

Treatment of Intra-Articular Phalanx Malunions with Extra-Articular Osteotomies and Osteosynthesis with Intramedullary Screws

Tratamiento de consolidaciones viciosas de fracturas intraarticulares de falanges mediante osteotomías extraarticulares y osteosíntesis con tornillos endomedulares

Maria Larrea Zabalo¹ Angel Ferreres Claramunt² Miguel Eugenio Perez Abad^{2,3}

¹Hospital de Bidasoa, Hondarribia, Guipúzcoa, Spain

²Institut Kaplan, Clínica Creu Blanca, Barcelona, Cataluña, Spain

³Hospital de Mataró, Mataró, Cataluña, Spain

Address for correspondence Maria Larrea Zabalo, Hospital de Bidasoa, Barrio Mendelu s/n, 20280 Hondarribia, Gipúzcoa, Spain (e-mail: maria.larrea.zabalo@gmail.com).

Rev Iberam Cir Mano 2024;52(1):e62–e66.

Abstract

Malunions of intra-articular fractures in phalanges cause deformities that limit function and are not well tolerated. On the other hand, their treatment with intra-articular osteotomies is associated with complications, mainly stiffness. We herein present a series of two cases of intra-articular malunion treated through extra-articular osteotomy and synthesis through a little invasive method: intramedullary screws. After the aforementioned procedure, the patients presented full range of motion and were able to return to their activities without pain in less than 3 months. The main advantages of the technique described are, on the one hand, the avoidance of complications secondary to intra-articular procedures, and, on the other hand, the use of devices that require less aggressive approaches and less wide deperiostizations.

Keywords

- ▶ interphalangeal joint fracture
- ▶ unicondylar
- ▶ intramedullary screw
- ▶ malunion

Resumen

Las consolidaciones viciosas de fracturas intraarticulares de falanges provocan deformidades que limitan funcionalmente y son mal toleradas. Por otra parte su tratamiento mediante osteotomías intraarticulares está asociado a la aparición de complicaciones principalmente la rigidez. Este artículo presenta dos casos de consolidaciones viciosas intraarticulares tratadas mediante una osteotomía extraarticular y síntesis por un método poco invasivo el tornillo endomedular. Tras dicho procedimiento los pacientes presentaron un rango de movimiento completo y una vuelta a sus actividades sin dolor en menos de 3 meses. Las ventajas principales de la técnica descrita son por un lado la evitación de las complicaciones secundarias a procedimientos intraarticulares y por otro el uso de dispositivos que precisan abordajes menos agresivos y desperiostizaciones menos amplias.

Palabras Clave

- ▶ fractura interfalángica intraarticular
- ▶ unicondílea
- ▶ tornillo endomedular
- ▶ consolidación viciosa

received
January 24, 2023
accepted
January 28, 2024

DOI <https://doi.org/10.1055/s-0044-1787074>.
ISSN 1698-8396.

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Thieme Revinter Publicações Ltda., Rua do Matoso 170, Rio de Janeiro, RJ, CEP 20270-135, Brazil

Introduction

Fractures that affect the articular surfaces of the phalanges can go unnoticed in the acute phase and manifest at a time when a malunion has been established. Angulations of 10 to 20° in the coronal or sagittal planes usually have minimal impact on hand function, but malrotation is usually poorly tolerated.¹

Therefore, the clinical presentation of intra-articular malunions of the phalanges can be inflammation, pain, deformity, and functional limitation due to interlacing of fingers or the quadriga phenomenon,¹ as well as early osteoarthritis in more advanced stages.²

Patients with symptomatic malunions are susceptible to surgical treatment ranging from articular and extra-articular corrective osteotomies to arthrodesis and arthroplasties.³ Therefore, even if the fracture is intra-articular, the possibility of satisfactorily treating it in an extra-articular fashion has been demonstrated, avoiding complications related to intra-articular approaches.⁴

On the other hand, the intramedullary nailing technique using cannulated screws in phalangeal and metacarpal fractures and malunions of these has proven to be a solution that significantly reduces the number of complications associated with other osteosynthesis methods.^{1,5}

In the current article, we present two cases with a less aggressive surgical option in terms of approach and osteosynthesis for those patients with malunions of intra-articular fractures who do not present osteoarthritis or joint pain.

Clinical cases

Case 1

A 12-year-old woman presented with a 6-month-old unicondylar fracture of the proximal phalanx of the little finger of the right dominant hand (►Figure 1). The collapse of the ulnar condyle caused an angular deformity with ulnar deviation and inability to make a fist.

The isolated mobility of the finger was complete and painless.

