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Tendinopathies of the Hand and Wrist

Ellen Pong DPT, MOTR/L

Photo by Author

Learner Outcomes

As a result of this course, participants will be able to:

1) ...identify the anatomical structures that are relevant to hand and wrist tendinopathies.

2) ...discuss the pathoanatomy and classifications of hand and wrist tendinopathies.

3) …incorporate evidence-based clinical assessments for hand and wrist tendinopathies into their clinical practice.

4) ...discuss current knowledge in conservative and post-operative treatments for hand and wrist tendinopathies, state the potentials and limitations of these treatments according to research evidence.

Introduction

Imagine your hand hurting or popping every time you use it. Simple tasks become very painful. Fine motor and gross motor are affected. Dressing, hygiene, childcare, driving to work, recreation, and of course, your daily work are all diminished because of pain and dysfunction.

Image by Author

Introduction

Tendinopathies of the hand and wrist are significantly represented in occupational disorders, and a cause of lost work days (Elder & Harvey, 2005; Pong & Yelvington, 2015).

Photo by Author

Introduction

Tendinopathy is a word we use to describe a painful condition of a tendon, without knowing if the problem is inflammatory or degenerative, or both (Fedorczyk, 2012).

Tendons transmit loads and motion, and are subjected to large mechanical loads. The repetitive occurrence of such results in both acute (lacerations and ruptures) and chronic (tendinopathy) injuries (Wang, Guo & Li, 2012).

Introduction

Although tendinopathies are viewed as chronic injuries versus ruptures and lacerations, there are acute, sub-acute, and chronic stages within the general diagnosis called tendinopathy (Fedorczyk, 2012; Wang, Guo & Li, 2012).

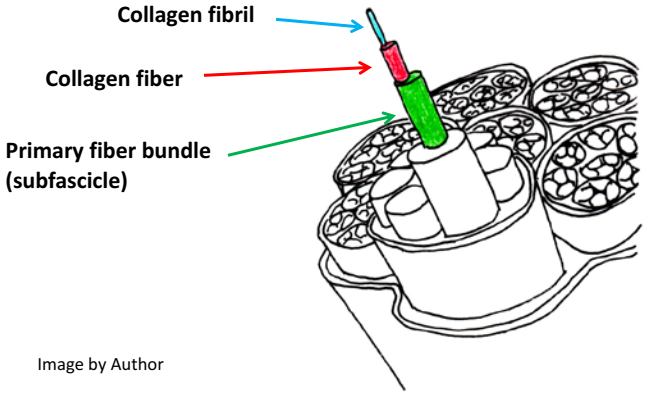
In addition to mechanical causes such as overuse, tendinopathies may also be caused by rheumatologic disorders, primary tumors, hormonal factors (estrogen stimulation and deficit), and bacterial infections (Fedorczyk, 2012; (Vuillemin, Guerini, Bard & Morvan, 2012).

Anatomy

- Insertion point
  - The junction between tendon and bone
  - Tendon merges with the periosteum
- Musculotendinous junction
  - Tendon merges with fascia covering the muscle
- Tendons structured in fibrillar arrangement of collagen
  - Molecules, fibrils, fibers, fascicles (fiber bundles) tendon unit

(Fedorczyk, 2012; Pong & Yelvington, 2015; Wang, Guo & Li, 2012)

Anatomy



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Anatomy

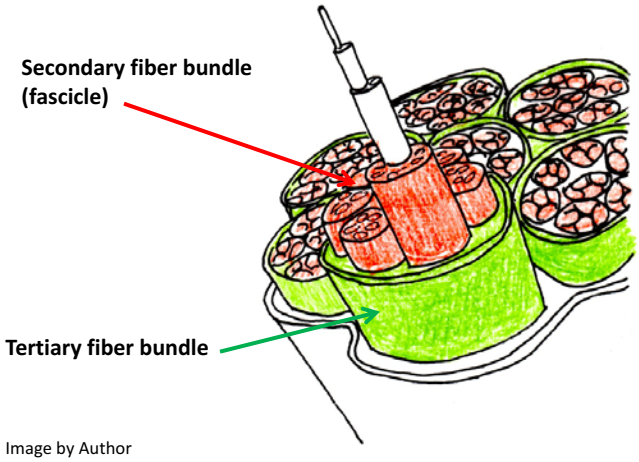


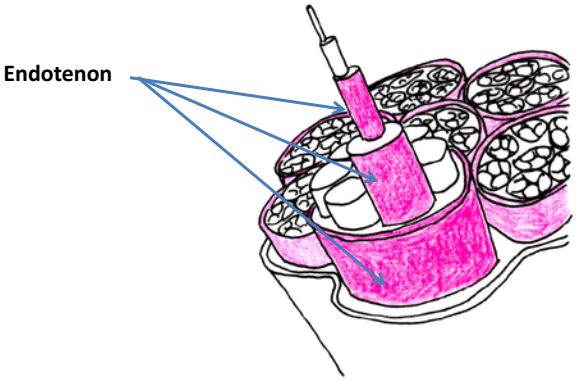
Image by Author

Anatomy

- Fiber bundles (primary, secondary and tertiary) are each surrounded by *endotenon*, which serves as a pathway for blood vessels, nerves, and lymphatics.
- The *epitenon* surrounds the tendon itself, containing all of the fiber bundles.
- The *paratenon* is a synovial sheath surrounding most tendons of the hands and feet.

(Pong & Yelvington, 2015)

Anatomy



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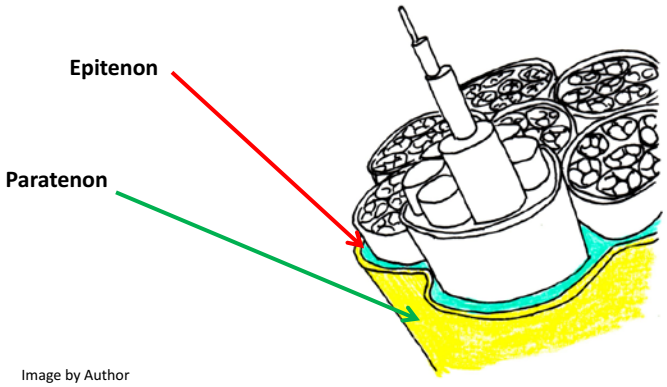
Anatomy



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Structural Anatomy

- Tensile strength of the tendon is provided by collagen.
- At least 7 types of collagen are found in tendons; however, Type I accounts for 70-80% of the dry weight in normal tendons.
- Proteoglycans and glycoproteins perform needed functions including holding water, resisting compression, facilitating fibrillar slippage, facilitate tendon healing, and allow the tendon to return to its shape after loading.

