



**DISTAL RADIUS FRACTURES:  
PEARLS AND PITFALLS**

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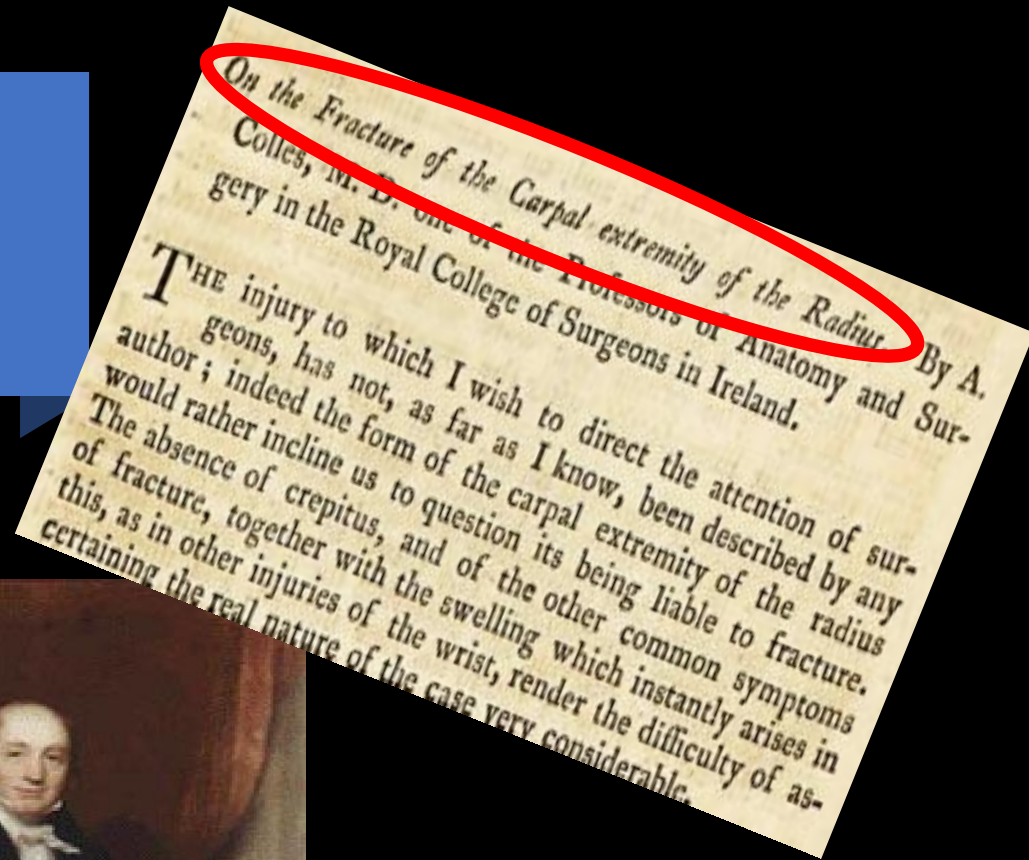
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# HISTORY MATTERS !!

- **Abraham Colles (1773 – 1843)**
- Professor of Anatomy, Surgery and Physiology
- Royal College of Surgeons, Ireland
- President RCSI (twice !)

“This fracture takes place at about an inch and a half above the carpal extremity of the radius”



# HISTORY MATTERS !!

## TREATMENT per Professor Colles

- **Manipulate:** "...make a moderate extension, until he observes the limb restored to its natural form."
- **Maintain:** "a thick and firm compress be applied on the anterior surface of the limb"
  - And "a very narrow wooden splint along the naked side of (the ulna). This latter splint, I now think, should be used in every instance
- **Outcome:** the limb will at some remote period again enjoy perfect freedom in all its motions, and be completely exempt from pain : the deformity, however, will remain undiminished through life.

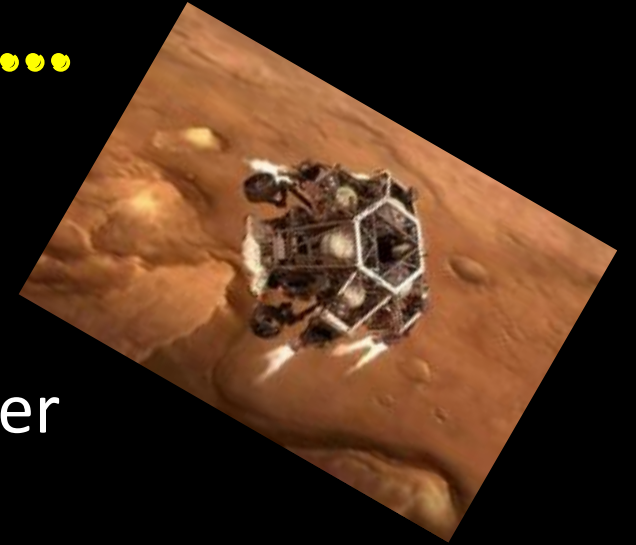


It is obvious that, in the treatment of this fracture, our attention should be principally directed to guard against the carpal end of the radius being driven back into the canal. For this purpose, while assistants hold the limb in a middle state between pronation and supination, let a thick and firm compress be applied transversely on the anterior surface of the limb, at the seat of fracture, taking care that it shall not press on the ulna: let this be bound on firmly with a roller, and then a thin splint, formed to the shape of the arm, be applied to both its anterior and posterior surfaces. In cases where the end of the radius is driven into the canal, a very narrow wooden splint, I now think, should be used in every instance.

# THE QUESTION FOR US NOW IS...

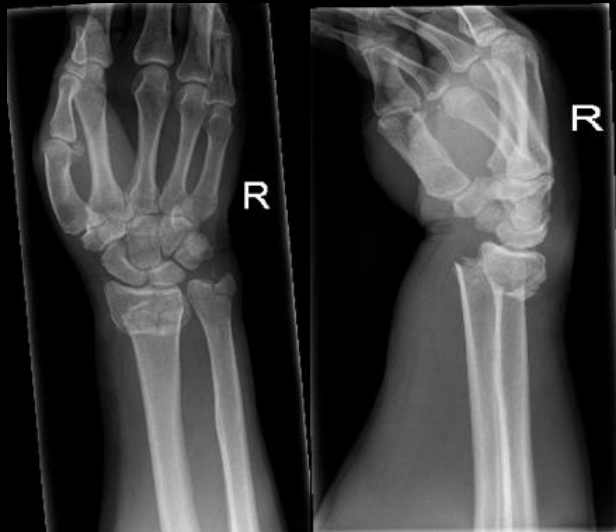
# REALLY ..?!

- In an era when we can now land a rover the size of an SUV on **MARS**...  
is that really the best we can do for radius fractures?
- And if we can do better, then what are the **PEARLS** and **PITFALLS** of doing so ?



