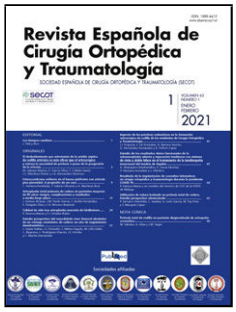
Journal Pre-proof



[Artículo traducido] Tratamiento conservador de las fracturas del extremo distal del radio: un arte abandonado

R. Kaempf P. Fischer V. Triviño D. Falcochio D. Fernandez P.J. Delgado

PII: S1888-4415(25)00200-0

DOI: https://doi.org/doi:10.1016/j.recot.2025.11.018

Reference: RECOT 1647

To appear in: *Revista Espanola de Cirugia Ortopedica y Traumatologia*

Received Date: 18 June 2025

Accepted Date: 1 September 2025

Please cite this article as: Kaempf R, Fischer P, Triviño V, Falcochio D, Fernandez D, Delgado PJ, [Artículo traducido] Tratamiento conservador de las fracturas del extremo distal del radio: un arte abandonado, *Revista Espanola de Cirugia Ortopedica y Traumatologia* (2025), doi: https://doi.org/10.1016/j.recot.2025.11.018

es

rev

RECOT 1621

S1888-4415(25)00160-2

10.1016/j.recot.2025.09.002

unknown 2025

Received: 18-6-2025; **Accepted:** 1-9-2025

UPDATE

[Artículo traducido] Tratamiento conservador de las fracturas del extremo distal del radio: un arte abandonado

[Translated article] Conservative treatment of distal radius fractures: an abandoned art

R. Kaempf[a*] ricardokaempf@gmail.com, P. Fischer[a], V. Triviño[b], D. Falcochio[c], D. Fernandez[d], P.J. Delgado[b]

[a] <org>Unidad de cirugía de la mano, Santa Casa de Porto Alegre</org>, <city>Porto Alegre</city>, <country>Brazil</country>

a Unidad de cirugía de la mano, Santa Casa de Porto Alegre, Porto Alegre, Brasil

[b] <org>Unidad de cirugía de la mano y microcirugía, Hospital Universitario HM Montepríncipe, Boadilla del Monte</org>, <city>Madrid</city>, <country>Spain</country>

b Unidad de cirugía de la mano y microcirugía, Hospital Universitario HM Montepríncipe, Boadilla del Monte, Madrid, Spain

[c] <org>Unidad de cirugía de la mano, Santa Casa de São Paulo</org>, <city>São Paulo</city>, <country>Brazil</country>

c Unidad de cirugía de la mano, Santa Casa de São Paulo, São Paulo, Brasil

[d] <org>Universidad de Berna</org>, <country>Switzerland</country>

d Universidad de Berna, Switzerland

* Corresponding author.

Resumen

Las fracturas del radio distal (FRD) son frecuentes y todo cirujano ortopédico debe saber tratarlas adecuadamente.

Obtener buenos resultados sin cirugía es complejo: requiere maniobras correctas en Urgencias, seguimientos con ajustes o cambio de yesos, radiografías de control y supone molestias para el paciente. Además, algunos especialistas, especialmente los más jóvenes, se ven seducidos por la teórica facilidad y comodidad de los procedimientos quirúrgicos, lo que contribuye a una menor familiaridad con el tratamiento conservador.

Esta actualización ofrece una guía práctica sobre el tratamiento conservador de las FRD, desde la atención inicial, el diagnóstico y la reducción, hasta los criterios radiográficos y clínicos que deben valorarse en el seguimiento para definir si la evolución permite mantener el tratamiento no quirúrgico.

Abstract

Distal radius fractures are common injuries that every orthopedic surgeon must be able to treat effectively.

Achieving good outcomes without surgery is complex: it requires proper maneuvers in the emergency department, follow-up visits with cast adjustments or replacements, and follow-up radiographs, often resulting in discomfort for the patient. Additionally, some specialists, especially younger ones, are drawn to the perceived ease and convenience of surgical procedures, which contributes to less familiarity with conservative treatment.

This update provides a practical guide to the non-operative management of distal radius fractures, from initial care, diagnosis, and reduction techniques to the radiographic and clinical criteria that must be assessed during follow-up to determine whether continued conservative treatment is appropriate.

Keywords: Distal radius fracture; Colles' fracture; Conservative treatment; Reduction technique; Closed reduction; Cast immobilisation

Palabras clave: Fractura del radio distal; Fractura de Colles; Tratamiento conservador; Técnica de reducción; Reducción cerrada; Inmovilización con yeso

Introduction

In the 19th century, Abraham Colles described distal radius fractures (DRFs) as a benign condition that did not cause functional limitations.[1] it is now known that inadequate treatment of wrist fractures can, in addition to causing cosmetic deformity, lead to numerous complications, such as pain and decreased mobility and strength. Up to 25% of patients treated for DRFs present with some type of complaint in the distal radioulnar joint (DRUJ), which could be related to the displacement of the injury and the tilt and morphology of the sigmoid notch.[2-9]

DRFs are a constant presence in trauma emergency departments, with an annual incidence of more than 64,000 fractures per year in the United States, accounting for one-sixth of all fractures treated in emergency departments.[4,10] Given their commonality, there is a constant need for orthopaedic surgeons to recognise which fractures should be treated conservatively, since conservative treatment reduces the need for unnecessary surgical intervention, which incurs costs for the healthcare system and poses a risk of complications for patients.[11,12] A Swedish study evaluated nearly 24,000 distal radius fractures treated in emergency departments across the country and demonstrated that almost 75% of them could be treated conservatively.[13]

Achieving satisfactory results with conservative treatment is notably more challenging than with surgical treatment. Orthopaedic surgeons require significantly greater skill and technique to achieve adequate reduction and proper immobilisation than they do for surgery. Furthermore, conservative treatment is more labour-intensive, requiring frequent follow-up appointments, adjustments and replacements of casts, follow-up X-rays for the early detection of displacements or initially undiagnosed injuries, and the discomfort of wearing a cast. All these factors explain why certain fracture patterns that could be treated conservatively end up requiring surgical treatment, and why patients who do not wish to remain immobilised opt for surgery.[14]

