

HAND SURGERY

LEC:5

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CARPAL TUNNEL SYNDROME, OVER USE SYNDROME, AND DUPUYTREN DISEASE

Carpal tunnel syndrome (CTS)

Most common compressive neuropathy in the upper extremity

Anatomy of the carpal tunnel

- *Volar boundary* is TCL: Attaches to scaphoid tubercle/trapezium radially and to pisiform/hook of hamate ulnarly
- *Dorsal boundary (floor)* formed by proximal carpal row and deep extrinsic volar carpal ligaments
- *Carpal tunnel contains* the median nerve, flexor pollicis longus tendon, four FDS tendons, and four FDP tendons.

Normal pressure approximately 2.5 mm Hg. When pressure exceeds 20 mm Hg, epineurial blood flow decreases and nerve becomes edematous. When pressure exceeds 30 mm Hg, nerve conduction decreases.

Forms of CTS:

- 1-Idiopathic form most common in adults. Mucopolysaccharidosis is the most common cause in children.
- 2- anatomic variation: Persistent median artery, small carpal canal, anomalous muscles, extrinsic mass effect
- 3- systemic risk factors include obesity, pregnancy, diabetes, thyroid disease, chronic renal failure, inflammatory arthropathy, vitamin deficiency, alcoholism, advanced age.
- 4-Acute CTS occurs in the setting of high-energy trauma, hemorrhage, or infection.

(Direct relationship between repetitive work activities (e.g., keyboarding) and CTS has never been established.)

Diagnosis

- Paresthesias and pain (often at night) in volar aspect of radial 3&1/2 digits (thumb, index, long, and radial half of ring)
- Most sensitive provocative test: carpal tunnel compression test (Durkan test). Other provocative tests: Tinel and Phalen
- Semmes-Weinstein monofilament testing is sensitive for diagnosing early CTS.

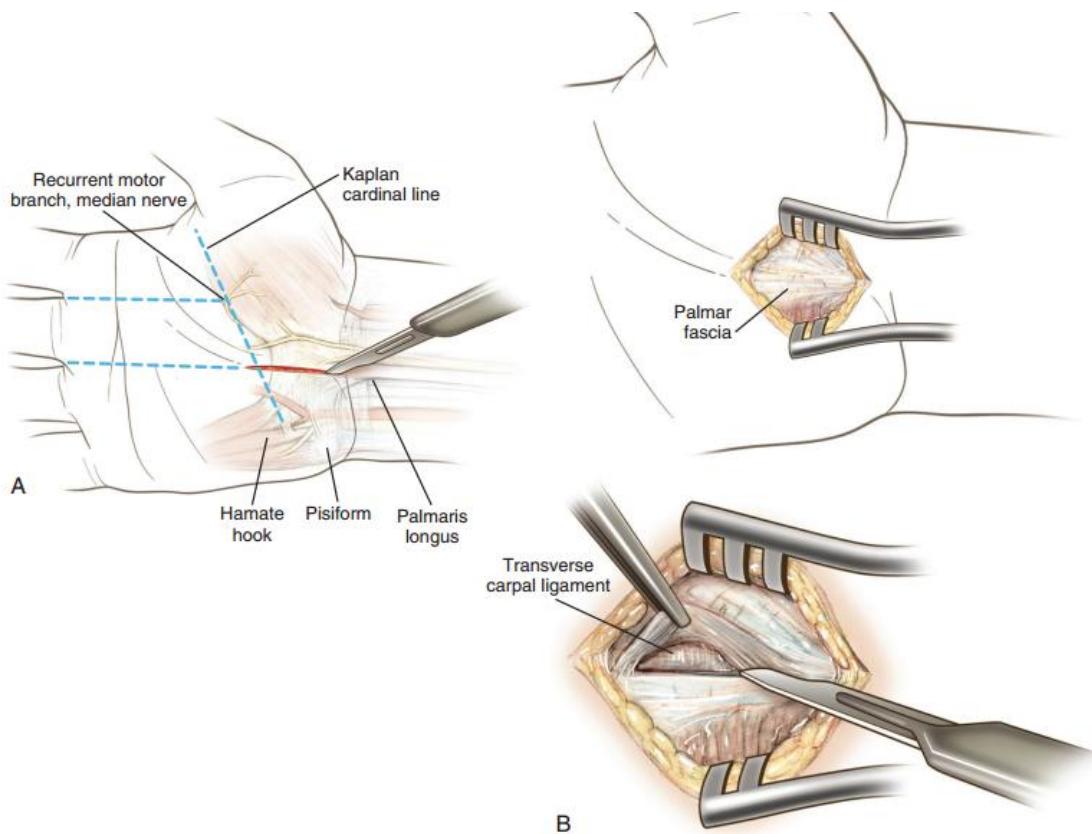
- Weakness, loss of fine motor control, and abnormal two-point discrimination are later findings.
- Thenar atrophy may be present in severe denervation.
- Electrodiagnostic tests are not necessary for the diagnosis of CTS but may help confirm diagnosis in equivocal cases.