(Wang, Guo & Li, 2012)

Pathoanatomy

- The *tenocyte* represents the majority of cells in a tendon.
  - Main function is to maintain tendon homeostasis and repair injured tendons
- *Tendon stem cells* (TSCs) have been recently found to self-renew and differentiate into tenocytes
  - May be responsible for tendinopathy by undergoing aberrant nontenocyte differentiation with excessive mechanical loading

(Pong & Yelvington, 2015; Wang, Guo & Li, 2012)

Pathoanatomy

Effects of Mechanical Loading on Tendons	
Mechanical Load Level	*Effects on Tendons*
Low	< tensile strength
	< size
	< collagen production
	< anabolic activities
	> catabolic activities
Moderate	> tensile strength
	> collagen synthesis
	< collagen degradation
	< adhesions
	< inflammatory mediators
	> TSCs differentiating into tenocytes
Excessively High	< tensile strength
	< collagen organization
	> myofibroblasts
	> inflammatory mediators
	> TSCs differentiating into nontenocytes
	> leukotrienes (> edema)
Adapted from: (Wang, Guo & Li, 2012)	

Pathoanatomy

- Tendon healing phases:
  - Acute inflammatory (1-2 days)
  - Repair-regeneration (proliferative) (up to 6 weeks)
  - Maturation (remodeling) (3 weeks to 1 year)
- Collagen synthesis by tenocytes – Day 5 to Week 5
- Intrinsic tenocyte proliferation – Week 4 to Week 8

(Pong & Yelvington, 2015)

Tendinopathy Classification: Tendinosis

- *Tendinosis* - degenerative rather than inflammatory condition:
  - Hypoxic degeneration
  - Mucoid degeneration
  - Tendolipomatosis
  - Calcific tendinopathy
- *Tendinosis* is characterized by:
  - Fiber disorientation
  - Hypercellularity
  - Focal necrosis
  - Calcification

(Pong & Yelvington, 2015)

Tendinopathy Classification: Tendonitis

- *Tendonitis (tendinitis)* – an inflammatory response
  - Vascular disruption
  - Symptomatic degeneration
  - Lymphocytes and neutrophils are present
  - Fibroblastic proliferation
  - Hemorrhage
  - Granulation tissue

(Pong & Yelvington, 2015)

Classification: Paratendinitis

- *Paratendinitis (tenosynovitis; stenosing tenosynovitis)* – inflammation of the outer layer of the tendon
  - Fibrin deposition
  - Exudate
  - Areolar tissue degeneration
- *Combined Paratendinitis and Tendinosis*
  - Difficult to differentiate from single conditions

(Pong & Yelvington, 2015)

Specific Tendinopathies

Location	Name	Structures Involved
Dorsal-radial wrist pain/symptoms	DeQuervain's Tenosynovitis	Extensor pollicis brevis (EPB) and Abductor pollicis longus (APL)
	Intersection Syndrome	Extensor pollicis brevis (EPB), Abductor pollicis longus (APL), Extensor carpi radialis brevis (ECRB), & Extensor carpi radialis longus (ECRL)
	Extensor Digitorum Brevis Manus Syndrome	Aberrant muscle Extensor digitorum brevis manus
Mid-dorsal wrist pain/symptoms	Extensor Pollicis Longus Tenosynovitis	Extensor pollicis longus (EPL)
	Extensor Indicis Proprius Syndrome	Extensor indicis proprius (EIP)
	Extensor Digitorum Communis Tenosynovitis and Fourth Compartment Syndrome	Extensor digitorum communis (EDC) & Posterior interosseous nerve (PIN)
Dorsal-ulnar wrist pain/symptoms	Extensor Carpi Ulnaris Tenosynovitis	Extensor carpi ulnaris (ECU)
	Extensor Carpi Ulnaris Subluxation/Dislocation	Extensor carpi ulnaris (ECU)
	Extensor Digiti Minimi Tenosynovitis	Extensor digiti minimi (EDM)
Volar-radial wrist pain/symptoms	Flexor Carpi Radialis Tendinopathy	Flexor carpi radialis (FCR)
Mid-volar wrist pain/symptoms	Carpal Tunnel Syndrome	Flexor digitorum profundus (FDP) & Flexor digitorum superficialis (FDS)
	Lindburg's Syndrome	Flexor pollicis longus (FPL) & index flexor digitorum profundus (FDP)
Volar-ulnar wrist pain/symptoms	Flexor Carpi Ulnaris Tenosynovitis	Flexor carpi ulnaris (FCU)
	Trigger Finger	A1 pulley & flexor digit flexor tendons

Tendinopathy by Symptom Location

- Pain/symptoms at the dorsal-radial wrist
  - **DeQuervain's Tenosynovitis**
  - Intersection Syndrome
  - Extensor Digitorum Brevis Manus Syndrome

DeQuervain's Tenosynovitis: Pathology

- A stenosing condition of the abductor pollicis longus and extensor pollicis brevis caused by hypertrophy/hyperplasia of the extensor retinaculum covering the first dorsal compartment of the wrist
  - Previously thought that pathological change was fibrosis and fibrocartilaginous metaplasia without inflammation
  - Recent small study (n=13) revealed increased expression of neutrophil elastase and COX-2 positive cells, which the authors state are inflammatory markers, supporting their conclusion that inflammation ***is*** present in this tenosynovitis.

(Kuo et al, 2015; Vuillemin, Guerini, Bard & Morvan, 2012)

DeQuervain's Tenosynovitis: Pathoanatomy

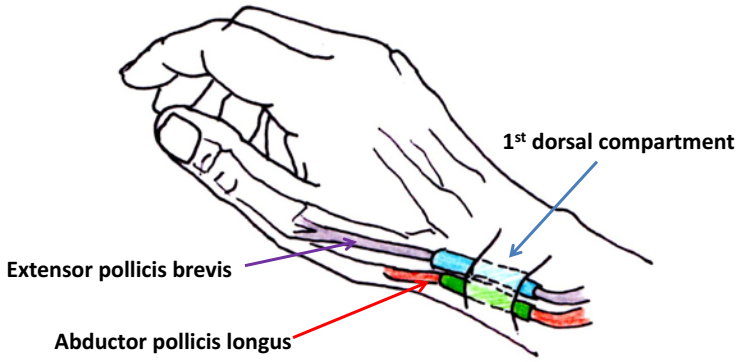


Image by Author

DeQuervain's Tenosynovitis: Presentation

- Presentation:
  - Pain and possibly swelling in the region of the radial styloid, first dorsal compartment
  - Pain is exacerbated by motion and activity of ulnar deviation with a closed fist and thumb MP flexion
    - Specific activity examples – wringing washcloth, gripping golf club, lifting baby or child, hammering a nail, swinging a racquet

(Goel & Abzug, 2015)

DeQuervain's Tenosynovitis: Diagnosis

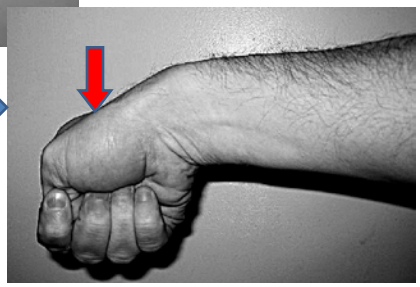
- Finkelstein's test – VIGOROUSLY misrepresented in the literature; often confused with Eichhoff's test procedure; both tests produce pain at the radial styloid when positive.
- Finkelstein's test:
  - Clinician grasps patient's thumb and quickly pulls the wrist into ulnar deviation via the hold on the thumb.
- Eichhoff's test:
  - Patient actively places thumb into palm and folds fingers over it; clinician then passively moves wrist into ulnar deviation
- Psychometric properties of these assessments are currently unknown.

