Immediate Motion of Intra-articular Fractures of the Distal Radius with Fragment Specific Fixation

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The devices shown in this presentation are approved by the FDA
Comminuted intra-articular fractures of the distal radius occur in patterns that contain a subset of 5 major cortical fragment components.

Treatment of these injuries should obtain anatomic restoration of the articular surface with minimal disruption of the soft tissue envelope. Fixation should provide enough stability to allow immediate mobilization of the joint.

Optimal fixation is achieved with implants that are specifically designed for each fracture component.
Fracture Components of Distal Radius Fractures

- Dorsal wall
- Radial column
- Ulnar corner
- Intraarticular
- Volar rim
Challenge of Distal Radius Fixation

- Fractures of the distal radius present a unique set of fixation issues and differ from most other sites.
- Distal fragments are periarticular and extremely small.
- The proximity to a tight network of tendons and retinacular sheaths precludes the use of bulky plates.
- Distal fragments are too thin to provide adequate thread purchase for bone screws.
- The mere creation of holes for bone screws in distal fragments can result in iatrogenic comminution.

The traditional plate and screw approach is not the answer for distal radius fractures!
Fragment specific approach

TriMed® Wrist System

• Specific implants are designed for each of the 5 cortical fracture elements.
• Fixation is always based on adjacent **ipsilateral** cortex.
• Fixation elements are symbiotic and multi-planar, creating rigid load sharing construct with small flexible implants.
• All implants are extremely low profile distally.
• Fixation stable enough to allow immediate motion post-operatively.
• Technique uses limited exposure, minimal soft tissue dissection.
Radial column fragment

“Keystone of fixation”

- Largest and strongest fragment
- Deforming pull of brachioradialis
- Orthogonal tricortical surface
- Restoring radial length supports proximal carpal row – unloads lunate facet
Pin plates for radial column and ulnar corner

- Pin plate does not function like a standard plate; instead, it provides a second point of fixation that greatly increases the rigidity of a transstyloid and ulnar corner K-wire.
- Distal pin holes are cut with a laser to allow range of pin insertion angles.
- Hooks are created in pins and impacted into adjacent hole resulting in an extremely low profile implant.
- Bone screws only placed proximally into adjacent ipsilateral cortex.
- Plate also functions as buttress, creating interfragmentary compression.
Wire forms: Dorsal wall, intraarticular, and volar rim fragments

- Four wire forms for fixation of periarticular and completely articular fragments
  - Small fragment clamp
  - Buttress pin
  - Combination small fragment clamp/buttress pin
  - Volar buttress pin
- Fixation to adjacent ipsilateral cortical bone of proximal fragment with bone screw and washer
- Low profile distally
Wire form example

Pre-op:
Radial column, dorsal wall, ulnar corner and volar rim

Post-op:
Treated with radial pin plate, ulnar pin plate, small fragment clamp (dorsally), and volar buttress pin (volar fragment). Patient able to return to work on computer at 1 week and do normal ADLs without cast.
Volar buttress plate (L-plate)

- Simple buttress plate for volar rim fractures
- Inserted through same limited volar incision as radial pin plate
- Proximal bone screw fixation along subcutaneous radial border
Case example 1: Combined axial load and bending mechanism

Pre-op:
Radial column, dorsal wall, and ulnar corner injury in an active patient. Notice articular stepoff between ulnar corner and radial column seen on the AP view, and dorsal wall fragment visible on lateral film.
Post-op:
Treatment consists of 3 hole radial pin plate, 3 hole ulnar pin plate, dorsal wire form and bone graft. Patient was allowed to mobilize wrist, forearm and fingers immediately after surgery.

Clinical appearance at final follow-up 5 years later shows normal cosmesis. Patient had full range of motion, normal grip strength, and normal function.
Complete fragmentation example 2

Pre-op:
Open radial column, dorsal wall, ulnar corner, volar rim, and impacted articular fragment injury from axial loading mechanism.

Post-op:
Treatment consists of 5 hole radial pin plate, 3 hole ulnar pin plate, dorsal wire form, volar L-plate and bone graft.

10 day appearance of wrist shows the two small incisions. Patient is able to use the extremity to dress, eat, and do normal ADLs. No cast immobilization was used.
Cortical fragmentation example 3

Pre-op:
Closed radial column, dorsal wall, ulnar corner, and volar rim fragment injury from axial loading mechanism. Inadequate reduction despite casting in extreme position.

Post-op:
Treatment consists of 5 hole radial pin plate, 5 hole ulnar pin plate, dorsal wire form, volar L-plate and bone graft.

10 day appearance of wrist again shows the two small incisions. Patient had returned to work as a typist and was quite pleased with the rapid return to function.
Cortical fragmentation example 4

Pre-op:
Comminuted fracture demonstrates radial column, ulnar corner and volar rim fragments. Not well visualized is the dorsal wall fragment which was evident at time of surgery.

Post-op:
Treatment consists of 5 hole radial pin plate, 5 hole ulnar pin plate, dorsal wire form, volar L-plate and bone graft.

Particular note is made of the need to apply graft both to the dorsal metaphyseal defect as well as the radial column defect.
Clinical data 2001

- 73 patients
  average F/U 2.8 years (.6 to 5.3 years)
- Average age 54 ± 16 years (range 14 - 82)
- 4:3 female / male
- 2:1 left / right
- Fracture type:
  A3 -- 3
  C1 -- 2
  C2 -- 6
  C3 -- 62

3 scapholunate tears, 1 scaphoid fx
## X-ray parameters

<table>
<thead>
<tr>
<th></th>
<th>Injury</th>
<th>Postop</th>
<th>Union</th>
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<tr>
<td>Radial inclination</td>
<td>9°</td>
<td>26°</td>
<td>27°</td>
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<tr>
<td>Volar tilt</td>
<td>-20°</td>
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<tr>
<td>Ulnar variance</td>
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<tr>
<td>Articular incongruity</td>
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<td>AP distance</td>
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<td>19 mm</td>
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</tbody>
</table>

Radiographic union: 71/73 by 2 month, all healed by 3 months
Contraindications

- Severe osteoporosis
- Fractures extending proximally
- Completely non-compliant patient
TriMed® Fragment specific approach

Advantages:

• Restores articular congruency
• Extremely accelerated recovery time
• Immediate joint mobilization
• Low morbidity
• Minimal postoperative care
• Very happy patients
TriMed® Fragment specific approach

- Technically demanding procedure
- Requires training and development of new surgical skills
- More time spent with initial treatment

Take a training course before you try it!