

## Epicondylitis

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- The term "tennis elbow" was first introduced to the literature in the 1883 as lawn tennis elbow.
- According to pathology and histologic findings, an alternative term "angiofibroblastic tendinosis" was introduced.

### Incidence

- 2% of population
- Half of tennis players older than 30 years old had experienced symptoms of tennis elbow one time or another.
- Sports and occupational activities that require stressful use of forearm are related to the occurrence of tennis elbow (baseball, fencing, carpentry, plumbing...)
- Age: 35~50 yrs old (median 41 yrs old).
- Gender: male/female ratio equal.

### Classification

- 1) Lateral tendinosis
  - commonly involved tissue: ECRB(97%, 35% rupture), anterior edge of EDC (35%), occasionally underside of the ECRL
- 2) Medial tendinosis
  - commonly involved tissue: origin of the pronator teres, palmaris longus, and FCR
  - close to their attachment to the medial epicondyle, occasionally FCU, rare occasion flexor sublimis
- 3) Posterior tendinosis: primary-triceps

### Associated abnormalities

- Medial tendinosis: ulnar nerve neurapraxia (40%), MCL strain and/or rupture.
  - Type I: isolated medial tendinosis.
  - Type II: medial tendinosis with an associated ulnar neuropathy.
- Medial and/or lateral tendinosis: intra-articular pathology(5~20%)  
ex)chondromalacia, synovitis, osteophytes, loose bodies.
- Posterior tendinosis: olecranon fossa synovitis, chondromalacia, osteophytes, loose bodies.
- Mesenchymal syndrome (multiple sites of tendon pain)
  - : rotator cuff tendinosis, carpal tunnel syndrome(10%), bilateral tennis elbow, DeQuervain s syndrome, trigger finger.

### Etiology

- Overuse: epicondylitis is currently thought to be caused by tendon overuse and failed tendon healing.
- Trauma: acute onset may be associated with direct blow to epicondylar area.
- \* Risk factors for tendon overuse
  - Age older than 35 years
  - High activity level (sports and occupational)
  - Demanding activity technique
  - Inadequate fitness level

### Pathology

- Tendinitis (inflammatory changes) <<< Tendinosis (degenerative changes)
- Gross appearances
  - dull, gray, friable, and often edematous tissue (angiofibroblastic tendinosis)
- Microscopic appearances
  - normally ordered tendon fibers are disrupted by the invasion of fibroblasts and vascular, atypical, granulation-like tissue
  - adjacent tendon appears to be hypercellular, degenerated, and microfragmented
  - inflammatory cells may be noted in the tendon and supportive tissue
    - ; from traumatic repair (early and old scar tissue) rather than tendinosis itself
  - in cases treated with corticosteroid injection, nonpolarizable amorphous eosinophilic material can be identified.

- the degree of angiofibroblastic infiltration correlates with the clinical phases of pain and the duration of symptoms

### **Diagnostic evaluation**

- Pain: activity related to rest pain
- Tenderness over epicondylar area
- Provocation manual test
- ROM: within normal limit, occasional loss of terminal extension (up to 15°)
- Radiographs: tendon calcification(20%) or reactive exostosis
- MRI: tendon thickening with increased T1 and T2 signal near its origin of epicondyle

### **Clinical correlations of pathology**

#### **1) Category I**

- Pathology: acute, reversible inflammation, no angiofibroblastic invasion
- Clinical signs: minor aching pain, usually after heavy activity
- Treatment: NSAIDS, rehabilitative exercise, avoidance of overuse

#### **2) Category II**

- Pathology: partial angiofibroblastic invasion, some healing response, permanent
- Clinical signs: pain with activity and rest, most routine activities possible after rest
- Treatment: promote healing nonoperatively, occasionally operation

#### **3) Category III**

- Pathology: extensive angiofibroblastic invasion with/without partial or complete rupture of the tendon
- Clinical signs: significant functional deficit, pain at rest and night, routine activities impossible, the complete lesion is observed arthroscopically
- Treatment: operation

### **Differential diagnosis**

- Lateral tendinosis: posterior interosseous nerve entrapment, synovitis, plica,

chondromalacia, adolescent osteochondritis dissecans, cervical osteoarthritis and nerve root compression

- Medial tendinosis: ulnar nerve compression, MCL degeneration and/or rupture,
- Posterior tendinosis: extra-articular olecranon exostosis, intra-articular abnormalities (olecranon synovitis, chondromalacia, loose bodies)

