THE HAND TO SHOULDER CENTER

Hand and Wrist Tendinopathies

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Advent Health
Tendinopathy-
- It is an affliction of the tendon, occurring anywhere along its course.

Tenosynovitis-
- It is an inflammation of synovial sheath that encloses the tendon

Stenosing tenosynovitis-
- Occurs when a size discrepancy exists between the tendon and pulley or sheath through which the tendon passes.
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**Tendinosis** –
- it is chronic degenerative changes in the tendons.

**Tendinitis**- 
- it is an inflammation of tendon caused by injury

➢ in stenosing tenosynovitis and tendinosis, the conspicuous absence of inflammatory cells typically is noted.
Tendons of wrist and hand commonly affected in tendinopathy:

**Compartment 1**
- Adductor pollicis longus
- Extensor pollicis brevis

**Compartment 2**
- Extensor carpi radialis longus and brevis

**Compartment 3**
- Extensor pollicis longus
**Compartment 4**
Extensor digitorum
Extensor indicis

**Compartment 5**
Extensor digiti minimi

**Compartment 6**
Extensor carpi ulnaris
Tendinopathy of the hand and wrist -

Various tendinopathy of hand and wrist are-
1. Stenosing tenosynovitis
2. De Quervain’s tenosynovitis
3. Intersection syndrome
4. Extensor pollicis longus tenosynovitis
5. 4th compartment tenosynovitis
6. 5th compartment tenosynovitis
7. Extensor carpi ulnaris tenosynovitis
8. Flexor carpi radialis tenosynovitis
Stenosing tenosynovitis/trigger finger/locked finger-

**Definition** - It is an inflammation of synovial sheath that encloses the flexor tendons of the thumb and fingers. It may result from enlargement of tendon itself or narrowing of 1st annular pulley.
Incidence-
- Stenosing tenosynovitis at A1 pulley is by far the most common tendon pathology.
- Age: above 40 yrs
- Sex: women are affected 6 times more than men
- High incidence in patients with DM, RA
- Prevalence:
  - Normally: 2-3%
  - In diabetes: 10-20%
Etiology-

- Exact etiology is unknown
- It is likely multifactorial
- Contributing factors includes-
  - Genetic changes
  - Overuse
  - Inflammatory disorders such as RA, trauma and other occupational disorders
  - Systemic disorders such as –
    - renal insufficiency,
    - thyroid disease,
    - DM
Pathophysiology-

- Stenosing tenosynovitis may occur because of the sheath or pulley become narrowed or because of the increased size of the tendon secondary to degeneration or tendinosis.
- This distortion prevents the easy and smooth gliding of the tendon.
- Various pathophysiology are-
  1. Overuse
  2. Inflammatory disorders
  3. Systemic disorders
* Normally, the tendons of fingers glide back and forth under a restraining pulley.

* Thickening of A1 pulley and flexor tendon sheath primarily the flexor digitorum profundus (FDP) and flexor digitorum superficialis (FDS) causes restriction of normal gliding mechanism.

* A nodule may develop on the tendon causing it to get stuck at the proximal edge of A1 pulley.

* When the patient attempts to extend the digit, there is difficulty in doing so.
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- With more forceful attempts to extend the digit, it classically snaps open with significant pain at the distal palm and into proximal aspect of affected digit.
- Less commonly, the nodule is restricted distally to A1 pulley resulting in difficulty of flexing the digit.
- Middle, ring finger and thumb is commonly affected 
- Types - are 
  - congenital
  - Acquired
Sign & Symptoms-

- Painful snapping sensation (triggering) in the affected fingers.
- Inability to extend finger smoothly.
- Reduced grip, clicking, catching or locking.
- In most patients, a tender nodule can be palpable at the site of the A1 pulley
- Patient may also have a PIP joint contracture, which often fails to fully reverse even after successful release.
- >60% patient may have carpal tunnel syndrome
Management-

It is divided into two types-
1. Conservative
2. Surgical

1. Conservative-
This includes –
- Rest with splints or braces in mild cases
- Supervised physical therapy
- NSAIDs
- Corticosteroid injection
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1. **Rest with splints, braces and orthosis** -
   - Are reported to provide relief in 40-80% of cases.
   - These aids typically immobilise the metacarpophalangeal joints but allows PIP joint and distal interphalangeal joint motion.

