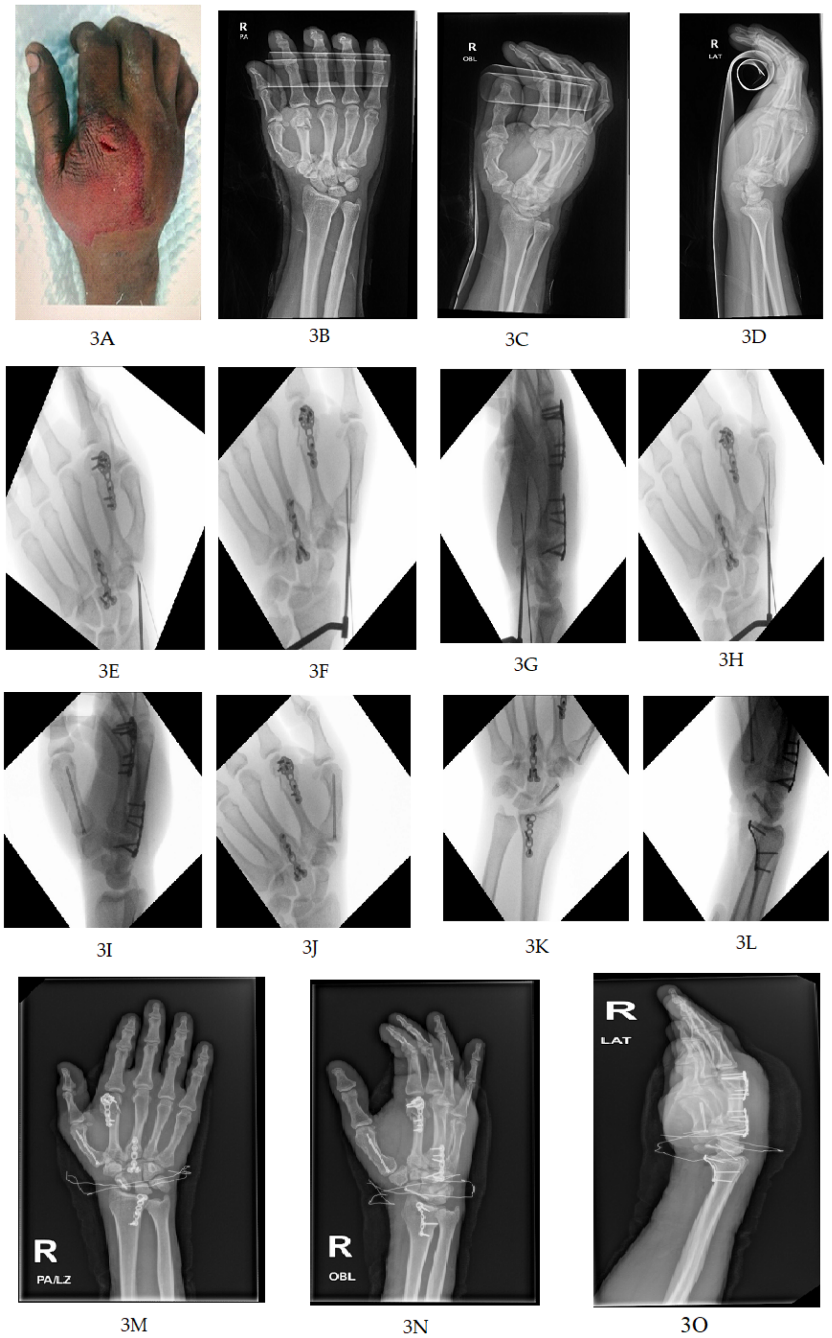

Figure 3: 3A Clinical photograph, 3B-3D Preoperative radiographs, 3E– 3L post-operative radiographs and 3M-3O radiographs 6 months after surgery

Conclusion

The present study demonstrates that intramedullary fixation of metacarpal fractures using headless compression screws has proven to be a safe and successful surgical treatment option for the metacarpal base. The entry point for anterograde screw fixation of 1st MC is extraarticular and approach does not violate CMC joint. Moreover, it is not indicated only for base of 1st MC but also could be for shaft as well even for severe comminuted shaft fractures. The advantages of this technique over previously described methods include no requirement for subsequent hardware removal, thus allowing for earlier mobilization. This offers great benefits to patients who require an earlier return to daily activities and to the workforce. Most metacarpal fractures are isolated injuries, which are simple, closed, and stable. Although many metacarpal fractures do well without surgery, there is a paucity of literature and persistent controversy to guide the treating physician on the best treatment algorithm.

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