# RADIUS FRACTURE RELEVANCE

- Distal radius fractures (DRFs) are among the most common orthopaedic fractures in the western world (1,2).
- 600,000 ER visits / year – USA (3)
- 1.6 fractures / 1,000 people – USA (4)
- The distribution of DRFs in the general population is bimodal (5)
  - **Young men** (high energy trauma)
  - **Older (female) patients** (low-energy, falls)
    - Underlying osteopenia / osteoporosis



1. Rundgren et al: BMC Musculoskeletal Disorders (2020) 21:88
2. Ludvigsen et al: JBJS 2021; 103-A(5): 405-414
3. Valdes et al: JHS 2015; 40(6): 1110-1116
4. Karl, Rosenwasser et al: J Orthop Trauma 2015; 29(8): e242-248
5. Stirling ERB et al: J Hand Surg Eur Vol 2018; 43(9): 974-82.

# HISTORY MATTERS !!

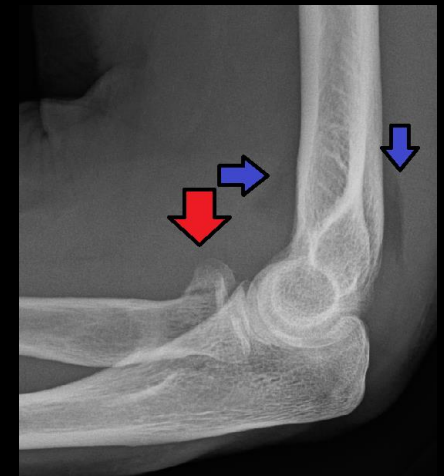
## PRE-OP POINTS

### - PEARLS

- Details of injury and mechanism
- Likely associated injuries
  - Radial head / elbow
  - TFCC
- Nerve injuries (especially median nerve problems)

### - PITFALLS

- Failure to have pain management discussion
- Is surgery INDICATED ?
- Is surgery BEST option ?



# HISTORY MATTERS !!

## UNUSUAL FRACTURE MECHANISMS

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### An Open Distal Radius Fracture Inflicted by a Bear Mauling

A Case Report and Literature Review

Corey S. Rosenbaum, DO, Michael Suk, MD, JD, MPH, and Brett Puckett, MD

*Investigation performed at the University of Florida, Jacksonville, Florida*

JB&JS



JBJS 2013



ROCKS !!



SUCKS !!



# PRE-OP POINTS

## - PEARLS

### - Which Imaging Needed ?

- Plain films essential
- **FLUORO** enormously helpful (in office eval)
  - Maybe not for reduction in ER ?
    - Dailey, Stern *JHS* 2018; 43: 927-931.
- Advanced imaging rarely useful acutely
  - Expensive
  - Going to fix Humpty-Dumpty based on intra-op findings to the best of ability while there, not based on shadows seen on images pre-op.



EDITOR'S CHOICE

## The Effectiveness of Mini-C-Arm Fluoroscopy for the Closed Reduction of Distal Radius Fractures in Adults: A Randomized Controlled Trial

Steven K. Dailey, MD,\* Ashley R. Miller, MD,\* Rafael Kakazu, MD,\*  
John D. Wyrick, MD,\* Peter J. Stern, MD\*



## PRE-OP POINTS

- **PITFALLS**
- Failure to recognize patient's baseline anatomy (contralateral)
- Especially for scapholunate alignment
- Failure to consider **associated** injuries
  - Scapholunate interosseous ligament
  - Lunotriquetral interosseous ligament
  - Triangular fibrocartilage disc
  - Median nerve compression
  - Distal Radioulnar Joint (DRUJ)



CURRENT CONCEPTS

### Distal Radius Fractures: Current Concepts

Mark H. Henry, MD

Despite the frequency of distal radius fractures, studies in the existing literature have not been able to determine the optimal surgical strategies for various fracture patterns. Numerous clinical articles have been written, but most are level IV case series or expert opinion reviews. Good biomechanics studies have been published that suggest advantages of certain fixation methods over others. Transference of these expectations to clinical reality, however, requires well-controlled patient trials. In large part, this has not happened. This article reviews the theoretical pros and cons of different surgical strategies used for adult distal radius fractures, and then looks at randomized controlled trials that have been published in the last 5 years. (*J Hand Surg* 2008;33A:1215-1227. Copyright © 2008 Published by Elsevier Inc. on behalf of the American Society for Surgery of the Hand. All rights reserved.)

**Key words** Distal, radius, fracture, surgical, fixation.

Henry M: *JHS* 2008

# PRE-OP POINTS

## FIXATION METHOD CHOICE

### PEARLS

- External Fixation
  - Rarely used now
  - Poly-trauma; extensive open wounds
- Plate Fixation
  - Plethora of vendors and options avail.
  - **Pick one and get good at using it.**



### Surgical Treatment of Distal Radial Fractures with External Fixation Versus Volar Locking Plate

A Multicenter Randomized Controlled Trial  
Trine Ludvigsen, MD, Kjell Matre, MD, PhD, Rakel Sif Gudmundsdottir, MD, Yngvar Krukhaug, MD, PhD,  
Eva Hansen Dybvik, PhD, and Jonas Meising Fevang, MD, PhD  
Investigation performed at Haukeland University Hospital, Bergen, and Viss Hospital, Viss, Norway

**Background:** The use of volar locking plate fixation (VLP) for unstable extra-articular distal radial fractures has increased in the last decades. External fixation (EF) is less frequently used. This change of surgical approach has only to some extent been evidence-based.

**Methods:** In this multicenter, randomized controlled trial, we compared VLP and EF in patients between 18 and 70 years of age who had a displaced extra-articular distal radial fracture (OTA/AO type A3). The patients were examined at 6 weeks, 3 months, and 1 year postoperatively. The primary outcome measure was the Patient-Rated Wrist/Hand Evaluation score (PRWHE). Secondary outcomes were the shortened version of the Disabilities of the Arm, Shoulder and Hand (QuickDASH), pain score on a visual analog scale (VAS), and radiographic measurements. Range of motion, grip strength, finger stiffness, complications, and reoperations were also recorded.

**Results:** One hundred and fifty-six patients were included. One hundred and forty-two (91%)—127 women (89%) and 15 men (11%)—completed 1 year of follow-up. Sixty-nine patients were treated with VLP and 73, with EF. The mean age was 56 years. At 6 weeks, the median PRWHE score was significantly higher in the EF group (44) compared with the VLP group (27) ( $p < 0.001$ ). At 3 months and 1 year, the difference between groups was not significant. The median QuickDASH score was 27 in the VLP group and 43 in the EF group at 6 weeks ( $p < 0.001$ ), and a significant difference persisted at 3 months ( $p = 0.023$ ). The VLP group had superior results in terms pain during activity, wrist extension, and ulnar and radial deviation at 1 year, whereas the number of major complications was similar in the 2 groups.

**Conclusions:** Patients treated with VLP had earlier recovery of function compared with patients treated with EF. One year postoperatively, we found no significant functional difference.

**Level of Evidence:** Therapeutic Level 1. See Instructions for Authors for a complete description of levels of evidence.

JB&JS

Ludvigsen T, Matre K, Gudmundsdottir R et al: Surgical treatment of distal radius fractures with external fixation vs. volar locking plate. *JBJS*. 2021 March 103(A);(5):405-414.



