Common Conditions of the Hand, Wrist, and Elbow

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Common Causes Hand and Wrist Pain
- Trigger Finger
- Dequervain’s tenosynovitis
- Carpal Tunnel Syndrome
- Medial and Lateral Epicondylitis

Trigger Finger (Stenosing Tenosynovitis)
- Catching or locking when bending the finger
- Painful – pull it extended
- Pain palm hand
- Palpable nodule
**Trigger Finger**

- “Stenosing tenosynovitis”
- Flexor tendon stuck passing under first annular (A1) pulley

**Anatomy of the Flexor Tendon/Pulley System**

- Nodular, inflammatory enlargement of flexor tendons in the sheath
- Attempted gliding/pull-through of the tendon through the A1 pulley is impeded
- The finger becomes “locked” in flexion
- Often the finger must be passively extended with a palpable clunk

**Order of frequency of affected digits**
- Thumb most commonly seen
- Ring or long finger second most common
- Index finger
- Small finger
Primary Trigger Finger

- Most Common
- “Idiopathic”
- No known cause

Secondary

- Associated with known disease
- Disease cause thickening in tendon/pulley
  - Diabetes
  - Rheumatoid arthritis
  - Amyloidosis
  - Sarcoidosis

Congenital

- Infantile form
- Thumb

Pathophysiology

- Histology fibrocartilaginous metaplasia of the A1 pulley
- Inner gliding layer of the pulley
**Classification System**

- **Grading system (Green):**

<table>
<thead>
<tr>
<th>Grade</th>
<th>Type</th>
<th>Description</th>
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</thead>
<tbody>
<tr>
<td>I</td>
<td>Pre-triggering</td>
<td>Pain in the palm, possible history of catching, but not seen on examination, tenderness over A1 pulley</td>
</tr>
<tr>
<td>II</td>
<td>Active</td>
<td>Patient is able to demonstrate catching but cannot actively extend the finger</td>
</tr>
<tr>
<td>III</td>
<td>Passive</td>
<td>Patient able to demonstrate locking, which requires passive extension (IIIa) and can have inability to flex (IIIb)</td>
</tr>
<tr>
<td>IV</td>
<td>Contracture</td>
<td>Locked trigger finger with fixed flexion and contracture of the proximal interphalangeal joint</td>
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**Diagnosis**

- Made Clinically
- "Locking", "catching", or "clunking" of the finger
- Tenderness in palm over the A1 pulley
- Palpable tender nodule on the flexor tendon
- See locking and catching with flexion and extension

**Treatment**

- Conservative
- Surgical

**Conservative Treatment**

- Splinting – either slight flexion and in extension (most commonly) have been described
- NSAIDS (ibuprofen, alleve)
- Occupational/hand therapy
- However, studies show steroid injection alone is more effective than splints
**Steroid Injection**

- Most effective symptoms less than 6–12 mos.
- 60–70% of can resolve after a single injection
- The success rate in diabetics is less than 50%

**Injection**

- Done in clinic
- Combination local anesthetic and steroid
- Around the tendon in area of A1 pulley

**Risks of Injection**

- Infection
- Fat atrophy
- Skin necrosis
- Bleaching of skin
- Tendon Rupture

**Injection In Diabetics**

- Increase sugars
- Greatest effect 24 hours after injection
- Effect lasts up to 5 days
Surgery

- Failure of non-surgical treatment
- May be a first line treatment in diabetics, in patients with a locked finger

A1 Pulley Release

- Transverse crease, oblique, or longitudinal incisions
- Protect the digital artery and nerve
- Release A1 pulley

Surgery

- Release the A1 pulley
- Allows the tendon to glide freely

Longitudinal Incision
Dequervain’s Tenosynovitis

Complications

- Bowstringing – due to inadvertent A2 pulley injury
- Digital nerve injury (radial of thumb most common)
- Recurrence or persistence of triggering

Symptoms

- Pain on thumb (radial) side of wrist
- Worse with lifting/ repetitive activity
- Mothers of very young children
- Worse at night
- Worse with thumb motion
**Extensor tendons**

- Divide them into 6 compartments
  - DeQuervain’s involves 1st compartment
  - Tendons are abductor pollicis longus and extensor pollicis brevis