Differential diagnoses

cervical radiculopathy,
brachial plexopathy,
thoracic outlet syndrome,
pronator syndrome.

Treatment

- Nonoperative treatment includes activity modification, night splints, and NSAIDs.
- Single corticosteroid injection yields transient relief in approximately 80% after 6 weeks, but only 20% are symptom free by 1 year
- Operative treatment options include open, mini-open, or endoscopic release of the TCL.



Overuse syndrome

STENOSING TENOSYNOVITIS (TRIGGER DIGIT):

- A.** Enlargement of the flexor tendon, causing a size discrepancy between the tendon and annular pulley, causing catching and locking symptoms during tendon excursion.
- B.** May be nodular or diffuse, as seen with rheumatoid arthritis.
- C. A1 pulley is the most common site.** Proximal edge is located at the distal palmar crease in the little and ring fingers, between the proximal and distal creases in the middle finger, and at the proximal crease in the index finger and thumb.
- D. Order of frequency** of the affected digits: Thumb most common, then ring finger, middle finger, index finger, small finger.
- E. Middle-aged women** are the most common group.
- F. Most cases are idiopathic**, but there is an increased incidence with diabetes, rheumatoid arthritis, gout, and amyloidosis.
- G. Presenting symptoms**
 - 1. Catching, sticking, or occasional locking offingers in flexed position.
 - 2. Pain in distal palm, commonly referred to the PIPJ.
 - 3. Symptoms are often worse on awakening.
 - 4. Nodule palpable on tendon with movement.

H. Treatment

- 1. Splinting**
- 2. Injection of steroid (with local anesthetic)**
- 3. Surgery:** Indicated in
 - i. Long-standing triggering
 - ii. Persistent triggering that fails injection and splinting

DEQUERVAIN'S TENOSYNOVITIS

- A. Stenosing tenosynovitis** of the tendon in the first dorsal compartment of the wrist (APL and EPB)
- B. Signs and symptoms**
 - 1. Radial-sided wrist pain with thumb use
 - 2. Tenderness over first dorsal compartment (radial styloid)
 - 3. Positive **Finkelstein's test**: pain when grasp the thumb and deviate the wrist ulnarily
- D. Treatment**
 - 1. Splinting** (forearm-based thumb spica) and NSAIDs for mild or early cases
 - 2. Steroid injection** into first dorsal compartment
 - 3. Surgery:** Release of the first dorsal compartment with tenosynovectomy.

INTERSECTION SYNDROME

A. *Inflammation and pain of the dorsal wrist where the first dorsal compartment (**APL** and **EPB**) crosses the second dorsal compartment (**ECRL** and **ECRB**), approximately 4 cm proximal to the wrist.

