

Malunion Right Base Proximal Phalanx Ring Finger: A Case Report

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ABSTRACT

Phalanx region has complex anatomical and functional unit with unique osseous, soft tissue, articular composition and adjacent structure. Trauma and injury of this complex biologic phalanx may impact functional system significantly leading to pain, instability and stiffness or limit the range of motion. Corrective derotational osteotomy for malunion fracture in phalanx are challenging procedure by unique anatomy This case present about 17-year-old female patients came to Polyclinic Department of Sanglah Hospital with Malunion Right Proximal Phalanx Ring Finger. Patient treated with Osteotomy Derotational and Open Reduction Internal Fixation Plate Screw.

Keywords: Malunion, Proximal Phalanx, Ring Finger, Derotational Osteotomy, Surgery

INTRODUCTION

The fingers are particularly susceptible to trauma and injury. Thus, fracture of phalanx is relatively common. They are most often the result of forced rotation, hyperextension or direct trauma. Distal phalanx fractures are the most common among phalangeal fractures, followed by proximal phalanx (PP) fractures. The fracture is usually impacted or comminuted dorsally and has

apex volar angulation. Management of phalangeal fractures is aimed at adequate anatomical reduction, maintaining fracture stability and early controlled mobilisation. Nonsurgical treatment of phalangeal fractures typically involves closed reduction if indicated, buddy taping to adjacent finger for stabilization and/or splinting for a short period of immobilization.^[1] A period of immobility for 2-3 weeks is generally accepted for most phalangeal fractures, anything longer than 3 weeks has been shown to increase long-term stiffness. Surgical treatment using Kirschner wire percutaneous pinning may be necessary for unstable fracture which if left would lead to deformity (including angular, rotational, and shortening) or decreased hand function.^[2]

Malunion is a frequent complication following phalangeal fractures, particularly in proximal phalanx fracture. Inappropriate fracture healing from closed reduction may lead to a malunion which can result in rotational or angular deformities. Coonrad and Pohlman reported that malunion was associated with loss of reduction and immobilization in insufficient flexion at the metacarpophalangeal (MP) joint.^[3] Phalangeal malunions can result in rotational or angular deformities which cause deviation or shortening in the digits, and which essentially lead to a limitation in hand function especially when the dominant hand is involved. When it causes

impairment in hand function or if there is any cosmetic deformity, surgical correction is preferred. The aim of surgical correction is to restore the clinical function by anatomic repair. There are various corrective osteotomies technique for the treatment of malunion of the phalanges.^[4] This study presented a malunion of proximal phalanx following a fracture of base proximal phalanx of ring finger. This patient underwent de-rotational osteotomy and internal fixation with mini straight plate.

CASE PRESENTATION

17-year-old female patients came to the Outpatient Clinic, complaining discomfort on ring finger of his right hand after kicked by her friend 2 month ago (June 2021). Patient was doing karate, then her right hand was kicked by her opponent. Patient also complained that she had difficulty in writing and holding things after that accident. There is no history of unconsciousness, nausea, vomiting. Patient already go to bone setter 1 time on June 2021, and patient already treated by buddy taping on July 2021 but didn't getting better.

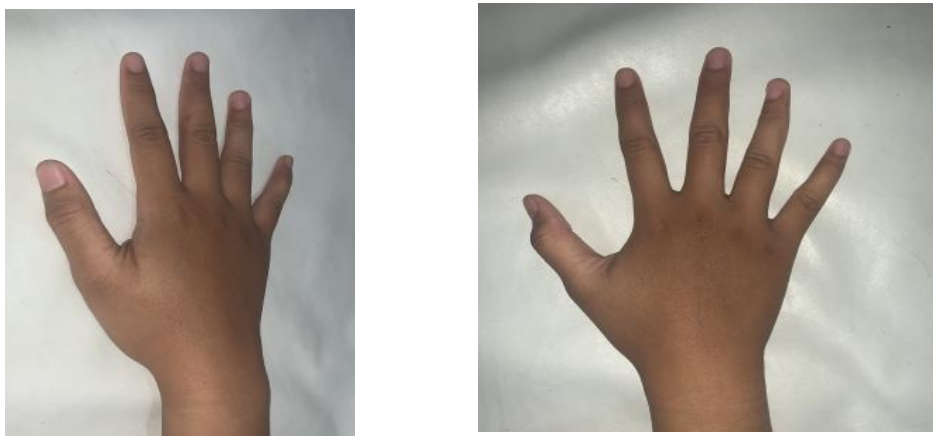


Figure 1. Physical examination of the patient (Right Hand Region)