The distal radius is the most fragile bone in the wrist and, therefore, the most frequently fractured.[11,15,16] There are two main groups of patients who present with wrist fractures. The most common is women who fall and injure their wrists while breaking their fall, a frequent occurrence after menopause, as osteoporosis develops at this stage due to hormonal factors. The other group of patients with wrist fractures consists of young adults, generally men, who suffer high-energy trauma such as traffic accidents, sports injuries, or falls from heights. These fractures tend to present with significant displacement, multiple fragments, and a high incidence of associated injuries.[4,13,15,17]

The vast majority of articles describing series of patients treated for wrist fractures end up mixing different fracture patterns, making it difficult to determine the exact incidence of displaced versus non-displaced fractures, intra- and extra-articular fractures, and stable versus unstable fractures. Therefore, it is nearly impossible to know what percentage of wrist fractures can be treated conservatively.[4,11,13] In a series of 2,141 wrist fractures, McQueen et al. identified that 48% of the fractures were extra-articular and 15% were minimally displaced.[2]

The aim of this article is to assist the orthopaedic surgeon in performing conservative treatment for wrist fractures, demonstrating reduction and immobilisation techniques and the expected outcomes, as well as determining when surgical treatment is indicated.

Functional anatomy

Anatomically, the wrist begins at the distal border of the pronator quadratus muscle and ends at the joints between the carpus and metacarpals. A detailed understanding of these structures and their biomechanical interactions is fundamental to understanding which injuries can be treated conservatively.[18]

The radius is the main stabiliser of the carpal bones, and important ligaments that ensure wrist stability originate from it. In addition to the two concave articular surfaces that articulate with the scaphoid and lunate, the radius also has an articular surface that articulates with the ulna, called the sigmoid fossa, forming the distal radial joint DRUJ.[5,19–21] The distal radius articular surface has a volar tilt of 11°, measured from the transverse plane perpendicular to its long axis, and an ulnar tilt of 23°, also measured from the same plane.[3,5,18,21]

Emergency department management

In the Emergency Department, we should suspect a DRF when we encounter a patient who has fallen and, while trying to protect themselves, has sustained trauma to the hand or wrist.[4,13,15,17]

Clinically, a DRF causes swelling and a fork-shaped deformity, as the most common mechanism is a fall with the wrist extended, resulting in a dorsally displaced fracture. In non-displaced fractures, oedema and pain are observed on the back of the wrist.[3] The type of fracture and its complexity depend on

several factors, such as the intensity of the applied force, the position of the hand at the time of the trauma, and bone quality.[18,22,23]

Diagnosis is made using posteroanterior (PA) and lateral radiographs, which may be supplemented with oblique views. Computed tomography (CT) and magnetic resonance imaging (MRI) are useful for a better understanding of the fracture and for diagnosing associated injuries, and should be used in special situations.[1,5,9,18–20]

Several factors help the orthopaedic surgeon decide when these fractures can be treated conservatively and when surgery is required. Conservative treatment is indicated and recommended for nondisplaced fractures, both intra- and extra-articular. It is also applied in fractures with minimal displacement, with less than 5° of dorsal deviation or two millimetres of shortening, and for displaced fractures that remain stable after reduction.[5,10,14,16,18,19,22,23]

Other factors, such as the patient's age; occupation; the presence of associated injuries; the physician's experience, and the patient's expectations, should be considered when deciding on the type of treatment. Elderly patients with low functional demands often tolerate greater deformities, as they rarely experience complaints or disability, even with moderate deformities.[10,11,18,19,24–26]

The goal of conservative treatment is to maintain the anatomical alignment of the fracture for a period of four weeks. This is the time required for bone healing to be sufficiently stable, thus reducing the risk of fracture displacement. It is important to know that, during conservative treatment, reduction and alignment are maintained through indirect contact with the cast, which supports and stabilises the bone fragments, as well as by the hydrostatic pressure generated by the soft tissues.[1,9,11,18,24,27]

Classifications

Several classification systems have been described for DRF but the eponyms remain widely used and should be understood. A Colles' fracture is defined as an injury with tilt and dorsal displacement, classically extra-articular. A Smith's fracture is characterised by volar tilt, is also extra-articular, and is metaphyseal. A Barton fracture results from a shearing mechanism and can be volar or dorsal, similar to a Chauffer fracture, but this one affects the styloid process of the radius in the sagittal plane.[12,18,20,28]

Among the most widely used classifications is the Frykman classification, which consists of eight subtypes. In this classification, odd-numbered subtypes affect only the radius, while even-numbered subtypes present an associated distal ulna fracture. Types 1 and 2 are considered extra-articular fractures, types 3 and 4 those with an intra-articular radiocarpal component, types 5 and 6 present a fracture line over the distal radiocarpal joint (DRUJ), and types 7 and 8 are fractures that affect both joints. Although it is a classic and historical classification, its clinical utility for defining treatment is limited, as it does not include the extent or direction of initial displacements and comminution.[19,22,28]

The Arbeitsgemeinschaft für Osteosynthesefragen (AO) classification follows the logic of other classifications in this group for epiphyseal fractures. Type A comprises extra-articular injuries, type B corresponds to partial articular fractures when part of the joint remains intact in contact with the metaphysis, and type C represents complete articular fractures with no intact joint in contact with the metaphysis. After subdivision, this classification totals 27 subtypes.[1,5,20]

A widely used classification system today is that of Fernández, which is based on the mechanism of injury. It considers five types: bending, shearing, compression, avulsion, or a combined mechanism. It analyses the force that caused the fracture, guides the reduction manoeuvre, and suggests possible treatment methods.[11,20]

Reduction manoeuvres

For displaced fractures, emergency treatment begins with reduction which is correction of the deformity by repositioning the bone. The reduction manoeuvre should be performed as soon as possible, since oedema makes the tissues inelastic and hinders the procedure. The ideal time for reduction is defined as within the first 12 hours after the trauma.[11,16,18,29]