Preoperative planning was carried out based on the radiographs, estimating that the angulation that should be corrected was of 15° in the coronal plane. A zigzag dorsal approach was performed on the distal third of the proximal phalanx and proximal interphalangeal joint. The need for deperiostization was minimal because only the region where the corrective osteotomy was performed was deperiostized.

An extra-articular metaphyseal osteotomy was performed, correcting the 15° angular deformity, which was fixed using a 2.2 × 22-mm retrograde cannulated intramedullary screw (Aptus Hand, Medartis AG, Basel, Switzerland) (►Figures 2–3). Closure of the periosteum, tendon and skin was performed. A compressive bandage was applied. The patient regained full mobility and had no pain.

Case 2

A 61-year-old woman presenting with a fracture at the base of the middle phalanx of her left ring finger, of the non-dominant hand, which had persisted for 13 months. The malunion caused rotational and angular deformities towards the ulnar region (►Figure 4). The patient presented inability to make a fist and grasp objects. Finger mobility was complete and painless. A computed tomography (CT) scan was requested, which enabled a more precise determination of the characteristics of the deformity and of the surgical planning (►Figure 5).

A zigzag dorsal approach was performed over the distal third and distal interphalangeal joint. The need for deperiostization was minimal because only the region where the corrective osteotomy was performed was deperiostized. An extra-articular osteotomy was performed at the diaphyseal level, correcting the angular and rotational deformities. Osteosynthesis was performed using a cannulated retrograde intramedullary screw measuring 2.2 × 22 mm in length (Aptus Hand) (►Figure 6).

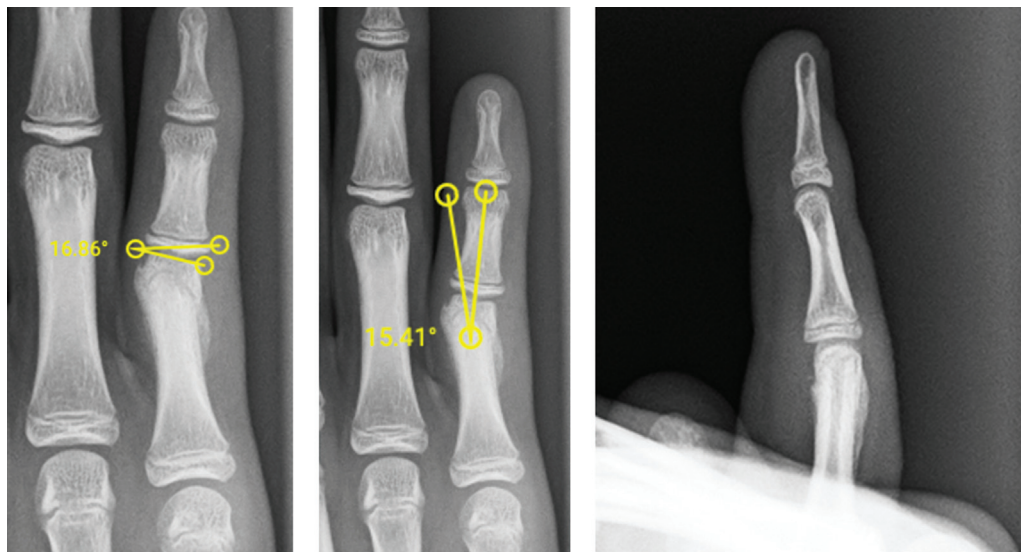


Fig. 1 Unicondylar fracture of the proximal phalanx of the fifth finger of the dominant hand, of 6 months of evolution, which caused an angular deformity with ulnar deviation and inability to make a fist.



Fig. 2 Postoperative radiograph after extra-articular metaphyseal osteotomy correcting the angular and rotational deformities, and fixation using a retrograde cannulated intramedullary screw.

The patients were evaluated through serial clinical and radiographic controls, in which range of motion, pain, and radiographic signs of consolidation were determined. In both cases, full range of motion was obtained, symmetrical to the contralateral one, and the patients had no pain. This technique enabled early mobilization and a return to activities of

daily living and sports in less than 3 months. At the 1-year follow-up, the patients presented full mobility, function equal to that before the fracture, and absence of pain.

