



ORIGINAL RESEARCH PAPER

Orthopaedics

AN UNSTABLE MIDDLE PHALANX NECK FRACTURE TREATED WITH A SINGLE KIRSCHNER WIRE

KEY WORDS: Middle phalanx neck fracture, single K-wire, early rehabilitation

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ABSTRACT

Hand fractures are extremely common and many of these fractures may be treated effectively by non-surgical methods. Surgical fixation is the choice of management for unstable, displaced fractures and it requires a good understanding of the fracture morphology, surgical skill and implant preference of the surgeon. K-wires as an implant can provide a minimally invasive, cost-effective, stable fixation of the fracture and combined with early mobilization, enables the patient to get favorable functional outcomes. A common method of fixation is using 2 crossed K wires which although can provide a more rigid fixation, is not without challenges. We describe with a case of a middle phalanx fracture of the non-dominant hand in a manual labourer, who underwent fracture fixation with a single Kirschner wire and was instituted early active mobilization. By the post-operative 6th week, he achieved an excellent functional outcome.

INTRODUCTION

Phalangeal fractures of the hand account for nearly 1/4th of below-elbow fractures.¹ Most of the stable and non-displaced fractures can be treated conservatively, whereas unstable and displaced fractures require surgical fixation to enable early return to activity. Conservative treatment can often result in mal-union and stiffness of the affected digit.^{2,3} Multiple methods of phalangeal fixation have been described for extra-articular fractures including joint sparing and joint violating fixations.⁴⁻¹¹ We achieved a joint sparing stable fixation using a single retrograde Kirschner wire (K-wire) with bi-cortical purchase in a closed displaced middle phalanx transverse neck fracture, enabling supervised early active mobilization.

Case Report

A 44-year-old, right-hand dominant, male manual labourer with no co-morbidities, presented to the hand surgery outpatient department of the Sri Ramachandra Hospital following a one-day history of blunt trauma to his left index finger. He was clinically and radiologically diagnosed to have a closed dorsally angulated (apex volar) middle phalanx neck fracture of the index finger without any neurovascular deficit [Figure 1].

Technique

Under digital block, reduction of the fracture was performed by hyperextension of the fracture followed by sustained flexion of the distal interphalangeal joint (DIPJ) and proximal interphalangeal joint (PIPJ). The reduction was done under the guidance of a C-arm mobile X-ray imaging system. The fracture was fixed using a single retrograde 1.25mm K-wire starting distally from the ulnar cortex of the middle phalanx to the radial cortex proximally sparing both the DIPJ and PIPJ [Figure 2]. Intra-operative active range of movements were found to be complete, confirming that there was no tendon impingement [Figure 3]. The fracture was reduced and the fixation was found to be stable. The K-wire tip was bent and kept proud from the skin. One dose of antibiotic was given intra-operatively. Post-operatively, serial pin tract dressings were done. Supervised early active mobilization was initiated on the 3rd postoperative day. He underwent regular exercises supervised by our hand therapist. At the 4th post-operative week, the index finger X-rays were taken in antero-posterior and lateral positions [Figure 4]. Following a satisfactory radiological outcome, the K-wire was removed. The patient was followed up for 6 weeks post-operatively. The final assessment was done by calculating the quick DASH score,

pulp-to-palm distance (PTP) and grip strength using a calibrated Jamar dynamometer.

RESULT

At 6 weeks follow-up, the PTP was found to be 0cm, quick DASH 0%, and his grip strength was comparable to the opposite side.

DISCUSSION

The middle phalanx has an hourglass shape, a thinner medullary canal, and more cortical bone stock.¹² There are numerous modalities for the fixation of middle phalanx fractures including K-wires, external fixators, plates, screws, loop wires, and tension band wiring.⁴⁻¹¹ Middle phalanx neck fractures tend to displace dorsally due to the forces of the flexor digitorum superficialis tendon acting on the proximal fragment and the extensor force acting on the distal fragment. Plate fixations have shown poor functional outcomes in middle phalanx fractures.⁴⁻⁷ External fixators can cause impingement of the lateral bands of the extensor tendon.¹² Since our patient was operated under a digital block, we were able to analyse active intra-operative movements confirming no impingement of the tendon.

Per-cutaneous crossed K-wire fixation can be cumbersome and can cause fracture site distraction leading to delayed union or non-union.¹³ We used a single retrograde 1.25mm K-wire sparing with a bi-cortical purchase sparing both the DIPJ and the PIPJ. Joint-sparing fixations have shown better post-operative functional outcomes than joint through fixations.^{12,14}

At a six-week follow-up, our patient did not have any extensor lag but had mild flexion loss which caused no functional deficit. Grip strength is largely contributed by the medial 3 digits and the thumb which can explain why our patient's grip strength did not show a significant decrease.¹⁵ Our patient was carefully selected for this procedure. He was compliant with the post-operative advice and hand therapy.

Although complications like pin tract infections, tendon impingement, implant loosening, mal-alignment and malunion are possible, our patient did not have any of them.^{16,17}

The limitations of our study include selection bias and a short follow-up period. Since our patient had a fracture in his non-dominant index finger, which can be circumvented for most

activities, it may account for his early improved functional outcome. Since a single K-wire was used, the fixation may not be as rigid as other techniques. This technique may not provide stability in a comminuted fracture.

CONCLUSION

This technique of using a single K-wire in a simple closed fracture of the neck of the middle phalanx, sparing the joints, provides a stable fixation and when combined with early rehabilitation delivers a viable option for a favourable functional outcome in compliant patients.

Consent

Informed consent was obtained from the patient regarding the publication of the article, and all personal information of the patient was kept anonymous.

Acknowledgments

Our hand therapist, Mr. Venu Babu, was crucial in providing hand therapy and in rehabilitating the patient.

Conflict Of Interest

The authors declare no conflicts of interest related to the publication of this study.

Figures:-



Figure 1: Pre-operative X-rays of the left hand index finger AP and Lateral views showing the fracture of the middle phalanx.



Figure 2: Intra-operative C-arm images of the fracture fixation.



Figure 3: Intra-operative active finger movements.



Figure 4: Post-operative 4th week X-rays.

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