

Distal Radius Fractures What is Best and When?



**What's the best way to
treat distal radius
fractures?**

What's the Evidence?



Cochrane Collaboration

The Cochrane Collaboration

The world's largest independent network of health researchers

Events

Search survey - Thank you!

Thank you for participating in our survey. We will use the results to improve our website and our services. Your feedback is important to us. We will contact you again in the future. Thank you for your contribution.

Our Network

The Cochrane Library

Discover the Cochrane Library

The Cochrane Library

Register your account

Help us improve our services

1. Your account

The Cochrane Collaboration is a network of health researchers working together to produce high-quality, unbiased evidence to inform health care decisions. We are currently working on several projects to improve our services and to make it easier for you to find the information you need.

What is the Cochrane Collaboration? We are a network of health researchers working together to produce high-quality, unbiased evidence to inform health care decisions. We are currently working on several projects to improve our services and to make it easier for you to find the information you need.

Search

Search

Search

Search

Search

Search

The Cochrane Collaboration is a network of health researchers working together to produce high-quality, unbiased evidence to inform health care decisions. We are currently working on several projects to improve our services and to make it easier for you to find the information you need.

SEARCH RESULTS

Cochrane Collaboration
Search results

Cochrane Collaboration
Search results

Search

Search

Search

The Cochrane Collaboration Cochrane Reviews

Search Reviews

Advanced search

Explore

New + Updated

Other languages

Full Text: [The Cochrane Library](#)

Search & filters

by topic

Full list of all reviews

by country of author

by date range

Auto summaries | Evidence for summaries | Cochrane Methodology Abstracts

Home

Cochrane reviews

Search & filters

Auto summaries

Custom

Other topics

The Cochrane Library

News

Events

Training resources

About us

Search abstracts & summaries

Local full-text reviews

Search Reviews

Browse abstracts & summaries

- By topic (according to Cochrane Review Group)
- Full list of all reviews (alphabetical list by title)

Special collections

- New reviews and full-text reviews from the current issue
- Updated reviews and full-text reviews from the current issue
- Review groups
- Country of author

Special collections

- Audio summaries of selected reviews (Podcasts from The Cochrane Library)
- Evidence and summaries resources for non-IT systems and other non-IT users (evidence)
- Cochrane Methodology Abstracts

Other languages

- Abstracts in Spanish (from the Evidence Cochrane Title)
- Summaries in German (from the Evidence Cochrane Title)

View full-text reviews

There are several ways to access the full-text reviews in The Cochrane Library, published and hosted by Wiley InterScience, including subscriptions, pay-per-view access, and individual downloads of individual reviews.

Find out how to access The Cochrane Library for more information. If you already have access, you can begin searching.

For all information on subscriptions and for technical enquiries, please contact the Wiley InterScience Customer Support.

Closed reduction methods for treating distal radial fractures in adults

- Handoll and Madhok
- 2003 (updated 2007)
- 3 trials
- “There is **insufficient evidence** for comparisons tested within randomized controlled trials to establish the relative effectiveness of different methods of closed reduction used in the treatment of displaced fractures of the distal radius in adults.”

Conservative interventions for treating distal radial fractures in adults

- Handoll and Madhok
- 1999 (updated 2005)
- 37 trials
- “**Not enough evidence** to tell what type of non-surgical treatment is best for treating a broken wrist.”

Surgical interventions for treating distal radial fractures in adults

- Handoll and Madhok
- 2001 (updated 2003)
- 48 trials
- 25 treatment comparisons
- “**Not enough evidence** to tell when surgery, or what type of surgery, is best for treating a broken wrist.”

Percutaneous pinning for treating distal radius fractures in adults

- Handoll, Vaghela, and Madhok
- 2007
- 13 trials
- 25 treatment comparisons
- “Though there is **some evidence to support its use**, the precise role and methods of percutaneous pinning are not established. The higher rates of complications with Kapandji pinning and biodegradable materials casts some doubt on their general use.”

External fixation versus conservative treatment for distal radial fractures in adults

- Handoll, Huntley, and Madhok
- 2007
- 15 trials
- “There is **some evidence** to support the use of external fixation for dorsally displaced fractures of the distal radius in adults. There is **insufficient evidence** to confirm a better functional outcome, external fixation reduces redisplacement, gives improved anatomical results and most of the excess surgically-related complications are minor.”

Different methods of external fixation for treating distal radius fractures in adults

- Handoll, Huntley, and Madhok
- 2008
- 9 trials
- “There is **insufficient robust evidence** to determine the relative effects of different methods of external fixation. Adequately powered studies could provide better evidence.”