Before reduction, adequate analgesia should be provided at the fracture site. The method varies depending on the type of fracture, the patient's clinical condition, and the state of their soft tissues. For fractures with dorsal displacement, we suggest aspiration of the haematoma and infiltration of four to eight millilitres of local anaesthetic, such as 2% lidocaine without vasoconstrictor (Xylocaine®). Bupivacaine (Marcaine®), which is more potent and less toxic, has recently been used. The needle entry point is located in the dorsal and central portion of the radius, immediately proximal to Lister's tubercle, with the needle angled proximally to distally. This allows access to the fracture site while avoiding the impacted dorsal cortex of the distal metaphysis. In cases associated with ulnar fractures or when the patient presents with pain on the ulnar side of the wrist, we recommend a second infiltration directed at the distal ulna and the distal radial forearm (DRUJ). However, there is no scientific evidence to support this practice. After the procedure, 10 to 15 minutes should be allowed before attempting reduction. Although theoretically there is a potential risk of contamination and infection of the haematoma, several studies have shown that this rarely occurs.[18,22,30]

This procedure has the disadvantage of not producing complete anaesthesia or providing muscle relaxation. However, it is safe enough to be performed in the Emergency Department without the need for an operating room or the presence of an anaesthesiologist. These are required in cases where a plexus block is needed for subacute fractures or general anaesthesia is required in paediatric patients.[11,18]

Regarding the reduction manoeuvres for displaced distal radius fractures, there are two main techniques. The first and most classic is attributed to Sir Robert Jones (Fig. 1).[31]

It initially requires countertraction applied to the arm with the elbow flexed. The first step is disimpaction of the fracture. Subsequently, reduction is achieved by applying a force opposite to that which caused the fracture. In dorsally angled fractures, such as Colles' fractures, force is applied to the distal radius fragment, from dorsal to volar and from radial to ulnar, while an assistant maintains traction on the fracture. The third step is to lock in the reduction achieved by pronating the hand and wrist, which affects the distal fragment of the fracture (Fig. 2). For volarly displaced fractures, such as Smith's fractures, reduction is performed by longitudinal traction followed by extension and supination manoeuvres of the wrist and hand.[1,3,5,11,16,18,22]

The second reduction technique was popularised by Böhler[15] and is based on strong traction applied to the fingers and thumb by an assistant (Fig. 3).

For traction to be effective, the elbow must be flexed and fixed. If this is not possible, a second assistant is required to apply countertraction. This disimpacts the fracture, allowing the surgeon to freely manipulate the bone fragments to achieve alignment. Caldwell suggested using a Chinese finger trap for this method. The patient's fingers point toward the ceiling while a countertraction force is applied to the arm with the elbow flexed, generating continuous traction without the need for assistants. This method restores bone length, reduces DRUJ surface area and restores ulnar inclination of the radius. To restore palmar tilt of the distal radius fragment, Agee demonstrated that additional force is sometimes necessary.[1,3,5,11,16,18,22]

Immobilisation

After achieving bone reduction, the fracture must be immobilised safely and effectively. There is no consensus on the type of cast or the need to immobilise the elbow. Stable, non-displaced fractures can be treated with forearm-palmar splints, which keep the elbow free, as the possibility of displacement is minimal. This type of immobilisation is better tolerated, providing patient comfort and reducing the risk of stiffness.[3,18,19,22]

Displaced or unstable DRFs are classically immobilised with a sugar tong splint for a minimum of three weeks. Although some recent articles have shown no difference in treatment outcomes with above- or below-elbow plaster casts, we initially apply a plaster cast above the elbow. [32,33] The advantage of this type of immobilisation is that it can be applied while the upper limb is still suspended by the traction used during the reduction manoeuvre. Furthermore, it allows for adequate control of pronation and supination for reduction and, after application, blocks this movement without impeding elbow flexion and extension. This immobilisation also causes less discomfort in the DRUJ. Another way to immobilise

displaced distal radius fractures is with a brachiopalmar splint, which completely immobilises the elbow. An alternative is the application of a longitudinally split circular plaster cast, a method that was more commonly used in the past. It is important to remember that the immobilisation should not extend distally beyond the metacarpophalangeal flexion crease of the hand. The fingers should remain free for movement, which reduces the risk of oedema and stiffness. [3,11,22,24]

The most widely accepted immobilisation position for distal radius fractures with dorsal displacement is with the wrist flexed at 15° and ulnarly deviated at 10°. This slight volar and ulnar deviation, generated during the reduction manoeuvre, causes the intact dorsal periosteal bridge to tighten and stabilise the fracture through the principle of a tension band (Fig. 4).[9,16,21]

Regarding forearm position, studies show no superiority of supination, neutral, or pronation. Therefore, immobilisation in neutral rotation or even 20° of pronation is recommended, a position that patients tolerate better. Some authors suggest immobilising the wrist in extension, arguing that this facilitates finger mobility and noting that this position does not influence the risk of fracture displacement.[20,34]

The forced flexion position with maximum ulnar deviation and pronation, used in the past and known as the Cotton-Loder position, is no longer recommended due to the high risk of complications, such as oedema and joint stiffness in the fingers. It can also generate symptoms of carpal tunnel syndrome and complex regional pain syndrome.[5]

To maintain reduction, immobilisation must follow Charnley's principles in the general conservative treatment of fractures. To stabilise a fracture, three points of support are necessary: one proximal and one distal to the fracture, on the concave side of the initial tilt, and the third point of support at the fracture site, on the convex side of the initial deformity.[11]

Treatment and prognosis

The success of conservative treatment for DRFs depends on a combination of accurate diagnosis and stability of the injury, along with knowledge and practice of reduction, immobilisation, and follow-up procedures.[35]

Conservative treatment is strongly indicated for non-displaced DRFs, where the patient should remain with the wrist immobilised in a splint for three to four weeks, while the elbow can remain free. An additional two weeks of wrist protection with a removable orthosis are then required. These fractures have an excellent prognosis, and most often result in a full functional recovery. Minimally displaced and

stable DRFs, defined as those with less than two millimetres of radial shortening and less than 5° of dorsal tilt (Fig. 5), can also be treated in the same way.

