Objectives
Anatomy Essentials
Ulnar sided wrist pain
• ulnar negative variance
• ulnar positive variance
Salvage Procedures

DRUJ
distal radioulnar joint
Formed by sigmoid notch on radius with ulnar head
Axis of rotation longitudinal from head of radius proximally to ulnar head distally
In pronation the radius rotates around the ulna

DRUJ
At extremes of pronation & supination, there may be as little as 2mm, or < 10%, articular contact between radius & ulna

DRUJ and TFCC

TFCC
Triangular Fibrocartilage Complex
Intrinsic Stabilizers of DRUJ

- Joint capsule
- Ligamentous attachments include
  - Dorsal ulnolunate
  - Dorsal ulnotriquetral
  - DOB

Extrinsic stabilizers of DRUJ

1. Tendon of ECU
2. Sixth dorsal compartment subsheath
3. Pronator quadratus
4. Interosseous ligament

ECU only motor unit w/ a relationship to the TFCC
- Tendon sheath blends with TFCC
- ECU held close to center of rotation of wrist by the TFCC
- TFCC is an important pulley for the ECU
- Disruption of the ECU may contribute to abnormal loading & force transmission through TFCC

Pronator Quadratus

- Some texts describe a 2-headed composition
- Medial & anterior surface of ulna
- Lateral & anterior surface of radius
- Only muscle that attaches to radius at one end & ulna at the other
- Activation of PQ may contribute to ulnar impingement syndrome

The Interosseous Membrane

- Combination of ligaments and membranes
  - 3 portions: proximal, middle, distal
- Distal 3 ligaments in constant tension during f/a rotation
- Central band (CB) widest, stoutest
The Dorsal Oblique Bundle

- Distal 3 ligaments in constant tension during flexion/extension rotation
- Dorsal oblique bundle (DOB) has continuity with fibers of TFCC
  - DOB present in 40% population
  - Possible secondary stabilizer of the DRUJ

Functions of TFCC

- Stabilizes the DRUJ and separates it from the carpus
- Provides a continuous gliding surface across the entire distal face of the 2 forearm bones for flexion-extension and translational movements
- Provides a flexible mechanism for stable rotational movements of the radiocarpal unit around the ulnar axis
- Suspends the ulnar carpus from the dorsal ulnar face of the radius
- Cushions the forces transmitted through the ulnocarpal axis
- Solidly connects the ulnar axis to the volar carpus

Pronation

- Sigmoid notch migrates volarly to <10% articular contact
- Superficial dorsal fibers ineffective in pronation
- Deep palmar ligamentum subcruentum tightens

Supination

- Sigmoid notch migrates dorsally to <10% articular contact
- Superficial palmar fibers ineffective in supination
- Deep dorsal ligamentum subcruentum tightens

The deep RUL are considered more important to the stability of the DRUJ than the superficial ligaments

Ulnar sided Wrist Pain

Many causes:
- instabilities
- ulnar abutment
- degeneration
- fractures
- tendinitis
- nerve compressions

Instabilities

Can include: DRUJ, LT joint, mid carpal joint, ulnar carpal joint, and at ECU

DRUJ instabilities-
- prominent ulnar head,
- S shaped wrist,
- (+) Piano Key Sign,
- (+) Ulnar Compression Test,
- (+) Piano Key Test.

Treated with orthosis or surgery

Ulnar Variance

Describe the articular relationship between the radius and ulna

Ulnar variance is the distance that the distal articular portion of the ulnar head stops proximally (-) or extends distally (+) compared to the articular surface of the radius

Loads through the radius or ulna are altered
Negative Ulnar Variance
Associated with Kienbock’s disease (AVN of lunate) due to 100% stress through the radius
Unknown etiology: poor vascularity, trauma, (-) ulnar variance
Mostly in 30-40 y/o
4 Stages of Kienbock’s:
1. linear compression fx of lunate
2. abnormal density, but no lunate or carpal collapse
3. lunate collapse
4. extensive arthritic changes

Treatment of Kienbock’s disease
STT fusion
Radial shortening
Ulnar lengthening
Vascularized bone graft to lunate
Capitate shortening with intermetacarpal artery (HORI proc)
Various salvage procedures for Stage IV (PRC, TWA, denervation)

Ulnar Abutment Syndrome
(-) ulnar variance
AKA-impaction/loading/impingement
Can be caused by malunited radial shortening or DRUJ ligament injury
Increased stress on lunate and triquetrum
Associated with:
TFCC degeneration
LT tears
DRUJ ligament tears