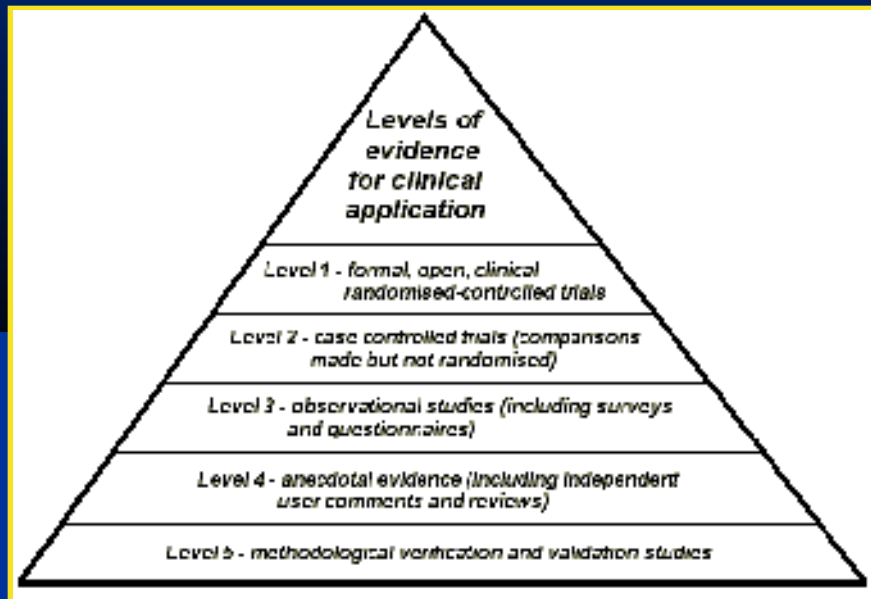
Bone grafts and bone substitutes for treating distal radial fractures in adults

- Handoll and Watts
- 2008
- 10 trials
- “Bone scaffolding **may improve anatomical outcome** compared with plaster cast alone but there is **insufficient evidence** to conclude on functional outcome and safety; or for other comparisons.”

Rehabilitation for distal radius fractures in adults

- Handoll, Madhok, and Howe
- 2002 (updated 2006)
- 15 trials
- “The evidence from randomized controlled trials is **insufficient** to establish the relative effectiveness of the various interventions used in the rehabilitation of adults with fractures of the distal radius.”

Level 1 Evidence



reproducible



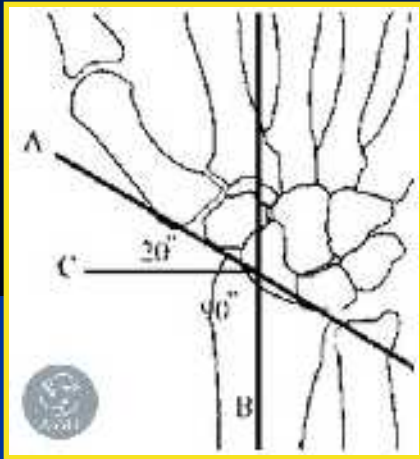
Goals of Treatment

- Goals
 - General functional outcome correlates with maintenance/restoration of normal distal radial morphology
 - Physiologic age significant factor in the above
 - Digital stiffness correlates with poor functional outcome