From physical examination on the right hand region swelling was not found, no bruise, with rotation over proximal ring finger deformity. From palpable, there was tenderness over right ring finger, radialis artery is still palpable, capillary refill time was less than two seconds, oxygen saturation 99%, and active ROM 1st, 2nd, 3rd, 5th MCP-IP 0/90, active ROM 4th MCP-IP limited due to pain.



Figure 2. Right Hand X-Ray AP/Oblique view

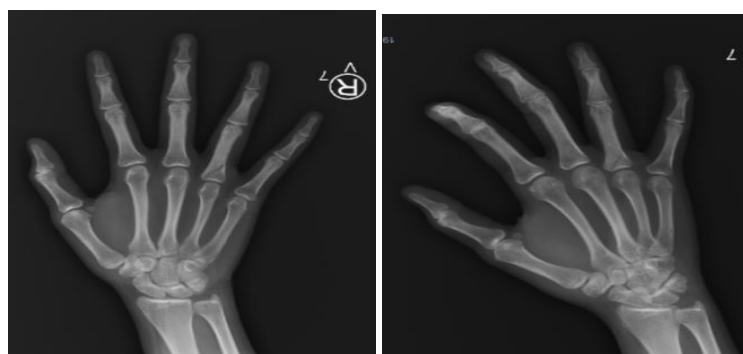


Figure 3. Right Hand X-Ray AP/Oblique view

Radiographic examination showed right hand fourth base proximal phalanx was fracture. There was no neurovascular deficit of the right hand. This patient was diagnosed with malunion right base proximal phalanx ring finger.

This patient had history treated by bonesetter one time on June 2021, and had history treated with buddy taping but didn't getting better, next we plan to do open reduction and internal fixation. In operating room, patient in supine position with general anaesthesia, we do dorsal incision on base proximal phalanx ring finger. We wound malunion at base proximal phalanx ring finger and we do derotational osteotomy with temporary fixation with k-wire. Followed by insertion of mini straight plate 6 holes and 6 screw. After that we check the stability and we remove the k-wire.

After surgery, He started finger pump and wrist exercises to improve swelling of the right hand and avoiding joint stiffness. He received regular follow-up to check the wound and the stitches. An unstable finger

fracture will most likely be casted initially, resulting in stiffness later on and a longer recovery time. After the cast, the finger may receive a custom splint from an occupational therapist or physical therapist specializing in hand therapy. These splints are created for the individual and their specific injury and needs. The splint will help place the finger in the position needed for optimal healing.

In a stable finger fracture, a hand specialist may recommend anything from buddy taping your fingers to receiving a custom splint. In both cases, it is extremely important to go to hand therapy, even if the specialist recommends buddy taping. The therapist can recognize stiffness or dysfunction that is normal and abnormal for the injury. Hand therapy is vital for the mobilization and strengthening of the finger and overall hand for return to sport. The finger itself is at risk of dislocation and freezing without proper interventions. The entire process can take up to 12 weeks for a stable finger and up to 14 weeks for an unstable finger.