B. Often a history of repetitive wrist motion

C. Crepitus can sometimes be felt at the intersection site

D. Treatment

1. Activity modification, splinting (forearm-based thumb spica), and NSAIDs for mild or early cases.

2. Steroid injection (with local anesthetic)

3. Although uncommon, surgery is indicated for refractory cases and consists of release of the second compartment followed by postoperative splinting.

Ganglion cysts

Most common benign tumor of the hand.

i. Mucin-filled cyst attached to the tendon, tendon sheath, or joint capsule

ii. Most often occur in second to fourth decade of life, though they can occur in children and the aged

iii. Most often occur at the dorsal wrist, followed by volar wrist, flexor tendon sheath (volar retinacular), and distal interphalangeal (DIP) joint (mucous cyst)

Volar wrist ganglion

a. Epidemiology: 10% to 20% of the hand and wrist ganglions

b. Anatomy: Between the first extensor compartment and the flexor carpi radialis tendon sheath. About 60% arise from the radioscaphoid joint and 30% from the scaphotrapezial joint.

Dorsal wrist ganglion

a. Epidemiology—60% to 70% of all hand and wrist ganglions

b. Anatomy: *Usually over the scapholunate (SL) junction between the third and fourth extensor compartments. Approximately 75% connect by the stalk with the SL joint ligament.

c. Presentation: Compressible, transilluminating, mobile, limited wrist dorsiflexion, aching discomfort

d. Diagnosis/workup: Clinical exam, ± diagnostic ultrasound (US) if unsure, magnetic resonance imaging (MRI) if diagnosis remains elusive

e. Treatment

i. Observation: If not symptomatic or impairing

ii. Supportive splinting/nonsteroidal anti-inflammatory drugs (NSAIDs)

iii. Puncture and aspiration: High potential for recurrence

iv. Surgical excision: Indicated for pain, impairment, and failure of conservative treatment.

f. Outcomes: Recurrence is very low if small cuff of normal tissue is taken with the cyst and stalk

Dupuytren's disease (DD)

Dupuytren's disease (DD) is a benign fibroproliferative disorder that occurs in the fascia of the palm and digits, resulting in nodules, cords, and contractures of the fingers.

1. Almost exclusively a disease of Caucasians—most commonly, people of Northern European ancestry (Scandinavia or British Isles).
2. More common in males, 7 to 15 times greater incidence
3. Incidence peaks between ages 40 and 60
4. ***Autosomal dominant inheritance with variable penetrance**
5. Underlying cause is unknown; not occupational or traumatic
6. Bilateral involvement is common.
7. The **ulnar rays** of the hand are most commonly affected.
 - Ring finger, followed by small and long fingers. Thumb and index involvement less common.
8. Underlying cause is unknown; not occupational or traumatic

Dupuytren's diathesis is an aggressive presentation of the disease with earlier and more rapid progression, and increased likelihood of recurrence after treatment. Risk factors for Dupuytren's diathesis include:

- Male sex
- Early onset of disease
- Bilateral involvement
- Family history
- Ectopic disease:
 - dorsal knuckle pads [**Garrod's pads**])
 - Penile fibromatosis (**Peyronie's disease**)
 - Plantar fibromatosis (**Ledderhose disease**)