2. **Supervised physical therapy** -
   - Often aimed at developing differential gliding between the FDS and FDP tendons.
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- Physical therapy tends to be less effective than steroid injection in preventing pain and triggering.
- Recurrence rate is less than steroid injection.

3. **Corticosteroid injection**-
   - Steroid injection into A1 pulley region or into the synovial tendon sheath commonly are used as a first line treatment of trigger finger.
   - They have shown excellent response rate of 60-90%
   - Recurrence rate is high with concomittent DM, multiple affected digits and other associated tendinopathies.
Complications following corticosteroid injection are uncommon but can include:
- Fat atrophy
- Tendon rupture
- Transient elevation of blood sugar level particularly in diabetic patients
Surgical management:

If nonsurgical management fails, then surgery is considered. Options are:
- open or
- percutaneous release of the A1 pulley

1. Open release:
   - open release is the standard and is associated with a high rate of excellent results.
   - Open release can be achieved by a transverse, oblique, or longitudinal incision.
- Local anaesthesia is preferred because it allows the patient to move the affected finger during surgery to confirm the lack of triggering after release.
- If triggering persists despite A1 release, additional pathology such as an Ao pulley-a tight band of superficial palmer aponeurosis proximal to the A1 pulley or structural changes in the FDS or FDP should be sought.
- In certain patients, such as those with long-standing DM, trigger digit, or RA, an element of FDP entrapment may be present at the FDS decussation, or enlargement of the FDP may have led to entrapment at the A3 pulley.
During the preoperative evaluation in particular, the surgeon should have a heightened level of suspicion about patients with a preoperative PIP joint contracture because these patients may have changes in the tendons that could cause residual triggering after a complete A1 pulley release.

Options in this setting include reduction tenoplasty of the FDP tendon or, more commonly, excision of a slip of the FDS.

Recurrence is rare following open release.
Complications of open release -
- are rare but include-
- injury to neurovascular bundle.
- stiffness and bowstringing if the pulley is cut.
- wound complications
2. Percutaneous release-
- the specific instruments and techniques used for percutaneous release vary but include hypodermic needles, knife blades, or purpose made devices or blades deployed under tactile feel or with ultrasound guidance.
* An injection of local anaesthesia over the intended surgical site is used.
* In general, percutaneous release is easiest in the setting of active triggering because adequate release can be confirmed immediately.
* To extend or hyperextend the MCP joint, the patient rests the dorsum of the hand on a stack of towels, allowing the digital neurovascular structures to drop more dorsally and away from the surgical site.
- The patient may be asked to flex and extend the digit, and the region of the A1 pulley is palpated over the volar area of the MCP joint.
- The blade or needle is introduced at the proximal edge of the A1 pulley and is used to cut distally.
- If a needle is used, it is typically 18-19 gauge, and the bevel is oriented parallel to the tendon.
- It may be placed into the flexor tendon; the location may be confirmed by movement of the digit; and the needle is withdrawn until it is just out of the tendon.
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- The needle is then advanced longitudinally, producing a tactile grating sensation as the pulley is cut.
- When the surgeon believes that release is complete, the needle is withdrawn, and an attempt to elicit triggering is made.
De Quervain’s stenosing tenosynovitis-

- It is also called as stenosing tenosynovitis of 1st dorsal compartment.
- It is named after Swiss surgeon Fritz de Quervain who first identified it in 1885.

**Definition**

It is a chronic constrictive tenosynovitis affecting the abductor pollicis longus and extensor pollicis brevis tendons of the thumb at the wrist within the fibro-osseous sheath of 1st dorsal compartment at level of radial styloid.
Incidence-

- Age – 30-50 years
- Sex- F:M 10:1

Aetiology are

- Idiopathic
- Overuse of wrist like grasping, pinching, squeezing
- It may be associated with -
  - rheumatoid arthritis
  - pregnancy
  - Postpartum periods
  - lactation
Clinical features-

**Symptoms**- are
- Pain over the thumb side of the wrist, gradual or sudden, located at 1st dorsal compartment at wrist; it may radiate down the thumb or up the forearm.

