Distal Radius Fractures: Palmar or Dorsal Approach?

G.R. Sennwald

Consultant Hand surgeon at the Hand Unit of the University of GENEVA
26° Congresso Brasileiro De Cirurgia da Mão

Distal radius, what has been proposed

1. Simple splint
2. Circular splint
3. Pinning
4. Intrafocal pinning (Kapandji)
5. Axial pinning
6. External fixator
7. Dorsal plate
8. Palmar plate
9. Combined plates
10. With or without grafting (bone or bone substitute)

There is no consensus on the management of theses fractures.
But definitions seem unclear in many papers.
This might be the reason of discrepancy.

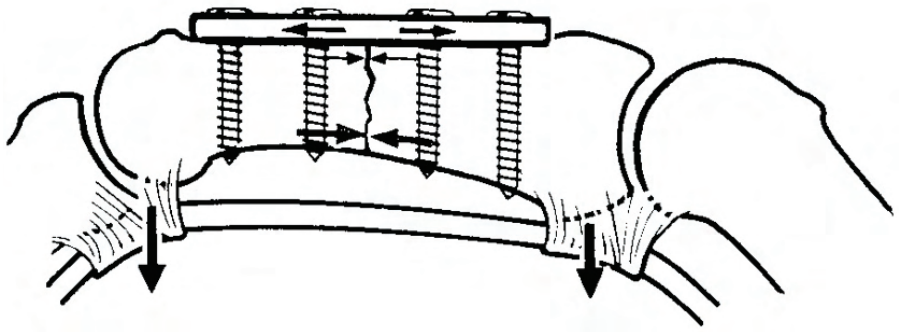
Definitions

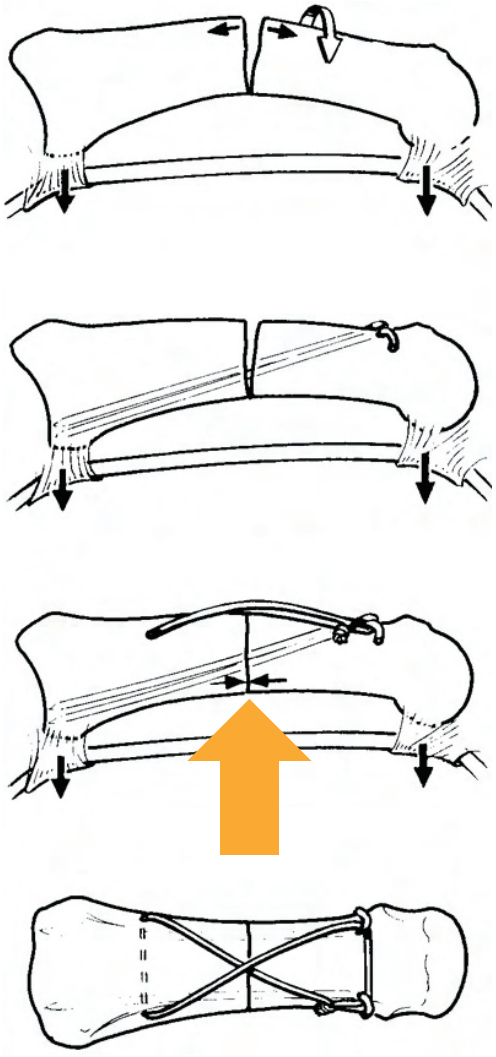
- Tension band
- Neutralisation
- Splint (Bridge)
- Buttress

Definitions

- **Tension band**

Palmar buttress must be present.
K-wire better with porosis.

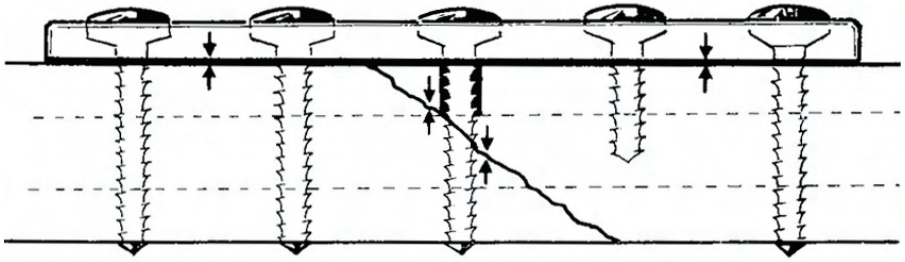




Definitions

- **Neutralisation**

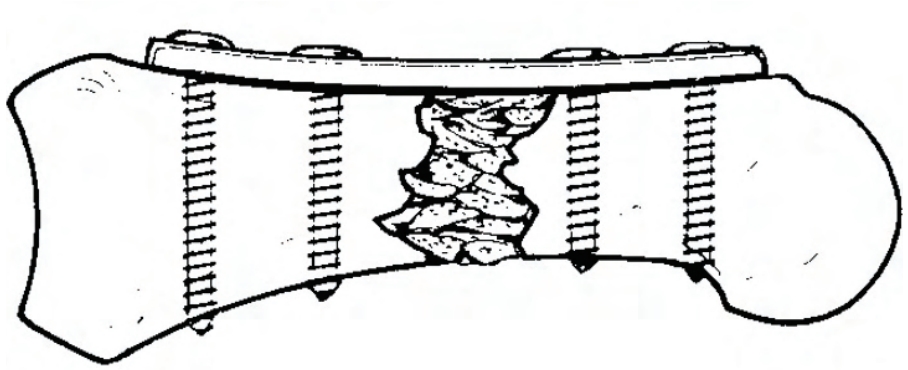
Needs interfragmentary compression.
Seldom possible at the distal radius.

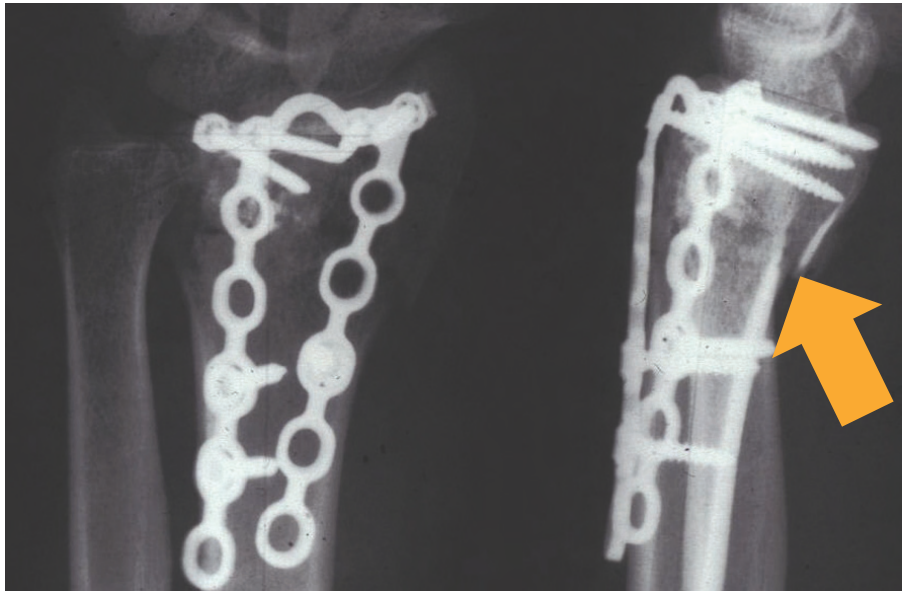


Definitions

- **Splint (Bridge)**

Often the case at the distal radius and in the rule presented as buttress-plate.