Discussion

The basic principles of the treatment of intra-articular fractures of the phalanges and metacarpals are based on the restoration of the anatomy of the articular surface.⁶ However, corrective intra-articular osteotomies that reproduce the initial fracture are technically difficult to perform due to the small size of the fragments and the difficulty in fixing them stably.² The intra-articular approach also carries the implicit risk of stiffness, inflammation, and loss of fixation or necrosis of the fragment, which would produce greater deformity and joint incongruity.⁶ On the other hand, restoration of the articular surface does not ensure that joint range will be recovered nor that osteoarthritis will not develop in the future.³

This associated morbidity prompted Harness et al.⁴ to describe techniques that addressed the problem extra-articularly. Although they do not correct the joint incongruity, these techniques address rotational and angular alterations of the phalanges in a less aggressive manner, facilitating recovery of range of motion and function.⁴ This approach helps avoid worsening articular cartilage injury and minimizes the risk of joint stiffness. That is why in the technique herein described an extra-articular approach to the fracture has been performed, presenting good clinical results, avoiding complications secondary to the intra-articular approach.

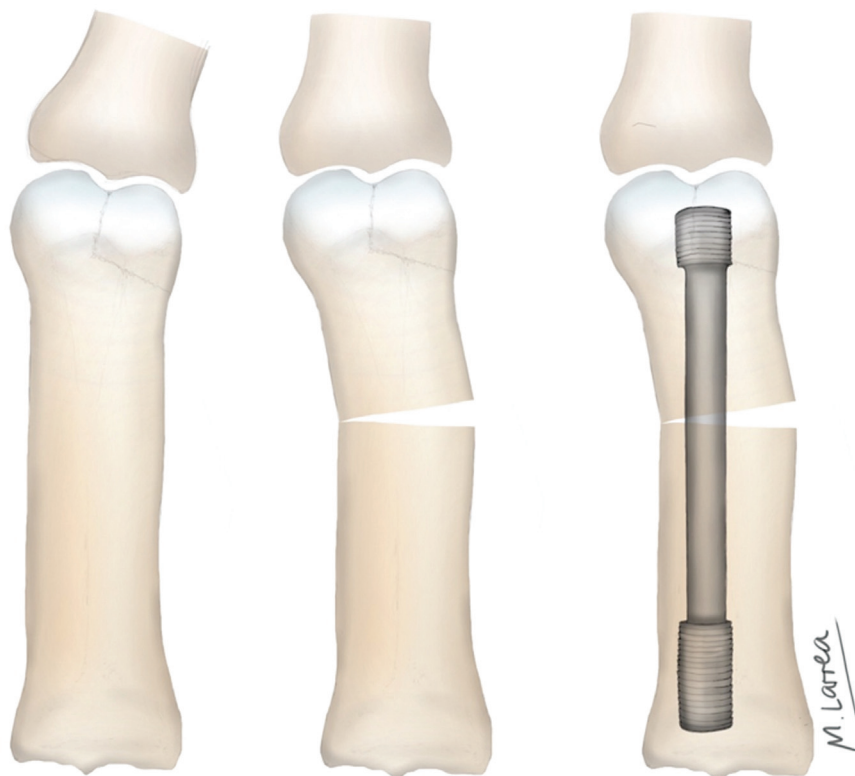


Fig. 3 Extra-articular osteotomy correcting the deformity secondary to joint malunion and fixation using a cannulated intramedullary screw.

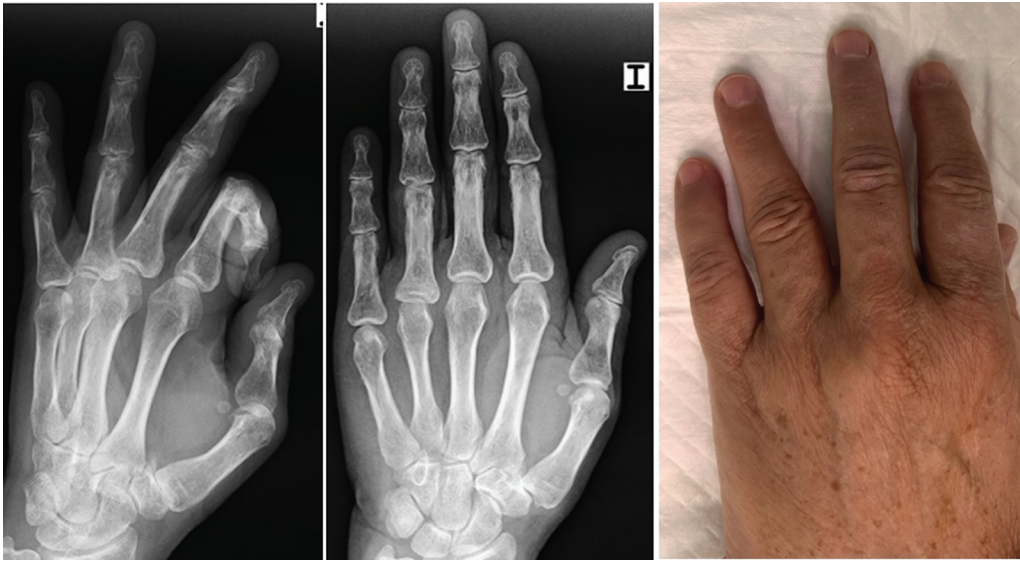


Fig. 4 Fracture of the base of the middle phalanx of the fourth finger of the left hand, of 13 months of evolution, which caused rotational and angular deformities towards the radial region.