VLP



EF

# FIXATION CHOICE

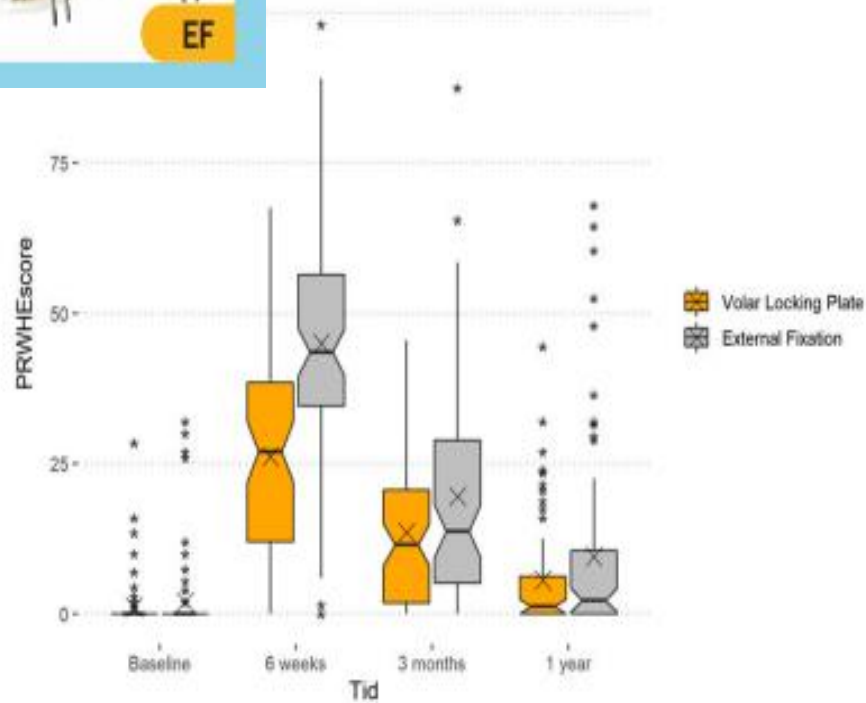
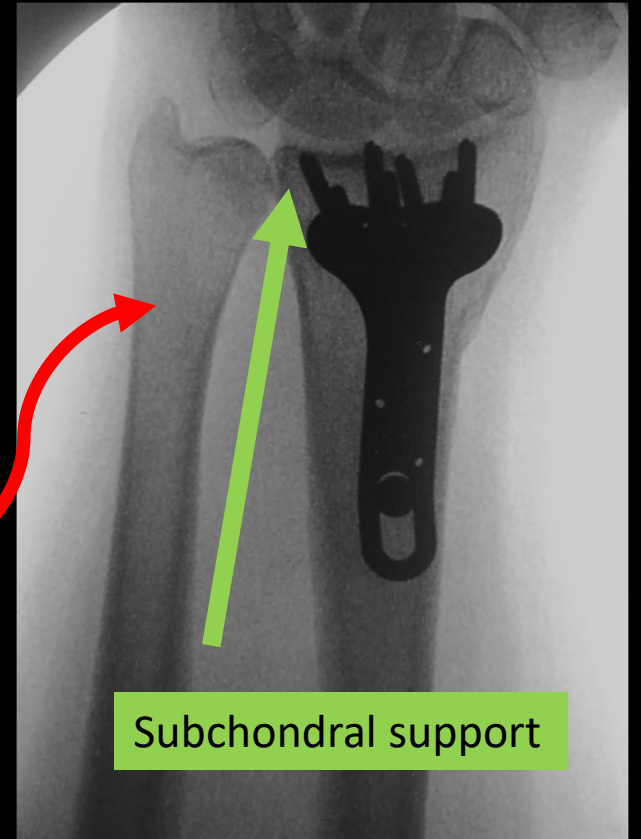
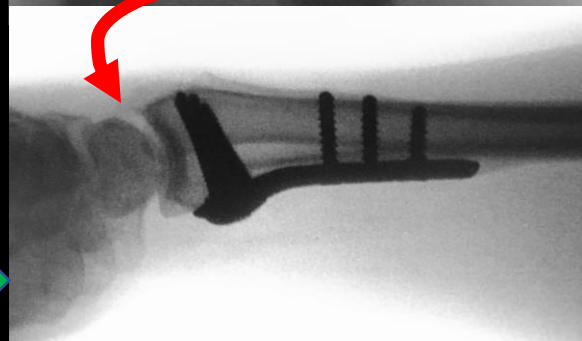
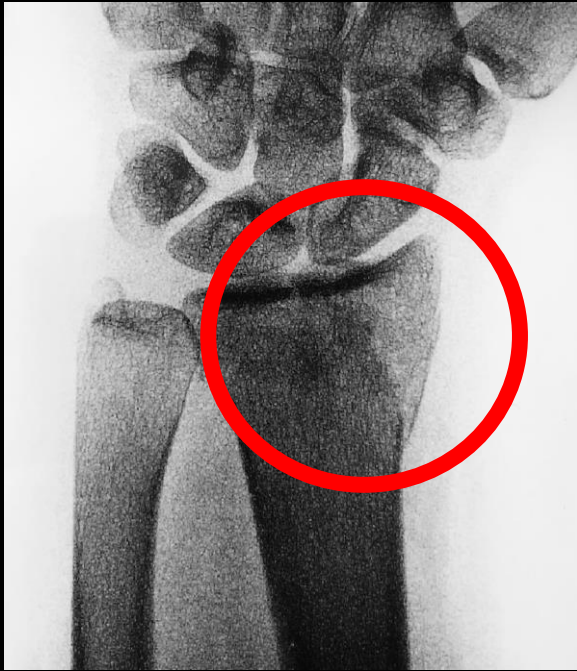


Fig. 2  
The change in PRWHE score over time for patients with VLP (orange) and EF (grey). The top and bottom of each box denotes the interquartile range, the horizontal line within the box denotes the median, X denotes the mean, and \* denotes outliers. An approximation of the 95% confidence interval is also included, represented by the notches around the median. Tid = Time.

