‘That looks painful Achilles. Is it your curiously unnamed tendon again?’
“Treatments of tendinopathy that seem to be effective in poor quality studies frequently fail to show clinical benefit when assessed in good clinical studies.”

- De Vos et al., JAMA 2010
Distinct pathologies

1. Paratenonitis
2. Noninsertional Achilles tendinopathy
3. Insertional Achilles tendinopathy and variants
   - Achilles Insertional Calcific Tendinosis (AICT)
   - Haglund’s deformity
   - Retrocalcaneal bursitis
4. Acute rupture
5. Chronic rupture
Intratendinous pathology

- Histopathology: 4 key features
  - Increased cell number and cellular proliferation
  - Increased ground substance
  - Collagen disarray
  - Neovascularization

- Imaging
  - Ultrasound
  - MRI

- Primarily NOT inflammatory

- Early: compensation for excessive load
- Late: failed healing response

- The continuum model
Continuum model of tendinopathy


- Normal tendon
  - Stress shielded
  - Unloaded
  - Optimized load

- Reactive tendinopathy
  - Excessive load +/- individual factors
  - Appropriate modified load

- Tendon disrepair

- Degenerative tendinopathy

Adaptation
Strengthen

Optimized load
Why does it hurt?

- Overall weak association between pain and extent of pathology
- Reactive tendinopathy
  - Increased pain-associated neurotransmitters/receptors
  - Neurogenic inflammation
- Tendon disrepair and degenerative tendinopathy
  - Neovascularization associated with innervation and neurotransmitters
  - Concentrated neurotransmitters near and in vessel wall
  - Sclerosing therapy effective at pain reduction

Normal tendon

Reactive tendinopathy

Tendon disrepair

Degenerative tendinopathy
Rationale for treatment

- Triad of swelling, pain, dysfunction
- Normalize tendon anatomy
  - Appropriate cyclic loading – mechanotherapy
  - Simulate acute injury
    - ESWT
    - Surgical
    - Target biochemical mediators of tendon healing
  - Direct surgical remodeling
- Decrease Pain
  - Immobilization, complete or relative rest
  - Target neovascularization
    - Mechanotherapy
    - Sclerosing therapy
    - Surgical
- Increase function
  - Mechanotherapy
Eccentric training

- Increases type 1 collagen without reactive changes
- Decreases neovascularization
- Multiple level 1 RCTs supporting use for short and long term resolution of mid-portion tendinopathy
  - Improves pain
    - Mean pain reduction 60%
  - Improves function
    - Strength comparable to contralateral limb
  - Improves tendon structure/thickness
    - 70% normal structure at 3.8 years, nearly all remaining abnormal tendons asymptomatic
  - High patient satisfaction
    - >80%, maintained long term
- Can be supplemented with additional therapies
  - Many show no additional benefit (NSAIDs, rest, night splint)
Sclerosing therapy

• Explicitly targets neovascularization with polidocanol

• Pilot study 2002, since supported by multiple RCTs
  • Alfredson et al. 2005
    • 9/10 in treatment group, crossover yields 10/10
  • Lind et al. 2006
    • After 3 injections, 37/42 satisfied, back to preinjury activity level
    • At 2 years, tendon thickness improved, pain reduction maintained (VAS 75→7), 38/42 satisfied
  • Willberg et al. 2008
    • After 2-3 injections, 18/26 satisfied with pain reduction
    • Additional injections (up to 5) yielded 26/26 satisfied

• Viable minimally invasive treatment option
Extracorporeal Shock Wave Therapy

- Al-Abbad H and Simon JV. *Foot Ankle Int* 2013.
  - Systematic meta-analysis of 6 RCTs
    - Some treatment variability
    - 1500-2500 impulses, energy flux density 0.08-0.5 mJ/mm²
    - Average of 3 weekly treatments
    - Significant reduction in pain and functional improvement
  - Satisfactory evidence for ESWT alone, but improves when combined with eccentric training.

  - Level 1 meta-analysis, 13 trials.
    - Superior results compared to eccentric training for insertional tendinopathy.
    - Moderate support for ESWT alone for midportion tendinopathy.
    - Superior outcomes when combined with eccentric training for midportion tendinopathy.
ESWT

- Non-insertional Achilles tendinopathy
    - Eccentric exercise: 56% reported complete recovery at 4 months
    - Shockwave plus EE: 82% complete recovery at 4 months
    - No difference at 1 year

- Insertional Achilles tendinopathy
    - Eccentric exercise: 28% complete recovery at 4 months.
    - Shockwave plus EE: 64% complete recovery at 4 months.
    - Results stable at 1 year
Other options?

• Corticosteroid injection
  • Shrier et al., *Clin J Sports Med.* 1996. Only level 1 study showed no benefit of corticosteroid. Risk of weakness/rupture supported only by animal models and case reports.

• Platelet-Rich Plasma (PRP)
  • De Vos et al., *JAMA* 2011: Level I study of PRP injections in chronic midsubstance tendinopathy. No difference compared to saline injection at 24 months. Eccentric stretching in both groups.
  • De Jonge et al., *Am J Sports Med* 2011. Level 1 study. One year followup. No significant difference between groups. 59% satisfied with treatment. Ultrasonographic improvement in both groups.

• Aprotonin

• Topical glyceral trinitrate
  • Paoloni et al. *JBJS* 2004. Topical glyceryl trinitrate plus eccentric training. 78% asymptomatic versus 49% in control group.
Surgical treatment

• Targets regions of degenerative tendinopathy

• No consensus on technique, but results are consistent.

• Successful return to sports in 50-80%, but all based on level IV evidence

• Better outcomes in athletic versus sedentary patients

• Must be followed with appropriate rehabilitation
  • Treat “the donut”
Typical treatment paradigm

- Rest/immobilization
  - Relative rest
  - Relative immobilization
  - Strict immobilization
- Address “inflammation”
- Physical therapy
  - Eccentric strengthening
  - Adjuncts (soft tissue mobilization, ultrasound, etc)
- Frustrated flail
- Surgical debridement

“Treatments of tendinopathy that seem to be effective in poor quality studies frequently fail to show clinical benefit when assessed in good clinical studies.” De Vos, JAMA 2010
What should a clinician do?

Proposed evidence-base protocol

Upon presentation with mid-portion tendinopathy
- Address obvious training error
- 12 weeks of eccentric training
- Continue pain-moderated activity in athletes (pain <5/10)

If responding or resolved
- Continue maintenance eccentric training 6-12 months

If not responding
- Consider topical GTN (low risk), continue eccentric training x 12 weeks
- ESWT and eccentric training x 12 weeks
- Sclerosant x 3 (6 months total)
- Surgical debridement, rehabilitation
- Continue maintenance eccentric training

Adapted from Alfredson and Cook Br J Sports Med 2007
References