(Pong & Yelvington, 2015)

DeQuervain's Tenosynovitis: Diagnosis

True Finkelstein's test. The clinician grasps the patient's thumb, uses it to quickly and passively place the wrist into ulnar deviation, causing pain at the radial styloid process.

Eichhoff test, often mistaken for Finkelstein's test. The patient actively grips the thumb in the fist and then the clinician passively places the wrist into ulnar deviation, which causes pain at the radial styloid process



Images adapted from: Pong & Yelvington, 2015

DeQuervain's Tenosynovitis: Diagnosis

- Additional clinical tests:
  - Extensor pollicis brevis entrapment test may identify the separate compartment for the EPB which is sometimes present; sensitivity 81%, specificity 50%
  - Palpation for tenderness is positive over the radial styloid and first dorsal compartment
  - Resisted thumb extension is painful

  (Pong & Yelvington, 2015)

DeQuervain's Tenosynovitis: Diagnosis

- Differential diagnosis:
  - Intersection syndrome
  - Scaphoid fracture
  - FCR tendinopathy
  - 1st CMC joint arthritis
  - Wartenburg's Syndrome

  (Elder & Harvey, 2005; Pong & Yelvington, 2015)

DeQuervain's Tenosynovitis : Treatment

- Non-operative treatments commonly used include:
  - Corticosteroid injections
  - Ultrasound
  - Soft tissue massage including Graston Technique
  - Therapeutic Exercises
  - NSAID medications
  - Icing
  - Activity modification
  - Immobilization in forearm-based thumb spica splint (neutral wrist; 30° CMC flexion; 30° thumb abd; IP left free)
- *None of these conservative treatments have strong evidence that they are more than palliative.*

(Goel & Abzug, 2015; Menendez, Thornton, Kent, Kalajian & Ring, 2015)

DeQuervain's Tenosynovitis : Treatment

- A recent single-blind, RTC (n=50) tested the efficacy of the NSAID ketoprofen 2.5% in phonophoresis on pregnant female patients with DeQuervain's tenosynovitis.
- Phono treatment was accompanied by static splinting and exercises.
- Parameters: Pulsed, 3MHz, 0.8 w/cm^2; 10 min sessions; 3x/4 weeks.
- Authors reported a statistically significant improvement in grip and pinch strength, as well as pain reduction in the treatment group versus the control group.

(Tabinda & Mahmood, 2015)

DeQuervain's Tenosynovitis : Post-Operative Treatment

- Forearm-based thumb spica splint is recommended post-operatively 1-2 weeks
- Patient education regarding activity modification and re-injury prevention
- Exercises:
  - Active and active-assisted ROM exercises initiated within 2 weeks post-op
  - Gentle strengthening at 4 weeks
  - Resisted eccentric thumb extension and abduction started at week 5
- Retrograde massage
- Transverse (cross friction) scar massage
- Desensitization

None of these has been proven efficacious by research at this time.
(Goel & Abzug, 2015)

Tendinopathy by Symptom Location

- Pain/symptoms at the dorsal-radial wrist
  - DeQuervain's Tenosynovitis
  - **Intersection Syndrome**
  - Extensor Digitorum Brevis Manus Syndrome

Intersection Syndrome: Pathology

- Thought to be a tenosynovitis, but also may include tendonitis, tendinosis, and bursitis.
- Exact pathology is unknown.
- Attributed to friction from intersecting muscle bellies and tendons of abductor pollicis longus, extensor pollicis brevis, extensor carpi radialis brevis, and extensor carpi radialis longus
- Friction occurs at the dorsal aspect of the distal forearm, 4-6cm proximal to the wrist.

(Elder & Harvey, 2005; Pong & Yelvington, 2015)

Intersection Syndrome: Pathoanatomy

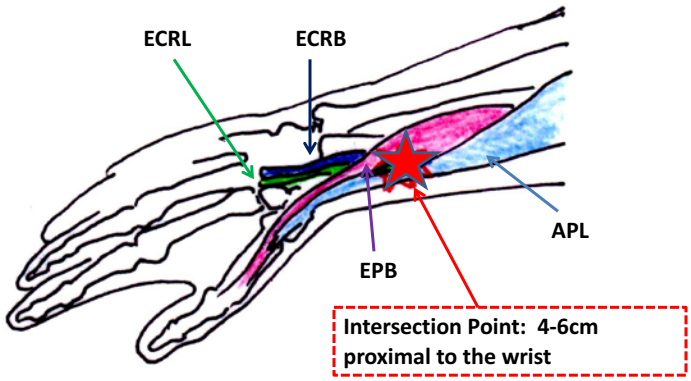


Image by Author

Intersection Syndrome: Presentation

- Patient may present with pain and/or swelling at the intersection point.
- Possibly palpable and audible crepitus with wrist flexion and extension
- Weakened pinch and grip
- Most common causes:
  - Work involving wrist flexion and extension with eccentric loading of extensor compartment
  - "Bugaboo forearm" snow skiing
  - Racquetball
  - Rowing

(Elder & Harvey, 2005; Pong & Yelvington, 2015)

Intersection Syndrome: Diagnosis

- Positive palpation to tenderness and possibly visible swelling proximal to first dorsal compartment (specifically, dorsal aspect of the distal forearm, 4-6cm proximal to the wrist)
- Possible palpable/audible crepitation between APL/EPB and ECRL/ECRB with wrist extension and flexion at intersection point
- Thickening and fluid collection at intersection point may show on MRI

Psychometric properties of these tests currently unknown.

(Elder & Harvey, 2005; Pong & Yelvington, 2015)

Intersection Syndrome: Differential Diagnosis

- DeQuervain's tenosynovitis
  - Provocative tests will be positive similar; however, symptoms will occur more proximally for Intersection Syndrome

(Pong & Yelvington, 2015)

Intersection Syndrome: Treatment

- Specific conservative treatments have included:
  - Work/activity modification
  - NSAIDs and analgesics
  - Resting hand splint
  - Taping forearm and/or wrist and thumb
    - "Nonstretch sports tape was applied, with an ulnarly directed tension force across the dorsal aspect of the forearm. Taping was performed daily for 3 weeks" (Kaneko & Takasaki, 2011, p. 514).