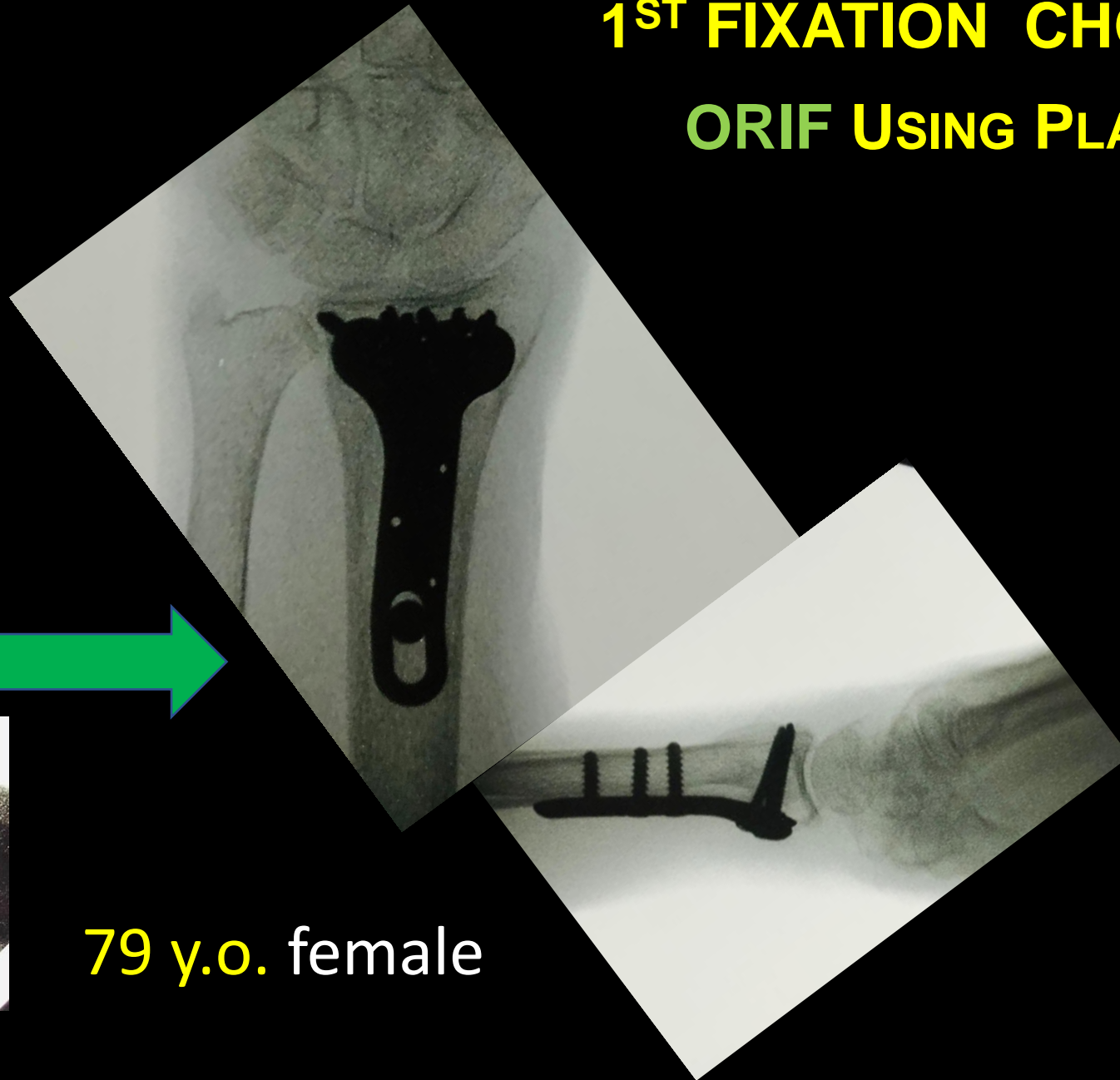
- 75 VLP; 81 ExFix
- Multicenter RCT
- 40 surgeons
- **NORWAY**  
(homogeneous pop.)
- Clear differences in PROM @6 weeks, 3 months
- No sig. diff at 12 months
- **Those first 3 months MATTER !**

# 1<sup>ST</sup> FIXATION CHOICE: ORIF USING PLATE



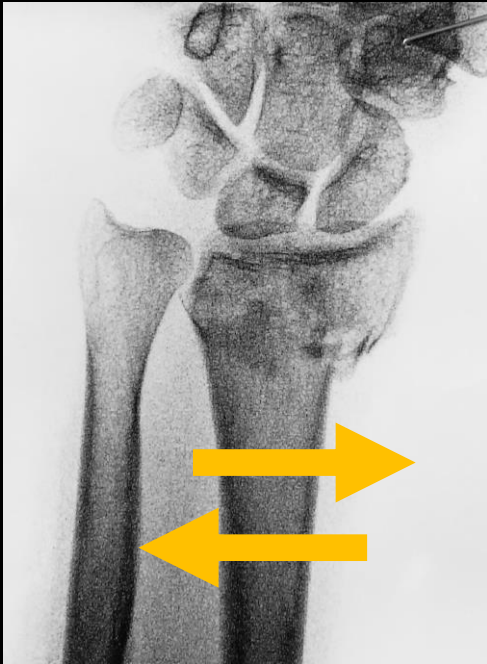
28 y.o. female: one-year post-op

**1<sup>ST</sup> FIXATION CHOICE:  
ORIF USING PLATE**



**79 y.o. female**

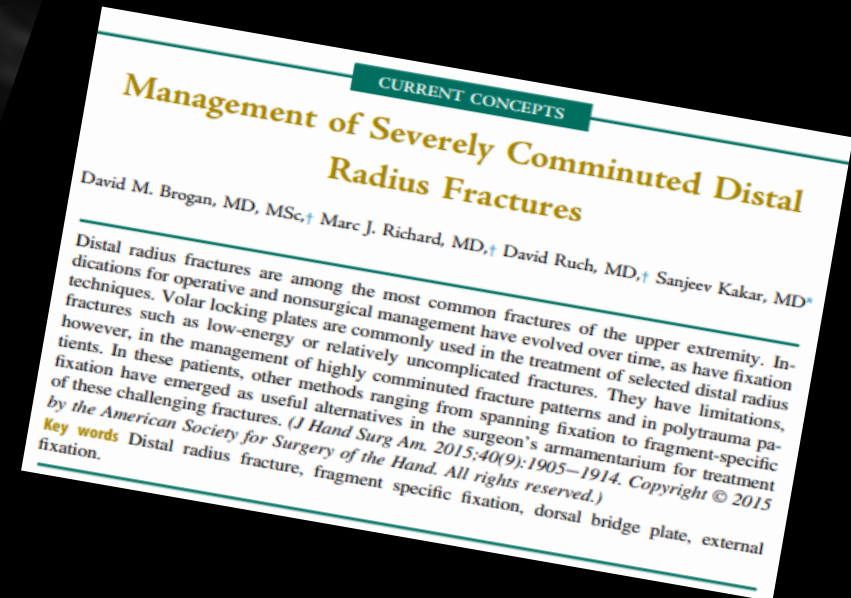
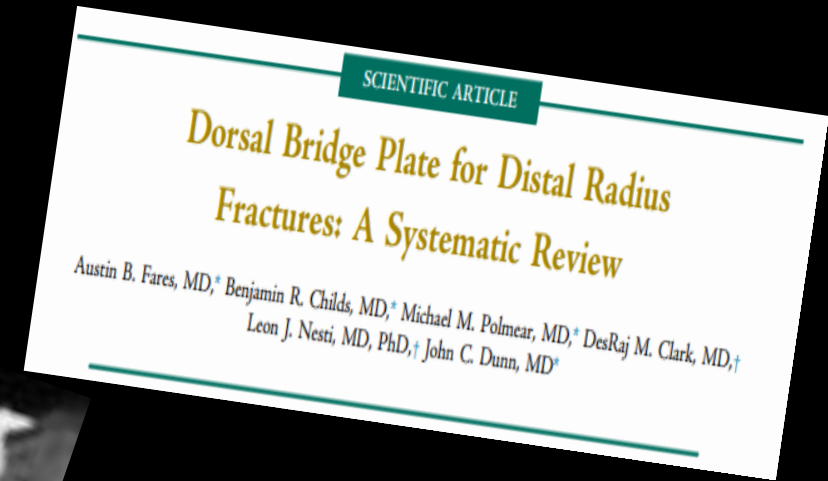
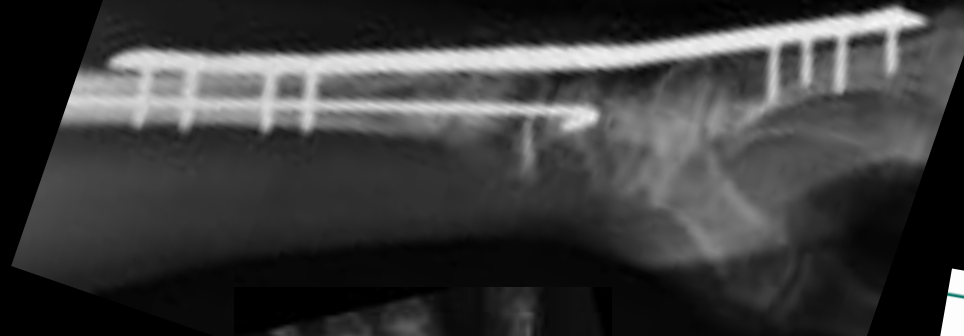
# 1<sup>ST</sup> FIXATION CHOICE: ORIF USING PLATE