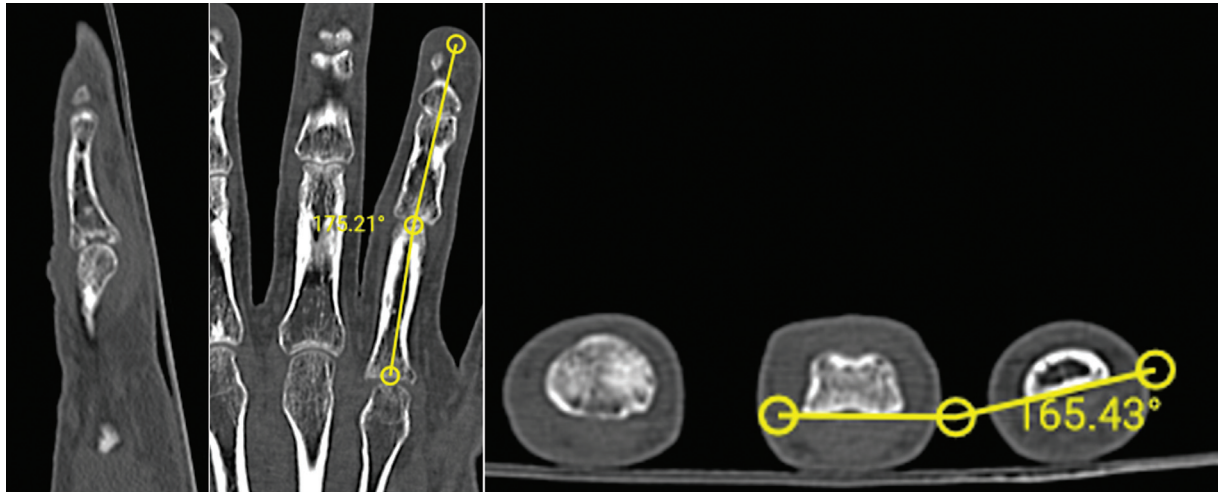


Fig. 5 Computed tomography scan showing and quantifying the angular and rotational deformities caused by the intra-articular fracture.



Fig. 6 Postoperative radiograph after corrective extra-articular osteotomy and osteosynthesis using a cannulated retrograde intra-medullary screw.

On the other hand, intra-articular techniques have temporal limitations in terms of their execution, and are only recommended when the fracture focus is consolidated, not before 3 months since the fracture.² Neither the techniques that reproduce the fracture line nor those that involve advancement are indicated when there is established irreparable cartilage damage; therefore, neither are they recommended beyond 4 to 6 months.⁶ In the case of the extra-articular technique, since the fracture focus is not addressed, it does not present such temporal limitations, although the presence of irreparable cartilage damage would still be a contraindication.

Regarding the fixation method, the use of Kirschner wires with or without cerclage wiring has been described as a less invasive method, but this fixation does not enable early mobilization. More rigid fixations with screws or plates, however, require wide approaches and a greater risk of tendon adhesions. Osteosynthesis using cannulated intra-medullary screws enables the performance of fixation in a simpler and less invasive way. It has been shown that the

Table 1 Indications for extra-articular osteotomy and osteosynthesis with cannulated intramedullary screw in malunions of phalangeal joint fractures

- | |
|---|
| <ul style="list-style-type: none"> - Absence of pain; - Absence of osteoarthritis; and - Articular step-off shorter than 2–3 mm. |
|---|

impact of this technique on the articular surface is not significant.¹

The technique herein described does not cover joint deformity, and we do not know to what degree of joint injury it is capable of providing correction to angular and rotational deformities. It seems reasonable that it can be used in fractures with a step-off shorter than 2 to 3 mm². Likewise, it would be contraindicated in patients with established osteoarthritis or pain. The indications for the technique herein described are summarized in ►**Table 1**.

On the other hand, the follow-up of the cases presented was of 1 year, so the longer-term results are unknown. However, it is a reproducible technique that avoids the complications of intra-articular osteotomies and more aggressive fixation methods.

Conflict of Interests

The authors have no conflict of interests to declare.

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