This treatment can also be considered in low-demand patients, such as frail elderly individuals or those with comorbidities, in whom a surgical procedure would not be justified.[7,9,11,15,18,25,3]

For displaced fractures that remain aligned and stable after reduction, conservative treatment can be followed. In these cases, wrist immobilisation and pronation-supination blocking are performed for the first four weeks. During this period, weekly appointments are scheduled, during which follow-up radiographs are taken to verify that bone alignment is maintained. If the reduction is adequate, the splint is adjusted weekly without needing to be changed.[3,11,12,26]

Bone reduction failure, or displacement after an attempt at conservative treatment, is considered to have occurred when follow-up radiographs show a dorsal tilt greater than 10° or radial shortening greater than five millimetres compared to the unaffected side. Secondarily displaced deep radial fractures require surgery. In cases where a fracture is displaced despite a well-performed reduction and proper immobilisation, further reductions are ineffective.[37]A new reduction attempt and continued conservative treatment may be considered if the fracture is displaced due to inadequate treatment, insufficient stabilisation, a poorly applied cast, or excessive cotton padding.[9,38]

After this one-month period, a closed cast is applied with the elbow freed for an additional two weeks, totalling six weeks of wrist immobilisation. Currently, some authors describe advantages in the use of removable 3D-printed casts, highlighting greater patient comfort during the treatment period. It should be noted that there is no consensus in the literature regarding the necessary duration of rigid immobilisation for nondisplaced distal radius fractures, with six weeks being the most commonly used period.[1,39]

High-demand activities and contact sports are permitted after three months of treatment, and it is important to note that full recovery of wrist strength and mobility can take up to twelve months.[1,39]

In the treatment of distal radius fractures, after management in the Emergency Department, the patient should be instructed to move their fingers, especially with the hand elevated. The "six-pack" exercise protocol popularised by Dobyns can be explained. In the first few days after the injury, the patient should be advised to apply cold to the fracture site at least three times a day for 15 minutes. They should also be instructed to remove the sling daily and mobilise the shoulder with rotation and elevation exercises. This prevents swelling in the hand and reduces the risk of stiffness throughout the upper limb.[11,18]

During treatment, the patient should be alert to signs of excessive compression from the cast, which can cause nerve compression and even compartment syndrome. This complication is most likely to occur in the first few days after the injury and causes intense pain, paresthesia, and an inability to passively or actively move the fingers. In this case, the patient should go to the Emergency Department as soon as possible.[9,15,16,18,19]

After six weeks, once the cast is removed, the patient is referred to rehabilitation. Physiotherapy in a specialised clinic is recommended for patients who wish to return to activities quickly, for severe injuries, and for those who have difficulty regaining mobility on their own.[1,3,15]

Boersma demonstrated high variability in orthopaedic surgeons' satisfaction with bone alignment after reduction of distal radius fractures (DRFs), highlighting the importance of knowledge of specific reduction and stability criteria for appropriate treatment.[40] In displaced fractures, assessing stability before and after the reduction manoeuvre will help in deciding on the best type of treatment. Volar displacement fractures, such as volar Barton and Smith fractures, are considered inherently unstable, and most require surgical fixation.[28] Fractures with an initial dorsal or palmar tilt greater than 20°, joint displacement greater than two millimetres, dorsal translation exceeding two-thirds of the diaphysis, radial shortening greater than five millimetres, metaphyseal comminution, or associated fracture of the distal ulna, or in patients with osteoporosis or over 60 years of age, are considered unstable.[1,11,22,41] These injuries present a high risk of displacement, therefore surgical treatment should be considered. Thus, fractures with considerable initial displacement, cortical comminution, and significant shortening have a poor prognosis with conservative treatment, even with adequate reduction and immobilisation techniques. Most of these fractures displace within the first two weeks of follow-up, and surgical fixation may be indicated from the first days of treatment, depending on the patient's profile (Fig. 6).[25]

The anatomical positioning of the volar cortex of the distal radius, without bone overlap during the reduction manoeuvre, has been shown to be one of the most important factors in defining stability and the risk of loss of reduction during the fracture healing process.[14,38,42]

We found ample evidence that fractures healed with displacement have poor functional outcomes. There is also a close relationship between the quality of the reduction and the final position of the union with the degree of recovery and patient satisfaction with the treatment.[2,23] Fractures with articular displacement greater than two millimetres progress to early osteoarthritis; therefore, in some injury patterns, a CT scan is recommended to accurately verify the presence of steps or articular defects, which are difficult to visualise on plain radiographs. Simples.[20]

We emphasize that the correct identification of fracture stability patterns is an important criterion for the success of conservative treatment. Thus, by recognising which fractures are amenable to reduction and immobilisation and becoming familiar with these techniques, we can achieve satisfactory clinical results in the treatment of most fractures.

Publication ethics

1. Has your work involved animal experimentation?: No
2. Does your work involve human patients or subjects?: No
3. Does your work include a clinical trial?: No
4. Are all the data shown in the figures and tables included in the manuscript included in the results and conclusions section?: No

Funding

None.

Additional information

This research received no specific funding from public sector agencies, commercial sector organizations, or non-profit entities..

Conflict of interests

The authors have no conflict of interests to declare.