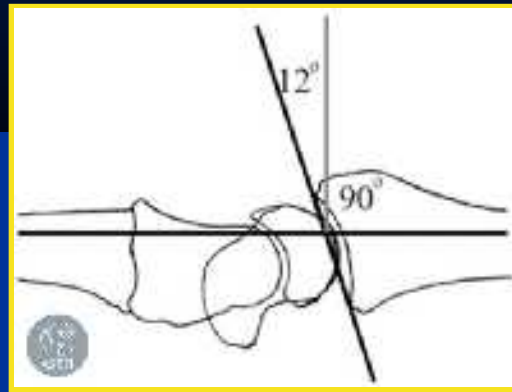
Goals of Treatment

Restore Normal Anatomy

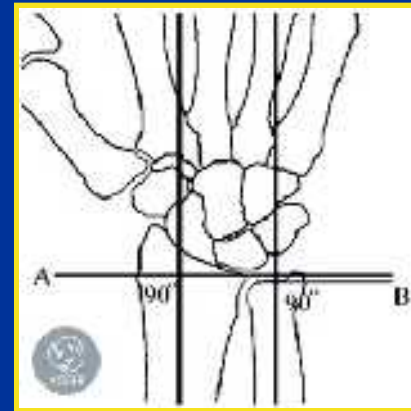
Angular alignment



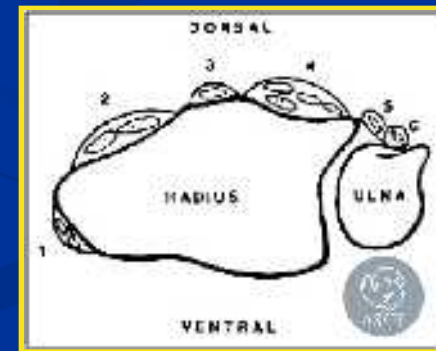
Radial inclination
20 degrees



Volar tilt
12 degrees



Radial length
+/- 2 mm



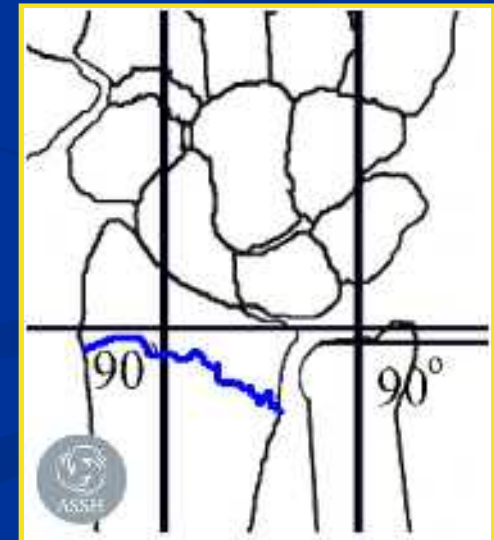
Restoration
of DRUJ

Goals of Treatment

- Radiographic Goals
 - Intra-articular step-off (**B**)/gap (**A**)
 - Restoration of articular congruity ≤ 2 mm
 - Significant (>2 mm) stepoff \rightarrow radiographic evidence of post-traumatic arthritis
(*Knirk and Jupiter, JBJS 1986*)
 - Radial length (**C**) within 2 mm of normal
 - Dorsal tilt, neutral to no more than 10°



B



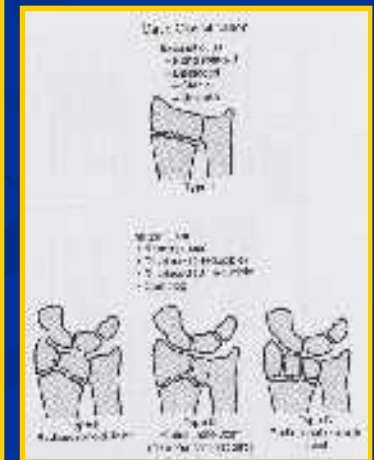
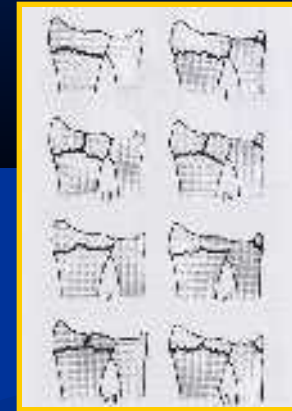
C

Goals of Treatment

- Treatment Recommendations
 - Must be individualized
 - Physiologic age
 - Individual needs
 - Medical co-morbidities
 - Primary decision – non-operative
vs. operative treatment

Classification of Distal Radius Fractures

- Classification Schemes
 - Allow comparison of fracture types for outcome studies
 - Generally do not guide treatment
 - Many cumbersome
 - Inter-observer variability common
- Common schemes
 - Eponymic: Colles, Smith, etc.
 - Frykman (8 types)
 - Melone (4 types)
 - Intra-articular fractures only
 - AO (27 types)
 - McMurtry and Jupiter (5 types)
 - Universal (9 types)
 - Fernandez (5 types)



Intra-articular Fractures

- Intra-articular
 - Non to minimally displaced
 - **Radial styloid fracture**
 - Associated injuries
 - SLIOL Tear
 - Perilunate dislocation
 - Scaphoid fracture



Intra-articular Fractures

- Intra-articular
 - Impaction/axial load
 - Pattern varies
 - Typically 3 major fragments
 - Radial styloid - 1
 - Dorsal portion of lunate facet – 2 (*die punch fragment*)
 - Volar Portion of lunate facet - 3
 - Comminution varies
 - Angle of impact
 - Energy imparted
 - Quality of bone