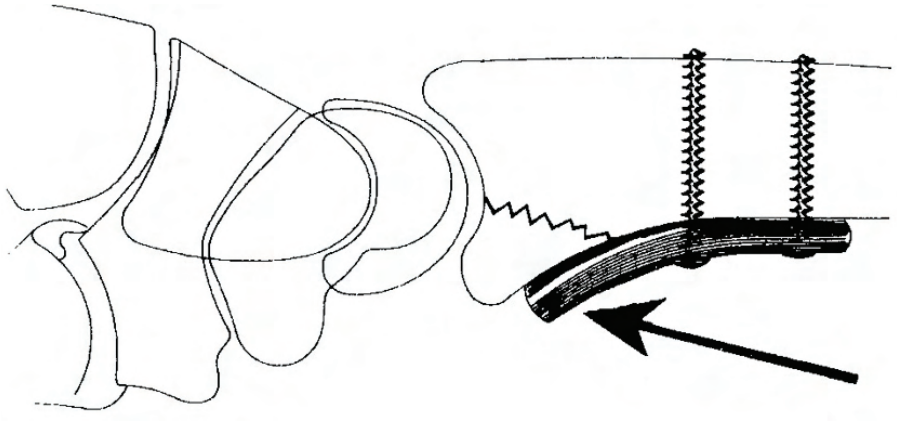




Definitions

- **Buttress**

The best technique for Barton fractures.
Defines the approach!



Distal radius, treatment controversy

- **Cast immobilisation**

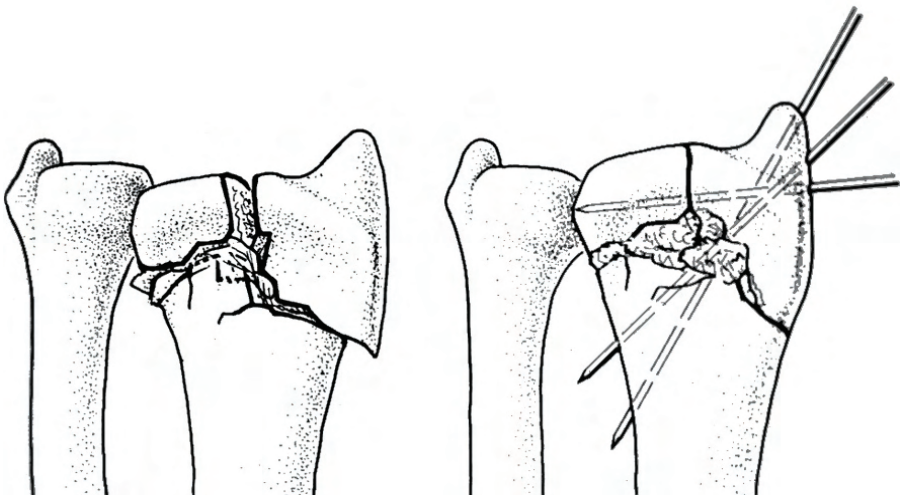
Avoids surgery, i.e. complications.
But cannot maintain length, rotation or axes.

I.e. if reduction necessary => open!

Distal radius, treatment controversy

- **Pinning Willeneger**

Difficult, does not always maintain correction as shown. Inadequate if porosis. Does not stabilise gliding.

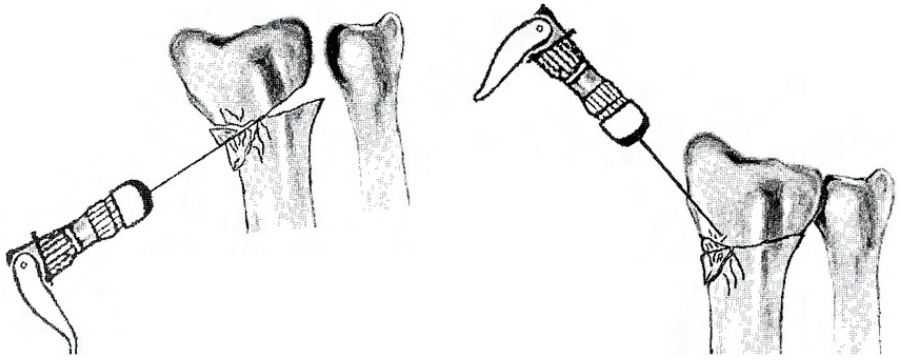


Distal radius, treatment controversy

- **Pinning Kapandji**

Overcorrection possible.
Limited indications.
Not always sufficient alone.

(Trumble et al., JHS 23A:381, intrafocal pinning of distal radius fractures with and without external fixator)

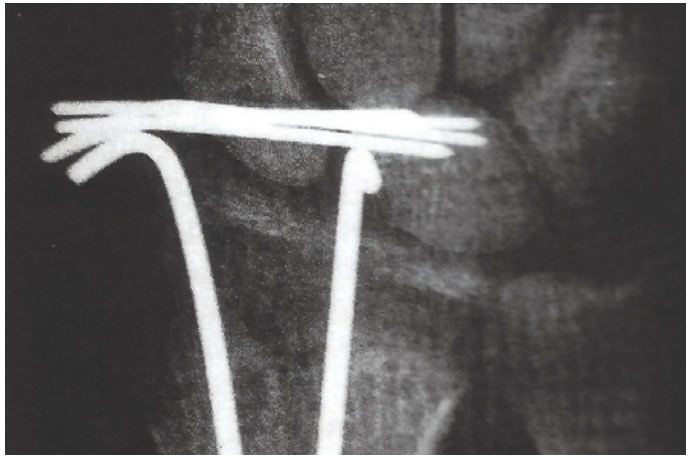


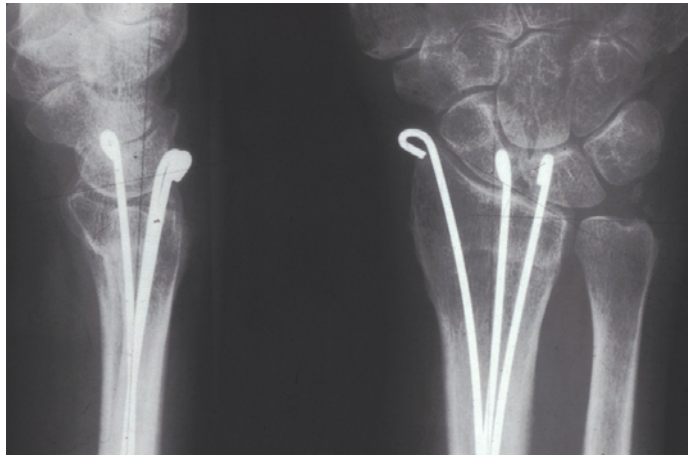
Distal radius, treatment controversy

- **Pinning Py**

Cannot maintain length.