**DeQuervain’s Tenosynovitis**

- Tendonitis of tendons of the first dorsal compartment
- Abductor pollicis longus and extensor pollicis brevis
- Sheath enclosing the tendons becomes narrowed leading to pain and inflammation

**Pathophysiology**

- Thick sheath over tendons shows histologic changes, similar to pulley with trigger finger
- Thickening of the sheath and accumulation of mucopolysaccharides have been seen

**Anatomy**

- Hand Surgery Update IV, Chapter 22, Figure 3
Symptoms
- More common in women (6:1 ratio)
- Often occurs in new mothers and in later stages of pregnancy as an overuse of the thumb
- Pain at the thumb base or radial wrist
- Patients will sometimes complain of ‘clunking’ of the thumb

Examination
- Tenderness over tendons at thumb side of wrist
- Finkelstein’s test
  - place their thumb in their fist, move fist ulnarly, sharp pain over the radial wrist
**Treatment**

- Conservative
- Surgical

**Conservative Treatment**

- Splinting – forearm based thumb spica
- Helpful for acute symptoms and in combination with other modalities
- NSAIDS
- Occupational therapy (lifting palm up)

**Steroid Injection**

- Very effective
- Risks of injection, however, must be considered
- Generally limit number of injections (2-3 max)

**Steroid Injection**

- Very subcutaneous location
- Skin bleaching
- Fat necrosis/skin thinning
- Subcutaneous tissue atrophy
- In diabetics, short-term increase in blood glucose
- Corticosteroid flare (pain after injection)
- Inject into sheath!
Pregnancy/lactation

- Thought due to the increased fluid shifts/edema secondary to hormonal fluctuation
- Generally responds to splinting and corticosteroid injection
- One study showed nearly 100% response to steroid injection, symptoms almost always resolve at the end of lactation

Surgical Treatment

- Indicated only after failure of conservative treatment
- Division of the fibro-osseous sheath over the tendons

Complications of Surgery

- Injury to superficial radial nerve branches
- Palmar subluxation of the tendons
- Incomplete release of tendon sheath due to a separate “sub-compartment”/multiple slips

Carpal Tunnel Syndrome
Symptoms

- Numbness into thumb, index, middle, and half of ring finger
- Worse at night, with wrist bent (phone, driving)
- Pain/burning in the wrist, fingers, arm
- Late stage—weakness

Definition

- Compression of median nerve in carpal tunnel
- Irritation of the nerve presents as numbness/pain

Anatomy of Carpal Tunnel

- Contents
  - Median nerve
  - Flexor tendons
- Borders
  - Transverse carpal ligament (TCL)
  - Roof of carpal tunnel
  - Connects carpal bones
  - Carpus forms radial and ulnar borders and floor
Anatomy

- Palmar aspect of thumb, index, long and radial half of ring fingers
- Dorsal aspect of fingers distal to the PIP joint

Thenar Muscle
- Opponens Pollicis
- Abductor Pollicis Brevis
- Flexor Pollicis Brevis (Superficial 1/2)

Carpal Tunnel Syndrome

- Most common compression neuropathy of the upper extremity

Etiology
- Most cases are idiopathic
- Women more than men
- Incidence increases with age
Systemic Causes

<table>
<thead>
<tr>
<th>Rheumatoid arthritis</th>
<th>Hemophilia</th>
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<tr>
<td>Diabetes</td>
<td>Multiple myeloma</td>
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<tr>
<td>Hypothyroidism</td>
<td>Obesity</td>
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<tr>
<td>Gout</td>
<td>Renal failure</td>
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<tr>
<td>Amyloidosis</td>
<td>Pregnancy</td>
</tr>
<tr>
<td>Osteoarthritis</td>
<td>Menopause</td>
</tr>
<tr>
<td>Alcoholism</td>
<td>Mucopolysaccharidosis</td>
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</table>

Rare mechanical causes

<table>
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<th>Tenosynovitis</th>
<th>CMC arthritis</th>
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<tr>
<td>Ganglion</td>
<td>Fracture</td>
</tr>
<tr>
<td>Median artery</td>
<td>Acromegaly</td>
</tr>
<tr>
<td>Abnormal muscle</td>
<td>Tumor</td>
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Pathophysiology

- Normal pressure within carpal tunnel is 2.5 mmHg
- Decrease in epineural blood flow and edema occurs with pressure 20–30 mmHg
- Nerve conduction diminishes at pressures >30 mmHg
- Continued or extended pressure elevation may result in complete median nerve block
**Symptoms**