**Signs**-
- Swelling and tenderness along the APL and EPB tendons.
- Thickening of fibrous sheath.
Diagnosis-

Finkelstein’s test-
- Tenderness can be elicited at the tip of styloid by sudden ulnar deviation of flexed hand with the thumb tucked inside the palm.
- Most pathognomonic objective sign but not diagnostic.
- Test is also +ve in 1st carpometacarpal arthritis, wartenberg’s syndrome.
Diagnosis-

- The diagnosis is based on the clinical examination and history.
- Radiographs of the wrist may be obtained to exclude alternative pathology in the distal radius or carpus; thumb carpometacarpal arthritis may coexist and may or may not be symptomatic.
- On radiographs, soft tissue calcification at first dorsal compartment may be visualised occasionally.
Management-

Options are-
1. Conservative
2. Surgical

1. conservative -
Rest and splintage -
- Rest and splinting alone is successful in about 14 to 18% of patients.
- Typically, a forearm based thumb spica splint is used to enforce a period of rest or prevent motions that exacerbate the symptoms.
Physical therapy-
• This may include education about therapy and the modification of activity, modality treatment, and tendon gliding exercises.

Steroid injection-
• Cortisone injection is the most successful nonsurgical treatment modalities reported in the literature by far, with a 62% to 100% success rate suggested by prior studies.
Steroid injection in de Quervain’s tenosynovitis
The success rate is poorer if an associated septum is present within the first dorsal compartment or if triggering of the first dorsal compartment tendons occurs.

**Risk of corticosteroid injection**—include
- Skin depigmentation
- Skin and subcutaneous tissue atrophy
- Transient elevation of blood sugar level
Surgery-

- Surgery involves the release of the tendon sheath covering the first dorsal compartment.
- This release can be achieved by a transverse or longitudinal incision.
- Care should be taken to identify and protect the superficial branch of the radial nerve.
• After sheath is released, a separate subcompartment for the two tendons should be sought.
• If present, this subcompartment should also be released.
• Missing this step is the most common cause of recurrence or residual symptoms.
• Most surgeons advocate release of the compartment on dorsal side, thus leaving a volar portion of the retinaculum to act as a buttress against volar subluxation of the tendon.
* Complications are minor and rare. They include:
  - Volar subluxation of the first compartment tendons over the radial styloid.
  - Superficial radial nerve neuritis or neuroma.
  - Residual symptoms, or a painful or bothersome scar.
Intersection syndrome-

- It is irritation of the tendons of the second dorsal compartment.
- It is associated with the frequent and repetitive use of the wrist and typically occurs in athletes.
* Pain is located at the intersection of the first and second dorsal extensor compartments and is speculated to be related to rubbing of the EPB/APL against the radial wrist extensors.

• The wrist discomfort is more proximal than that seen in de Quervain synovitis, and is exacerbated by wrist motion, particularly resisted wrist extension.
• Palpable or audible crepitus may be noted.
• The diagnosis is based on the history and clinical examination.
• Differential local anaesthetic injections may help in supporting the diagnosis or in differentiating between intersection syndrome and de quervain syndrome.
• The initial treatment is non surgical and includes a trial of anti-inflammatory medications, rest, activity modification and forearm based wrist splinting at about 15 degree of wrist extension.
• Corticosteroid injection also may be helpful.
• Many patients will respond to these measures, but if nonsurgical management fails, surgical release of the second dorsal extensor compartment is an option.
Extensor pollicis longus tenosynovitis-

- Tendinitis or tendinosis of the third dorsal extensor compartment is rare and is even rarer in the patient without RA.
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- Triggering or snapping of the extensor pollicis longus (EPL) resulting from a size discrepancy between the tendon and the compartment has been described and may progress to attenuation and rupture of the tendon.

- A high rate of rupture is seen; thus, surgery is preferred over nonsurgical treatment.
Etiopathogenesis-

- The disorder is believed to be more common in drummers or following trauma to the wrist, particularly a fall on the extended wrist.
- The proposed mechanism involves impingement of the EPL between the dorsal radius and the third metacarpal.
- Impending or complete rupture of the EPL classically is described in the setting of a minimally displaced distal radius fracture and has an estimated 5% incidence.
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- Although rupture could be related etiologically to rubbing of the tendon over a sharp bony prominence (i.e. attrition rupture)
- It is believed to be related most commonly to a nutritional phenomenon, in which swelling increases the pressure within the compartment and alters the blood supply to the mesotendon in this relative watershed zone, causing ischemic changes in the tendon.
• This phenomenon likely is related to the unique anatomy at this area, in which the EPL tendon takes a sharp turn just distal to the lister tubercle and is encased in the tight fibrous sheath of the third compartment, which does not allow for expansion.
• Thus swelling increases the pressure in the non-compliant compartment, altering the blood supply and leading to ischemic changes.
Symptoms-

