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Double X Configuration Screw Fixation for Middle Phalanx Fracture – A Case Report

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Learning Point of the Article:

Middle phalanx fractures could potentially be stabilized with the help of crossed double screws gaining rigid construction.

Abstract

Introduction: Techniques for treating phalangeal fractures are evolving. Intramedullary screws are a trendy surgical choice that leads to optimal results. Metacarpals and proximal phalanges could tolerate two screws. We want to demonstrate that middle phalanx fractures could also be treated with double-cannulated screws.

Case Report: A 19-year-old patient with a middle phalanx fracture of the 4th left digit was treated with Kirschner wires leading eventually to malunion. We revised the fracture with a redo, recreating the fracture and introducing retrograde crossed-cannulated screws with excellent stability that allowed an immediate range of motion. The patient achieved union with full grip and range of motion.

Conclusion: Middle phalanx fractures could be treated with two screws in a crossed configuration achieving stable fixation and obviating the proximal interphalangeal joint.

Keywords: Screws, intramedullary, fracture, middle phalanx, double

Introduction

Fractures of the phalanges are common [1, 2]. New techniques have evolved to gain better outcomes and to hasten return to work following injury [3, 4]. Cannulated screws act as internal splints and allow an early range of motion. They have superior outcomes regarding union, range of motion, and time to return to work in comparison to Kirschner wires [5, 6]. Some studies demonstrated the option of introducing two screws in the metacarpal and proximal phalanx and called it Y-strutting [3, 7]. We opt to demonstrate that two screws could be inserted into the middle phalanx with straight forward simple technique.

Case Report

A 19-year-old patient who came to our department after a crush injury from a car's door was diagnosed with an open middle phalanx displaced fracture in the left 4th digit (Fig. 1). He was operated on upon arrival. The procedure included irrigation debridement and fixation with Kirschner wires (Fig. 2). Following the procedure the patient was put in a splint that was removed after 10 days to allow mobilization of the proximal interphalangeal (PIP) joint under the supervision of occupational therapy. During follow-up, the patient gained union of the fracture but with clinical malrotation as the 4th digit rided the 3rd digit impeding full grip. The patient was called for revision surgery for osteotomy and realignment 5 weeks following the primary surgery.

Surgical technique

With a minimally invasive approach, a 1 cm radial mid-axial approach was utilized for the distal third for the middle phalanx.

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Author's Photo Gallery

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Figure 1: X-rays show an unstable middle phalanx fracture of the left 4th digit.

After exposing the fracture site, an osteotome and freer elevator were utilized to help reproduce the original fracture line. Following this step, while maintaining the digit in reduction following correction of the malrotation, two crossing retrograde Kirschner wires were introduced in X configuration from the set of 1.7 mm cannulated compression screw system (CCS 1.7 mm, APTUS, Medartis). The two K-wires were introduced in a way that will allow the insertion of twin self-drilling screws that will not meet in the sagittal plane (Fig. 3). Following inserting the screws, the K-wires were removed. The X-configuration screws stabilized the osteotomy site and kept its position. This allowed an immediate range of motion following the surgery.

Figure 2: X-rays and fluoroscopic images demonstrating Kirschner wires stabilizing the middle phalanx fracture.

Outcome

The fracture healed with the osseous union (Fig. 4). Clinically the patient had a full range of motion with a symmetric power grip (Fig. 5).

Discussion

Treating phalanx fractures with intramedullary screws is an evolving practice that was introduced by Del Piñal et al. [3]. Multiple studies have shown the benefit of intramedullary

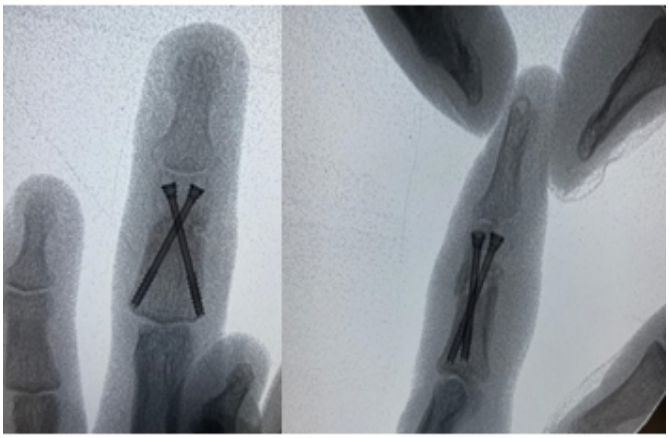

Figure 3: Fluoroscopic images demonstrate double crossing intramedullary screws stabilizing the middle phalanx.

Figure 4: X-rays demonstrate healing and union of the middle phalanx fracture.

Figure 5: Clinical image shows the full grip of the hand in the outpatient clinic. A proximal interphalangeal joint of the 4th digit has a full range of motion.

screws treating phalanx fractures to achieve stability and allow an early range of motion [4, 8]. A good outcome is anticipated regarding the range of motion and union with marginal complications [9, 10]. The screw could either be introduced in antegrade or retrograde fashion [11-13]. Metacarpals and proximal phalanx fractures could be treated with either one cannulated screw or two screws depending on the fracture configuration [7, 14]. While multiple studies included middle phalanx fractures series treated with cannulated screws, none to our knowledge described two screws configuration to address this fracture [3, 8]. George et al. [15] described 23 middle phalanx fractures that were treated with a 1.7 mm or 2.2 mm cannulated screw that was inserted in the retrograde technique with good results. Middle phalanges are smaller than metacarpals and proximal phalanges, yet they can withhold two cannulated screws [16].

Our case report stands out as it demonstrates the capacity of the middle phalanx to hold in double screws which will add to the stability of the construct allowing immediate range of motion and potentiating union. By introducing the K-wires in a retrograde fashion at the edge of the phalanx head, it could be aimed proximally in X-configuration by allowing one wire to be dorsal and the other volar. Then we insert the 1.7 mm cannulated screws that swallow the 0.6 mm K-wires in a length that will engage the cortical contralateral edge. Our hypothesis is that this technique will allow a superior purchase than one screw construct of a 2.2 mm cannulated screw and obviate the cartilaginous surface of the PIP joint leading to a better outcome.

We recognize the anecdotal nature of this case report. Our main aim is to demonstrate that middle phalanx fractures could be approached with two screws as is the case in metacarpal and proximal phalanx fractures. Still, more biomechanical and clinical studies should be performed to confirm the superiority of this technique versus on screw classical technique.

Conclusion

This case report demonstrates the potential of the middle phalanx of the hand to contain two crossing intramedullary screws not violating the PIP joint. This technique endows a rigid construct that allows immediate motion of adjacent joints.

Clinical Message

When feasible, middle phalanx fracture could be approached with crossing double screws, especially when stiffness is feared and an early range of motion is warranted.

Declaration of patient consent: The authors certify that they have obtained all appropriate patient consent forms. In the form, the patient has given the consent for his/ her images and other clinical information to be reported in the journal. The patient understands that his/ her names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

Conflict of interest: Nil **Source of support:** None

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