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CASE REPORT

Percutaneous Corrective Osteotomy for Early Malunion of the Proximal Phalanx: A Case-Based Technical Perspective

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ABSTRACT

Malunion of proximal phalanx fractures can lead to considerable functional impairment, especially in the presence of angular or rotational deformities. Established malunions are typically addressed through open corrective osteotomy, whereas the treatment of early malunion is not as well delineated. We present a case of a four-week-old malunion of the proximal phalanx of the fifth finger successfully treated with percutaneous corrective osteotomy and Kirschner wire fixation. This minimally invasive technique made it possible to realign accurately, kept the soft tissue intact, and made it easier to start rehabilitation early. The case shows that there is a small but clinically important time frame during early malunion when percutaneous correction is still possible. This could help avoid the complications that come with open osteotomy. The technical aspects, reasoning behind decisions, and functional effects are examined in relation to the current literature.

KEYWORDS

Proximal phalanx fracture • Early malunion • Percutaneous osteotomy • Kirschner wire fixation • Finger fractures • Rotational deformity

INTRODUCTION

Fractures of the proximal phalanx are common hand injuries that are often seen as not very important. But even small leftover deformities can make it hard for the hand to work right because they change how the tendons work, make the joints not fit together right, and cause the hand to rotate incorrectly. Malunion of proximal phalanx fractures is not merely a cosmetic issue; it also impairs finger functionality, particularly in the ulnar digits, where the deformity is more pronounced when the fingers are flexed.[1,7]

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Open corrective osteotomy is the best way to fix a phalangeal fracture that has been deformed for a long time.[1,2] On the other hand, there has been relatively little focus on how to treat early malunion, which usually happens 3 to 6 weeks after an injury. At this point, the callus is not fully mature, and the deformity may still be able to be fixed with less invasive methods.

This report talks about a case of early proximal phalanx malunion that was fixed with percutaneous corrective osteotomy and K-wire fixation. The goal is to emphasise the concept of a "early malunion window" and discuss the function of minimally invasive correction prior to the necessity of open osteotomy.

CASE REPORT

A middle aged gentleman reported to our OPD four weeks after having broken the proximal phalanx of his fifth finger of right hand. The patient complained of having trouble with his hand's function and he did not have pain. He was treated elsewhere conservatively with strapping. A clinical examination revealed an angular deformity accompanied by rotational malalignment more evident when the fingers were flexed, resulting in overlap with adjacent fingers (Figure 1).

Figure 1: Maluniting proximal phalanx of right hand 5th finger

Figure 2: Fluoroscopic images showing controlled manipulation and K-wire fixation

Radiographs showed that the proximal phalanx was angulated and mal-uniting. The condition and complications were explained to the patient. He was advised to undergo percutaneous correction instead of open osteotomy because the injury was recent and the fracture had not yet fully healed. On the OT table, wrist block was given. Fluoroscopy was used to check the malunion in all planes. Percutaneous osteotomy was done at the place where the bones were maluniting. The osteotomy was done with 1.5 mm K-wire to have proper control. Controlled manipulation fixed the alignment and rotation (Figure 2). This was clinically confirmed and confirmed under fluoroscopy and found to be acceptable. K-wires of size 1.5 mm were inserted in criss-cross fashion and stability was confirmed under fluoroscopy. Appropriate dressing was done and capillary refill time was satisfactory. Post operatively radiology showed that the wires were insitu and immobilized adequately (Figure 3,4).

Figure 3: Immediate Post-Op X-ray showing K-wires insitu in 3 orthogonal planes

Figure 4: Post-op day 2 image showing K-wires insitu

DISCUSSION

Malunion after proximal phalanx fractures is a known cause of long-term dysfunction, especially when there is a rotational deformity.[7] Even small discrepancies in rotation can cause fingers to overlap when fingers are flexed. This can disrupt the functions of hand making the grip and fine motor tasks more difficult. Rotational malalignment is frequently underestimated in radiographic assessments, demanding clinical evaluation in contrast to angular deformity.

Conventional education supports open corrective osteotomy for verified malunions.[1,2] Open techniques work, but they may harm soft tissue, make tendons adhesions, and make things stiff after surgery, especially around the proximal interphalangeal joint.[11] As a result, minimally invasive options have gained popularity in selectively chosen instances.

This case shows that early malunion has its own treatment window. About four weeks after the injury, the fracture biology still lets for controlled correction without a lot of exposure. During this time, percutaneous osteotomy can fix deformities without damaging the periosteal and soft tissues, which is important for tendon gliding and joint mobility.[3,6]

Several authors have written about favourable results with minimally invasive or percutaneous correction of phalangeal malunions.[2,3,8] These methods rely on a careful clinical exam, a careful fluoroscopic monitoring, and a stable fixation. Kirschner wire fixation is still a good and widely available method, especially in places where resources are limited. It has also demonstrated efficacy when utilised alongside early mobilisation protocols.[5,6,13]

Biomechanical studies indicate that stable fixation of proximal phalanx fractures is essential for facilitating early mobilisation while maintaining reduction.[10,11] When placed in the right place, K-wire constructs can keep the implant small and reduce irritation to the soft tissue while still being stable enough. Early controlled movement has been shown to reduce stiffness and improve functional outcomes after fixing a phalangeal fracture.[13]

The important part of this case is the timeline for making decisions. It might make sense to treat acute fractures with closed reduction, early malunions with percutaneous corrective techniques, and late malunions with formal open osteotomy. Knowing about this progression might help avoid unnecessary delays and lower the chance of problems during surgery (Table 1).

Table 1: Timing-Based management strategy for proximal phalanx fractures and malunion (with Evidence Support)

Time from Injury	Biological Status	Common Clinical Issue	Recommended Management	Key Supporting Evidence
0–2 weeks	Acute fracture, minimal callus	Displacement or instability	Closed reduction ± percutaneous K-wire fixation	Stable fixation with K-wires allows acceptable alignment and early mobilisation in acute fractures[5,6,7]
3–6 weeks	Early malunion, immature callus	Angular and/or rotational deformity	Percutaneous corrective osteotomy with K-wire fixation	Minimally invasive correction feasible before callus consolidation; preserves soft tissue and tendon gliding[1–4,8]
>6–8 weeks	Established malunion, consolidated callus	Fixed deformity, stiffness risk	Open corrective osteotomy ± internal fixation	Open osteotomy provides reliable correction when deformity is established but carries higher stiffness risk[1,2,11]

CONCLUSION

The early malunion of proximal phalanx fractures should not be regarded as an unavoidable prerequisite for open corrective osteotomy. When diagnosed within a restricted timeframe, percutaneous corrective osteotomy with K-wire fixation provides a minimally invasive, biologically advantageous option that can restore alignment and function while reducing stiffness. Choosing the right patients, paying attention to rotational correction, and starting rehabilitation early are all important factors in success.

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