Elbow Instability Typically Lateral to Medial:
3 Stages

- Normal
- Stage 1: LUCL failed
- Stage 2: LCCL failed
- Stage 3A: MCL (post)
- Stage 3B: MCL (ant)

Posterolateral Rotatory Instability (PLRI)
O’Driscoll, 1991

Disruption of the Lateral Collateral Ligament Complex
FOOSH Injury
Axial compression
ER/supination
Valgus forces

Clinical Presentation
- History of recurrent painful clicking, snapping, clunking, locking; “giving way”
- History of “sprain”
- Prolonged crutch walking
- ROM and Grip Strength usually normal
- Occurs with extension/slight flexion and forearm partially supinated
- Difficult to compensate for instability
  - Varus stresses on elbow common
  - Shoulder Abduction
- Rule out tennis elbow and posterolateral plica syndrome

Posterolateral Plica Syndrome
Ruch, 2006

Characteristic findings include:
- Painful click or snap with terminal extension and supination in the absence of gross instability.
- Maximal tenderness posterior to lateral epicondyle and centered at posterior radiocapitellar joint.
- Symptoms mimic lateral epicondylitis
- Repetitive microtrauma related to the thickening/fibrosis of plica.
- Instability of the elbow may exacerbate the inflammation, leading to snapping.
- Arthroscopic management may provide a successful treatment option

PLRI and Tennis Elbow

- R/O tennis elbow; UCL attaches to lateral epicondyle
- About 25% of failed tennis elbow surgical cases develop PLRI
  - Iatrogenic injury (Singleton, 2004)
- PLRI with Tennis Elbow; insidious onset
  - Corticosteroids may contribute to degeneration of lateral stabilizing tissues (Kalainov & Cohen, 2005)
Posterolateral Pivot Shift Test

Clinic: apprehension test; both examiner and patient think radial head will sublux

Under anesthesia or local injection: full subluxation

Traditional Lateral Collateral Ligament Test

Not sufficient to test for PLRI
Elbow flexed slightly and varus stress applied by examiner.

Ligament Reconstruction for Chronic Instability

Tendon graft to reconstruct LUCL; typically using the Palmaris Longus; FCR, gracilis, plantaris may be used

Post-operative Referral to Therapy

• Typically one week post-op; range 3 – 10 days post-op if sound reconstruction
• Delayed referral to therapy (2-4 weeks) if tenuous reconstruction suspected

What does therapist need to know at time of initial referral?

Communicate!

• Type of Reconstruction
• Tissue Status
• Other Repairs, e.g. Fractures
• Tension on Ligament Repair
• NV / Medical Complications
• Arc of Motion where Elbow is Stable
• Position of Immobilization
• Type of Orthosis: Static vs. Hinged

Rehabilitation Goals

Optimize elbow motion without risk to ligamentous stability or in other words

Don’t let the elbow get stiff!
Don’t disrupt the reconstruction!

Pain and Edema Control
Early Controlled/Protected ROM
Protective Orthoses
ADLs and Functional Training
Progressive Strengthening
Progressive Return to Function

Monitor for Complications
Typical Post-Op Management for Ligament Reconstruction

- LAS in acute flexion forearm pronated for 2 wks
- Focus on Sagittal Plane Motion
  - Hinge brace for next 6 wks: initially extension is blocked to 60°; then reduced to 45° and 30° at 2 wk intervals; forearm remains pronated or neutral
- Control Shld, Forearm, & Wrist Position to Avoid Tension on Repair

Early Controlled Protected Ext/Flex

- Forearm Neutral
- Forearm Pronated

Early Controlled Protected Pronation/Supination to Neutral

Typical Post-Op Management for Ligament Reconstruction

- Brace removed at 6 - 8 weeks
- Careful Orthotic Intervention for the Stiff Elbow
- Full Extension, supination, and varus forces limited for at least 4 months
- Total Arm Strengthening
  - Rotator Cuff, Scapula Stabilizers, Biceps, Triceps, Deltoid
- Unrestricted activity at 9 months
  - Remember: ligaments taking longer to regain tensile strength and never 100% post-injury

Medial or Ulnar Collateral Ligament Complex

Valgus forces at the medial elbow attenuate the ulnar or medial collateral ligament.

