ACUTE EXTENSOR TENDON INJURIES OF THE HAND

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Introduction

• Extensor tendon injuries require the same amount of skill and knowledge required for flexor tendon injuries
• Common injuries due to exposed and superficial location
• Mechanism:
  - laceration
  - abrasion
  - crush
  - avulsion
Introduction

• majority of injuries at joint level
• limited retraction of tendon ends; gap usually due to unopposed flexion
• tendons are extrasynovial and covered with paratenon
• traditional teaching suggests extensor tendon injuries treated early do well. Retrospective study by Newport et al (J.Hand Surgery, 1990) on the long term results in 101 digits:
• i. 60% sustained an associated injury
• ii. patients with associated injuries achieved 45% good/excellent results
• iii. patients with no associated injury achieved 65% good/excellent results
• iv. distal zone injuries (I-V) did less well than proximal zone injuries (V-IX)
• v. the percentage of fingers that lost flexion was greater than the percentage that lost extension
• vi. 95% of the patients were satisfied with the functional result
Anatomy

• Finger extension is complex and considered more intricate than flexion

• extensor mechanism is composed of two separate and neurologically independent systems:
  i. Radial n. innervated extrinsic system
  ii. The intrinsic system innervated by the median and ulnar n. which is confined to the hand
Anatomy

• Extensor Zones: Functionally and topographically separated into numbered zones

• note odd-numbered zones are located over joints
Anatomy

- Wrist, thumb and finger extensors gain access to the hand beneath the extensor retinaculum via a series of six compartments.
- Tendons are covered by synovial sheath at this level only.
Anatomy

- Extensor tendon achieves simultaneous extension of two finger joints in a mechanism in which the central slip extends the middle phalanx and the lateral bands bypass the PIPJ and extend the distal phalanx.
- Critically important is the relative lengths of the central slip and two lateral bands.
- This length relationship is what is so difficult to restore following injury.
Zone 1
DIP joint

- **Mallet finger**: loss of continuity of the conjoined lateral bands at the distal joint of the finger resulting in characteristic flexion deformity
- functionally, loss of continuity of the extensor tendon over the distal finger joint with loss of active extension
- open or closed injuries
Zone 1
mallet finger

• Classification:
  type I- closed injury +/- avulsion fracture
  type II- laceration at or proximal to DIPJ
  type III- deep abrasion with loss of tendon substance
  type IV- a. transepiphyseal plate fracture
            b. hyperflexion injury with articular fracture involving 30-50% articular surface
            c. > 50% articular surface
Zone 1
mallet finger

- **Treatment**: goal is the restoration of tendon continuity with maximum functional recovery
- non-operative- POP splints
- operative- k-wire external tendon suture direct tendon repair
• **Type I injuries:** volar splint (Stack) 6/52; 2/52 nightsplint rarely, fine k-wire across DIPJ 6/52

• **Type II injuries:** laceration at DIPJ are repaired by simple roll-type suture which re-approximates the skin and tendon simultaneously

• **Type III injuries:** plastic referral for skin cover and late free tendon graft reconstruction

• **Type IV:** a. MUA and splintage  
  b + c. treat as articular fracture
Zone II injuries
middle phalanx

- Often due to laceration
- most Rx with roll-type suture and splintage if complete laceration
- if partial laceration (<50%) debride wound and begin early movement at 2/52
- thumb: if EPL divided, splint IPJ in full extension
Zone III injuries: PIPJ level

- **Boutonniere lesion**: disruption of the central slip of the extensor tendon at PIPJ associated with volar displacement of the lateral bands

- Characteristic deformity: loss of extension of the middle joint (PIPJ) and compensatory hyperextension of the DIPJ

- **Mechanism**: closed blunt trauma, laceration, forced flexion at PIPJ +/- avulsion fracture of dorsal base middle phalanx
Affections of the wrist and hand
• **Boutonniere deformity:** may become apparent 10-21 days post-injury

• **stages:**
  1. flexion at PIPJ due to loss of central slip and unopposed flexor action
  2. lateral bands migrate volarward (volar to the axis of joint rotation)
  3. volar position of lateral bands causes extrinsics to pull exclusively at DIPJ causing progressive hyperextension

• **Treatment:** dependent on the restoration of tendon balance and length relationship between central slip and lateral bands
Boutonniere deformity: Treatment

- **closed**- splint/ transarticular k-wire of PIPJ in full extension
- **open**- laceration at PIPJ likely to involve joint; debridement and antibiotics; simple laceration can be repaired with roll-type suture; PIPJ held in extension with splint or k-wire
- if tendon substance lost consider reconstructive procedures
Zone IV

Proximal phalanx

- Often partial tendon lacerations but require direct inspection for diagnosis
- Rx by core-type repair and rehabilitation with PIPJ in full extension for 6/52
- EPB and EPL at this level are directly repaired; rehabilitation in the position of function with thumb in full extension
Zone V
Metacarpal-phalangeal level

- Human bites: tendon injury associated with wound capable of significant infection. X-ray to note fracture or loose body.
- All require debridement; never close wound.
- Most tendon injuries partial; treat non-operatively with wrist and hand in the position of function.
- Simple laceration: direct repair of the tendon and extensor hood.
- Tendons do not retract.
Zone V
metacarpal-phalangeal level

- Traumatic dislocation of extensor tendon: subluxation/dislocation due to rupture/laceration of the extensor hood (sagittal band) tear commonly on radial side of digit with ulnar subluxation/dislocation of the tendon and digit

treat early by direct repair with static splinting of MCPJ in slight flexion
Zone VI
metacarpal level

• Zone VI injuries better prognosis than distal zones (II-IV):
  - less likely to have associated joint injury
  - less tendon surface/ increased subcutaneous tissue lessens adhesion formation
  - greater tendon excursion

• direct repair with core-type sutures followed by dynamic splintage ideal
Zone VII
Wrist level

• Injuries of the extensor mechanism at wrist associated with injury to the extensor retinaculum

• Lacerations at this level are said to be complicated by adhesion formation; partial resection of the retinaculum advised with preservation of proximal or distal portion to prevent bowstringing

• Tendons retract at this level; proximal/distal wound extension required to locate tendon
• Common site of extensor tendon rupture following closed fracture of distal radius/ulna especially EPL. ECU and EDC

• **Treatment:** direct repair with core-type technique

• rehabilitate with either early dynamic splintage or immobilisation in the position of function

• acute rupture of EPL is treated by EIP tendon transfer or direct repair
Dynamic splinting

- Extensor tendon repairs traditionally protected immobilised in extension
- Adhesions a problem
- Significant and extensive research has proven controlled and early passive motion of sutured tendon site by dynamic splinting useful to promote a well-healed, non-adherent gliding tendon surface in flexor tendon repairs
- Likely to be applicable to extensor injuries
Dynamic splinting

- Elastic traction maintains the fingers in extension
- excursion of the repaired tendon is achieved by active flexion
- splinting is started 3-5 days post-op and maintained for 5/52
- most beneficial in zones V-VIII
- requires a co-operative patient and a dedicated therapist
THANK YOU