1. REFERENCES

1. Henry MH. Distal radius fractures: current concepts. J Hand Surg Am. 2008;33(7):1215-1227. doi:10.1016/j.jhsa.2008.07.013
2. McQueen M, Caspers J. Colles fracture: does the anatomical result affect the final function?. J Bone Joint Surg Br. 1988;70(4):649-651. doi:10.1302/0301-620X.70B4.3403617
3. Levin LS, Rozell JC, Pulos N. Distal Radius Fractures in the Elderly. J Am Acad Orthop Surg. 2017;25(3):179-187. doi:10.5435/JAAOS-D-15-00676
4. Nellans KW, Kowalski E, Chung KC. The epidemiology of distal radius fractures. Hand Clin. 2012;28(2):113-125. doi:10.1016/j.hcl.2012.02.001
5. Simic PM, Weiland AJ. Fractures of the distal aspect of the radius: changes in treatment over the past two decades. Instr Course Lect. 2003;52:185-195.
6. Diaz-Garcia RJ, Chung KC. The evolution of distal radius fracture management: a historical treatise. Hand Clin. 2012;28(2):105-111. doi:10.1016/j.hcl.2012.02.007
7. de Oliveira RK, Binz MA, Ferreira MT, Ruschel PH, Serrano PD, Praetzel RP. Osteotomy of the distal radius using a fixed-angle volar plate. Rev Bras Ortop. 2015;47(2):173-185. doi:10.1016/S2255-4971(15)30083-5
8. Tolat AR, Stanley JK, Trail IA. A cadaveric study of the anatomy and stability of the distal radioulnar joint in the coronal and transverse planes. J Hand Surg Br. 1996 Oct;21(5):587-94. doi: 10.1016/s0266-7681(96)80136-7. PMID: 9230939.

9. de Bruijn MAN, van Ginkel LA, Boersma EZ, et al. The past, present and future of the conservative treatment of distal radius fractures. Injury. 2023;54 Suppl 5:110930. doi:10.1016/j.injury.2023.110930

10. Shapiro LM, Kamal RN; Management of Distal Radius Fractures Work Group; Nonvoting Clinical Contributor; Nonvoting Oversight Chairs; Staff of the American Academy of Orthopaedic Surgeons and the American Society for Surgery of the Hand. Distal Radius Fracture Clinical Practice Guidelines-Updates and Clinical Implications. J Hand Surg Am. 2021;46(9):807-811. doi:10.1016/j.jhsa.2021.07.014

11. Fernandez DL. Closed manipulation and casting of distal radius fractures. Hand Clin. 2005;21(3):307-316. doi:10.1016/j.hcl.2005.02.004

12. Jupiter J, Fernandez D. Complications following distal radial fractures J Bone Joint Surg. 2001;83A:1244-65.

13. Rundgren J, Bojan A, Mellstrand Navarro C, Enocson A. Epidemiology, classification, treatment and mortality of distal radius fractures in adults: an observational study of 23,394 fractures from the national Swedish fracture register. BMC Musculoskelet Disord. 2020;21(1):88. Published 2020 Feb 8. doi:10.1186/s12891-020-3097-8

14. Phillips AR, Al-Shawi A. Restoration of the volar cortex: Predicting instability after manipulation of distal radial fractures. Injury. 2014;45(12):1896-1899. doi:10.1016/j.injury.2014.09.007

15. Luokkala T, Laitinen MK, Hevonkorpi TP, Raittio L, Mattila VM, Launonen AP. Distal radius fractures in the elderly population. EFORT Open Rev. 2020;5(6):361-370. Published 2020 Jun 17. doi:10.1302/2058-5241.5.190060

16. Chhabra AB, Yildirim B. Adult Distal Radius Fracture Management. J Am Acad Orthop Surg. 2021;29(22):e1105-e1116. doi:10.5435/JAAOS-D-20-01335

17. Murray J, Gross L. Treatment of distal radius fractures. J Am Acad Orthop Surg. 2013;21(8):502-505. doi:10.5435/JAAOS-21-08-502

18. Schwartsmann CR. Tratamento não-cirúrgico das fraturas: “recuperando o prestígio”. Porto Alegre: Evangraft. 2022;1(1), 1-368.

19. Ring D. Intra-articular fractures of the distal radius. Journal of the American Society for Surgery of the Hand. 2002;2(2):60-77. doi:10.1053/jssh.2002.33322

20. Meena S, Sharma P, Sambharia AK, Dawar A. Fractures of distal radius: an overview. J Family Med Prim Care. 2014;3(4):325-332. doi:10.4103/2249-4863.148101

21. Raducha JE, Got CJ. Nuances of Radiographic Assessment of Distal Radius Fractures to Avoid Missed Fragments. Hand Clin. 2021;37(2):197-204. doi:10.1016/j.hcl.2021.02.002

22. Anderson AB, Tintle SM. Closed Reduction Techniques for Distal Radius Fractures and Appropriate Casting Methods. Hand Clin. 2021;37(2):239-245. doi:10.1016/j.hcl.2021.02.006

23. Raudasoja L, Vastamäki H, Aspinen S. Deterioration of initially accepted radiological alignment of conservatively treated AO type-C distal radius fractures: mid-term outcome. Eur J Orthop Surg Traumatol. 2020;30(6):1009-1015. doi:10.1007/s00590-020-02659-6

24. Inclan PM, Dy CJ. How to treat distal radius fractures. Hand Clinics. 2021;37(2):205-214. doi:10.1016/j.hcl.2021.02.003

25. Chang HC, Tay SC, Chan BK, Low CO. Conservative treatment of re-displaced Colles' fractures in elderly patients older than 60 years old—anatomical and functional outcome. Hand Surg 2001;6:137–44.

26. Boersma EZ, Nijhuis-van Der Sanden MWG, Edwards MJR, Ring D, Teunis T. Satisfaction with alignment after reduction of a displaced distal radial fracture. Journal of Bone and Joint Surgery. 2021;103(6):483-488. doi:10.2106/JBJS.20.00482

27. van Delft EAK, van Bruggen SGJ, van Stralen KJ, et al. Four weeks versus six weeks of immobilization in a cast following closed reduction for displaced distal radial fractures in adult patients: a multicentre randomized controlled trial. Bone Joint J. 2023;105-B(9):993-999. Published 2023 Sep 1. doi:10.1302/0301-620X.105B9.BJJ-2022-0976.R3

28. Walenkamp MM, Vos LM, Strackee SD, Goslings JC, Schep NW. The Unstable Distal Radius Fracture-How Do We Define It? A Systematic Review. J Wrist Surg. 2015;4(4):307-316. doi:10.1055/s-0035-1556860

