EXTENSOR TENDONS

Anatomy, Mechanism and Injuries
Extensor tendons at the wrist

- As they course under the extensor retinaculum, extensor tendons of the wrist and hand are divided into 6 compartments at the dorsal wrist, each containing specific tendons.
Deep Intrinsic Tendon
I: Lateral MC base

Superficial tendon
- Medial merge to Central band
- Lateral merge to Collateral band

Function Extend IP Lumbricals
O: FDP proximal to A1
I: Intrinsic tendon
Palmar Intrinsics (Unipennate)
Dorsal Intrinsics (Bipennate)
EXTRINSIC TENDONS

Central Band
- Origin (O): EDC
- Insertion (I): Middle phalanx base

Collateral band
- Origin (O): Central band
- Insertion (I): Distal phalanx (terminal tendon)

P1: Palmar Tendinous Slip (via joint capsule)
P2: Central Slip
P3: Terminal Tendon
Sagittal band

Transverse volar plate attachments

Retinacular ligament

Transverse to Central tendon

Oblique to Terminal tendon

Intertendinous expansions

- Triangular ligament
- Arciform fibres
- Tendinous junctures
**Extensor Mechanism**  
**(Apparatus)**

**Extrinsic actions**
Extension across MCP and PIP by Central band  
Extension across PIP and DIP by Collateral band

**Intrinsic actions**
Interossei Flex IP with Flexed MP, Extend IP with Extended MP  
Lumbricals Extend IP with Flexed MP, Flex IP with Extended MP
EXAMINATION

- Neurovascular status
- Flexor tendon function
- Radiographs if indicated
- Wound inspection (with or without LA)
  - Joint inspection
- Zone V- VII Carefully test MCP extension with wrist in Neutral and IP joints extended
INJURIES

- **Zone I – DIP Joint**
- **Zone II - middle phalanx**
- **Zone III – PIP Joint**
- **Zone IV – proximal phalanx**
- **Zone V – MCP Joint**
- **Zone VI - metacarpal**
- **Zone VII Wrist joint**
MALLET

- Terminal Tendon rupture
- Deformity may be delayed
- Type I extensor tendon avulsion from distal phalanx.
- Type II laceration
- Type III deep avulsion that injures tendon and skin.
- Type IV fracture of distal phalanx

SUPER MALLET

- Swan-neck deformity due to Mallet
- Failed closed Rx for Mallet
- Pre-existing hyper extensible PIP
TREATMENT

ZONE I – DIP joint

Open injury

Closed injury
- Accurate reduction of fracture involving a large intra-articular fragment (>30% of the articular surface).
- Mallet finger splint, aiming for slight hyperextension. 6 weeks.

Established mallet finger deformity:
- excision of the redundant scar and prolonged splintage
- DIP arthrodesis in 100° of flexion.
BOUTONNIERE DEFORMITY

Transverse Retinacular ligament tethers collateral band
Prevent active DIP extension when PIP is fixed in flexion

Incompetent Transverse retinacular ligament
TREATMENT

ZONE III – PIP joint

Open injury
- Repair with PIP joint fixed in full extension.
- In contaminated wounds, repair is best delayed.

Closed injury
- Spilintage
- Large bony fragment – K-wire fixation

Dislocation
- usually associated with disruption of central slip.

Established boutonnière deformity (Mobile or Static)
Techniques described which include repair of triangular ligament, transection of lateral bands, transfer of lateral bands to base of MP
Zone V – MP Joint

- Extensor Lag
- Sagittal band injury – cannot Initiate but can Maintain extension
- Remember hand intrinsic action – examine with wrist in neutral and IP extended

TREATMENT

- Fight bite due to human tooth injury - primary repair is contraindicated.
- Splint the MP joints in a full extension splint for 3 weeks. PIP and DIP joints should remain free
- Dynamic extension splint following removal of the full extension splint until no extensor lag remains.
SPECIAL TESTS

Mallet Finger Test

- extensor tendon integrity at the DIP joint.
  - Isolate the tendon by holding the involved finger at the middle phalanx.
  - Begin with the D.I.P. joint relaxed in flexion.
  - Instruct the patient to extend the D.I.P. joint.

Boutonniere Deformity Test (Elson’s Test)

- central slip integrity of the extensor tendon at the PIP joint.
  - Put finger over edge of table, with PIPJ flexed to 90deg and MP in extension
  - Instruct patient to extend P.I.P. joint against resistance
  - Normal – DIP floppy; Abnormal – DIP stiff

Sagittal Band rupture Test

- cannot Initiate but can Maintain extension
- **ZONE II** – Middle phalanx
  - No clinical deformity is present usually.

- **Zone IV** – Proximal phalanx
  - Treatment is by direct repair and K-wire immobilization.

- **Zone VI Metacarpal**
  - Tendinous juncture may mask injury
  - Horizontal mattress suture
  - Splintage

- **Zone VII Wrist joint**
  - Core suturing technique repair of tendons
  - Extensor retinaculum is divided and repaired by Z lengthening
TENDON REPAIR

- Ultimate strength of a tendon repair depends on number & size of sutures crossing the laceration site
- Resistance to gap formation depends on suture purchase

- Partial lacerations
  - > 50% need repair
  - proximal to the MP joint may not require repair
  - At or Distal to MP must be repaired
TECHNIQUES

Strength

Modified Bunnell > Modified Kessler > horizontal mattress and figure of 8

Newport and Williams (JHS 1992 Nov.)
MGH tendon repair technique
(crossing running suture repair/Becker)

• superior suture purchase (superior resistance to gap formation)
• more resistant to gap formation than Bunnell

Howard and Greenwald  (JHS Sep 1997)
POST OPERATIVE CARE

Dependant on the level of extensor tendon injury

- distal to MP joint
  - PIP and DIP joints are held immobilized in extension for 4-6 weeks

- proximal to the MP joints
  - MCP joint in extension for 1-2 weeks
  - followed by a passive extension/active flexion splint