TFCC Lesions
(Performer Classification)
Class 1: Traumatic
A. Central perforation
B. Ulnar erosion
Without distal ulnar fracture
Without distal ulnar fracture
C. Ulnar erosion
D. Radial erosion
With segmental scaphoid fracture
Without segmental scaphoid fracture
Class 2: Degenerative (ulnocarpal abutment syndrome)
Stage:
A. TFCC tear
B. TFCC tear
Lunate and/or ulnar chondromalacia
C. TFCC perforation
Lunate and/or ulnar chondromalacia
D. TFCC perforation
Lunate and/or ulnar chondromalacia
L-T ligament perforation
E. TFCC perforation
Lunate and/or ulnar chondromalacia
L-T ligament perforation
Unicarpal arthritis

TFCC Lesions
Central compared to Periphery
80% central, 20% periphery
Central tears usually not repairable due to poor vascularity
Central tears are usually degenerative in nature
Tears on the periphery are repairable

TFCC Diagnosis
Classic symptoms are ulnar sided wrist pain that is associated with popping or clicking
Palpable tenderness over the TFCC
Combined ulnar deviation and pronation/supination will produce popping or clicking and reproduce the patient’s pain
"Press Test" in which the patient is asked to lift himself out of a chair bearing weight on extended wrists has been shown to have 100% sensitivity for detecting tears
**TFCC Clinical Presentation**

Common Complaints: decreased strength and pain at limit

Pain with rotation usually denotes DRUJ involvement

Pain w/ UD suggests TFCC pathology or ulnar impaction

(+) Fovea Sign/Sulcus Sign

(+) TFCC Load Test

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**GRIT**

gripping rotatory impaction test

**Used to test for ulnar abutment**

Three forearm test positions (neutral, supination, pronation)

Expressed as ratio:

supination strength/pronation strength

1.0= normal

>1.0= possible ulnar impaction

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**Treatment for Ulnar Impaction**

Ulnar shortening osteotomy if radial articular alignment is good

Corrective radial osteotomy if significant malalignment of radius present

Darrach

Radial lengthening

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**Conservative Treatment for Central TFCC tear**

- 0-6 weeks
  - Splinting in a long arm cast or splint with the elbow in 90° flexion and the forearm neutral for 0-6 weeks to reduce the symptoms
  - 6 weeks
  - Active and active-assistive ROM exercises are initiated to the wrist and forearm 6 times a day for 10 minute sessions. A wrist immobilization splint is fabricated for comfort and protection.
  - 8 weeks
  - If patient is asymptomatic, progressive strengthening to the hand and wrist, avoiding a torsion load at the wrist.
  - If the patient's symptoms are not alleviated in 4-6 weeks surgical repair or debridement is suggested.

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**Treatment Guidelines for Debridement of TFCC Central tear**

POD 3-5: control edema, protect, minimize deconditioning.

AROM for wrist and forearm 6-8x/day x 10 min. Volar wrist splint between exercise bouts and night for comfort

No impact loading.

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Post op day 10-14: Control edema and pain, continue to protect repair, continue to minimize deconditioning.

Begin scar management within 48 hours of suture removal

Initiation of active-assistive ROM for wrist and forearm

Week 3-4: Control edema and pain, improve ROM. Passive ROM of wrist and forearm may be initiated. Dynamic wrist splinting may be initiated to improve ROM. Weighted wrist stretches may be initiated to increase ROM

Week 6+: Continue with ROM gains. Begin strengthening. Progressive strengthening may be initiated if patient is pain free. This may include using putty or a hand exerciser and progressing to hand weights. The wrist immobilization splint may be discontinued if the patient is asymptomatic. Gradual return to normal ADLs
TFCC-Peripheral Repair

Week 1: edema control. Patient remains in bulky post-op dressing

Week 2: edema and pain control. Long arm orthosis w/ elbow 90 deg and neutral wrist. Aromi/prom for wrist and digits. Isometrics for forearm/hand 10 reps x 4x/day. Low grade isotonic (lightest putty) Light ADLs (< 5#)

Week 3-6: edema and pain control. Increase ROM. Begin scar management. Improve strength. DC splint (unless painful). Isotonic exercise up to 10# max for upper arm, forearm. Weighted stretches <5# 3-4x/day x 20 min. ADLs <10#

Week 6-10: continue to improve ROM and strength. Simulate work requirements. Dynamic splinting pm.

TFCC Repair with Ulnar Shortening (USO)

Initially immobilize then mobilize following TFCC repair guidelines

Treated as fracture- depends on fixation type

Avoid gripping in pronation and resisted supination/pronation

Surgical Procedures – for Ulnar Impaction and DRUJ Instability

Salvage Procedures

Darrach/Distal Ulna Resection
Suave-Kapandji/Distal Radioulnar Fusion w/ Proximal Pseudoarthrosis
Hemi-resection Interposition (Bower’s)
Intercarpal Arthrodesis
STT Arthrodesis
Four Bone Arthrodesis
Proximal Row Carpectomy
Total wrist fusion
Distal ulna arthroplasty