(Sennwald G, Della Santa D. Chir Main. 2001; 20(3):218-25. Chir Main. Comparison of three techniques: external fixator, volar plate and axial pinning)

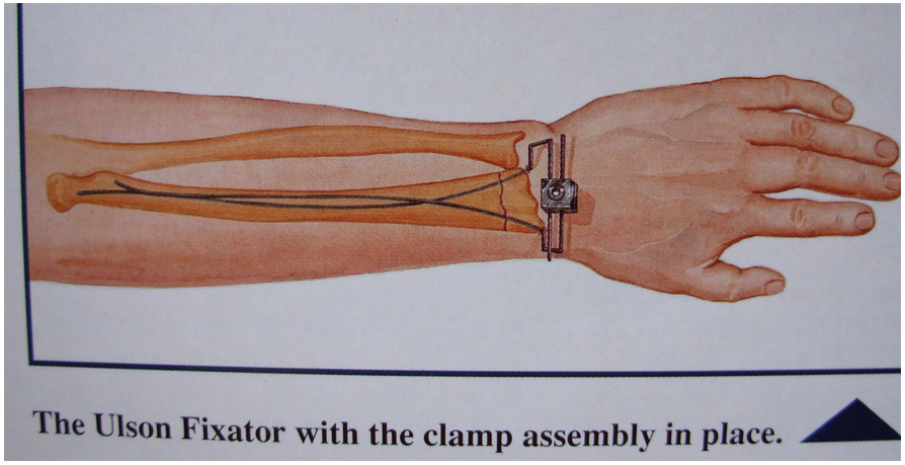




Distal radius, treatment controversy

- **Pinning Ulson**

We have no experience.

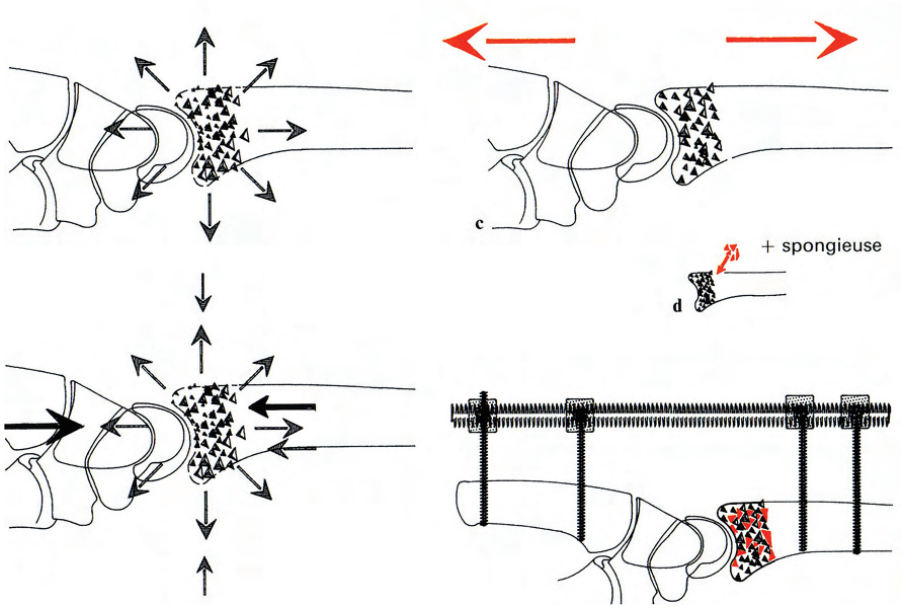


The Ulson Fixator with the clamp assembly in place.

Distal radius, treatment controversy

- **External Fixator (mainly placed dorsally)**

Grafting also dorsal for motion does not make sense.



Distal radius, treatment controversy

- **External Fixator**

Leung KS et al. An effective treatment of comminuted fractures of the distal radius. JHS 15A:11-17, 1990

100 cases treated with external fixator.

As suggested by Jakob RP
and Fernandez DL.

Leung KS et al. JHS 15A:11-17, 1990

The authors concludes:
why use another technique, despite
- one metacarpal fracture,
- one pin tract infection,
- 5 Transient sensory radial nerve and 3 median nerve impairment,
- 4 dystrophy (RSD)

Distal radius, treatment controversy

- **External Fixator**

External fixator despite its apparent simplicity is a subtle matter.

Seems less frequently used actually (at least if considering publications).

Experience of Geneva
(Fusetti C., Della Santa D.)

- **Review of 30 fractures, all over 60**

23 women, 7 men
Age : average, 72 years (60-85)

Fractures 17 A2, 7 A3
4 C1, 2 C2

Distal radius, treatment controversy

Experience of Geneva
(Fusetti C., Della Santa D.)

- **Review of 30 fractures, all over 60**

Follow-up: 15 months

Radiology	**preop**	**postop**
- *RU*	*+6,2mm*	*-0,3*
- *frontal*		*+18*
- *lateral*	*-21,5°*	*+4,0*
- *Arthrosis*	*7*	*7*

Experience of Geneva
(Fusetti C., Della Santa D.)

- **Review of 30 fractures, all over 60**

Follow-up: 15 months

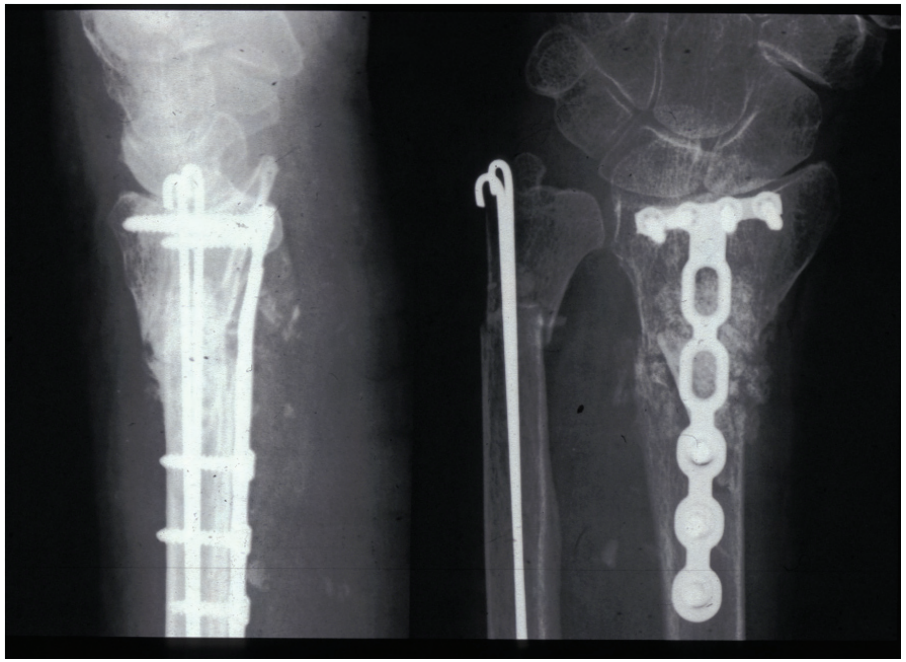
Function	**Motion**	**Strength**
- *Ext / Flex*	*70,5%*	
- *Add / Abd*	*96%*	
- *Sup / Pro*	*98%*	*85%*