Radiographic Evaluation

- Standard AP and lateral radiographs
- Oblique radiographs
 - Evaluate for non-displaced fractures not visualized on the AP and lateral views



Radiographic Evaluation

- Evaluation
 - Tilt views – improve assessment of articular surface
 - Lateral elevated 20°
 - PA elevated 10°



AP view



AP tilt view



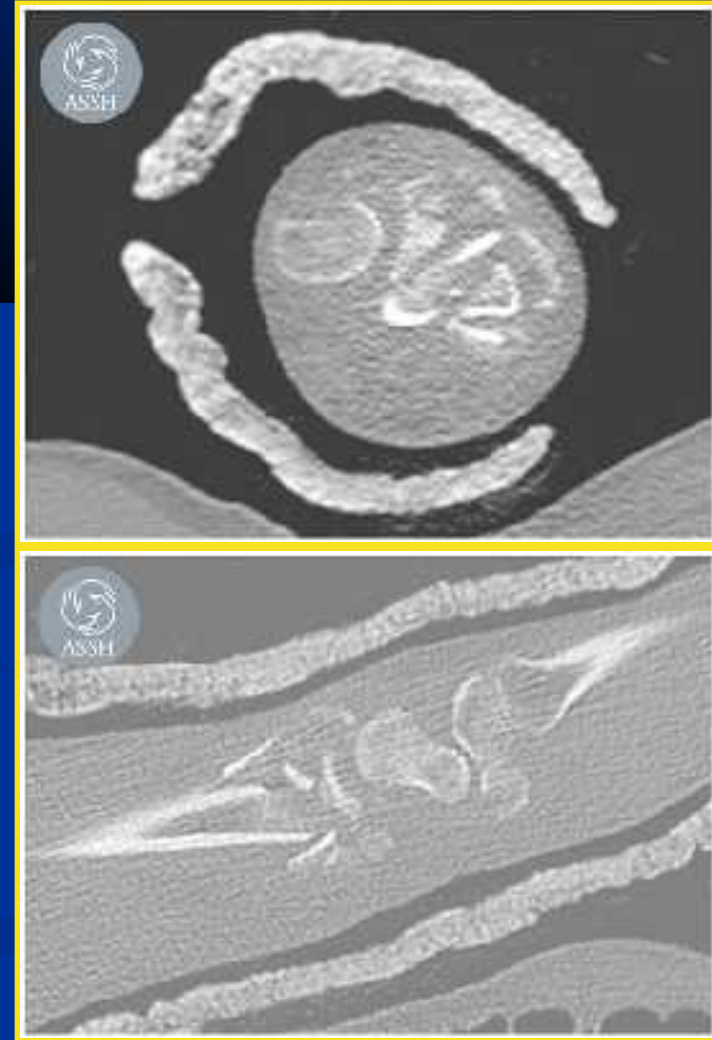
Lateral view



Lateral tilt view

CT Scans

- Evaluation
 - 2-D CT
 - More accurate than plain film x-rays in identifying:
 - Radio-carpal extension
 - Articular gap and step off
 - Comminution, metaphyseal defects



3D CT Scans

- 3-D CT
 - Improved reliability determining:
 - articular comminution
 - number of fragments
 - Reconstructions performed on pre-existing 2-D CT films



Operative Treatment

- Options

- Closed reduction and percutaneous pinning (CR/PP)
- External fixation (Ex-Fix)
- Arthroscopically assisted reduction
- Open reduction internal fixation (ORIF)
 - Dorsal approach/ plate
 - Volar approach/ plate
 - Fragment specific fixation
- Combination of above

Closed reduction and percutaneous pinning (CR/PP)

- Indications
 - Isolated radial styloid fracture
 - Extra-articular fractures
 - Minimal comminution
- Intrafocal vs. extrafocal pinning
 - Intrafocal - pins placed in fracture site
 - Extrafocal- pins used to pin fragment(s) to metaphysis
- Requires supplemental casting
- Pins removed in office @ 6 weeks



External fixation (Ex-Fix)

- Indications
 - Displaced fractures
 - Comminution (intra-articular)
 - Able to achieve satisfactory reduction via closed or percutaneous means
- Fixator may be used as a neutralization device
- **Must** be supplemented with percutaneous pinning or limited internal fixation
- Open approach to pin placement recommended



External fixation (Ex-Fix)