29. Einsiedel T, Freund W, Sander S, Trnavac S, Gebhard F, Kramer M. Can the displacement of a conservatively treated distal radius fracture be predicted at the beginning of treatment?. Int Orthop. 2009;33(3):795-800. doi:10.1007/s00264-008-0568-1

30. Aniel-Quiroga M, Fruner G, Monge-Baeza A, García-Toledo A, Liñán-Padilla A, Jiménez I. El bloqueo del hematoma no es suficiente como método de anestesia en la reducción de fracturas desplazadas de radio distal. Revista Española de Cirugía Ortopédica y Traumatología. 2023;67(5):371-377. doi:10.1016/j.recot.2023.03.004

31. Doski JO, Shaikhan R. Robert Jones bandage versus cast in the treatment of distal radius fracture in children: A randomized controlled trial. *Chinese Journal of Traumatology*. 2023;26(4):217-222. doi:10.1016/j.cjtee.2023.04.001

32. Okamura A, de Moraes VY, Neto JR, Tamaoki MJ, Faloppa F, Belloti JC. No benefit for elbow blocking on conservative treatment of distal radius fractures: A 6-month randomized controlled trial. *PLoS One.* 2021;16(6):e0252667. doi:10.1371/journal.pone.0252667

33. Raj V, Barik S, Richa. Comparison of above-elbow and below-elbow immobilisation for conservative treatment of distal end radius fracture in adults: a systematic review and meta-analysis of randomized clinical trials. *Chin J Traumatol*. 2023;26(4):204–210. doi:10.1016/j.cjtee.2022.12.005

34. Jamnik AA, Pirkle S, Chacon J, Xiao AX, Wagner ER, Gottschalk MB. The Effect of Immobilization Position on Functional Outcomes and Complications Associated With the Conservative Treatment of Distal Radius Fractures: A Systematic Review. J Hand Surg Glob Online. 2021;4(1):25-31. Published 2021 Nov 8. doi:10.1016/j.jhsg.2021.08.007

35. Cangussu BL, Rocha AP, Viana DF, Moreira JG, Castro IO, Sá JM. Correlation between radiographic parameters and clinical outcome in conservatively treated distal radius fractures. Rev Bras Ortop (Sao Paulo). 2024;59(2):163-170. doi:10.1055/s-0043-1776011

36. Gehrmann SV, Windolf J, Kaufmann RA. Distal radius fracture management in elderly patients: a literature review. J Hand Surg Am. 2008;33(3):421-429. doi:10.1016/j.jhsa.2007.12.016

37. Hoffer AJ, St George SA, Banaszek DK, Roffey DM, Broekhuyse HM, Potter JM. If at first you don't succeed, should you try again? The efficacy of repeated closed reductions of distal radius fractures. *Arch Orthop Trauma Surg*. 2023;143(8):5095-5103. doi:10.1007/s00402-023-04904-z

38. Ruschel PH, Oliveira RK, Pignataro MB, Folberg CR, Praetzel RP, Borges CS. Emprego de placa de ângulo fixo no tratamento de fratura com deslocamento dorsal da extremidade distal do rádio. Rev Bras Ortop. 2007;42(1/2):17-23.

39. Ochen Y, Peek J, Van Der Velde D, et al. Operative vs nonoperative treatment of distal radius fractures in adults: a systematic review and meta-analysis. JAMA Netw Open. 2020;3(4):e203497. doi:10.1001/jamanetworkopen.2020.3497

40. Boersma EZ, Meent HV, Klomp FP, Frölke JM, Nijhuis-van der Sanden MWG, Edwards MJR. Treatment of Distal Radius Fracture: Does Early Activity Postinjury Lead to a Lower Incidence of Complex Regional Pain Syndrome?. Hand (N Y). 2022;17(1):119-127. doi:10.1177/1558944719895782

41. Jordan RW, Naeem R, Jadoon S, Srinivas K, Shyamalan G. The value of manipulation of displaced distal radius fractures in the emergency department. Acta Orthop Belg. 2016;82(2):203-209.

42. Mathews JS, Martyn TLB, Rao KS, MacLean SBM. The Volar Cortical Hinge: An Independent Risk Factor for Distal Radius Fracture Displacement. J Wrist Surg. 2023;13(3):222-229. Published 2023 Aug 21. doi:10.1055/s-0043-1771376

Figure 1. Fracture site analgesia procedure. The needle entry point is in the dorsal and central portion of the radius, immediately proximal to Lister's tubercle, with the needle angled proximally to distally (A). Jones maneuver for reduction of distal radius fractures. Initially, countertraction is applied to the arm with the elbow flexed (B), causing disimpaction of the fracture (C). Subsequently, reduction is achieved by applying a force opposite to that which caused the fracture (D). In fractures with dorsal displacement, the force is applied to the distal fragment of the radius, from dorsal to volar and from radial to ulnar, while the assistant maintains traction on the fracture. Gr,1.