Distal radius, treatment controversy

Experience of Geneva
(Fusetti C., Della Santa D.)

- **Review of 30 fractures**

Complications:
Two malunions
One tendinitis (dorsal, screws too long)



Distal radius, treatment controversy

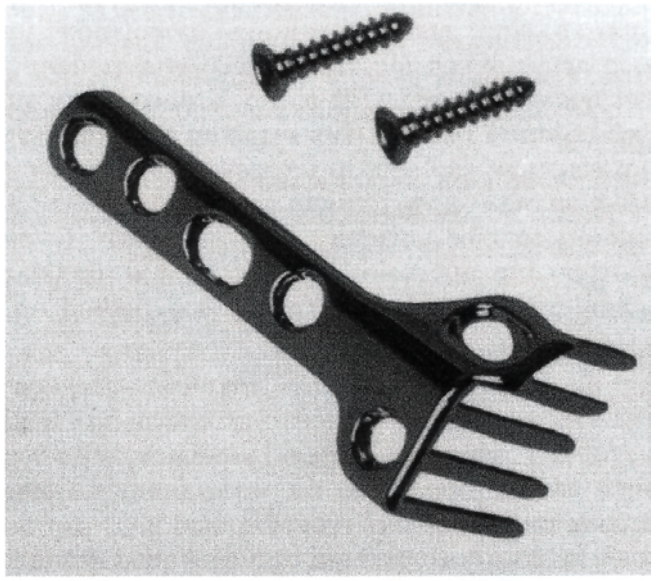
Experience of Geneva
(Fusetti C., Della Santa D.)

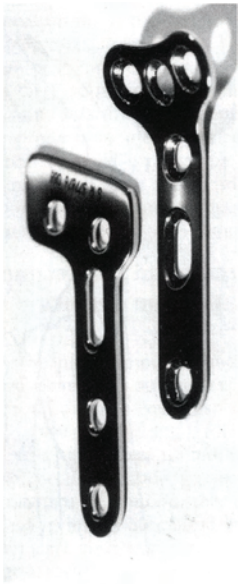
- **After 60 years of age, we obtained satisfactory results provided:**

- Correct placement of distal screws
- Correct screw length

With multiple surgeons,
even young ones, AO plate, Matthys

Plates:
Many models!
more or less stable





Distal radius, treatment controversy

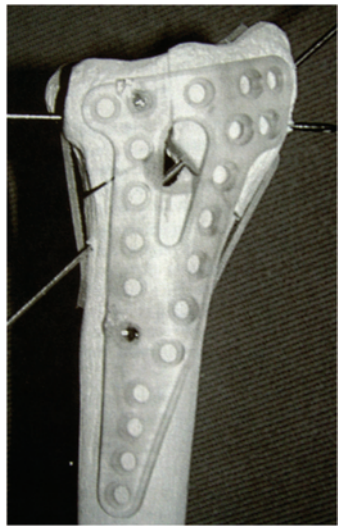
DORSAL PLATING OF UNSTABLE DISTAL RADIUS FRACTURES USING A BIO-ABSORBABLE PLATING SYSTEM AND BONE SUBSTITUTE

S. GANGOPADHYAY, K. RAVI and G. PACKER

From the Southend Hospital, Westcliff-on-Sea, Essex, UK

This study reports the results of open reduction and internal fixation of 26 unstable, intraarticular, dorsally displaced fractures of the distal radius using a bio-absorbable dorsal distal radius (Reunite) plate and calcium phosphate (Biobon) bone substitute. The bio-absorbable plate has the advantage of being low profile, easily contourable and angularly stable. In the majority of cases, this plate produces functional results comparable with metal plates. The Gartland and Werley score was excellent or good in 21 patients. The theoretical advantage over metal plates is in eliminating the need to remove the plate and hence the need for a second operation if implant-related extensor tenosynovitis occurs. Inflammatory tissue reaction to the degradation products of the plate is a potential concern, although the co-polymer ratio used in this plate appears to have reduced the severity of this reaction, which was seen in two patients in this series. The reduction was lost in five patients with severe dorsal comminution. Following this experience, we do not recommend this plating system for fractures with a metaphyseal gap of greater than 7 mm following reduction.

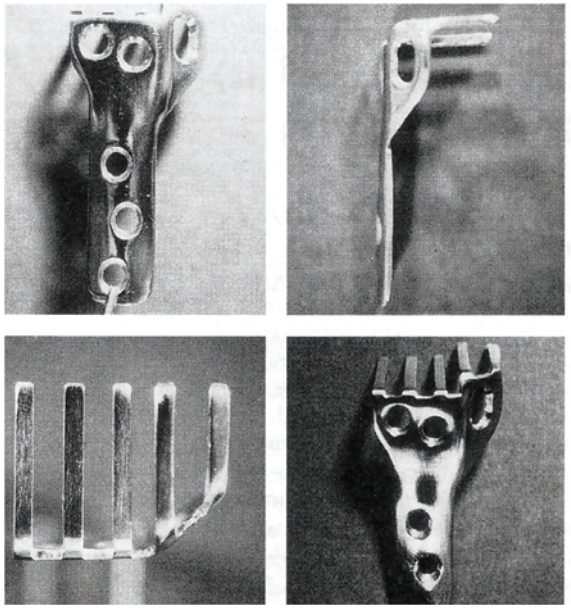
Journal of Hand Surgery (British and European Volume, 2006) 31B: 1: 93–100



JHS 20A:1021-27, 1995

Design and Biomechanics of a Plate for the Distal Radius

David Gesensway, MD, Matthew D. Putman, MD,
Peter L. Mente, PhD, Jack L. Lewis, PhD, Minneapolis, MN