- Usually removed at six weeks
- Advantages
 - Less invasive
 - Excellent stability
 - Neutralizes deforming forces
 - Relatively simple
- Disadvantages
 - Bridging Ex-Fix prevents wrist motion until removal
 - Overdistraction may produce wrist stiffness
 - Extreme position may promote
 - Extrinsic tightness
 - Carpal tunnel syndrome
 - Pin track infections



Arthroscopically Assisted Articular Reduction

- Evaluate/ manipulate articular surface in conjunction with
 - Percutaneous pinning with or without external fixation
 - Limited open procedures
- Best done within the first few weeks



Lunate facet fx - 6 R portal Post arthroscopic assisted reduction

Volar Buttress Plate

- Plate supports volar margin fractures
- Relies on solid screw fixation at uninvolved radial shaft
- Primarily indicated for partial articular fractures of the volar rim (volar Barton)
- Screw fixation at the metaphysis is optional and not always reliable



Dorsal Buttress Plate

- Plate resists dorsal displacement of dorsally displaced fractures
- Allows buttressing of dorsal articular fragments
- Dorsal approach through 3rd dorsal compartment
- Allows limited visualization of articular surface with concomitant arthrotomy
- May irritate extensor tendons
 - Associated tendon rupture
 - May require late plate removal



Volar Fixed-Angle Locked Plates (VFAP)

- VFAPs - introduced 2000
- Precontoured
- Facilitates application
- Template for fracture reduction
- Low profile devices
 - Threaded guide holes in transverse part of plate
 - Threads oriented to match tilt and inclination of normal articular surface



Volar Fixed-Angle Locked Plates (VFAP)

- Theoretical advantages of VFAP
 - Avoid zone of dorsal comminution leaving its blood supply undisturbed
 - Fewer soft tissue complications
 - tendon irritation and rupture
 - Soft tissue flexor tendon protection provided by:
 - concave surface of the volar distal radius
 - terminates at the volar lip- watershed line
 - pronator quadratus muscle

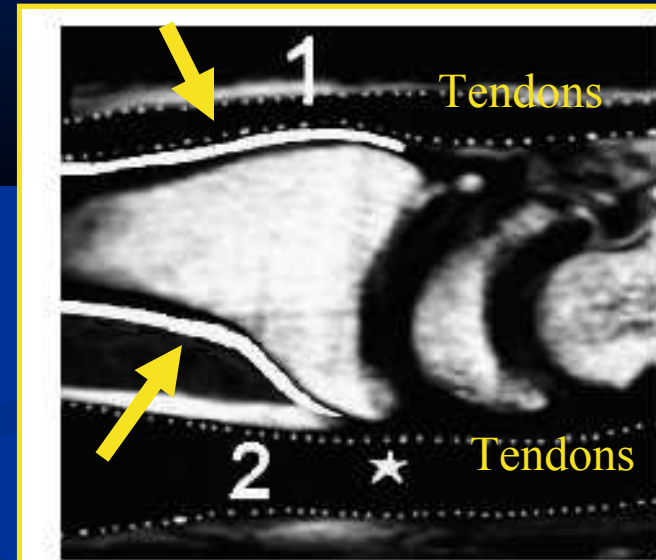


Fig 1A-B. (A) The extensor tendons run in intimate contact with dorsal plates. The flexor tendons only approach the volar radius at the watershed line (*). (B) Magnetic resonance imaging shows the flexor tendons are well separated from volar plates. The best location for the application of fracture implants is the volar aspect of the distal radius. Reprinted from Orbay J. Volar plate fixation of distal radius fractures. *Hand Clin.* 2005; 21:347-354 with permission from Elsevier.

Volar Fixed-Angle Locked Plates (VFAP)

- Subchondral position resists/blocks redisplacement of articular surface
- May allow limited purchase of dorsal cortical fragments
- Generally stable fixation which may allow early range of motion
- Relies significantly on fluoroscopy to evaluate articular surface and screw or peg placement



Volar Fixed-Angle Locked Plates (VFAP)

- Stable fixation:
 - Distal peg placement adjacent to the subchondral bone (within 2 mm)
 - Cortical screw purchase in diaphyseal bone proximally



Volar Fixed-Angle Locked Plates (VFAP)

Site of Best Fit Varies



Zimmer

Synthes JA

Hand Innov

Trimed

Acumed

Hand Innov

Synthes EA

0.31 mm
distal

0.7 mm
proximal

DVRAW
1.07 mm
proximal

1.1 mm
proximal

1.51 mm
proximal

DVRAN
1.68 mm
proximal

4.69 mm
proximal

Volar Fixed-Angle Locked Plates (VFAP)