Darrach

Reserved for elderly, less active or RA patients

Resection of distal ulna

Indicated for post traumatic or inflammatory arthritis of DRUJ

Can have problems with ulnar stump instability

Rehabilitation Guidelines for Darrach Procedure

7-10 days: cast then to wrist orthosis
2-4 weeks: exercise bouts for protected mid range motion
4 weeks: wean off orthosis progress to full ROM
4-6 weeks: begin gentle strengthening
Avoid power grip until week 8-12
If unstable: long arm orthosis w/ neutral forearm up to 4 weeks between exercise bouts. Watch for clicking/popping. Wrist strap may be helpful

www.eatonhand.com
Suave-Kapandji

Fusion of the DRUJ & creation of pseudoarthrosis in the distal ulna proximal to the fusion indicated for DRUJ arthritis

Rotation happens at the pseudoarthrosis

Ulnar support for the carpus is preserved, TFCC and ECU remain stabilized

Problem: instability with the ulnar stump (more common when instability is present pre-op)

Rehabilitation Guidelines for Suave-Kapandji

Long arm cast 7-10 days
Munster orthosis with neutral forearm 3-4 weeks if K wires or orthosis depending on fixation
Gentle sup/pron 45 deg
At 4 weeks AROM
At 6 week wean from orthosis
At 6-8 weeks PROM
Wait until fusion is confirmed before strengthening

Hemi-Resection

Involves the resection of only the articulating portion of the distal ulna and interposing soft tissue to prevent radio-ulnar impingement

Indicated for DRUJ arthritis
Does not correct ulnar plus deformity or DRUJ instability

Intercarpal Arthrodesis

Indicated for chronic scapho-lunate instability, lunate AVN, degenerative & traumatic arthritis
Goal to reduce wrist pain and remain durable under stress, maintaining functional ROM

Rehabilitation Guidelines for Intercarpal Fusion

Week 0-4: Casted. Edema control and AROM of uninvolved joints.
Week 4-6: Thermoplastic orthosis (forearm based thumb spica if scaphoid involved). Worn except for bathing
Week 6-8: Begin gentle AROM and gentle isometrics> when x-rays show bony healing can begin strengthening and PROM
Week 8-12: Address adaptive equipment and task modifications
Heavy activity should be avoided x 3 months

STT Fusion

(ScaphoTrapezial Trapezoidal)
Indicated for degenerative arthritis of STT joint, scapho-lunate instability and AVN of lunate
Offers good pain relief while maintaining grip/pinch strength and functional ROM

www.handtherapy.com

www.jaaos.org

www.boneandjoint.org.uk
Rehabilitation Guidelines for STT Fusion

Week 0-4: Short arm thumb spica cast. AROM to uninvolved joints.

Week 4-6: Thermoplastic wrist-thumb orthosis. Maybe a long arm cast to control forearm rotation. Gentle wrist AROM.

Week 6-8: gentle AROM/AAROM progressing to PROM. Isometrics at 6 weeks. At 8 weeks gentle strengthening. Heavy resistance at 12 weeks if solid healing.

Four Bone/Corner Fusion

Indicated for chronic scapholunate instability (SLAC wrist), radiocarpal arthritis from scaphoid non-union, and scaphoid AVN

Removes the scaphoid and fuses lunate, capitate, hamate, triquetrum

Maintains 50% normal ROM and 80% strength of contralateral side

Proximal Row Carpectomy

PRC attempts to convert complex link articulation to simple hinge joint.

Indicted with scaphoid non-union, radioscaphoid arthritis, S-L instability and AVN of lunate or scaphoid

Grip strength reduced due to relative shortening of the wrist/lengthening of extrinsic muscles

Rehabilitation Guidelines for PRC

Week 0-4: Wrist casted 0-10 deg extension. Encourage finger/thumb ROM. Gentle forearm rotation. Edema control.

Week 4-6: Thermoplastic wrist orthosis worn 24/7 except bathing and exercise bouts. Gentle isolated AROM. Avoid composite wrist/finger E/F

Week 6-8: Wean off orthosis. Add AAROM and isometrics.

Month 4-6: Work toward return to work

Total Wrist Fusion

Final procedure as all wrist motions are sacrificed for stability and pain relief.

Supination/pronation are preserved

Indicated for post traumatic arthritis, failed carpal fusions, and RA

Rehabilitation Guidelines

Week 0-4: Immobilized in cast or orthosis x 2-6 weeks until confirmed bony healing. AROM of uninvolved joints. Edema management.

Week 4-6: Edema control, digital ROM, scar management, desensitization, fine motors skills

Week 6-8: Wean off orthosis depending on healing. Continue w/ AROM.

Week 8-12: Light strengthening
Other Salvage Procedures...

Total wrist arthroplasty- used with extreme caution because long term results are not ideal esp for younger more active clients

Distal ulnar implant arthroplasty may be promising- has been shown to have less radioulnar convergence than Darrach or Interposition arthroplasty

QUESTIONS

Thank You

References


