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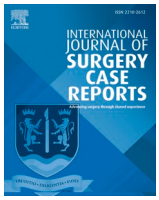

Case report

# Multiple drill hole osteotomy and Herbert screw for correcting a-2 years ring finger phalanx media malunion: A case report

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ABSTRACT

*Introduction and importance:* The rotational deformity is formed due to the instability of the fixation device used before in a spiral or oblique fracture pattern, and will create uncomfortable sensation also disturb daily activities. This condition usually treated with several methods of osteotomies and implants, that involving large wound and longer period of healing.

*Case presentation:* A 27-year-old male with chief complaint of discomfort sensation when the ring finger flexed and it was disturbing the daily activities. Two years ago, the patient was diagnosed with minimally displace closed fracture of the ring finger phalanx media and treated with buddy tapping for six months and become a malunion until now. Multiple drill hole osteotomy were made to correct the rotational position and fixed with Herbert screws. Three months follow up, the wound healed nicely and able to perform his daily activity.

*Clinical discussion:* Malunion that was formed from previous inadequate treatment could make uncomfortable sensation and disturbing daily activities usually treated with large osteotomies. Multiple drill hole (MDH) usage in combination with the Herbert screw to fix the new fracture line had several advantages compared to standard methods that were previously performed.

*Conclusion:* The combination of multiple drill hole and Herbert screws could be an alternative procedure with minimal surgical wounds. Without implant removal in the future, the patient can proceed to rehabilitation and return to his daily activities.

## 1. Introduction

An inadequate treatment of phalanx fracture in which frequent fracture of the hand, may result in stiffness of the finger, loss in the range of motion, cosmetic problems, and disturbing the daily activity caused by scissoring deformity and creating the uncomfortable sensation while flexing the finger [1,2]. The long-term effects of the deformity can upset muscle balance, range from the weakness of pinch and grip, and may cause pain [3]. Furthermore, there was a lack of significant reports on middle phalangeal fracture with rotational deformity, especially in the combination treatment of drill hole osteotomy and headless screw fixation [4]. We present a rotational deformity after distal middle phalanx close fracture after conservative treatment. This work has been reported in line with SCARE criteria and the consent was obtained from the patient for publication of this report [5].

## 2. Presentation of case

A-27-year-old male, came with a chief complaint of discomfort sensation when he flexed his finger. Two years ago, he accidentally hurt his finger during sports and was diagnosed with a minimally displaced condylar closed fracture of the ring finger phalanx media by the physician in the previous hospital. It was treated with buddy taping for six weeks without having a rehabilitation program. The ring finger overlapped with the middle finger while flexing the finger due to a 15-degree rotational deformity (Fig. 1A). There was no history of any remarkable medical, surgery and drug use and smoking in this patient. His vital sign was good, and there was no pain, ROM limitation, and other deformity observed in this patient. The ring finger X-ray reveals that the condylar part of his phalanx media was completely union and slightly angulated to the radial side, and it is difficult to detect the original fracture site

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**Fig. 1.** (A) Rotational deformity of the ring finger. (B & C) The fracture union completely as seen in AP and lateral views of X-ray.