Strong supportive evidence for these treatments is lacking.

(Palmer & Lane-Larsen, 1994; Pantukosit, Petchkrua & Stiens, 2001)

Intersection Syndrome: Treatment

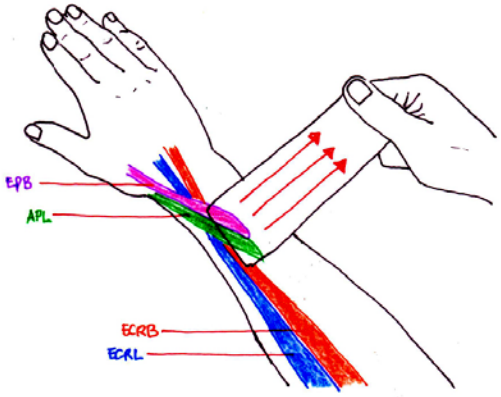


Image adapted from: (Kaneko & Takasaki, 2011)

Intersection Syndrome: Treatment

- Two surgical approaches:
  - Longitudinal incision over intersection point in line with muscle bellies of APL and EPB; fascia and sheath around these are released (Williams, 1977).
  - Decompression of the second dorsal compartment (Grundberg & Reagan, 1985).

  More current developments in surgery for this condition were not evident.

Tendinopathy by Symptom Location

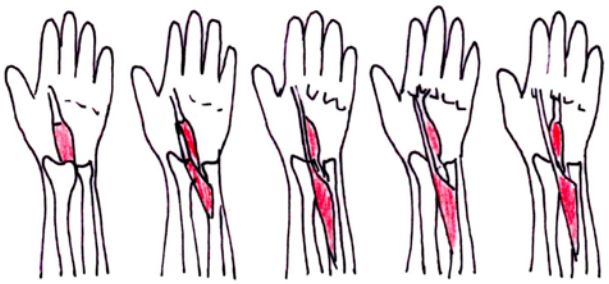
- Pain/symptoms at the dorsal-radial wrist
  - DeQuervain's Tenosynovitis
  - Intersection Syndrome
  - **Extensor Digitorum Brevis Manus Syndrome**

Extensor Digitorum Brevis Manus Syndrome

- Rare condition, is one cause of 4th Compartment Syndrome
- Aberrant muscle involved, the extensor digitorum brevis manus, incidence of 1-9%; is possibly a variant of the extensor indicis proprius muscle
- May present as a painless or painful mass on the proximal second metacarpal space

(Elder & Harvey, 2005; Mahabir, Williamson, Williamson & Raber, 2003)

Extensor Digitorum Brevis Manus Syndrome



EDBM variations:
from left, Type I, Type IIa, Type IIb, Type IIc, and Type III

Image by Author

Extensor Digitorum Brevis Manus Syndrome

- Provocative testing:
  - Resisted extension of the fingers reproduces mid-dorsal wrist pain
  - Weightbearing on the palm of the hand with wrist in full extension reproduces mid-dorsal wrist pain
- Differential diagnosis:
  - Ganglion and synovial cysts
  - Carpal bossing

(Elder & Harvey, 2005)

Extensor Digitorum Brevis Manus Syndrome

- Treatment
  - If painless, and diagnosis is confirmed with clinical exam and/or MRI, treatment is not required
  - If painful, conservative treatment is attempted first, although evidence shows little success
    - NSAIDs, splinting, corticosteroid injections, paraffin bath
  - Surgery will usually consist of extensor retinaculum release; occasionally, excision of the EDBM is supported

(Elder & Harvey, 2005; Mahabir, Williamson, Williamson & Raber, 2003)

Tendinopathy by Symptom Location

- Pain/symptoms at the mid-dorsal wrist
  - **Extensor Pollicis Longus Tenosynovitis**
  - Extensor Indicis Proprius Syndrome
  - Extensor Digitorum Communis Tenosynovitis and Fourth-Compartment Syndrome

Extensor Pollicis Longus Tenosynovitis

- A tenosynovitis of the EPL tendon
- Most commonly seen in conjunction with rheumatoid arthritis
- Also evidenced with racquet sports, drumming, tendon nodule presence, and after distal radius fractures
- Presentation includes:
  - history of dorsal wrist pain and swelling
  - Possibly crepitus at Lister's tubercle
  - Occasionally snapping and/or triggering of the EPL

(Elder & Harvey, 2005; Kardashian, Vara, Miller, Miki & Jose, 2011; Luenam, Kosiyatrakul & Prachaporn, 2010)

Extensor Pollicis Longus Tenosynovitis: Pathoanatomy

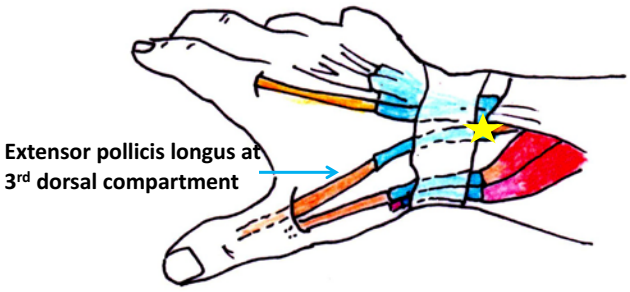


Image by Author

Extensor Pollicis Longus Tenosynovitis

- Provocative testing:
  - Resisted thumb extension reproduces pain along the EPL, near Lister's tubercle
  - Passive thumb flexion at IP joint reproduces pain along the EPL sheath
  - Tenderness to palpation along EPL tendon near Lister's tubercle

(Elder & Harvey, 2005; Kardashian, Vara, Miller, Miki & Jose, 2011; Luenam, Kosiyatrakul & Prachaporn, 2010)

Extensor Pollicis Longus Tenosynovitis

- Treatment:
  - Cortisone injections and splinting are recommended but not proven efficacious in the literature
    - Tendon rupture has occurred following corticosteroid injections
  - Surgical decompression is recommended in chronic cases

(Elder & Harvey, 2005; Kardashian, Vara, Miller, Miki & Jose, 2011; Luenam, Kosiyatrakul & Prachaporn, 2010; Mills, Charalambous & Hayton, 2009)

Tendinopathy by Symptom Location

- Pain/symptoms at the mid-dorsal wrist
  - Extensor Pollicis Longus Tenosynovitis
  - **Extensor Indicis Proprius Syndrome**
  - Extensor Digitorum Communis Tenosynovitis and Fourth-Compartment Syndrome

Extensor Indicis Proprius Syndrome

- Pathology:
  - EIP passes through fourth dorsal compartment with the MTJ lying predominately within the compartment
  - compartment becomes very tight with wrist flexion
  - Anomalous anatomic variations are common
  - Repetitive irritation of the tenosynovium with passing under proximal retinacular edge
  - In some cases, hypertrophy of the EIP is a contributing factor