- Numbness
  - Increased at night or with work
  - Relief with dependency, shaking hand
  - May include ulnar digits
- Palm, volar wrist pain
  - May involve dorsal MP area
  - May radiate to shoulder
- Weakness, clumsiness, dropping objects

**Tinel's Sign**

**Phalen's Test**

**Nerve conduction tests**

- Stimulate median nerve, sensors at tip or in muscle
- Motor latency 4.5 ms or 1 ms > opposite hand
- Sensory latency 3.5 ms or 1 ms > opposite hand
- Median–ulnar latency difference ≥0.5 ms
Stages

- **Mild**
  - Duration < 1 year
  - Intermittent numbness
  - Normal sensory testing
  - No weakness or atrophy
  - Minimal NCV changes, no denervation
- **Moderate**
  - Continuous numbness, paresthesias
  - Increased threshold on sensory tests
  - Increased distal motor latency
- **Severe**
  - Persistent loss sensory + motor function
  - Thenar atrophy

Nonsurgical Treatment

- Initial treatment for most cases
- Splint
- Occupational therapy
- Corticosteroid injection

Treatment

- Conservative
- Surgical
Predictors of Outcome with Conservative Treatment

- Age > 50 yrs
- Duration symptoms longer than 10 months
- Constant numbness
- Stenosing tenosynovitis
- Phalen's positive in < 30 sec
- (Kaplan et al, JHS 15B, 1990)

Surgical Treatment

- Acute CTS
  - from trauma or infection
- Chronic CTS
  - Weakness
  - Persistent numbness
  - Unresponsive to nonoperative measures

Surgery

- Release transverse carpal ligament
- Under local anesthesia
- Stitches out in 7–14 days
Surgical Treatment

Predictors of Outcome

- Longterm failure
  - Weakness or atrophy of APB
  - Predisposing condition
  - No relief from initial steroid injection

- Longterm success
  - 100% of those with >6 months relief from injection and splinting

Kulick et al., JHS A 1986

Medial and Lateral Epicondylitis

Lateral Epicondylitis
Lateral Epicondylitis

- One of the most common overuse syndromes encountered in the upper extremity
- Known as tennis elbow after being described by Morris in 1882 to be caused by lawn tennis
- Tendinosis of the components of the extensor origin

Epidemiology

- 1–3% of population will experience lateral epicondylitis in their lifetime
  - Equal male/female incidence
  - Usual onset between age 35–50

- 5–10% can be attributed to playing tennis
  - 10–50% of regular players
  - Risk increases 2–3.5x playing > 2 hr/week
  - Age > 40 increase 2x for women, 4x for men
  - Associated with hard surface, poor stroke mechanics, improper grip and racquet weight

Risk factors

- Manual labor with heavy tools
- Repetitive activities
- Dominant arm
- Poor coping mechanism
- Depression
Anatomy: Lateral Epicondyle
- Serves as origin of:
  - Extensor Carpi Radialis Brevis (ECRB)
  - Extensor Digiti Comminus (EDC)
  - Extensor Digiti Quinti (EDQ)
  - Extensor Carpi Ulnaris (ECU)
  - Superficial head of supinator (deep)
  - Lateral Collateral Ligament Complex (LUCL)
  - Anconeus

Anatomy
- Common extensor origin (CEO)
- ECRL has muscular origin proximal to epicondyle along supracondylar ridge

Pathoanatomy
- Lateral epicondylitis begins as a microtear
- Inadequate healing response
- Always involves the ECRB
  - Deep and more superior fibers

Pathoanatomy
- Histologically proven tendinosis (Nirschl)
  - Disordered collagen
  - Mucoid degeneration
  - Angiofibroplastic hyperplasia
  - No inflammatory component
Pathoanatomy
- ECRB crosses both elbow and wrist
  - Under tension with elbow extended in all conditions of power grip
  - Leads to increased shear stresses at the origin (Briggs and Elliot, *Arch Anat 1985*)
- ECRB undersurface rubs between outer edge of capitellum and ECRL with the elbow in extension (Bunata et al, *JBJS 2007*)

