Objectives

Anatomy Essentials
Ulnar sided wrist pain
• Instabilities
• Ulnar variances
• Tendinitis
• Nerve compressions
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

TFCC

Triangular Fibrocartilage Complex

DRUJ and TFCC
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/r rotation
- Central band (CB) widest, stoutest
The Dorsal Oblique Bundle

- Distal 3 ligaments in constant tension during f/a 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

Ulnar sided Wrist Pain

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

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

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

Various Orthoses

Pisiform boost
Wrist brace
custom TFCC brace,
long arm splint/sugar tong/Muenster splint
Ulnar Variance

Describes 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 the 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

Radial shortening
Ulnar lengthening
STT fusion
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 fx, radial shortening or DRUJ ligament injury.

Increased stress on lunate and triquetrum.

Associated with:
TFCC degeneration
LT tears
DRUJ ligament tears

TFCC Lesions (Palmer Classification)

Class 1: Traumatic:
A. Central perforation
B. Ulnar avulsion
C. With articular fragment
D. With sigmoid notch fracture
E. With sigmoid notch fracture

Class 2: Degenerative (ulnar abutment syndrome)

Stage A:
1. TFCC wear
2. TFC perforation
3. Lunate or triquetrum

Stage B:
1. TFCC wear
2. TFC perforation
3. Lunate or triquetrum

Stage C:
1. TFCC perforation
2. Lunate or triquetrum

Stage D:
1. TFCC perforation
2. Lunate or triquetrum
3. L-T ligament perforation
4. Ulnocarpal 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

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

Ulnar Impaction

TFCC Load Test

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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.
  • 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.

Treatment Guidelines for Debridement of TFCC Central tear

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

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

No impact loading.
**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

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**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. Arom/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.

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**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

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**Surgical Procedures – for Ulnar Impaction and DRUJ Instability**

- 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

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**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

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 Interposition

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, scapholunate instability and AVN of lunate
Offers good pain relief while maintaining grip/pinch strength and functional ROM

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/thumb 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
Total Wrist Fusion 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