(Elder & Harvey, 2005; Pong & Yelvington, 2015)

Extensor Indicis Proprius Syndrome: Pathoanatomy

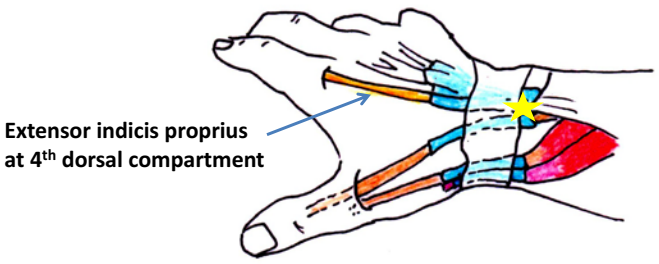


Image by Author

Extensor Indicis Proprius Syndrome

- Patient presentation:
  - Pain, tenderness, swelling over mid-dorsal wrist at the 4th dorsal compartment
  - Symptoms aggravated with activities involving repetitive wrist flexion and extension
- Provocative testing:
  - Resisted extension of the index finger with the wrist fully flexed reproduces symptoms
- Differential diagnosis:
  - EDC tenosynovitis, EPL tenosynovitis, ganglion cyst, Kienbock's disease

(Elder & Harvey, 2005)

Extensor Indicis Proprius Syndrome

Provocative testing:

Resisted extension of the index finger with the wrist fully flexed reproduces symptoms

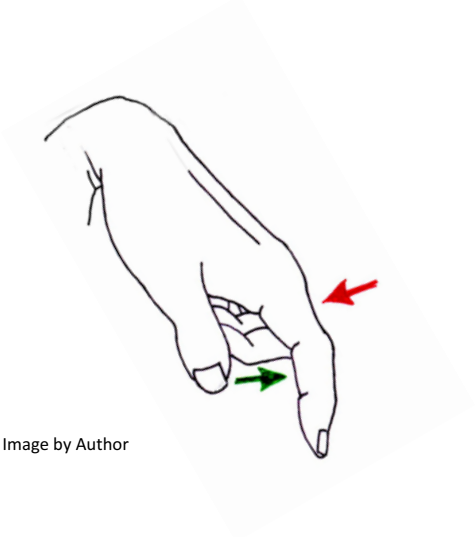


Image by Author

Extensor Indicis Proprius Syndrome

- Treatment – similar to other lesser known tendinopathies of the hand and wrist, conservative treatment is recommended but not well supported in the literature
  - Rest, splinting, local corticosteroids
- Reports of operative treatment are also scarce
  - Release of the 4th dorsal compartment

(Elder & Harvey, 2005)

Tendinopathy by Symptom Location

- Pain/symptoms at the mid-dorsal wrist
  - Extensor Pollicis Longus Tenosynovitis
  - Extensor Indicis Proprius Syndrome
  - **Extensor Digitorum Communis Tenosynovitis and Fourth-Compartment Syndrome**

Extensor Digitorum Communis Tenosynovitis

- One of several causes of Fourth Compartment Syndrome
  - Crowding in the 4th dorsal compartment by various pathological conditions may cause painful compression of the posterior interosseous nerve
- Extremely limited information in the literature
- Very rare in recorded occurrence
- Presentation: pain over 4th dorsal compartment exacerbated by activities involving wrist and finger flexion
- Provocative testing: diffuse pain with resisted finger and wrist extension

(Elder & Harvey, 2005)

Extensor Digitorum Communis Tenosynovitis: Pathoanatomy

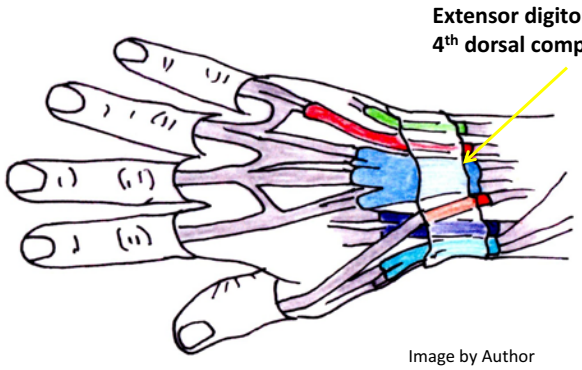


Image by Author

Extensor Digitorum Communis Tenosynovitis

- Treatment:
  - Very general due to difficulty in identifying tissue-specific cause
  - Surgery recommended with failure of conservative treatment
  - Surgical release of the 4th dorsal compartment addresses anomalous causes that prevent success of conservative treatment

(Elder & Harvey, 2005)

Tendinopathy by Symptom Location

- Pain/symptoms at the dorsal-ulnar wrist
  - **Extensor Carpi Ulnaris Tenosynovitis**
  - **Extensor Carpi Ulnaris Subluxation/Dislocation**
  - Extensor Digiti Minimi Tenosynovitis

Extensor Carpi Ulnaris Tenosynovitis/ Subluxation or Dislocation

- Extensor carpi ulnaris tendinopathy can include a tenosynovitis, where there is entrapment of a thickened overused tendon, a trapped or untrapped tendinosis, and an unconstrained tendinopathy, where a ruptured ECU sub-sheath allows the ECU to sublux in a volar direction
- The ECU muscle uses the 6th dorsal compartment as a pulley; damage can cause tendon subluxation or dislocation.

(Garcia-Elias, 2015)

Extensor Carpi Ulnaris Tenosynovitis/ Subluxation or Dislocation: Pathoanatomy

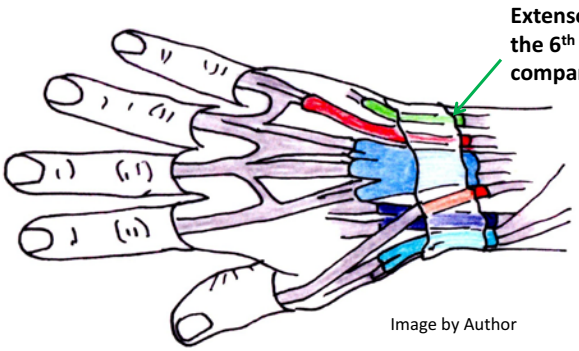


Image by Author

Extensor Carpi Ulnaris Tenosynovitis/ Subluxation or Dislocation

- Both ECU tenosynovitis and subluxation have frequent causation by sports, such as rowing, racquet, and weightlifting
- Presentation:
  - Tenosynovitis
    - history of chronic pain at dorso-ulnar wrist
    - Swelling, thickening in the area
  - Subluxation/Dislocation
    - Dorso-ulnar wrist pain
    - Clicking (often audible) at the ulnar head with activities involving pronation and supination

(Elder & Harvey, 2005)