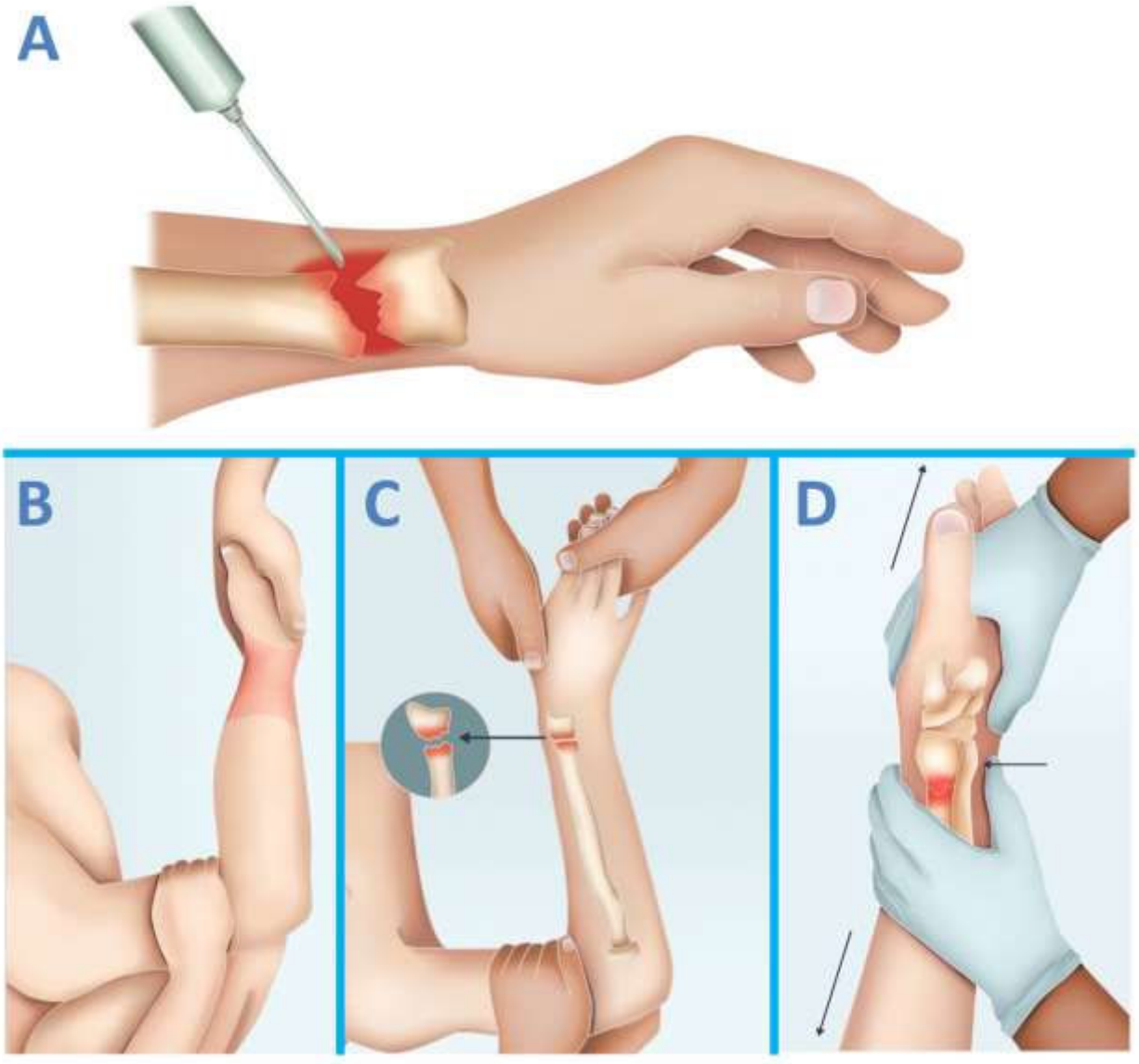


Figure 2. The final steps of the Jones manoeuvre are to lock the reduction achieved by pronating the hand and wrist, and consequently, the distal fragment of the fracture (A-D), and to immobilise it (E and F). Gr.2.