Mechanism of Injury
Common to Overhead-Throwing Athletes

- May be spontaneous failure; “pop”, acute
- Many athletes report vague onset of medial elbow pain; unable to perform at 100% effort
  - ↓ accuracy
  - ↓ velocity
  - ↓ endurance
- Attenuation of anterior bundle of MCL
- Static images rarely diagnostic; stress radiographs or arthroscopy have been used

Diagnosis

- Straightforward if acute injury
- Static images rarely diagnostic
- Stress radiographs or arthroscopy have been used

“Milking Maneuver”

Moving Valgus Stress Test

O’Driscoll, 2005

Traditional Medial Collateral Ligament Test

Not sufficient for unless complete tear.
Elbow flexed slightly and valgus stress applied by examiner.

Unhappy Triad

- Laxity of the medial or ulnar collateral ligament
- Medial Epicondylitis
- Ulnar nerve neuritis
Rehabilitation: initial occurrence of pain

• REST
• Evaluation of throwing technique
• Throwing Program
  • Wilk & Arrigo, JOSPT, 1993
  • Wilk, Clinics in Sports Medicine, 2004


Thrower’s Ten Program: RC Series

Thrower’s Ten Program: Total Arm

Thrower’s Ten Program: Forearm

MCL or UCL Reconstruction

Tendon graft to reconstruct MCL; typically using the Palmaris Longus; Gracilis, F-P muscle splitting

Post-op Rehabilitation Following Repair

• Long Arm Orthosis; acute elbow flexion, neutral forearm
• Edema and pain management
Post-op Rehabilitation Following Repair

- Hinge orthosis for early motion
- Custom or Commercial
  - 1st wk: no motion
  - 2nd wk: 30° – 100°
  - 3rd wk: 15° – 110°
- Full Motion by 6 wks

Post-op Rehabilitation Following Repair

- Management of Stiff Elbow
- Management of Irritable Scar

Elbow Fractures

Represent 6% of all fractures equally split between all 3 bones!

Medical Management of Fractures

- Restore articular congruity
- Stable anatomic reduction
- Stable rigid fixation
- Necessary for Early Active Mobilization

Sylvia Davila, PT, CHT
Ch. 76 in Rehab of the Hand/UE, ed. 5
Ch. 79 in Rehab of the Hand/UE, ed. 6

- Distal Humerus
  - Extraarticular
    - Extracapsular vs. Intracapsular
  - Intraarticular
- Radial Head—Types I, II, III
- Ulna
  - Olecranon—Types I, II, III
- Coronoid—Types I, II
Specific Fracture Management

• Non-operative vs. Operative Management
• Long Arm Cast or Orthosis 10 days – 8 weeks
  • Acute elbow flexion
  • Forearm and wrist neutral
• Immobilization vs. Early Motion
  • Depends on fixation and stability

Type of Fixation

Determined When Therapy Initiated

Rigid: Full, early, pain-free AROM
Stable: Protected early AROM (limited range)
Tenuous: Delayed protected AROM

Early Controlled Protected Ext/Flex

Protective Orthoses: Fractures and/or Dislocations

Complications

• Malunion or non-union
• Stiffness
• Ectopic Ossification (HO vs. MO)
• Osteoarthritis (traumatic arthritis)
• Nerve Injury
  • Midshaft/distal 1/3 humerus fx (radial)
  • Medial distal humerus fx (ulnar)
• Prominent Hardware
• Compartment Syndrome (early)
  • Volkmann’s Ischemic Contracture if not treated

Phase I: Inflammatory (0-2wks)

• Protective Orthosis or Cast
• Pain Modulation
• Edema Management
• AROM/fracture/fixation
• Maintain ROM to Noninvolved Joints
• Monitor for Complications
Phase II: Fibroplasia (2-6/8wks)
- Continue interventions used in Phase I as indicated
- Promote tissue extensibility
- Progress/Maximize A/PROM w/o inflammation
  - Orthotic Intervention and Exercise
- Progress Strength and Function
- Monitor for Complications

Phase III: Remodeling (8wks - ?)
- Continue with Phase II interventions as indicated
- Maximize ROM, strength, and endurance w/o complications
- Management of a Stiff Elbow

Functional Range of Motion

Normal
Extension – Flexion = 0-140
Pronation – Supination = 0-80/85 each

Functional
Extension – Flexion = 30-130
Pronation – Supination = 0-50 each

Intrinsic Sources of Contracture
- Incongruity of Articular Surfaces
- Bony Block or Hardware Block
- Heterotopic Ossification

Extrinsic Sources of Contracture
- Joint Capsule Shortening/Fibrosis
- Adherent Brachialis
- Collateral Ligament Shortening/Fibrosis