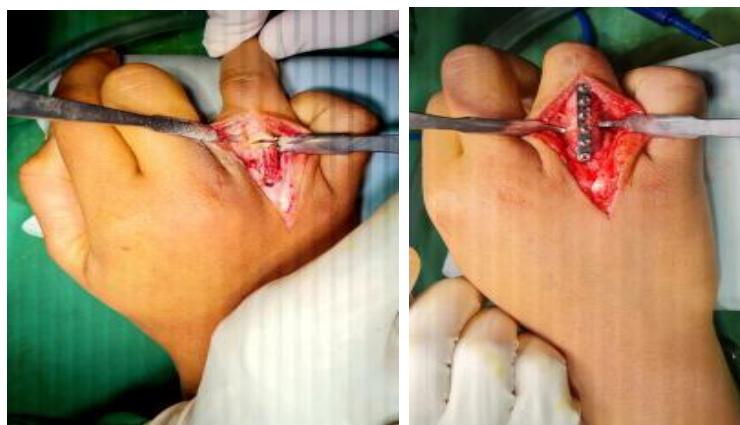


Figure 4. Clinical Picture Durante Operation



Figure 5. Clinical Picture Durante Operation



Figure 6. Right Hand X-Ray AP and Oblique View Post Operation

DISCUSSION

Fractures of phalanges may lead to unacceptable anatomical reduction especially if treated with conservative management. Inappropriate healing can result in malunion and create rotational or angular deformity. In proximal phalanx malunion, the tension on the central slip and lumbrical typically creates a volar apex angulation and shortening. It is reported that shortening of the proximal phalanx may result in extensor lag at the proximal interphalangeal (PIP) joint. This deformity certainly will create a disturbance in patient's daily activities that involve hands. Conservative management following phalanx fracture to be the most common source of malunion, usually through incomplete initial reduction or secondary displacement.^[5]

There are some variations of malunion deformity according to the plane: (1) Malrotation, which is caused by oblique or spiral fracture. Greater degrees of malrotation can result in functional impairment and pain from joint malalignment. It usually requires osteotomy and internal fixation with miniplate or Kirschner wires. (2) Apex volar angulation, which usually result in pseudoclawing hand or compensatory hyperextension at the metacarpophalangeal joint. This type of deformity can produce PIP flexion contracture. Sometimes, there is a concomitant shortening deformity. Thus, opening osteotomy with bone graft is preferred. Fixation will be achieved using

mini plate or Kirschner wires. (3) Lateral angulation. This type of deformity is usually corrected using a close wedge osteotomy and plate and screw fixation after the wedge osteotomy is done. (4) Shortening, which is typically seen after a comminuted fracture or long spiral fracture. Unless there is associated deformities, such as rotational or angulation, correction is rarely indicated. As stated above, proximal phalanx malunion typically has apex volar deformity.^[6]

This case presents 17 years old female patients with malunion in the base of the proximal phalanx of the ring finger following a fracture caused by direct hit 2 months ago. The patient was treated with derotational osteotomy and internal fixation with miniplates. In a study conducted in 12 patients (13 fingers) with phalanx malunion treated with osteotomy and rigid internal fixation using miniplate, the result was satisfactory with 0 average VAS pain score and no case of non-union during the follow-up.^[7] Osteotomy for phalanx malunion is recommended to perform at the base rather than close to the PIP joint, since there is a risk of contracture. Internal fixation using miniplate is best to be applied away from the tendon to minimize adhesions to permit early motion. In severely angulated malunion case, a dorsal opening wedge osteotomy is preferred and should be stabilized with a miniplate to restore the length of the phalanx, despite the higher risk of stiffness due to adhesion formation.^[8] Rigid fixation will allow early motion to reduce the potential for tenolysis or

capsulotomy due to stiffness caused by scarring. There may be an improvement in functional outcome following the correction surgery, even though post-traumatic arthritis is still a challenge.^[9]

For the post-surgery follow-up care, physical therapy plays a role in optimizing the outcome of the surgery. Appropriate physical therapy has been shown effective to regain function. Hardy et al. recommended different exercise and wrist support or splint to reduce post-surgery common problems such as stiffness and lag. Appropriate splinting will limit joint stiffness following the surgery, although it is mandatory to maintain the position of the hand in a safe position.^[3]

CONCLUSION

Phalanx malunion is a frequent complication which occurs following the fracture management, either conservatively or surgically, especially in the case of proximal phalanx fracture. This case presents a malunion of the base proximal phalanx of the right finger after the conservative fracture treatment. The patient was treated surgically, with osteotomy and fixated with 6 holes miniplate and 6 screws. Osteotomy and rigid fixation is the preferred method to correct malunion deformity of phalanx, as rigid fixation will let advance motion to reduce stiffness. Further follow-up is necessary for long-term outcome of this patient.

Declaration by Authors

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