Fractures of the distal radius
Aims

- History of fracture treatment
- Literature supporting current treatments
- Classification
- Clinical case discussions
- Surgical approach
History of distal radial fracture

- Petit - 1723
- Clause Pouteau – 1783
- Abraham Colles – 1814
the doctor to guard against the carpal end of the radius being “drawn back”. He recommended that an assistant should hold the limb in a position half-way between pronation and supination and that the reduction should consist of a transverse compression on the anterior surface of the limb. He then applied a tin splint, formed to the shape of the arm,

• “The practitioner can reassure themselves that despite the deformity the injury is easily treated with no long term loss of function.”
• Robert William Smith – 1847
• Alonzo Ferdinand Carr - 1879
• Willenegger and Guggenbühl in 1959 – static fixation

• Kapandji dynamic method 1967 – 10% incidence of volar displacement
Combined Kirschner wire fixation in the treatment of Colles fracture
A prospective, controlled trial

- Strohm 2004 – improved stability with combined method utilising 3 or more k wires
- “A good method for treating extra-articular fractures or simple intra-articular fractures”
• They are not load bearing and are reliant on cortical contact to prevent shortening + and intact metaphyseal segment

Hence poor results for complex intra-articular fractures or those with metaphyseal comminution.
• Advent of internal fixation 1970-80
  – Volar buttress plate + dorsal plate
• Relatively high complication rate including extensor tendon attrition / extensor tendon rupture
• High rate of displacement in comminuted fractures / osteoporotic bone
• External fixation +/- augmentation – better radiological result in medium term follow up + rigidity in cadaveric studies.
• However no good evidence to support improved functional long term outcome over K-wiring alone.
• Higher incidence of pain + stiffness in early phase including CRPS
• ? Due to overdistraction
• 2000 – Advent of distal radial locking plates – low profile / pre-contoured / fixed angle devices
• $250 million annual market in US
• 30 devices available
• Why the change in treatment despite no level I-II evidence to support it?
Changes in fracture pattern

• Mortality after wrist fracture is the same if not better than normal population
• Risk of hip fracture after wrist fracture nearly 2 fold in women. 3 fold in men

• ACTIVE ELDERLY POPULATION WITH HIGHER INCIDENCE OF OSTEOPOROTIC WRIST FRACTURES.
Increased understanding of radio-carpal function

• McQueen JBJS 1988 – significantly worse function if dorsal angulation >12 degrees or radial shortening > 10mm

• This correlates with more recent biomechanical studies.
• Associated injuries - 63% suffer TFCC tears / 32% scapho-lunate ligament rupture + 17% luno-triquetral tear with hyperextension injuries

Pechlaner


• Articular step-off > 1mm leads to significantly decreased SF-36 score at 2 years

Fernandez

• DRUJ instability leads to poorer outcome
• Instability unlikely with anatomically reduced fractures.
• Higher risk particularly with shortening
• Lateral column – osseous buttress
• Intermediate column – load transmission
• Lateral column – axis for forearm rotation + post for secondary loading.
Plate design

- Lower profile with variable axis for locking screws to allow fragment capture
- Placement of screws >4mm from subchondral bone halves force required for pullout

Drobez
Evidence for fixation

- Multiple case series / reports demonstrating good – excellent results of complex injuries with plates

- Intra-articular fractures – ex fix + k wires radiologically significantly better outcome than POP alone.


• Intra-articular fractures – better radiographic outcome at short to medium term with plate compared to external fixation


• Complex intra-articular fractures- better load tolerance of plate fixation vs augmented ext fixation

Meta-analysis 2005 – no evidence to support plate fixation over ext. fixation for complex intra-articular fractures

Margaliot  *The Journal of Hand Surgery, Volume 30, Issue 6, Pages 1185.e1-1185*
## Classification

### Frykman

- Descriptive only and does not include variables, such as direction and degree of displacement or comminution.

<table>
<thead>
<tr>
<th></th>
<th>Description</th>
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<tbody>
<tr>
<td>1 and 2</td>
<td>Extra-articular fracture ± distal ulna fracture</td>
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<tr>
<td>3 and 4</td>
<td>Intra-articular fracture involving the radiocarpal joint ± distal ulna fracture</td>
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<tr>
<td>5 and 6</td>
<td>Intra-articular fracture involving the DRUJ ± distal ulna fracture</td>
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<tr>
<td>7 and 8</td>
<td>Intra-articular fracture involving the RC and DRUJ ± distal ulna fracture</td>
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### Melone Classification

- Sub-types of 4-part intra-articular fractures
- Gives some indication to treatment

<table>
<thead>
<tr>
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<tbody>
<tr>
<td>1</td>
<td>Minimal comminution - stable</td>
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<tr>
<td>2</td>
<td>Die-punch. Comminuted unstable, dorsal or volar. 2a reducible, 2b irreducible</td>
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<tr>
<td>3</td>
<td>Spike. Displacement of medial complex as a unit + volar spike</td>
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<td>4</td>
<td>Split. Wide separation or rotation of the dorsal fragment + palmar fragment rotation</td>
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<tr>
<td>5</td>
<td>Explosion fracture; severe comminution with major soft tissue injury</td>
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• NB Chauffeurs fracture
  – Scaphoid fracture / SL ligament rupture
Markers of instability

• >10 degrees angulation
• >5mm radial shortening
• >2mm articular incongruity
• Comminution across the midaxial point on lateral radiograph
• > 12 degrees loss of radial inclination
• Comminution of dorsal + palmar cortex
• Irreducible fracture
• Loss of reduction at follow up
Cases
Surgical Approach

• Bed of FCR
• To aid reduction
  – Patient positioning
  – Open fracture site remove soft tissues
  – Release brachioradialis to expose 1\textsuperscript{st} dorsal compartment
  – Consider lamina spreader in radio – ulnar junction / external fixator
Radial Styloid - junction of EPB / EPL

– Beware superficial branch of radial nerve
• Dorsal approach through 3rd / 4th dorsal compartment
  – Incise retinaculum / mobilise EPL
• Ulnar styloid – direct approach
  – Beware superficial ulnar nerve