64 y.o. female:  
3 months post-op



# ALTERNATIVE FIXATION CHOICES: SPANNING BRIDGE PLATE

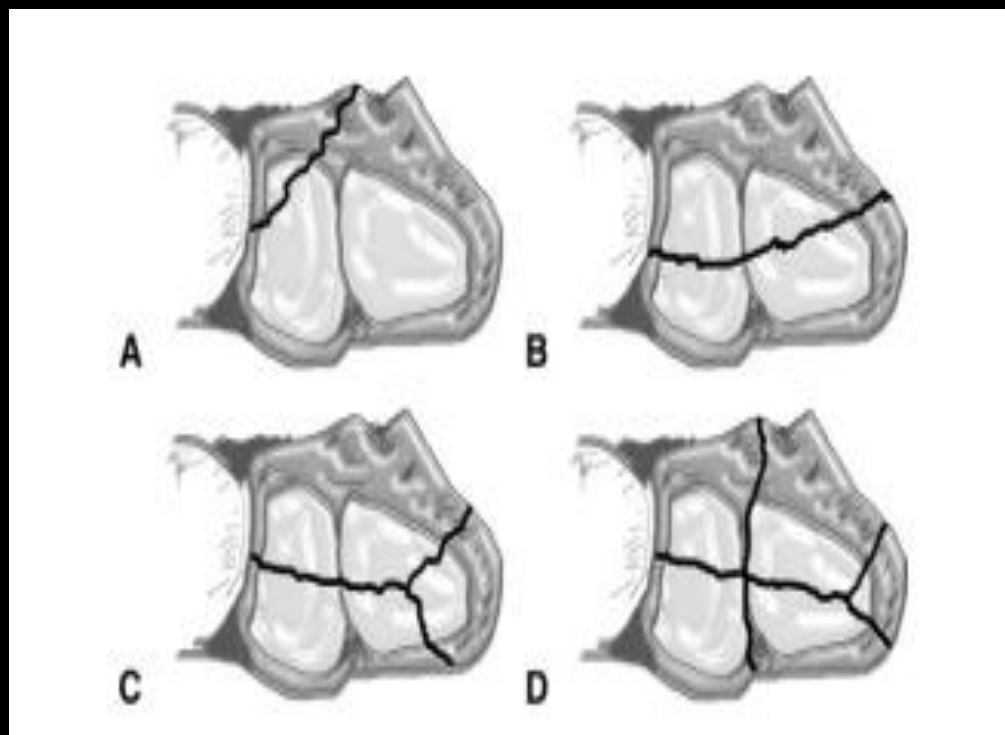


Images from Brogan, Richard, Ruch, Kakar. *JHS* 2015; 40(9): 1905-1914



# ALTERNATIVE FIXATION CHOICES:

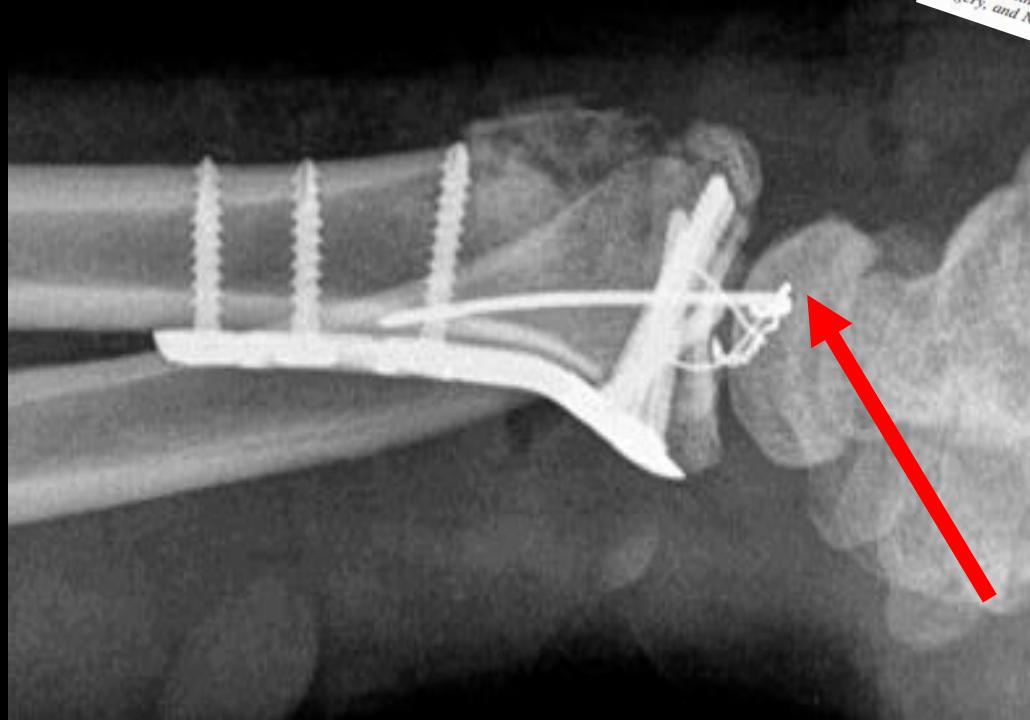
## LIMITED HARDWARE



COMMON FRACTURE PATTERNS



# ALTERNATIVE FIXATION CHOICES: COMBINATIONS



The Outcome of Intra-Articular Distal Radius Fractures Treated With Fragment-Specific Fixation  
Leon S. Benson, MD, Keith P. Minihane, MD, Laura D. Stern, BA, Erik Eller, BS, Roopa Seshadri, PhD  
From the Illinois Bone and Joint Institute, Evanston Northwestern Healthcare, Department of Orthopaedic Surgery, and Northwestern University Feinberg School of Medicine, Chicago, IL.

Benson, Stern *et al*: *JHS* 2006; 31-A(8): 1333-39.  
Results equivocal to standard fixation.

COMBINE plate fixation with additional screws and wire constructs. “Fragment Specific” fixation.