- Pain and swelling at the distal radius in the area of the lister tubercle; pain is exacerbated by active or passive thumb motion.
- Occasionally, palpable crepitus is present.
- Some patients demonstrate snapping or triggering.
- Radiography may be helpful in excluding any distal radius fracture or possible bony prominences.
Management-

- Treatment is typically surgical because a high risk of tendon rupture is present.
- The third dorsal compartment is approached via a dorsal incision centered over the lister tubercle, and the compartment is released.
- The EPL is moved to the radial subcutaneous tissues, and the compartment is inspected for any bony prominences.
- The tendon itself is inspected for attritional changes, and the surgeon should be prepared to graft or perform a tendon transfer if indicated.
Fourth compartment tenosynovitis

- Extensor tenosynovitis, or extensor digitorum communis tenosynovitis of the entire fourth compartment, can present in setting of RA or other inflammatory etiology
- It also may begin after trauma or a nondisplaced distal radius fracture.
- It has been proposed that, because of wrist stiffness, an increase in the moment of the extensors occurs as they course toward their target digits and insertion sites.
- Cooper et al. have described extensor digitorum communis tenosynovitis in a nonrheumatoid setting, in which the histopathologic evidence was consistent with traumatic tenosynovitis.
Sign and symptoms-

- It presents with pain over the 4th compartment, along with localised tenderness and swelling.
- Forced extension of the wrist may impinge the tendons and exacerbate the pain.
- The “tuck sign” in which a mass or synovial thickening tracks with the tendon as the tendon moves, commonly is present at the edge of the retinaculum during digital extension.
Treatment -

- Initial treatment include rest with splints, ice and NSAIDs.
- Steroid injections can be used if the symptoms persist.
- Failure of nonsurgical management to relieve pain suggests a physical etiology of increased pressure within the compartment, namely an accessory tendon or anomalous muscle, and may lead to surgical release or tenosynovectomy.
Fifth compartment tenosynovitis-

- The fifth compartment, containing the extensor digiti minimi, also may be affected in isolation.
- This occurrence is rare.
- The pain is localised over the fifth compartment, and the tenderness and swelling are present over the extensor digiti minimi tendon.
- This condition is investigated and managed by similar to other tendinopathies.
Extensor carpi ulnaris tenosynovitis

- Extensor carpi ulnaris (ECU) tenosynovitis is included in the differential diagnosis for ulnar side wrist pain and is a very common source of such pain.
- The diagnosis may be challenging because the ECU is apposed closely to other ulnar side wrist structures, including the triangular fibrocartilaginous complex (TFCC).
Etiopathogenesis-

- The ECU is a wrist ulnar deviator when the forearm is in pronation and a wrist extensor when the forearm is supinated.
- It has been shown to provide a static as well as a dynamic support to the wrist.
- The volar ECU sheath is adjacent to the TFCC, and ECU injury may coexist with concomitant TFCC injury.
- Because of close anatomic location and overlap in pathology between the ECU and the TFCC, it may be difficult to isolate the source of ulnar side wrist pain clinically and to differentiate between TFCC pathology and ECU problem, or both.
• When examining the ECU, it is important to differentiate between ECU tendinitis and ECU pain secondary to subluxation.
• Although ECU subluxation may begin with an injury to the wrist joint with or without any underlying fractures, while ECU tendinitis typically occurs following overuse or occurs in an idiopathic fashion.
• Pain is localised over the ulnar side of the wrist and worsens with gripping and other heavy activities.
• Unlike ECU subluxation, which may occur in athletes following an injury, tendinitis is seen more often in nonathletes.
The patient may be unable to localise the site of pain easily; hence it is important to differentiate the pathology from other causes of ulnar side wrist pain.

In the setting of ECU tendinitis, careful palpation reveals point tenderness over the ECU tendon, with some fullness.