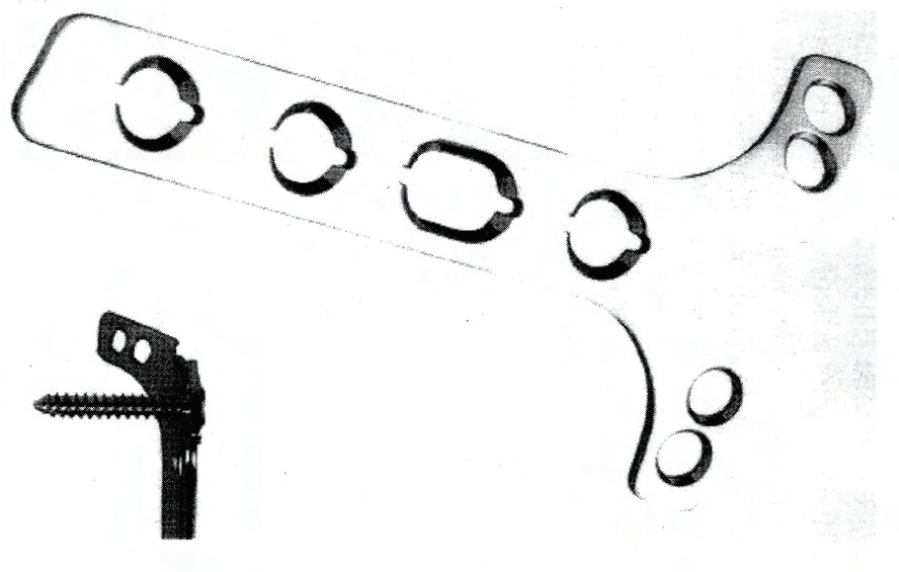


Distal radius, treatment controversy

JHS 31A:382-6, 2006

Treatment of Distal Radius Fractures With a Low-Profile Dorsal Plating System: An Outcomes Assessment

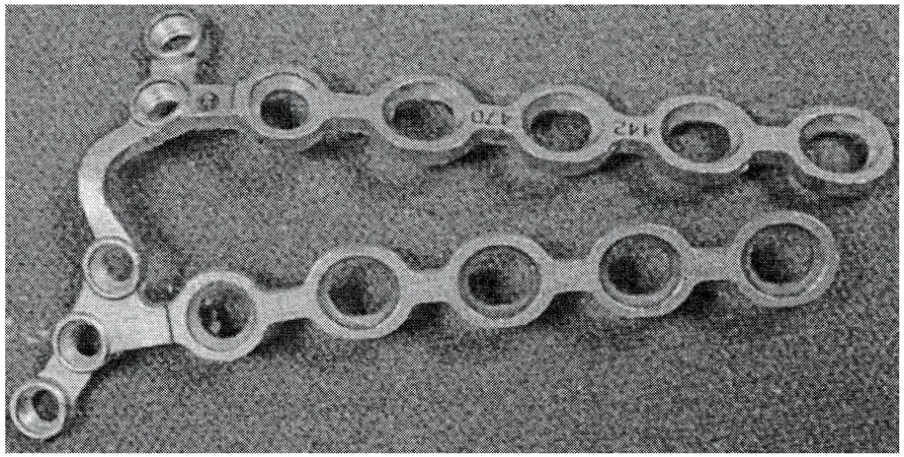
Paul M. Simic, MD, Jason Robison, MD, Michel J. Gardner, MD, Richard H. Gelberman, MD, Andrew J. Weiland, MD, Martin I. Boyer, MD



Conclusion: dorsal plating effective, but not for restoring radial height

Distal radius, treatment controversy

Plates:
Various metals



i.e., Titan

However with many complications

Complications of the AO/ASIF Titanium Distal Radius Plate System (π Plate) in Internal Fixation of the Distal Radius: A Brief Report

Gregoris K. Kambouroglou, MD, Terry S. Axelrod, MD,
Toronto, Ontario, Canada

Two patients are reported who had tendon rupture and plate breakage following internal fixation with the newly designed AO/ASIF titanium distal radius plate system (π plate). The incidence of complications with this system warrants further evaluation. (J Hand Surg 1998; 23A:737–741. Copyright © 1998 by the American Society for Surgery of the Hand.)

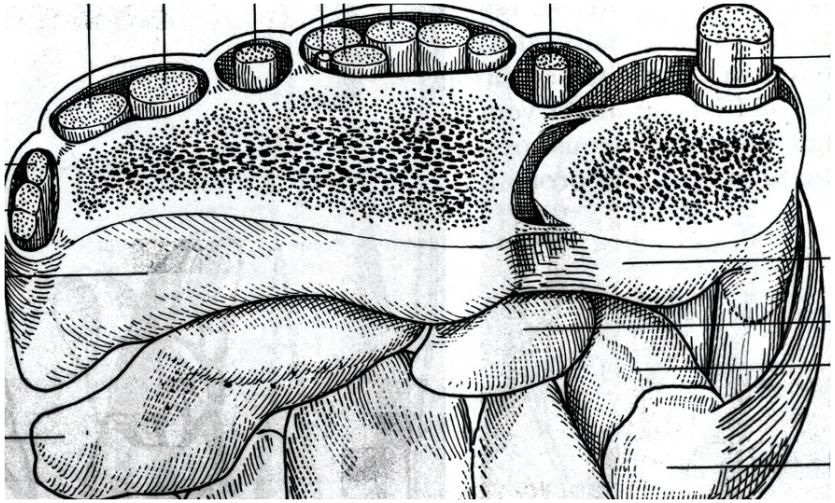
Kambouroglou GK, Axelrod TS
Complications of the AO/ASIF
Titanium distal radius plate system
JHS 23A:737-741, 1998 (2 cases)