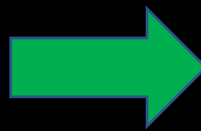
# ALTERNATIVE FIXATION CHOICES: COMBINATIONS



COMBINE plate fixation with additional screws and wire constructs.

# ALTERNATIVE FIXATION CHOICES:

# INTRAMEDULLARY NAILS



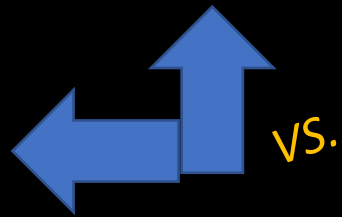
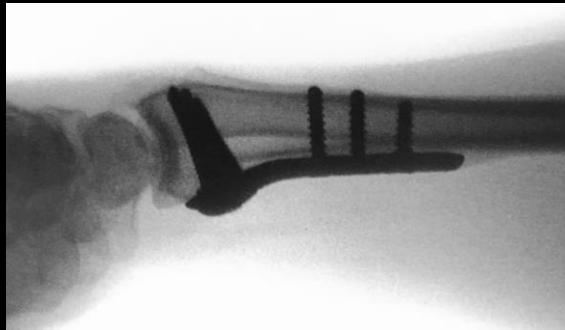
SCIENTIFIC ARTICLE

**Randomized Comparison of Volar Locking Plates and Intramedullary Nails for Unstable Distal Radius Fractures**

Johannes F. Plate, MD, PhD, Daniel L. Gaffney, MD, Cynthia L. Emory, MD, Sandeep Mannava, MD, PhD, Beth P. Smith, PhD, L. Andrew Koman, MD, Ethan R. Wiesler, MD, Zhongyu Li, MD, PhD

# ALTERNATIVE FIXATION CHOICES:

# INTRAMEDULLARY NAILS



Orthopaedics & Traumatology: Surgery & Research (2011) 97, 471–478

Available online at  
ScienceDirect  
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www.em-consulte.com/en

Orthopaedics & Traumatology  
Surgery & Research

ORIGINAL ARTICLE

**Dorsally displaced extra-articular distal radius fractures fixation: Dorsal IM nailing versus volar plating. A randomized controlled trial**

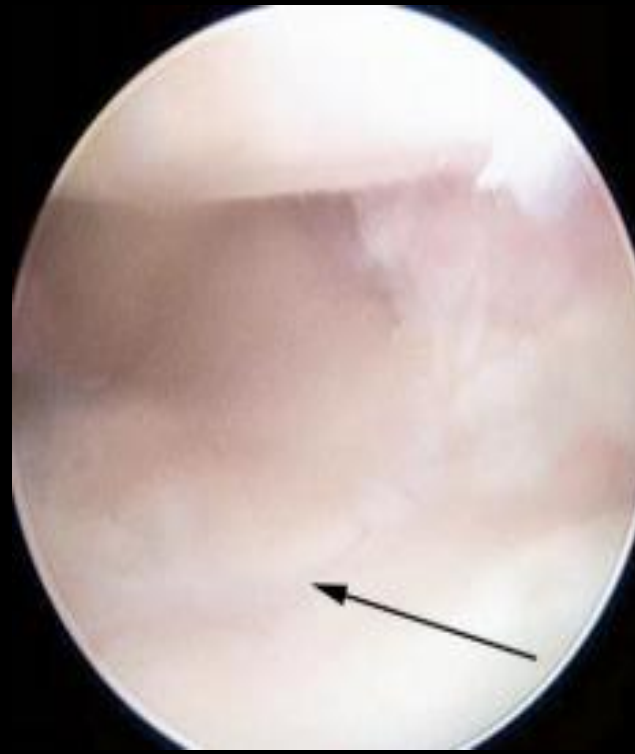
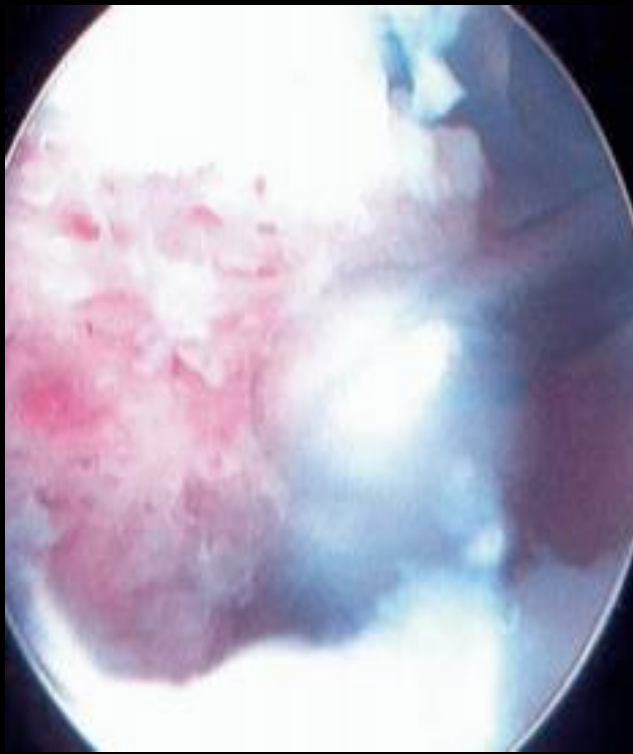
J. Chappuis\*, P. Bouté, P. Putz

Brugmann University Hospital Center, 4, place Van Gehuchten, 1020, Brussels, Belgium

**VLP performs better**

Chappuis et al: *Orthop Traum* 2011; 97: 471-478

# ALTERNATIVE FIXATION CHOICES: ARTHROSCOPIC ASSISTED REDUCTION AND FIXATION



# INTRA-OP

## PEARLS

- **Soft tissue handling.** Avoid bone stripping and further damage to vessels (radial artery), tendons – *primum non nocere*
- **Median nerve** – is CTR needed? – comments from **Neil Harness**
- **“Fragment-specific”** fixation more incisions and hardware may not be needed vs. “good enough”
- **Bone graft** or bone graft substitute – helpful to consent patient – “just in case”. **More COA sessions on this topic during Annual Meeting**

# INTRA-OP PITFALLS

- **DRUJ** (*Distal radioulnar joint*). Be sure to check stability. Stabilize as needed, including base of ulnar styloid fractures widely displaced.
- **Extensor tendons**. Avoid penetrating hardware protruding from volar approach. (C. Dy – **JBJS March 2021** “What’s new in hand surgery”)





# POST-OP PEARLS

- ***Pain Management***
  - Harken back to pre-op discussion and coaching
  - Opioid epidemic awareness
- ***Early Mobilization***
- ***Hand therapy***



# POST-OP

## PEARLS

- ***Pain Management***

- Harken back to pre-op discussion and coaching
- Opioid epidemic awareness

U.S. Surgeon General Jerome Adams, MD

Address to AMA House of Delegates October 6, 2018:

**One opioid overdose death  
every 12.5 minutes in the U.S.**



# THE OPIOID EPIDEMIC:

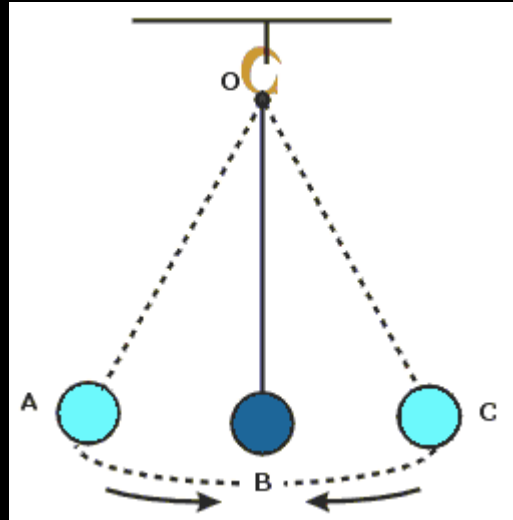
## THE SCOPE OF THE PROBLEM

2021: PENDULUM HAS REACHED OPPOSITE EXTREME

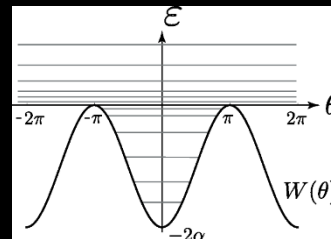
“5<sup>th</sup> Vital Sign”



“ZERO” PAIN



DRUG DEATH



# POST-OP PEARLS

- Supervised OT/ Hand Therapy Helps
- **Early Mobilization Beneficial !**
  - **Cochrane analysis – Handoll et al (2006)**  
better short-term improvements in:  
grip, pinch, and ROM.
- **Valdes et al: (2009):** Patients receiving early ROM needed significantly fewer therapy visits and attained functional ROM of wrist and forearm significantly faster
- **Valdes et al: JHS (2015)**
  - **Supervised OT beneficial for those with stiff fingers and other co-morbidities**



# POST-OP

## PEARLS

- Supervised Hand Therapy Helps
- **Early Mobilization Beneficial – maybe just as well with Home Exercise Program (HEP)**
- 2 RCTs found:
  - Patients with HEP instruction instead of formal supervised therapy = significantly greater improvement in functional outcomes at **6 wks.** ([Krischak et al., 2009](#)),
  - as well as at **3 and 6 mos.** ([Souer, Buijze, Ring: JBJS 2011](#))
  - **Confounding effects ?**



# POST-OP

## PEARLS

- Supervised OT/ Hand Therapy Helps
- ***Clear benefits shown in some studies:***

**Watt CF, Taylor NF, Baskus K.:** Do Colles' fracture patients benefit from routine referral to physiotherapy following cast removal?

*Arch Orthop Trauma Surg.* 2000; 120:413–415.

**Kay S, McMahon M, Stiller K.:** An advice and exercise program has some benefits over natural recovery after distal radius fracture: a randomised trial.

*Aust J Physiother.* 2008; 54:253–259.

Clinical Trial > Aust J Physiother. 2008;54(4):253-9. doi: 10.1016/s0004-9514(08)70004-7.

**An advice and exercise program has some benefits over natural recovery after distal radius fracture: a randomised trial**

Sandra Kay <sup>1</sup>, Margaret McMahon, Kathy Stiller

Affiliations + expand

PMID: 19025505 DOI: 10.1016/s0004-9514(08)70004-7

Clinical Trial > Arch Orthop Trauma Surg. 2000;120(7-8):413-5. doi: 10.1007/pl00013772.

**Do Colles' fracture patients benefit from routine referral to physiotherapy following cast removal?**

C F Watt <sup>1</sup>, N F Taylor, K Baskus

Affiliations + expand

PMID: 10968529 DOI: 10.1007/pl00013772

# POST-OP

## PEARLS

- Supervised OT/ Hand Therapy Helps
- **Referral to Therapist Variable:**
  - **Waljee et al Plast Recon Surg 2014**  
Patient predictors of therapy use include younger age, female sex, higher socioeconomic status, and fewer comorbidity conditions
- **Only 20.6%** of patients received either physical or occupational therapy following DRF
- DRF therapy protocols vary widely:  
massage, soft-tissue compression, manual therapy techniques, heat/cold modalities, electrical simulation, ultrasound, whirlpool, and exercise training (Home management training; work reintegration training)



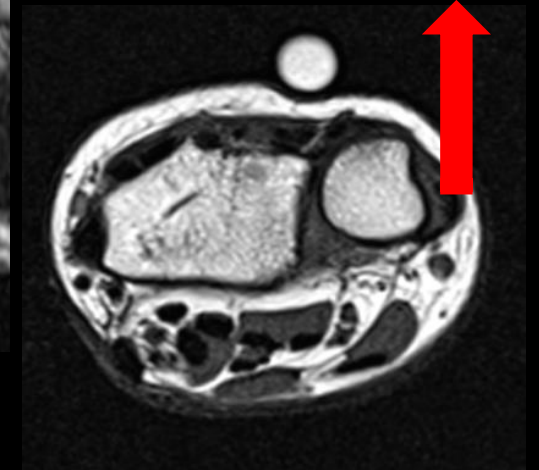
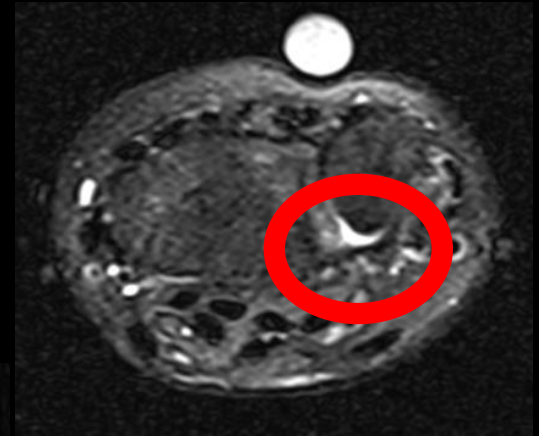
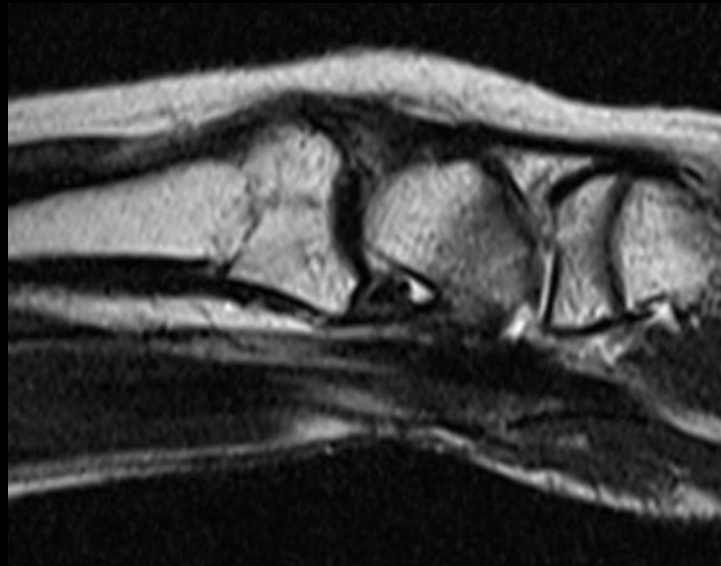
# POST-OP