Range of motion may not be restricted, but resisted ulnar deviation when the forearm is in pronation or resisted wrist extension when the forearm is supinated increases discomfort.
* Rolling the tendon under the examiner’s finger may elicit crepitus because of an edematous sheath.
* Altered sensation may be seen over the distribution of the dorsal sensory branch of the ulnar nerve because it travels in close approximation to the sheath.
* The ECU synergy test is helpful in differentiating between ECU pathology and intra-articular (i.e., TFCC) problems.
ECU Synergy Test

1. Elbow flexed 90°; forearm in full supination; wrist neutral; fingers in full extension

2. Examiner grasps patient's thumb and middle finger and palpates the ECU tendon with the other hand. The patient then abducts the thumb against resistance

3. Presence of both ECU and FCU muscle contraction is confirmed

4. Re-creation of pain along the dorsal ulnar aspect of the wrist is considered to be a positive test for ECU tendonitis
* Patients are assessed for subluxation of ECU tendon.
* The examiner moves the patient’s wrist from a position of supination and extension to one of flexion and ulnar deviation.
* This maneuver allows the ECU tendon to move out of the groove of the sixth compartment.
* The test is positive when visible subluxation is present or an audible snap is heard.
Diagnosis-

- Diagnostic studies may include plain radiographs, including PA grip view to evaluate for ulnar positive variance and possible ulnar impaction as an alternative source of ulnar side wrist pain.
- Occasionally, ultrasonography or MRI may be used to confirm tendinopathy, document subluxation, or exclude other sources of pathology.
- The diagnostic criteria can be improved by injecting local anesthetic into the ECU sheath.
- The elimination of symptoms and sign can differentiate this condition from other causes of ulnar side wrist pain.
Management -

It includes-
1. Conservative
2. Surgical

1. **Conservative** - the initial treatment is nonsurgical and may include –
   - Rest
   - Activity modification
   - Physical therapy
   - Ice and NSAIDs
   - Steroid injection
2. Surgical

- The surgical approach is made via a longitudinal incision centered over the sixth extensor compartment.
- The dorsal ulnar sensory branch should be identified and protected.
- The compartment is released via a longitudinal incision or by creating a retinacular flap for later repair.
* Any projecting fibro-osseous structure can be removed.
* For a subluxating ECU, the tendon is stabilised by creating a pulley from the retinaculum after the ECU has been released from its sheath.
Flexor carpi radialis tendinitis-

- The flexor carpi radialis tendon has a unique anatomic path and insertion.
- It angles across the trapezial ridge and enters a fibro-osseous tunnel adjacent to the trapezium before inserting into the base of the second metacarpal;
*In some cases, the trapezium may enclose the tendon.*

This narrow fibro-osseous tunnel makes the FCR tendon vulnerable to impingement and fraying from osteophytes and degenerative changes in the adjoining joint, including thumb CMC and scaphotrapezial degeneration.
Sign & Symptoms-

- Pain in the region of the radial volar forearm at the wrist level.
- The pain worsens with resisted wrist flexion and radial deviation.
- Swelling and tenderness may be present over the palpable area at the FCR.
Differential diagnosis-

Includes –
- Ganglion
- Scaphoid injury
- Thumb CMC joint arthritis
- Scaphoid-trapezium-trapezoid arthritis
Diagnosis-

- Plain radiographs are obtained to delineate arthritic changes and osteophytes.
- MRI may show signal changes or edema at the FCR sheath.
- Injection of local anesthetic with or without corticosteroid medication alleviates pain and can differentiate FCR tendinitis from other pathologies.
Management-

This can be-

1. non surgical
2. Surgical

1. Non surgical-
   - Rest and splinting
   - Physical therapy
   - NSAIDs
   - Corticosteroid injection.
Surgical-

- Release is achieved through a volar incision centered over the FCR at the wrist.
- Blunt dissection should be used to identify any cutaneous branches of the superficial radial nerve or the palmar cutaneous branch of the median nerve, and these nerve branches should be protected to avoid injury and neuroma formation.
- The FCR tendon and the fibro-osseous tunnel are identified.
The fascia over the tendon is decompressed from the volar wrist crease distal to the trapezium.

It is common to find fraying of the tendon, which should be debrided, and any bony impingement in the tunnel should be excised.
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