Extensor Carpi Ulnaris Tenosynovitis/ Subluxation or Dislocation

- Provocative tests:
  - ECU tenosynovitis
    - Resisted wrist ulnar deviation and extension
  - ECU subluxation/dislocation
    - Combined active forearm supination with wrist extension
- Differential diagnosis:
  - ECU tenosynovitis
    - ECU subluxation/dislocation; EDM tenosynovitis; TFCC tears
  - ECU subluxation/dislocation
    - TFCC tears

(Elder & Harvey, 2005)

Extensor Carpi Ulnaris Subluxation or Dislocation: Pathoanatomy

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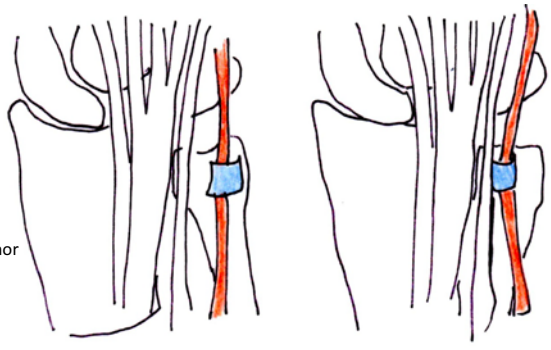


ECU relocates with pronation (left) and subluxes wth supination (right).

Extensor Carpi Ulnaris Tenosynovitis/ Subluxation or Dislocation

- Treatment – ECU tenosynovitis
  - Standard tendinopathy conservative care, lack of support or recent developments in the literature
    - NSAIDs
    - Splinting
    - Corticosteroid injection

(Crimmins & Jones, 1995; Elder & Harvey, 2005)

Extensor Carpi Ulnaris Tenosynovitis/ Subluxation or Dislocation

- Treatment – ECU tenosynovitis
  - Surgical treatment consists of 6th dorsal compartment release
    - Released on the radial side to allow a tight repair of the extensor retinaculum to prevent postoperative ECU subluxation
    - Post-operative care consists of 2-3 weeks immobilization in volar-based splint with wrist in 20° of extension, followed by traditional therapy to regain ROM, strength, and function

(Elder & Harvey, 2005)

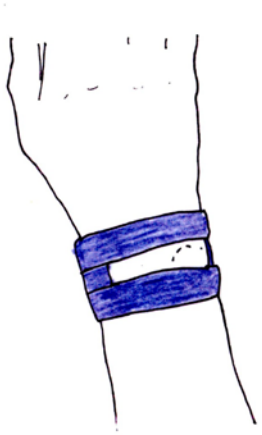
Extensor Carpi Ulnaris Tenosynovitis/ Subluxation or Dislocation

- Treatment – ECU subluxation/dislocation
  - Conservative treatment recommended for traumatic subluxation/dislocation has minor support in the literature
    - Long arm cast for 4-6 weeks
      - Wrist is in slight radial deviation and extension, the forearm in pronation
      - Casting is intended to allow the subsheath to reattach to the ulnar edge of the ECU groove
    - Short arm cast for 2-3 months
      - Wrist is in 15° of extension

(Elder & Harvey, 2005; Iorio & Huang, 2014)

Extensor Carpi Ulnaris Tenosynovitis/ Subluxation or Dislocation

- ECU subluxation /dislocation treatment: "Wrist Widgets" novel and unproven treatment is velcro bracing, originally developed for relief from pain due to TFCC tears; has been utilized with testimonials of success in pain relief and stabilization of ECU subluxation (Howard, 2007).



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Extensor Carpi Ulnaris Tenosynovitis/ Subluxation or Dislocation

- ECU subluxation /dislocation surgical treatment:
  - Reconstruction of the fibro-osseous tunnel via various methods
  - Acute injury can receive a primary repair
  - Chronic injury will need augmentation, such as a sling about the ECU tendon
- Post-operative care:
  - 6 weeks of long-arm casting/splinting in 90° elbow flexion, forearm in neutral, and 30° wrist extension
  - Followed by standard therapy to recover ROM, strength, and function

(Elder & Harvey, 2005; Iorio & Huang, 2014)

Tendinopathy by Symptom Location

- Pain/symptoms at the dorsal-ulnar wrist
  - Extensor Carpi Ulnaris Tenosynovitis
  - Extensor Carpi Ulnaris Subluxation/Dislocation
  - **Extensor Digiti Minimi Tenosynovitis**

Extensor Digiti Minimi Tenosynovitis

- Few cases of Extensor digiti minimi tenosynovitis reported
- Recent research finds that distal bifurcation of the EDM tendon can lead to tendon impingement on the septum; suggests this as a previously unknown etiology
- Generally brought on by repetitive use of the hand, such as handwriting

(Elder & Harvey, 2005; Yoo, Chung, Kim, Kim & Lee, 2012)

Extensor Digiti Minimi Tenosynovitis

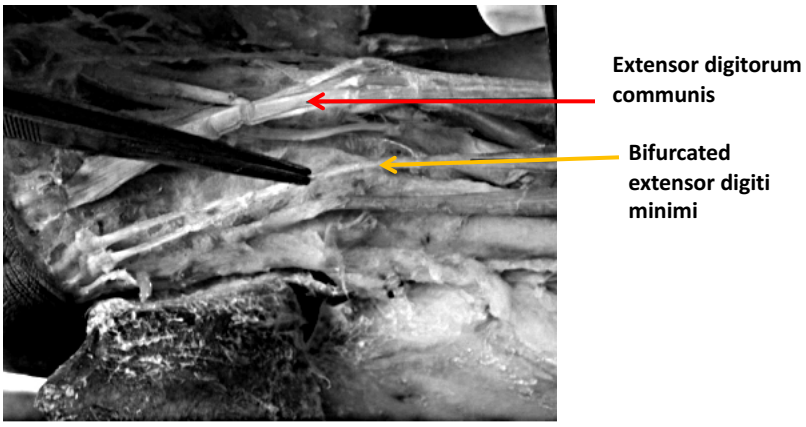


Photo adapted from: (Saha, Dey, Uzzaman, Dutta & Sadhu, 2015)

Extensor Digiti Minimi Tenosynovitis

- Presentation:
  - pain, swelling on ulno-dorsal wrist just distal to ulnar head
  - reports of pain with gripping and inability to extend 5th digit
- Differential diagnosis:
  - ECU tendinopathies; TFCC pathology; ulnar impaction
- Provocative testing:
  - Active wrist flexion with hand in a fist reproduces symptoms

(Elder & Harvey, 2005; Yoo, Chung, Kim, Kim & Lee, 2012)

Extensor Digiti Minimi Tenosynovitis

- Treatment:
  - Standard conservative treatment for tendinopathy
  - Surgical decompression via release of the 5th dorsal compartment

(Elder & Harvey, 2005; Yoo, Chung, Kim, Kim & Lee, 2012)