### Treatment

- The treatment should enhance the natural biologic healing response after injury ; (1) inflammatory exudation (2) infiltration of neovascular and fibroblastic elements (3) collagen and ground substance production (4) maturation and strengthening

### Nonoperative treatment

- 1) Relief of pain and control of inflammatory exudation and/or hemorrhage
  - rest (refrain from abuse), ice, elevation, protection, medication, cortisone injection, physical therapy (ultrasound, heat/cold)
  - ESWT (extracorporeal shock wave therapy): controversial effect
  - abstinence of abuse
  - alteration of training technique
  - alteration of equipment
  - counterforce brace
    - : multiple tension straps, wide dimensions, curved contours, solid material or air cells produce local pressure points and resultant muscle imbalances are avoided
    - : constrain full muscular expansion, decrease intrinsic muscle force to vulnerable area
- 2) Promotion of specific tissue healing
  - after adverse inflammation and pain are controlled (1~2 weeks)
  - rehabilitative exercises (multiple resistance system), high-voltage electrical stimulation, refraining from abuse
- 3) Control of force loads
  - excessive loading of the tendon should be minimized during rehabilitation, at the time of return to sports activity, and during ADL
  - counterforce brace

- 4) Improved performance technique
  - control of intensity and duration of activity
- \* Cortisone injection and brace might be useful as initial therapy
- \* Physical therapy and wait-and-see policy show good results in long-term follow-up.

### Surgical treatment

- \* Selection factors for surgery
  - 1) chronic symptoms exceed a duration of 1 year
  - 2) fail to respond to a good quality rehabilitation program
  - 3) persistent pain without activity
  - 4) multiple cortisone injection: three or more failed cortisone injections, iatrogenic cortisone atrophy
  - 5) quality of life is unacceptable by the patient
  - 6) tendon calcification, bony exostosis, intra-articular pathology: relative indication
- \* Methods
  - Mini-open technique
  - Percutaneous extensor tenotomy
  - Arthroscopy: arthroscopic findings are classified by Baker et al.
    - Type I: fraying of the ECRB tendon undersurface without a distinct tear
    - Type II: linear tear along the undersurface of the ECRB tendon
    - Type III: minimally retracted partial avulsion or complete avulsion of the tendon
- A) Lateral tendinosis surgery
  - bony exostosis of the lateral condyle is not absolute indication for tendon surgery per se, however, if the exostosis is prominent or tender to palpation, removal of exostosis is recommended
  - because the origin of the ECRB is extensive, the tendon does not retract more than 1 to 2 mm even when the majority of the tendon is excised
  - care is taken to spare the origin of the other tendons
  - the focus of surgery is the ECRB tendon attachment to the anteromedial aspect of the extensor aponeurosis
  - the cortex of the lateral condylar triangular recess is drilled
    - ; enhance vascular supply
    - ; improve biologic environment

; stimulate healing and formation of healthy fibrotendinous scar to replace the resected tendinous tissue

- Surgical failure
- the most common reason for continued pain after operation is failure to adequately address the tendinosis pathoanatomy.
- an aggressive release of the common tendon from epicondyle can result in a release of the collateral ligament and resulting joint instability

#### B) Medial tendinosis surgery

- if ulnar nerve dysfunction may be associated (60%), decompression may be required (ulnar nerve transfer is not indicated)
- Surgical failure
- the surgeon fails to identify and resect the pathologic tissue
- release of common flexor origin leads to iatrogenic instability
- medial antebrachial cutaneous neuropathy

#### C) Triceps tendinosis surgery

- arthroscopic approach may be considered

### **Surgical results**

#### **A) Lateral tendinosis**

- 85% complete pain relief and return to full strength
- 12% significant pain relief and strength return
- 3% no pain relief or strength improvement

#### **B) Medial tendinosis**

- 5% no pain relief or strength improvement

### **Postoperative management**

- light, adaptable elbow immobilizer (elbow 90°) for 48 hours
- active motion exercises are started 48 hours postoperatively
- elbow immobilizer is used intermittently for protection for another 3~5 days
- ADL initiates within 7 days
- active wrist exercises without resistance are started within 5~6 days
- wrist resistance exercises with 1 lb weight are started at 3 weeks
- counterforce brace is used during resistance exercises over the next 2 months

- sports activities: chipping and putting- 3-4 weeks
- tennis - 6~8 weeks
- full, unrestricted competitive sports - 4~6 months

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