Flexor Tendon Injuries: Finding Success in “No Man’s Land”

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Disclosures

• Nothing to Disclosure
• in the past 12 months, neither my spouse nor myself have had a financial relationship with a commercial interest (any entity producing, marketing, re-selling, or distributing health care goods or services consumed by or used on patients; with the exception of providers of clinical service directly to patients)

Zone 2 Flexor Tendon Injuries
Tendon Healing

Tendon healing involves an inflammatory phase from 48 to 72 hours after repair, a fibroblastic or collagen-producing phase from 5 days to 4 weeks, and a remodeling phase that continues until approximately 112 days.


Adhesions

- Passive ROM after repair improves strength and tendon healing
- Active ROM imparts stress on the repair and enhances biologic response and strength


Ideal Repair

- easy suture placement
- secured knots
- smooth end-to-end tendon apposition
- minimal to no gapping at the repair site
- avoiding injury to tendon vasculature
- having enough strength for early active postoperative motion.
Current Concepts

- 4 Strand Core Suture
- Braided Non-absorbable Suture  
  – 3-0 or 4-0
- Epitendinous Suture  
  – 6-0
WALANT

- Wide
- Awake
- Local
- Anesthesia
- No
- Tourniquet


Local

- Buffered 1% lidocaine with epinephrine (1:100,000)
  - 10 ml of lidocaine
  - 1 ml of 8.4% Sodium Bicarbonate
  - 10-15 ml
  - 10 ml in palm
  - 2 ml at proximal phalange
  - 2 ml at middle phalange
Rehabilitation

• Passive
  – Higher rate of adhesions
  – Less ultimate ROM
• Active
  – Higher rate of tendon Rupture


Passive Motion Protocol

Kleinert Protocol

Kleinert Splint
Passive Motion Protocol

Duran, RE. Controlled passive motion following tendon repair in zone II and III. In: The American Academy of Orthopaedic Surgeons. Symposium on tendon surgery in the hand. Mosby, St. Louis; 1975: 105-114


Passive Protocols

• Show significant improvement over immobilization
• Improved Range of motion
• Lower rupture rates

Active Motion Protocols

• Place and Hold
• Light active flexion

Repair Site forces

- passive digital flexion applies 2 to 4 N
- light active digital flexion applies approximately 10 N
- moderate digital flexion applies approximately 17 N
- strong composite grip applies 70 N


Prospective Randomized

- Active motion therapy provides greater active finger motion than passive motion therapy
- No risk of tendon rupture.
- Concomitant nerve injuries, multiple digit injuries, and a history of smoking negatively impact the final outcome of tendon repairs.


Meta-Analysis

- 170 articles
- Evidence ranging from level I to level IV
- Early passive motion (1598 tendon repairs)
  - 57 ruptures (4%)
  - 149 fingers (9%) with decreased range of motion
- Early active motion (1412 tendon repairs)
  - 75 ruptures (5%)
  - 80 fingers (6%) with decreased range of motion

Rehabilitation

- Most people are using combinations of therapy
- Evidence is difficult to interrupt
  - Different repair types
  - Low numbers
  - Concomitant injuries
- Need for more comparative studies


Take Home Points

- 4 stranded Core Repairs with Epitendinous Suture
- Rehabilitation: combination of passive and active
- Consider local only in a single digit

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