Associated diseases

1. Alcoholism
2. Diabetes mellitus
3. Epilepsy
4. HIV infection
5. Chronic obstructive pulmonary disease (COPD)

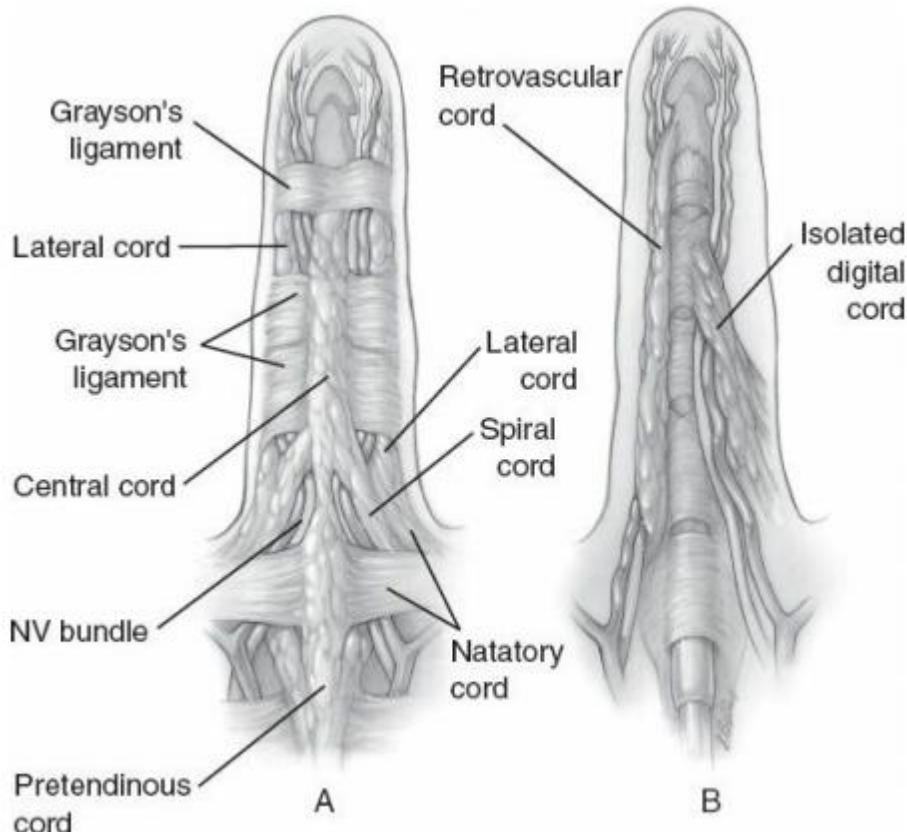
ANATOMY/HISTOLOGY/PATHOLOGY

A. Bands are normal digital and palmar subcutaneous fibrous connective tissue

1. Spiral band
2. Lateral digital sheet
3. Natatory ligament
4. Pretendinous band
5. Grayson's ligament: Palmar to neurovascular (NV) bundle
6. *Cleland's ligament: Dorsal to NV bundle and does not become diseased

B. *Cords are diseased tissue

1. **Spiral cord:** From diseased pretendinous band, spiral band, lateral digital sheet, and Grayson's ligament and central cord; wraps around the NV bundle. (Mnemonic: Plastic Surgeons Look Good)
2. **Lateral cord:** Contributes to PIP contracture
3. **Natatory cord:** From diseased natatory ligament; causes webspace contracture
4. **Pretendinous cord:** Cord in palm from diseased pretendinous band causes metacarpophalangeal joint contracture.
5. **Central cord:** Contributes to PIPJ contracture
6. **Retrovascular cord:** Causes DIPJ contracture



INDICATIONS FOR TREATMENT

- contractures that lead to loss of function or difficulty with hygiene.
- MP joint contracture >30 degrees
- *Any degree of PIP contracture*
- Rapidly progressive cases
- **+Ve Table top test”:** Patient unable to have digit and palm simultaneously on the surface of a table top is a sign of significant contracture.

NONOPERATIVE TREATMENT

- A. Steroid injections** may help painful palm nodules but do not prevent progression.
B. Collagenase injections

OPERATIVE TREATMENT

- 1. Percutaneous needle aponeurotomy:** Cords transected in clinic with sweep of a needle
- 2. Open fasciotomy:** Done in older patients with significant medical comorbidities
- 3. Limited fasciectomy:** Resection of only diseased tissue (most common procedure)
- 4. Regional fasciectomy:** Resection of diseased tissue and a margin of non-diseased fascia
- 5. Extensive fasciectomy:** Resection of diseased tissue and all potentially involved fascia
- 6. Radical fasciectomy (dermatofasciectomy):** Consider in recurrent disease.