Distal radius, treatment controversy

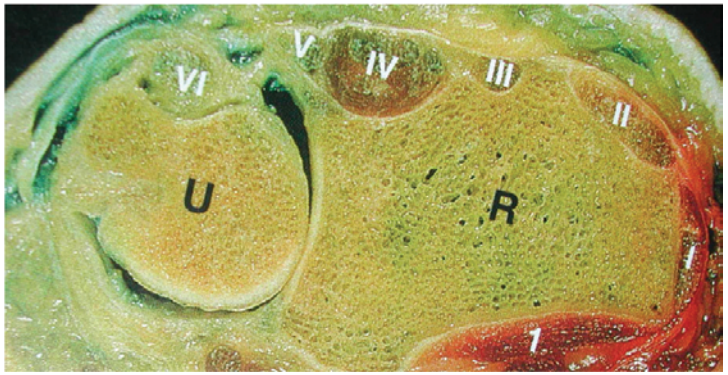
Plates:
More or less volume

The problem of anatomy

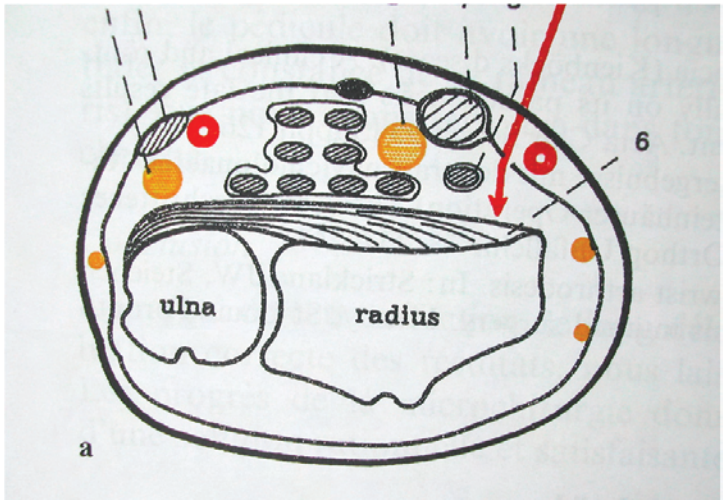
a) dorsal



a) dorsal



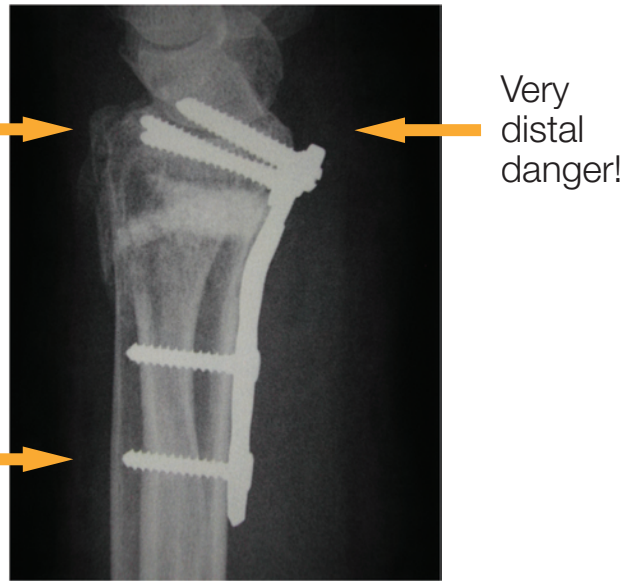
b) palmar



Distal radius, treatment controversy

Plates:
Have to be placed safely, firmly

Safely?



Distal radius, treatment controversy

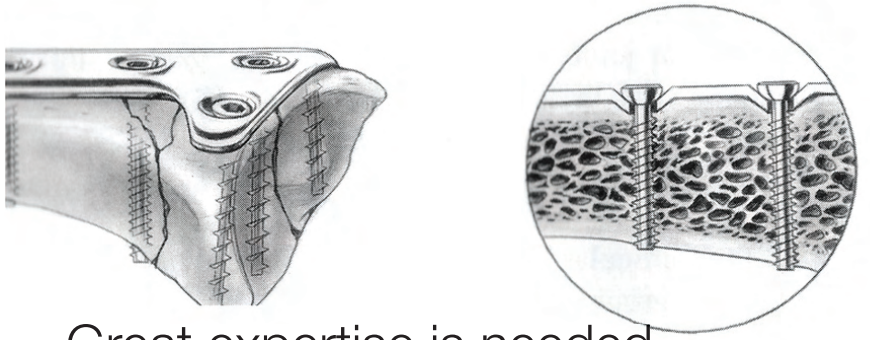
Carter P.R et al.
JHS 23A:300-7, 98

Dorsal approach
Special plate

73 cases – 96% intraarticular
88% reduction maintained.
19% required plate removal
Gartlan and Werley for outcome

Open Reduction and Internal Fixation of Unstable Distal Radius Fractures With a Low-Profile Plate: A Multicenter Study of 73 Fractures

Peter R. Carter, MD, Hugh A. Frederick, MD, Georgiann F. Laseter, OTR, FAOTA, CHT, Dallas, TX



- Great expertise is needed
- Plate, stainless steel, no bending.
- Only 9 patients were older than 65.
- big plate.
- Authors moderately satisfied….

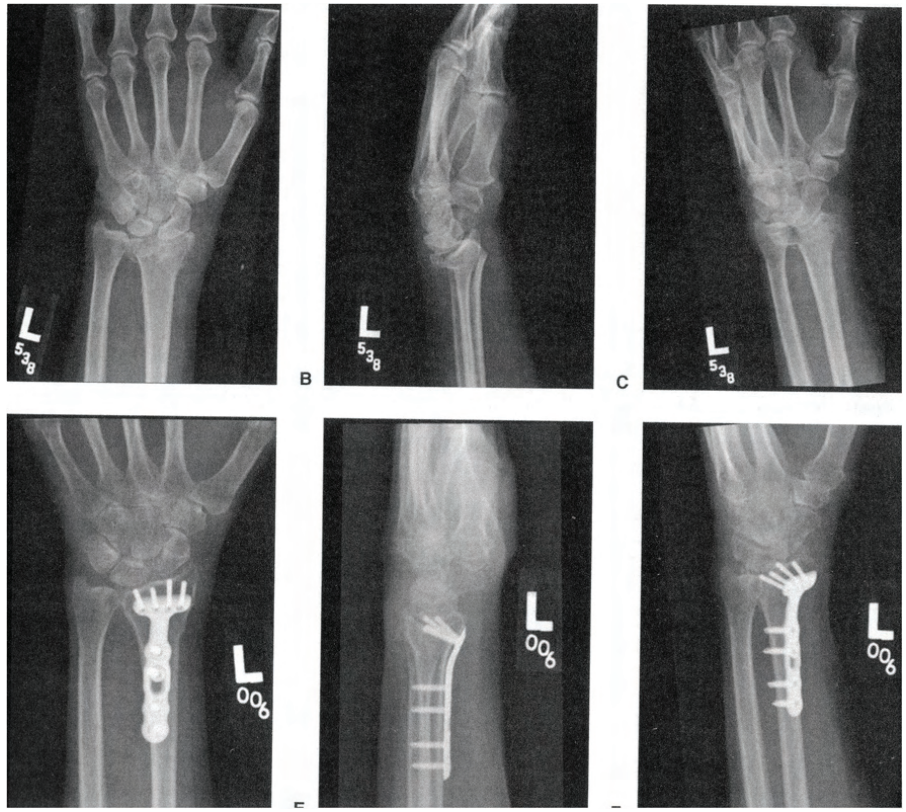
Distal radius, treatment controversy

Rozental TD, Blazar E.
Functional outcome and complications after volar plating for dorsally displaced unstable fractures of the distal radius.

JHS 31A:359-65, 2006.

41 patients
4 loss of reduction
3 plate removal (tendon).

Volar plating:
High complication rate.
High incidence of fracture collaps
Individual approach necessary



Distal radius, treatment controversy

Fernandez-Baca FB, Benrahho J.
Chirurgie de la Main 25:27-32, 2006.