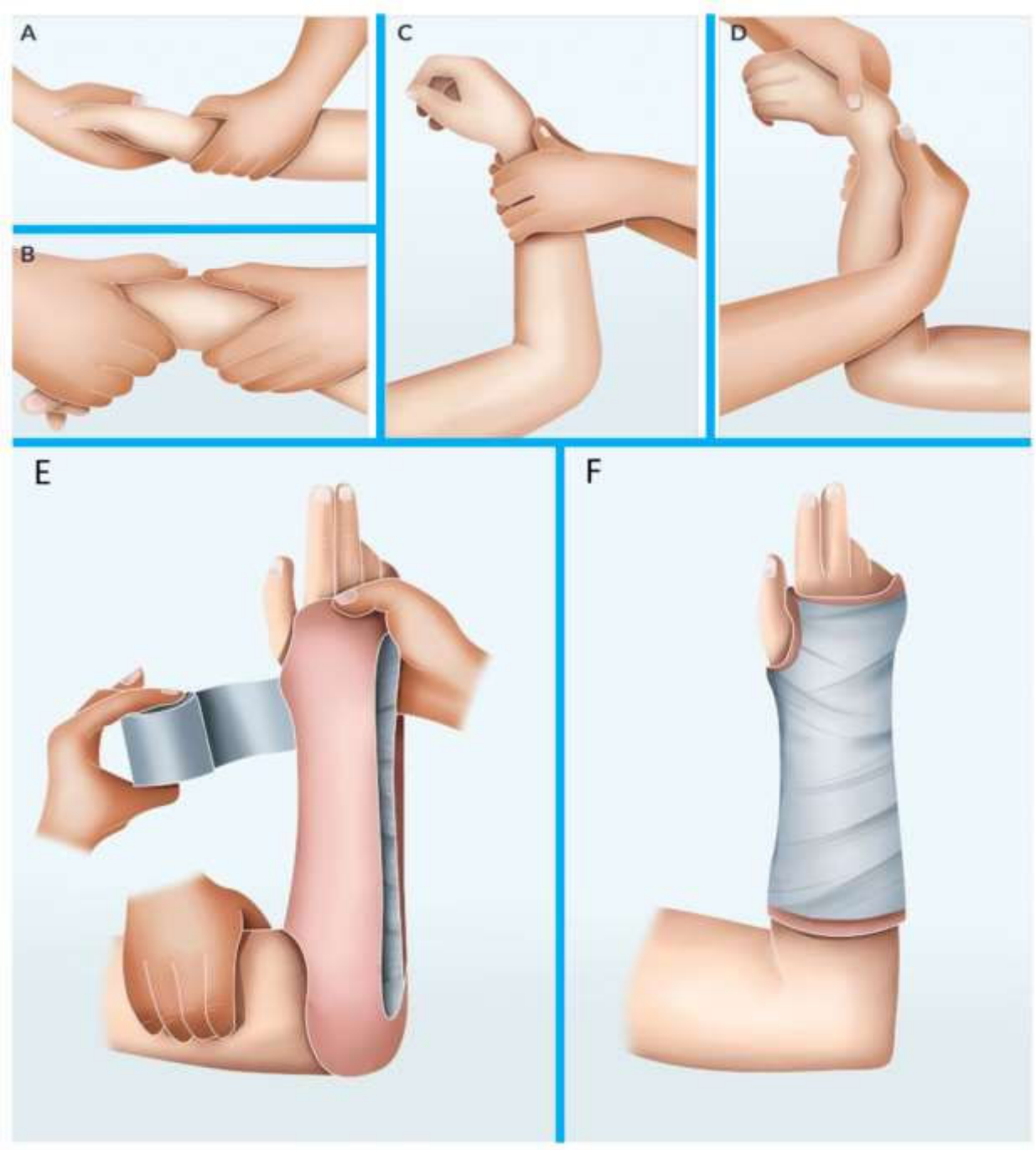


Figure 3 Another technique for reducing distal radius fractures is the Böhler method, which is based primarily on the application of strong traction to the fingers and thumb by an assistant. For the traction to be effective, the elbow must be flexed and fixed; otherwise, a second assistant must apply countertraction (A). This will disimpact the fracture, allowing the surgeon to freely manipulate the bone fragments to realign them (B and C). Gr.3.

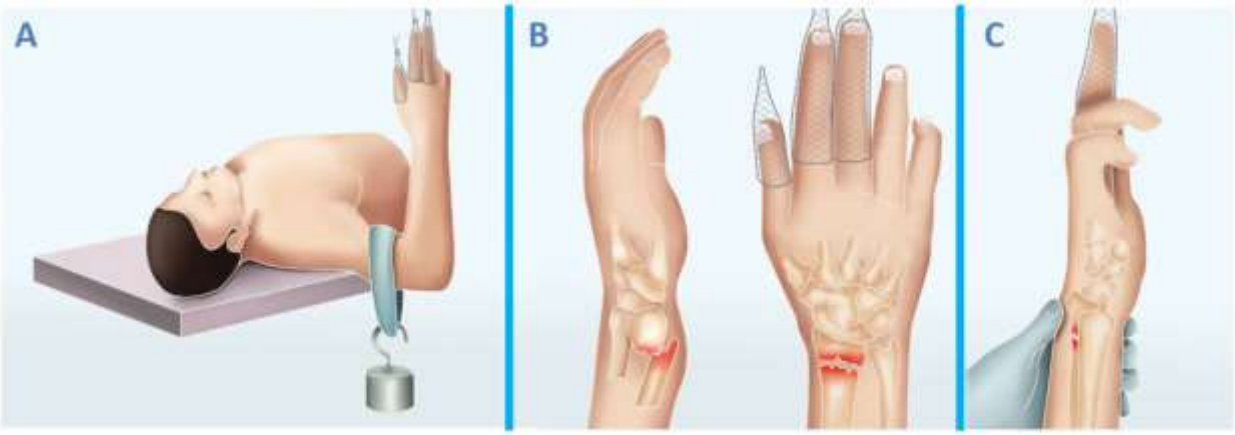


Figure 4 The most widely accepted immobilisation position for distal radius fractures with dorsal deviation is with the wrist flexed 15° and ulnarly deviated 10°. This slight volar and ulnar deviation generated during the reduction manoeuvre causes the intact dorsal periosteal bridge to tighten and stabilise the fracture using the tension band principle (A, B). Charnley's three-point support concept is used to stabilise the fracture (C). Figure 5. Conservative treatment performed in cases of distal radius fracture with minimal displacement, with less than two millimetres of radial shortening and less than 5° of dorsal tilt. The wrist was immobilised for four weeks with a plaster cast, leaving the elbow free. Radiographs on the day of injury (A), at 30 days (B), and at six months (C). Gr.4.

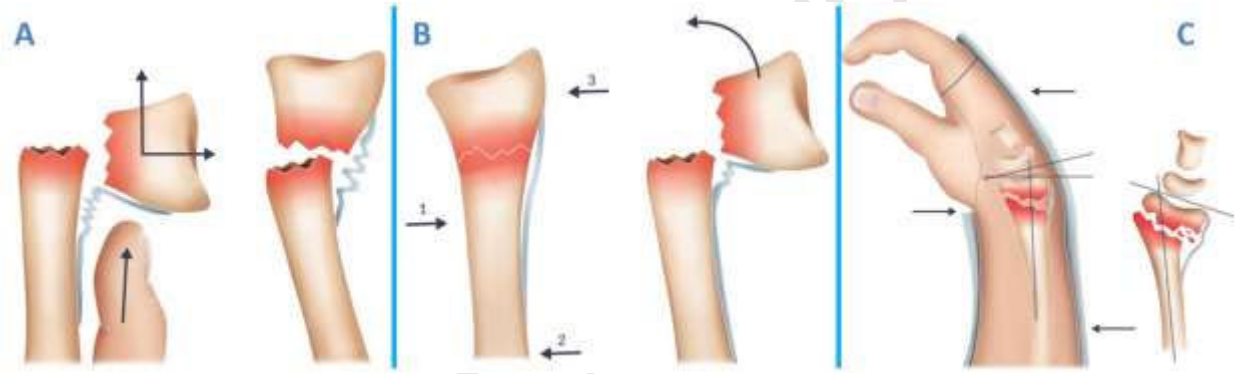


Figure 5. Conservative treatment performed in cases of distal radius fracture with minimal displacement, with less than two millimetres of radius shortening and less than 5° of dorsal tilt. The wrist was immobilised for four weeks with a plaster splint, leaving the elbow free. Radiographs on the day of injury (A), at 30 days (B), and at six months (C).

Modified from Fernandez DL.[11] Gr.5.

Figure 6. Patient with a displaced and unstable distal radius fracture. Dorsiflexion greater than 20°, with radial shortening greater than five millimetres and metaphyseal comminution (A). Despite good initial reduction (B), these injuries present a high risk of displacement and, therefore, surgical treatment should be considered (C, D, and E).

Modified from Fernandez DL.[11] Gr.6.