Tendinopathy by Symptom Location

- Pain/symptoms at the volar-radial wrist
  - **Flexor Carpi Radialis Tendinopathy**
  - Carpal Tunnel Syndrome
  - Linburg's Syndrome

Flexor Carpi Radialis Tendinopathy

- Flexor carpi radialis tendinopathy is a rare disorder with a higher occurrence due to surgical complication recently reported
- Causes:
  - Overuse
  - Rheumatoid arthritis
  - Complication of trapeziectomy and suspensionplasty for basal joint arthritis

(Elder & Harvey, 2005; Low & Hales, 2014)

Flexor Carpi Radialis Tendinopathy

- Presentation:
  - Pain, swelling at radio-volar wrist at level of distal wrist crease
- Provocative testing:
  - Simultaneous wrist flexion and radial deviation resisted from a neutral wrist position
- Treatment:
  - Standard conservative care
  - Surgical decompression

(Elder & Harvey, 2005; Low & Hales, 2014)

Tendinopathy by Symptom Location

- Pain/symptoms at the volar-radial wrist
  - Flexor Carpi Radialis Tendinopathy
  - **Carpal Tunnel Syndrome**
  - Linburg's Syndrome

Carpal tunnel syndrome can be caused by FDS/FDP tenosynovitis; however, it is primarily a nerve compression syndrome with a multitude of causes and will not be covered here.

Tendinopathy by Symptom Location

- Pain/symptoms at the volar-radial wrist
  - Flexor Carpi Radialis Tendinopathy
  - Carpal Tunnel Syndrome
  - **Linburg's Syndrome (Linburg-Comstock Anomaly)**

Linburg's Syndrome

- Linburg-Comstock Syndrome is an anomaly consisting of tendinous interconnections between the flexor pollicis longus muscle belly or tendon and the index flexor digitorum profundus (FDP), but can include additional tendons of the FDP.
- Possibly an acquired lesion or a congenital anomaly; thumb-finger flexor tenosynovitis is the result.
- Prevents independent flexion of the thumb IP and involved digital DIP joint(s).

(Elder & Harvey, 2005; Gancarczyk & Strauch, 2014)

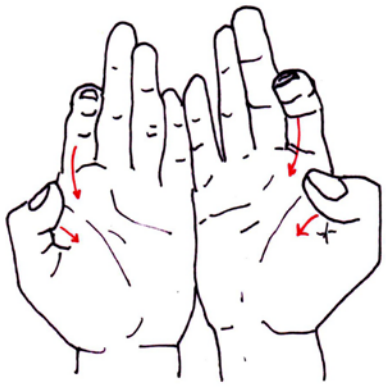
Linburg's Syndrome

- Can be asymptomatic but can develop symptoms after repetitive fine motor tasks requiring independent movements of fingers and thumb or heavy loading.
- Patient presents with activity-related pain on the distal volar forearm and wrist; may describe pain as "tearing sensation." Simultaneous movement of thumb IP joint flexion and IF FDP DIP joint flexion may evidence condition.
- Provocative testing: Passive extension of index finger (and/or other involved digits) with simultaneous active flexion of thumb IP joint, reproduces symptoms.

(Elder & Harvey, 2005; Gancarczyk & Strauch, 2014)

Linburg's Syndrome

Simultaneous movement of thumb IP joint flexion and IF FDP DIP joint flexion may evidence condition.



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Linburg's Syndrome

- Treatment:
  - Asymptomatic presentation may not require treatment unless function is impaired
  - Symptomatic presentation is not resolved by conservative treatment, although cortisone injections may offer temporary relief
  - Operative treatment consists of release of the anomalous intertendinous connection(s)

(Elder & Harvey, 2005; Gancarczyk & Strauch, 2014)

Tendinopathy by Symptom Location

- Pain/symptoms at the volar-ulnar wrist or hand
  - **Flexor Carpi Ulnaris Tenosynovitis**
  - Trigger Finger

Image by Author

Flexor Carpi Ulnaris Tenosynovitis

- Despite the claim of being the most common wrist flexor tendinopathy, FCU tenosynovitis is severely underrepresented in the literature.
- Sometimes mistaken for Guyon's canal syndrome
- Seen mostly in golf and racquet athletes
- Provocative testing: resisted wrist flexion and ulnar deviation reproduce pain just distal to the pisiform

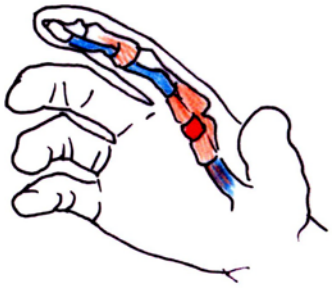
(Elder & Harvey, 2005)

Flexor Carpi Ulnaris Tenosynovitis

- Conservative treatment is stated to be effective; however, specific evidence is not seen in the literature.
  - Dorsal splinting
  - Corticosteroid injections
- Surgical treatment may vary
  - Excision of calcific deposits
  - Peritendinous adhesion lysis
  - Z-plasty of FCU with pisiform excision
  - Post-operative care varies with the specific surgery
- (Elder & Harvey, 2005)

Tendinopathy by Symptom Location

- Pain/symptoms at the volar-ulnar wrist or hand
  - Flexor Carpi Ulnaris Tendinopathy
  - **Trigger Finger**



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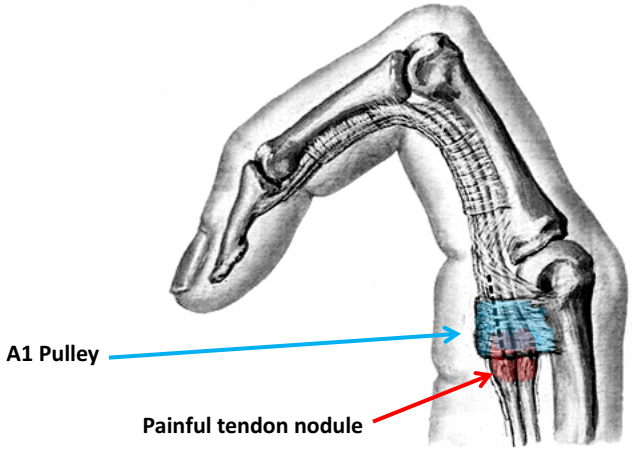
Trigger Finger: Pathology

- Formally termed "digital stenosing tenosynovitis" or "stenosing flexor tenosynovitis" (Colbourn, Heath, Manary & Pacifico, 2008, p. 336).
- Tendons of the FDS/FDP gliding through fibro-osseous sheaths are restricted in excursion under the A1 pulley at the MCP joint.
- Can result from irritation/inflammation of the tendon and can cause a tendon nodule
- Results in a snapping or "trigger" with finger movement from flexion to extension (Colbourn, Heath, Manary & Pacifico, 2008).