## PEARLS

### Managing DRUJ Pathology



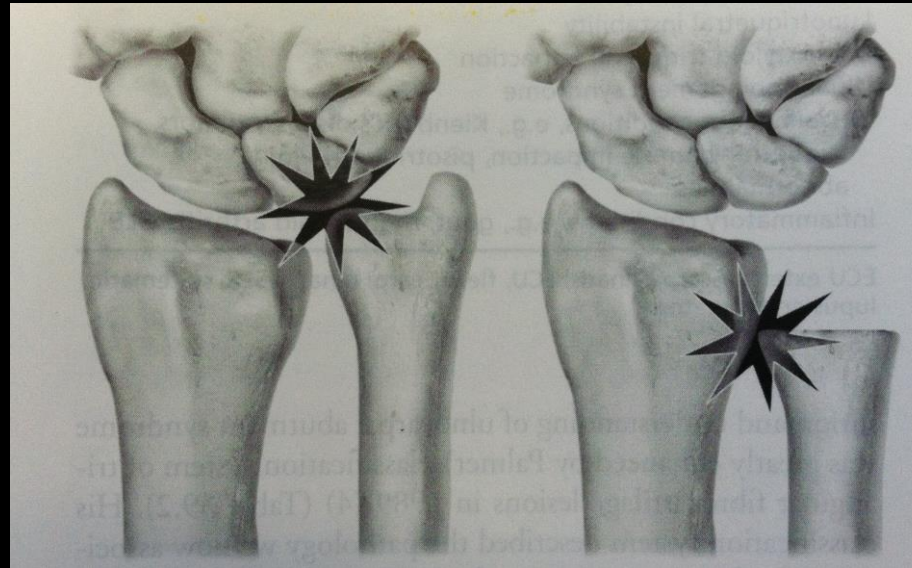
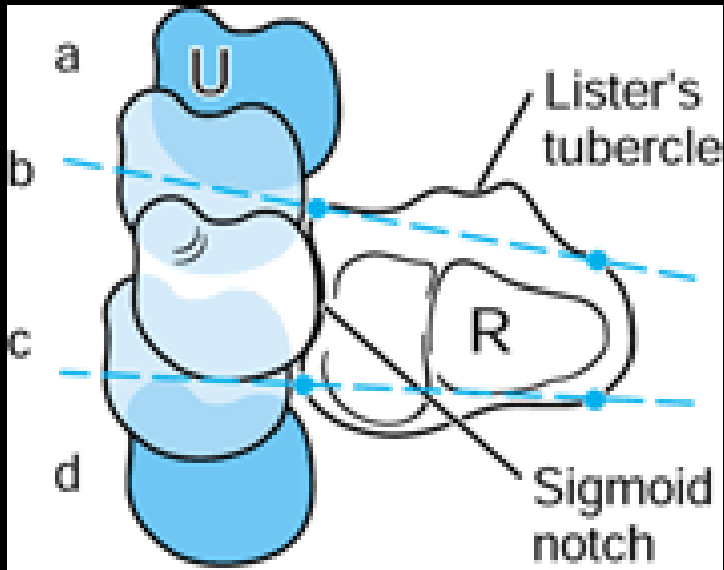
Ulnar styloid nonunion





# POST-OP PEARLS

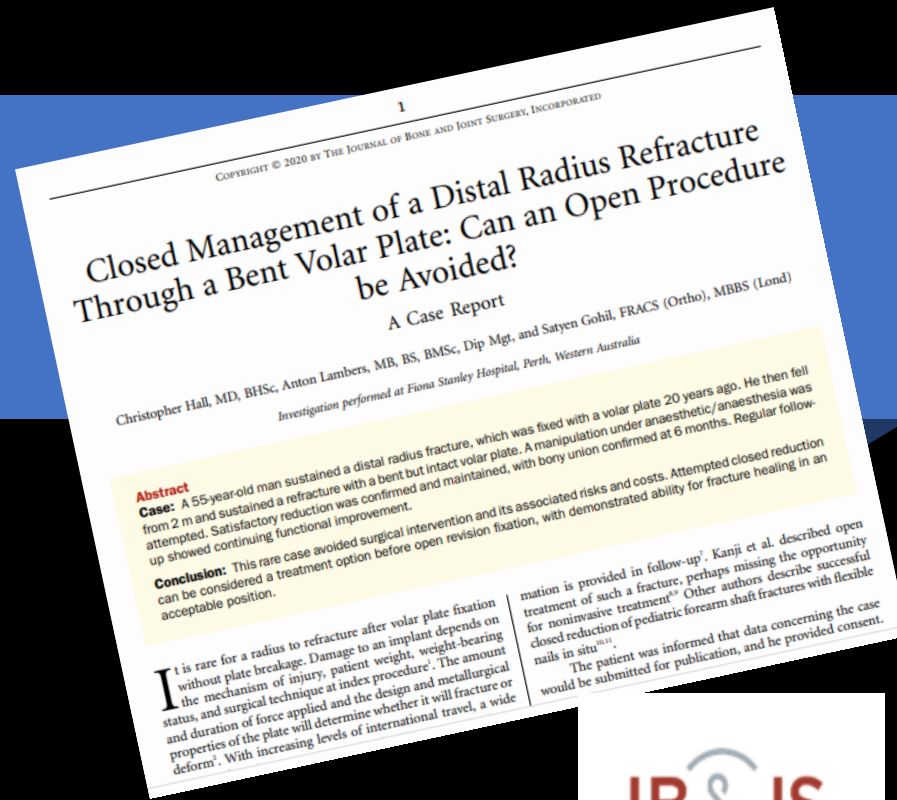
- Managing DRUJ Pathology – ultimate end game = Salvage Procedure



Impaction vs. Impingement



# POST-OP



## PITFALLS

- Managing bent or broken hardware
- “Bend it back” ?!

# POST-OP

## PITFALLS

- **Tendon ruptures**
  - 0.4% EPL (s/p closed fx)
  - 0.8% overall s/p ORIF

### SCIENTIFIC ARTICLE

## Incidence and Clinical Outcomes of Tendon Rupture Following Distal Radius Fracture

Brian D. White, MD, Jason A. Nydick, DO, Dawnne Karsky, MS, Bailee D. Williams, BS,  
Alfred V. Hess, MD, Jeffrey D. Stone, MD

White BD *et al*: *JHS* 2012; 37-A: 2035-2040.

# POST-OP



## PITFALLS

- Hardware removal
  - Avoid flexor tendon synovitis, esp. flexor pollicis longus (FPL)
  - Stress risers post-removal
- Flexor or extensor tendon ruptures
  - C. Dy: *JBJS* 2021 “What’s new in hand surgery”
  - Avoid prominent hardware
- Complex regional pain syndrome (CRPS) –  
comments from Amy Ladd

# SUMMARY: DISTAL RADIUS FRACTURES

- **DIAGNOSE**
  - *Evaluate for associated injuries*
  - *At least have considered them so ready to address intra-op as needed*
- **STABILIZE**
  - *If fracture warrants surgery, be sure to achieve stability to allow early motion*
- **REHABILITATE**
  - *Initiate early ROM and rehab to avoid problems and maximize outcomes*



**MAHALO!**