Examination of Extrinsic Sources
- Assess Muscle Length of Biceps
- Tightness limits elbow extension
Examination of Extrinsic Sources

Assess Muscle Length of Triceps
Tightness limits elbow flexion

Orthotic Intervention for ROM Deficits
Low Load Prolonged Stress

Tennis Elbow

• Incidence of 39.7% in tennis players (Gruchow & Pelletier, 1979)
• MeSH: pulls up the most citations

Lateral Epicondylitis
Lateral Epicondylosis
Lateral Epicondylalgia
Lateral Elbow Tendinopathy

Clinical Presentation

• ECRB most common musculotendinous unit involved
• Age of onset is 35-50
• Pain on or near the lateral epicondyle
• Aggravated by repetitive forceful gripping activities

Pain is Primary Complaint

• Degrees of pain and tenderness LE
• Pain limits grip
• Pain limits ability to accept load with elbow extended
Histological Findings

Normal Tendon

Neovascularization
Nerve fibers may be pain generators in tendinopathies

Fedorczyk, J Ortho Res, 2010

Primary Differential Diagnosis

• Radial Tunnel Syndrome
• C5/C6 Cervical Radiculopathy
• Proximal Neurovascular Entrapment
• Injury or Degenerative Changes to the Radiohumeral Joint
• Posterolateral Rotary Instability (PLRI)
• Posterolateral Plica

Components of Lateral Epicondylitis Examination

Patient History
• Patient Age
• Duration of Symptoms
• Number of Recurrences
• Mechanism of Injury
• Nature and Location of Pain

Symptomatic Tendinosis (IF)
Duration of Sx’s >3 months
Recurrent Problem
Age-related= older = tendinosis
Risk factor exposure

Location of Point Tenderness

Patient-Rated Forearm Evaluation
Patient-Rated Tennis Elbow Evaluation

Overend, J Hand Ther, 1999
MacDermid, J Hand Ther, 2005
Essential Components of Lateral Epicondylitis Examination

Physical Examination
- UE ROM: Especially Elbow and Wrist (Solveborn, 1996)
- Grip Strength
  - elbow position
  - Pain Free Grip Strength (Stratford, 1993)
  - Maximum Grip Strength

Cozen’s Test or Tennis Elbow Test
- Elbow is stabilized by examiner’s thumb on the lateral epicondyle.
- Patient actively makes a fist, pronates and extends the wrist with radial deviation while the examiner resists the motion
- Positive: Sudden severe pain in the area of the lateral epicondyle

Resisted Middle Finger
- Patient’s elbow is fully extended with forearm pronated and wrist fully flexed.
- Can be performed actively by the patient or passively by the examiner.
- May be used as a manipulation technique to rupture adhesions or as a non-traumatic test to provoke pain around the lateral epicondyle.

Handshake Test
- Firm handshake with elbow extended; supinates against the examiner’s resistance.
- The elbow is then flexed and the same maneuver is performed.
- Nirschl feels that this is a good indicator of prognosis

Kraushaar and Nirschl, 1999

Mills’ Tennis Elbow Test
- Mills, Br Med J, 1937
- Patient’s elbow is fully extended with forearm pronated and wrist fully flexed.
- Can be performed actively by the patient or passively by the examiner.
- May be used as a manipulation technique to rupture adhesions or as a non-traumatic test to provoke pain around the lateral epicondyle.

Non-operative Management
- Change in activity
- Referral to therapy
- NSAIDS
- Corticosteroid injection
- Goals:
  - Relieve pain, inflammation, improve flexibility, strength, endurance
  - “Revitalize unhealthy tissue that produces pain” (Nirschl)
Non-operative Management

General Treatment Goals
Acute Phase
• Abate acute pain or highly irritable symptoms
• Facilitate tissue healing
Restorative Phase
• Restore flexibility, strength, and endurance to the extensor muscle mass and common extensor tendon

Common Interventions Used During the Acute Phase

Orthotic Intervention
• To facilitate rest from aggravating activities

Common Interventions Used During the Restorative Phase

Therapeutic Exercises
• ROM
• Stretching
• Strengthening

Physical Agents
• To promote tissue conditioning prior to exercise
• To relieve discomfort following exercise
Total Arm Strengthening

- Rotator Cuff
- Biceps
- Triceps
- Scapular Stabilizers
- Repetitive UE Oscillations
- Promotes co-contraction and stabilization

Work Modifications

- 5lb limit grip or lift
- No repetition
- No pulling or twisting
- Avoid elbow extended and pronated carrying
- Vibratory tool restriction