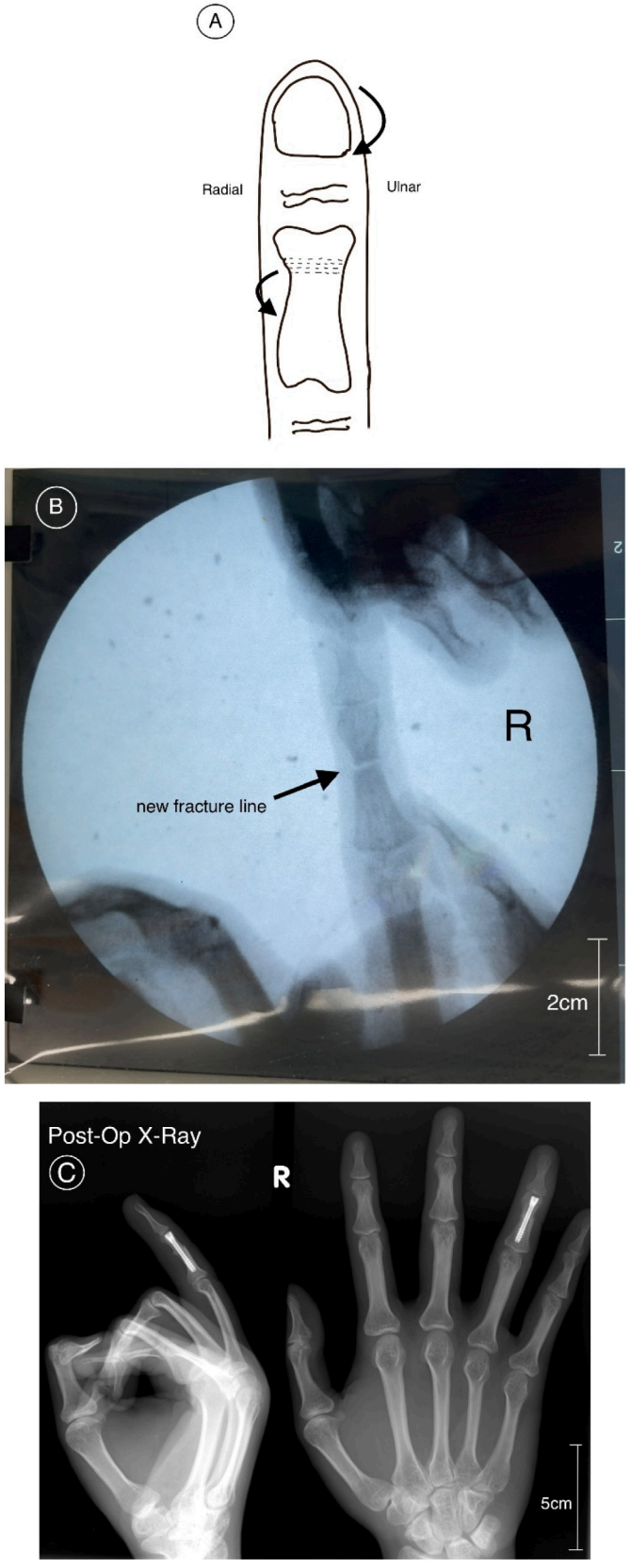


**Fig. 2.** (A) Surgery scheme, MDH site indicates with dotted lines. (B) New fracture line was formed by multiple drill hole as seen in C-arm. (C) Post-operative X-ray.

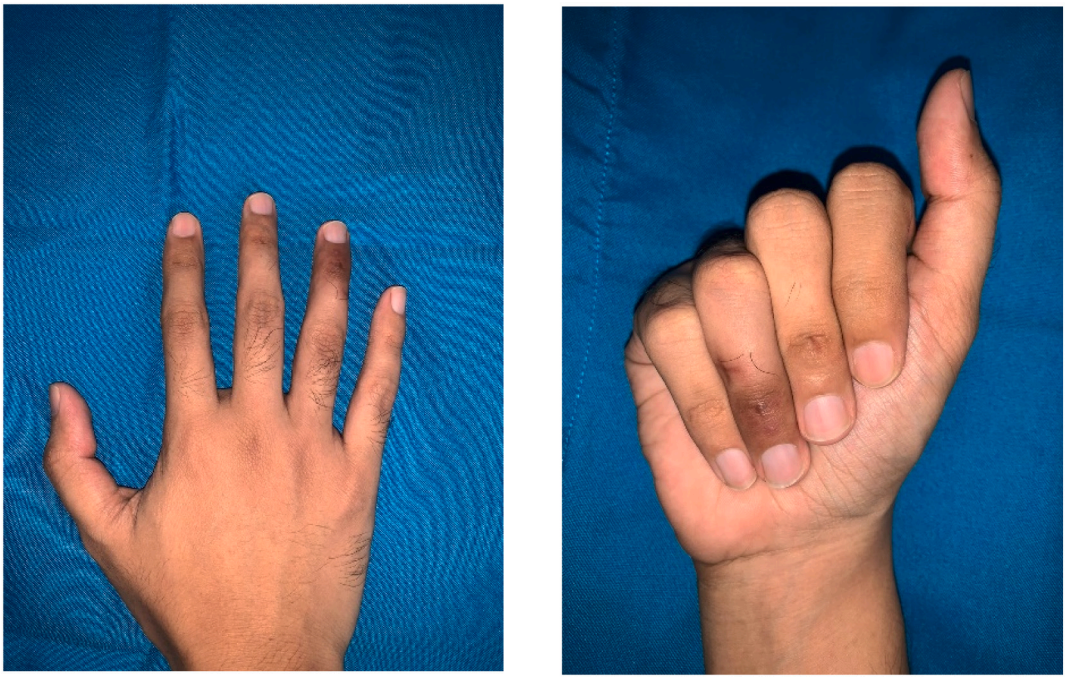

**Fig. 3.** Postoperative clinical condition.

(Fig. 1B, C).