Treatment of dorsally displaced distal radius fractures with a double dorsal plate: a study of 12 patients.

- 1 excellent
- 7 good
- 3 fair
- 1 bad i.e., 25% unsatisfactory

Authors concluded that they Applied the column theory Developed by Rikli et Regazonni *JBJS 78B:588-592*

Authors seem satisfied!

Authors concluded that they Applied the column theory Developed by Rikli et Regazonni *JBJS 78B:588-592*
Which gives good results (?).

Distal radius, treatment controversy

Personal problem:

What is the 3 columnar theory,
in other words, which columns
are meant?

In this example, we have two plates…

Obert L. et al. Chir. De la Main
20:436-46, 2001

Ostéosynthèse des fractures du radius
distal par plaque postérieure: avantag-
es et inconvénients

Focuses on the approach: radial (nerv)
or dorsal (tendons).

Complications 20%,
- tendon,
- volar tilt
- Radialis (if radial approach)

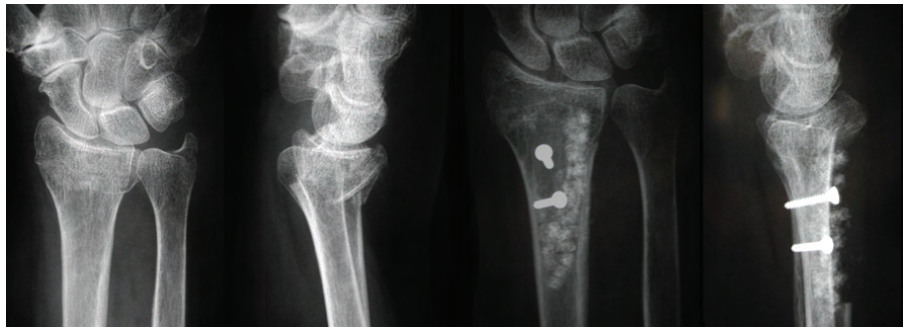
No definitive answer!

However, in elderly over 60 years of
age it functions….

Distal radius, treatment controversy

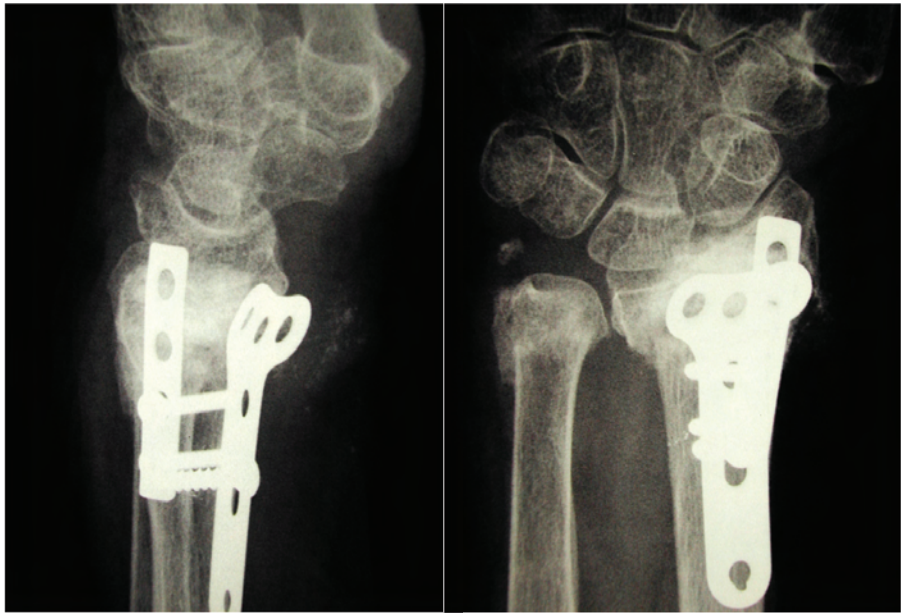
Plates:
Alternative, use the bone as a plate.

Safe.
Nearly no metal.
No problems with tendons.



Plates “sandwich”

Much metal bone substitute mandatory. Can be extremely difficult.
Its use avoids the external fixator.



Distal radius, treatment controversy

And what?
How shall we find a definitive answer?

Editorial
Judging the evidence, F.T. Horan,
JBJS, 87B, 1589

All surgeons search their knowledge in order to come to the best diagnostic and practical solution to the problem which they face.

Evidence based medicine:
i.e., recognise and define the best scientific observation which might influence practice.

Level I: high quality randomised, controlled trial.
Level II: randomised study of lesser quality.
Level III: retrospective comparative or systematic reviews.

Is it possible to carry out a high quality randomised control trial of surgical operative method?

According to A.J. Carr (*JBJS 87B:1593*) between 1992 – 2002, only 19 papers (3.1%) for shoulder were of sufficient quality….

Distal radius, treatment controversy

Conclusion:
Be careful.
A popular dogma does not always reflect reality.
Common sense remains essential.
Of course, try to do better…

Common sense
J. Taleisnik, *JHS 23A:570-574, 1998*

It dictates that we should not subject our patients to surgical procedures that we would not want performed on ourselves…
It dictates that we should not treat surgically what is not clearly supported by objective findings.

Distal radius, treatment controversy

- But what is an objective finding?
- Who detects the bias of a study?
- Who presents objective findings?
- Why can't we reproduce some presented papers?

Palmar plate fixation of the AO Type C2 fracture of distal radius using a locking compression plate. A biomechanical study in a cadaveric model.
JHS 28B:263-266
Leung E, Zhu L, Ho WW, Chow SP.

Experimental model

Facts: 80% of the load is transmitted through the radius.

Fixation of the fracture needs biomechanical stability to avoid secondary displacement.

Distal radius, treatment controversy

Palmar plate fixation of AO Type C2 fracture of distal radius using a locking compression plate - a biomechanical study in a cadaveric model

F. Leung, L. Zhu, H. Ho, W. W. Lu and S. P. Chow

From the Department of Orthopaedia Surgery, Queen Mary Hospital, The University of Hong Kong, Hong Kong and the Department of Orthopaedia and Traumatology. The First Military Medical University Nanfang Hospital, Guangzhou 510515, People's Republic of China

The stability of palmar plate fixation using a locking compression T-plate was compared with that of a conventional palmar T-plate and a dorsal T-plate in a cadaveric model of an AO type C2 fracture of distal radius. The wrist axial load transmission through the radius was tested for each fixation. The results show that, under 100N axial load, the palmar locking compression T-plate restores stability comparable to that of the intact radius, and is superior to conventional palmar or dorsal T-plates.