Clinical Presentation
- Pain over the lateral aspect of the elbow
  - Localized at or just distal to epicondyle
  - Sharp/burning in nature
  - Radiation along course of wrist extensors
  - Worsened by active wrist extension or forearm rotation with elbow extended
- Weakness of grip
- Difficulty grasping or lifting items

Clinical Presentation
- Night pain present in severe cases
- Stiffness upon wakening may be described by patient
- Pain with even light daily activities
  - Shaving
  - Picking up coffee cup

Physical Examination
- Assessment of grip strength
  - Compare to unaffected side
  - Baseline objective measure of severity of lateral epicondylitis
  - Can be tested serially to assess response to treatment
Physical Examination
- Assess for warmth or erythema
- Point tenderness just distal and anterior to lateral epicondyle
- Examine for tenderness in radial tunnel

Physical Examination
- Pain with resisted wrist extension
- Pain with resisted supination
- Long finger extension test (RTS)
- Pain with passive wrist and digital flexion

Treatment
- Activity modification
  - Limit lifting and repetitive grasping
  - Lifting with elbow flexed or forearm supinated need not be restricted
  - No vibrational tools
  - Equipment modification
    - Restring racquet
    - Change grip size
    - No gloves (they increase gripping force)

Nirschl Exercises
- Focuses on increasing strength, flexibility and endurance
- Stretch wrist extensors w/ elbow extended
- Progress to isometric and concentric strengthening
- Resume activities with increasing duration
Treatment: Non-operative
- Physical Therapy
  - Cross friction massage
  - Eccentric strengthening
  - Ultrasound
  - Iontophoresis
- NSAIDS (Oral and topical)

Treatment: Orthosis
- Counterforce brace
  - Theoretically limit muscle expansion
  - Create a new more distal muscle origin
  - Less tensile stresses seen by injured tendon
- Wrist cock-up splint
  - Diminishes contraction of the wrist extensors

Other Treatments
- Corticosteroid injection
- Platelet-rich Plasma
- Surgery

Autologous Blood Injection
- Edwards and Calandruccio, JHS 2003
  - Injection of 2ml of blood in 28 pts
  - 79% totally relieved of pain at final follow-up
Open Tendon Debridement
- Lateral incision over and just distal to epicondyle
- Incision of fascia in line with fibers
- Identification of the pathologic fibers of the ECRB (+ EDC)
- Resection of the diseased tissue

Medial Epicondylitis
- An overuse syndrome
  - Most common cause of medial elbow pain
  - Also known as “golfer’s elbow”
- Originally described by Morris in 1882
- Tendinosis of the flexor pronator origin

Epidemiology
- Prevalence of 0.3% in population studies (Shiri et al, *Am J Epidemiology* 2006)
  - 5–7x less common than lateral epicondylitis
- Slight male predilection (1.5–2:1)
- Peak incidence: 3rd – 5th decade of life
Epidemiology: Risk Factors
- Sports (implicated in 10–20% of cases)
  - Golf, pitching, rowing, javelin, Tennis (serve)
- Occupational
  - Forceful activities
  - Repetitive Motion
- Other
  - Smoking
  - Obesity
  - Low social support

Anatomy: Medial Epicondyle
- Anterior face serves as the origin of
  - Pronator teres (PT)
  - Flexor carpi radialis (FCR)
  - Palmaris longus (PL)
  - Flexor digitorum superficialis (FDS)
  - Flexor carpi ulnaris (humeral head, FCU)

Anatomy: Medial Epicondyle
- Ulnar nerve in cubital tunnel
- Medial collateral ligament
  - Main valgus stabilizer of elbow in flexion
  - Anterior oblique component is most important

Physical Examination
- Assess for warmth, erythema, swelling
- Point tenderness at or just distal and anterior to palpable medial epicondyle
**Physical Examination**
- Assess ROM
  - Usually normal
  - No mechanical Sxs
  - Valgus instability
- Assess Ulnar Nerve
  - Elbow flexion test
  - Tinel’s
  - Distal motor/ sensory exam
  - Can coexist
  - Subluxating ulnar nerve

**Differential**
- DDx from ulnar neuropathy

**Treatment**
- Similar to Lateral epicondylitis
  - PT, stretching, braces
  - Beware the ulnar nerve with injection
  - Surgery done less often
More Information

- American Society for Surgery of the Hand (www.ASSH.org)
- American Academy of Orthopaedic Surgeons (www.AAOS.org)

Thank you!