The surgery was performed by the senior orthopedics with general anesthesia, a small incision for osteotomies was made in the dorso-ulnar part of the distal side of middle phalanx. A multiple drill hole was done in order to break the bone and rotate the distal part of the ring finger. The fragment was fixed using K-wire with retrograde position, and we continue to measure the screw length. The mini-open incision was made slightly inferior from distal interphalangeal joint, drilling the bone using cannulated device close to the dorsal aspect, and inserted the Herbert cannulated screws 2.0 mm titanium (Fig. 2). Buddy tapping immobilization planed for two weeks and, the patient ordered to train the flexion and extension of the finger slowly by himself. Three months follow up (Fig. 3), the wound nicely healed, no sign of complication and the patient could do normal activities. The patient feels comfortable with his finger positions right now and the condition was better than before the surgical procedure.

## 3. Discussions

Malunion was a term to define the healed fracture but with some deformity [6]. The defect itself could be distinctive or combined with shortening, angulation and rotation [6]. The rotational deformity formed when metacarpal or phalangeal fracture, especially in spiral or oblique patterns, treated conservatively [7]. Furthermore, any rotational deformation happens unconsciously and it was due to the relatively unstable fixation and by the strong flexion force of flexor digitorum profundus ligament that can move the distal part of the fragment [7].

Indications for selecting the nonoperative or operative surgery treatment may differ from one patient to another. A study said 20 % of patients, instead of choosing surgery correction, would accept the defect [6]. But for others, the serious rotational defect can generate several problems such as cosmetic and daily activity disturbance caused by scissoring or deviation during finger flexion [2]. Step-cut osteotomies and several corrective techniques were known as a method to repair the angulation or rotational deformity in the phalanges bones. Although, none of them was explicitly state what is the best treatment in accordance of this case. In reconstructive orthopedic surgery, multiple drill hole is an established technique for correcting and lengthening osteotomies of the tibia, radius and correction of its deformity. With this technique, the periosteal and proximate structure damage could reduce by the improved control and lower heat formation [8].

The regular complication caused by utilization of K-wire or mini plate was stiffness, flexion contracture and extensor lag [9]. Meanwhile, recent large studies found that intramedullary fixation with headless compression screw is a reliable technique for the treatment of unstable extra-articular metacarpal or proximal and medial phalanx [9–11]. The small incision was made to visualize the extensor tendon in the distal phalanges. This is in accordance with mini-open study in cadaver conducted in Swiss and Austria, in 2021, which stated more significantly less tendon injury than a percutaneous approach [12].

In the present case, the patient sustained with minimally displaced condylar closed fracture of the ring finger phalanx media two years ago and became malunion. We treated the rotational deformity using multiple drill hole at the malunited bone then fixed it with Herbert screw and obtained acceptable result without any complications. Even though the Herbert screws was slightly difficult to find in many small hospitals in our country.

## 4. Conclusion

The combination of multiple drill hole osteotomy and headless compression screw (Herbert screw) was a reliable technique for correcting the phalanx media rotational deformity after two years of conservative management. With this combination, patient will receive more smaller wound, less possibilities to post operative stiffness and quicker to do the daily activities. Nevertheless, this patient still needs future follow-up to assess the total active motion, the Jamar grip strength, and the extensor tendon in the DIP joint of the ring finger.

## Consent

The patient consent regarding this study was obtained.

## Provenance and peer review

Not commissioned, externally peer-reviewed.

## Ethical approval

This study has been approved by the Ethical Committee of Universitas Airlangga Hospital, Surabaya, Indonesia.

## Funding

None.

## Guarantor

Huda Fajar Arianto.

## Research registration number

None.

## CRediT authorship contribution statement

All authors have been involved in all stages of study concept and writing the paper.

## Declaration of competing interest

None.

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