Volar Fixed-Angle Locked Plates (VFAP)

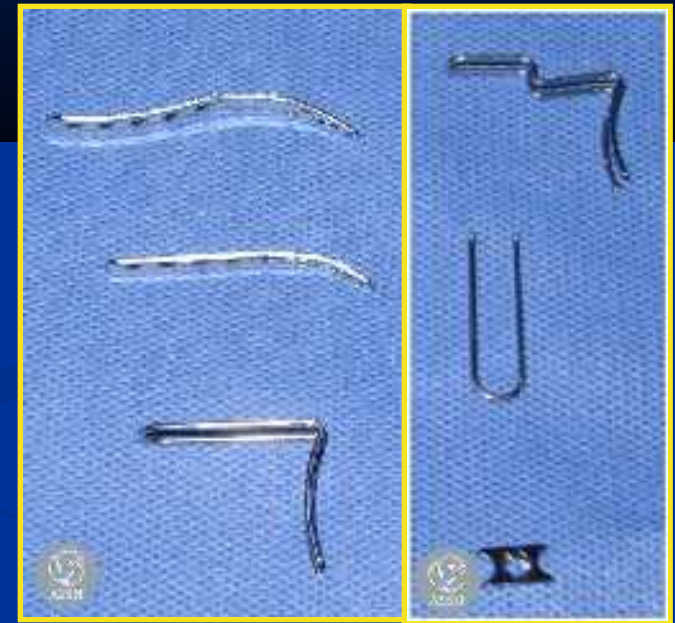


Fragment Specific Fixation

- System of small internal fixation devices to address specific

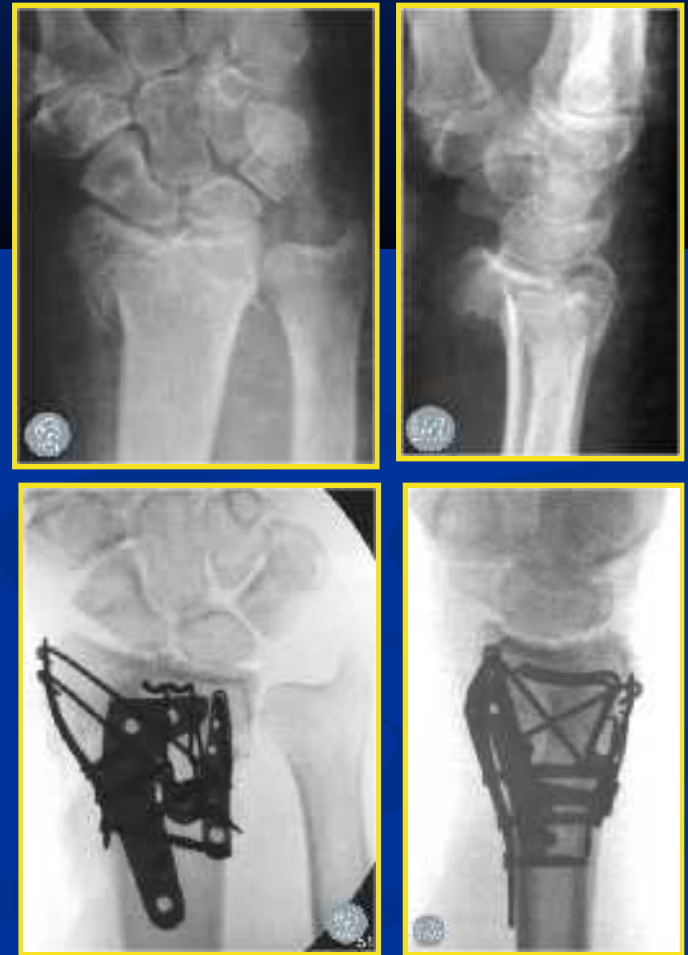
components of distal radius fractures

- Utilizes combination of pins, buttress plates, screws, wire forms and bone grafts
- Utilizes multiple small incisions
- Elements of system utilized varies from case to case depending upon fracture pattern
- Main advantage is the ability to obtain and maintain stable articular reduction
- Relies heavily on fluoroscopy



Fragment Specific Fixation

- Generally excellent stability allowing early range of motion
 - Learning curve
 - Steep
 - Technique somewhat tedious



What's the best way to treat distal radius fractures?

- No clear data
- Patient dependent
- Fracture dependent
- What works the best for you