Trigger Finger: Pathology



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Trigger Finger: Pathology

- Pathologic findings vary, suggesting specific and different causes for the general triggering seen.
  - Primary idiopathic trigger finger is tenovaginitis, with inflammatory changes in the retinacular sheath and peri-tendinous tissue
  - Tenosynovitis, as caused by rheumatoid arthritis, shows inflammatory changes in the tenosynovium
  - Other studies have shown fibro-cartilaginous metaplasia in the A1 pulleys and flexor tendons (Colbourn, Heath, Manary & Pacifico, 2008)

Trigger Finger: Associated Causes

- Rheumatoid arthritis
- Gout
- Diabetes
- Other disorders resulting in connective tissue changes
- Often found idiopathically in healthy, middle-aged women (Colbourn, Heath, Manary & Pacifico, 2008)

Trigger Finger: Treatment

- Variable evidence-supported treatment hierarchy:
  1. Use of orthoses/splints
  2. Corticosteroid injections
  3. Corticosteroid injections plus use of orthoses
  4. Operative treatment/surgery

(Colbourn, Heath, Manary & Pacifico, 2008; Huisstede, Hoogvliet, Coert & Fridén, 2014)

Trigger Finger: Treatment

Trigger Finger Treatment Options Based on Symptom Severity and Time

	1 very mild symptoms	**2** mild symptoms	**3** moderate symptoms	**4** severe symptoms	**5** very severe symptoms
5 chronic stage > 6 mos	corticosteroid injection	corticosteroid injection *with* splinting	corticosteroid injection *with* splinting; surgery	corticosteroid injection *with* splinting; surgery	surgery
4 chronic stage 3 ≤ 6 mos	corticosteroid injection	corticosteroid injection; corticosteroid injection *with* splinting	corticosteroid injection; corticosteroid injection *with* splinting; surgery	corticosteroid injection; corticosteroid injection *with* splinting; surgery	surgery
3 subacute stage 2 ≤ 3 mos	splinting	splinting; corticosteroid injection; corticosteroid injection *with* splinting	splinting; corticosteroid injection; corticosteroid injection *with* splinting; surgery	corticosteroid injection; corticosteroid injection *with* splinting; surgery	corticosteroid injection *with* splinting; surgery
2 subacute stage 1 ≤ 2 mos	splinting	splinting; corticosteroid injection; corticosteroid injection *with* splinting	splinting; corticosteroid injection; corticosteroid injection *with* splinting; surgery	corticosteroid injection; corticosteroid injection *with* splinting; surgery	corticosteroid injection; corticosteroid injection *with* splinting; surgery
1 acute stage ≤ 1 mos	splinting	splinting; corticosteroid injection; corticosteroid injection *with* splinting	splinting; corticosteroid injection; corticosteroid injection *with* splinting	corticosteroid injection; corticosteroid injection *with* splinting	corticosteroid injection; corticosteroid injection *with* splinting

Adapted from: (Huisstede, Hoogvliet, Coert & Fridén, 2014)

Trigger Finger: Treatment

- Use of splinting alone has variable success, according to research
  - Rodgers and associates (1998) found a 55% resolution of triggering with a Stax splint utilized with NSAIDs.
  - Sweezy (1999) and Sheon (1997) splinted the PIP joint with flexible elastic or cling gauze; however effective outcomes from this splint are not supported in the literature.
  - Splinting the MCP joint between 0-15° of flexion with full IP movement was reported to provide good outcomes in 70-73% of studied patients (Colbourn, Heath, Manary & Pacifico, 2008).

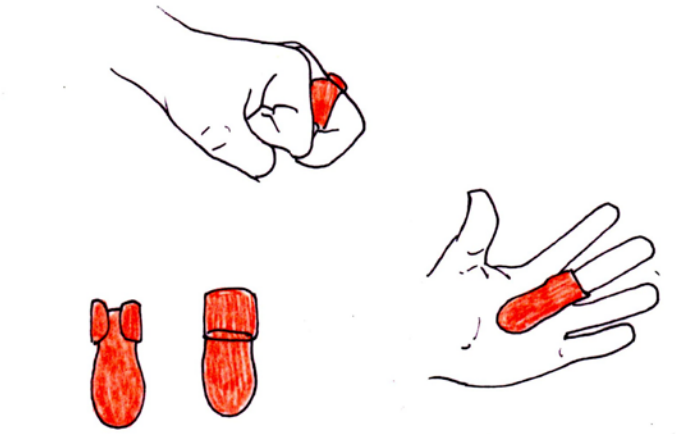
Trigger Finger: Treatment

- Recent Splinting Evidence
  - In 2008, a custom ring splint was tested in a pilot study of 28 participants with trigger finger. Results showed statistically significant improvement in both subjective and objective outcome measures.
  - After 6-10 weeks of splint wear, 53.6% had complete resolution of symptoms, and 39.3% had partial resolution (Colbourn, Heath, Manary & Pacifico, 2008).

Trigger Finger: Treatment

- Material: solid Orfilight 1/8”
- MCP joint in 15° flexion
- Left open dorsally if PIP joint was large or swollen
- Splint was worn day and night for 6-10 weeks
- Splint was removed 3x/day to perform exercises of passive IP flexion, composite full finger flexion, full finger extension, and active hooks, 5 repetitions each (Colbourn, Heath, Manary & Pacifico, 2008).

Trigger Finger: Treatment



Adapted from: (Colbourn, Heath, Manary & Pacifico, 2008).

Trigger Finger: Treatment

- Moderate and scarce evidence recommends an intermediate-acting corticosteroid along with a local anesthetic for injection treatment. A limit of one to three injections is advised (Colbourn, Heath, Manary & Pacifico, 2008; Huisstede, Hoogvliet, Coert & Fridén, 2014).

Trigger Finger: Treatment

- Evidence supports surgery as efficacious when conservative treatment has not resolved trigger finger signs and symptoms.
  - An open procedure is recommended over percutaneous technique.
  - Use of a local anesthetic is preferred.
  - A transverse incision and non-resorbable sutures are advised.

  (Huisstede, Hoogvliet, Coert & Fridén, 2014)

Review: Learner Outcomes

As a result of this course, participants will be able to:

1) ...identify the anatomical structures that are relevant to hand and wrist tendinopathies.

2) ...discuss the pathoanatomy and classifications of hand and wrist tendinopathies.

3) …incorporate evidence-based clinical assessments for hand and wrist tendinopathies into their clinical practice.

4) ...discuss current knowledge in conservative and post-operative treatments for hand and wrist tendinopathies, state the potentials and limitations of these treatments according to research evidence.

References

- Available in separate handout.

Conclusion

Questions and Answers:

Point of Contact:
Please feel free to email me with any additional questions or discussion of this course. Thank you for your time and attention!
ejpong@bellsouth.net