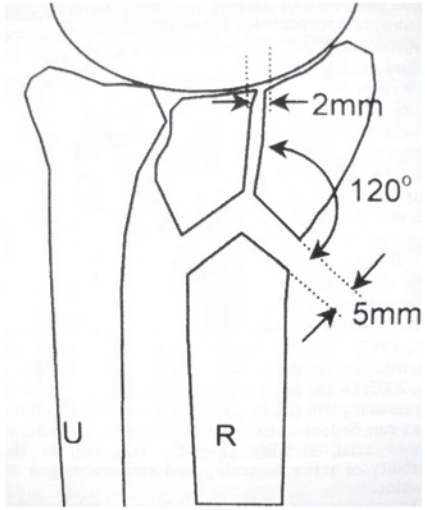
Journal of Hand Surgery (British and European Volume, 2003) 28B: 3: 263-266

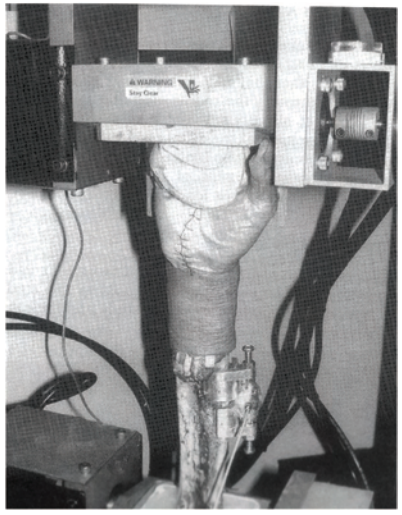
Distal radius, treatment controversy

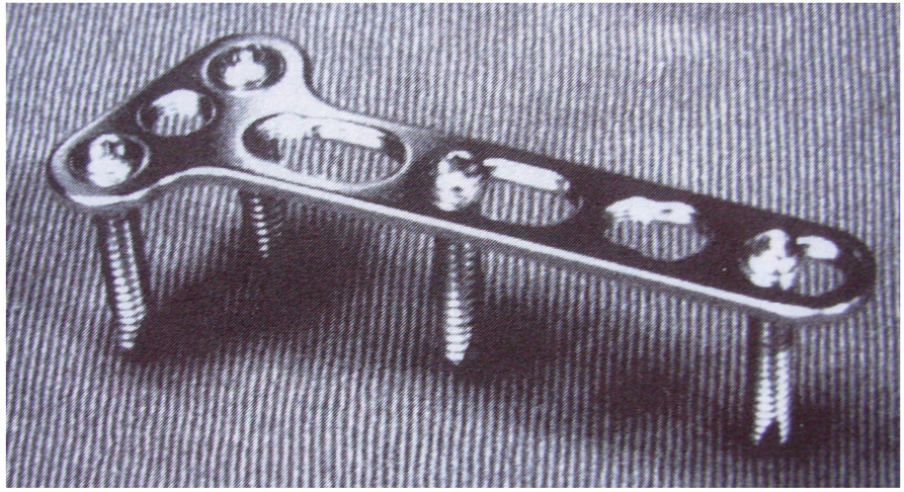
Leung E, Zhu L, Ho WW, Chow SP. JHS 28B:263-266

Experimental model
8 frozen forearms (4 cadavers)
Standardized osteotomy.
3 implants:

- Dorsal
- Palmar T-plate
- Palmar oblique Plate
- Axial load (100 N)
- Load sensor







Distal radius, treatment controversy

Discussion:
Design of volar plate easier.
Placement volar less demanding, less traumatic (no bone excision: Lister).
Anatomy more favourable.
Angular stability of the screw are important.

The study demonstrate that palmarly LCP plate is superior to conventional palmar and dorsal T-plates.

I have a similar experience based

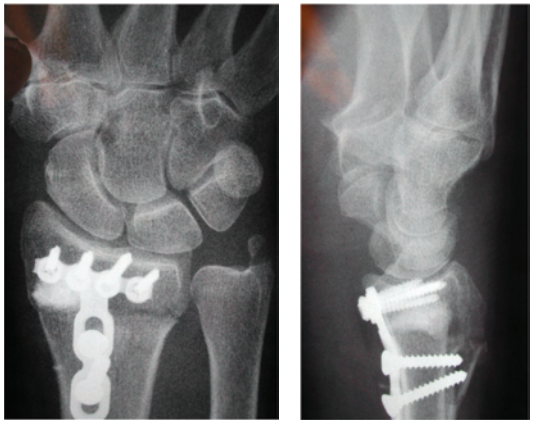
on experience as a surgeon,
on observation as a teacher,
on observing younger fellows.

But
one has to be pragmatic,
surgery is not a dogma,
patients are not reproducible,
fractures are variable and seldom similar,
the same for the bone quality.

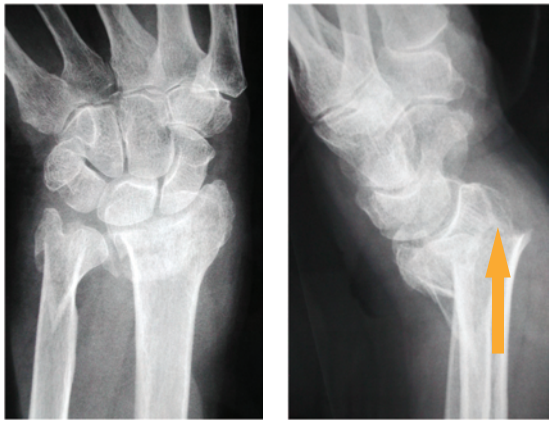
Distal radius, treatment controversy

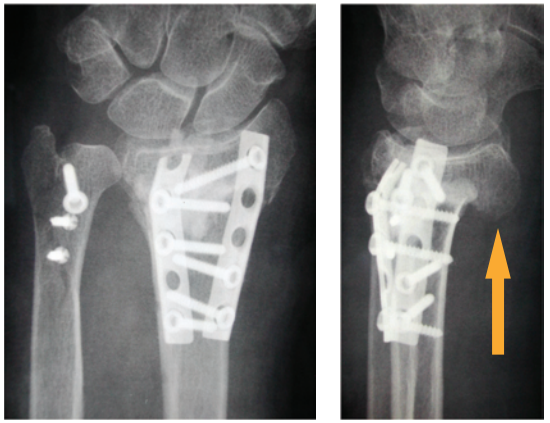
Facit
Volar plate might be a valuable solution for most cases, since material is much better nowadays.
However, combined solutions might be valuable.
Alternatives are necessary.

I prefer the volar approach:



But there is no rule without exceptions.
If possible with bone substitute.





Distal radius, treatment controversy

Axelrod TS, RY McMurtry,
JHS 15A:1-10, 1990

Open reduction and internal fixation of comminuted, intraarticular fractures of the distal radius.
As stated by these authors, and despite better material, osteosynthesis of distal radius fractures remains a challenge and requires skill, precision and planning.

I am aware I did not give a clear answer.

I hope however that the thoughts and facts I presented will help you in decision making, since the success of an operation starts by analysis the x-rays.