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Conservative Management of Achilles Tendonopathy

Sequence of (Pathological) Events

1. Overload
2. Overload detected by cells
3. Cells increase their activation & proliferate
4. With continued load, the aggreca migrates up the tendon, which results in thickening
5. Matrix breaks down sufficiently, providing opportunity for vascular penetration

The Load Factor

- Without load, tendons lose function, with degradation occurring in the matrix & cells
- Overload leads to tendinopathy
- Therefore the aspects of load are critical

Practical Implications

- If the tendon is healthy & the load is appropriate, the tendon will be strengthened
- If there has been significant unloading, followed by an episode of heavy loading, then the response will be significant (no stimulus for protein production/structure)

In practice this means that:

A) load needs to be increased gradually & heavy tendon loading days every 3 days initially

B) if you detect a tendon response early, you can normalise it by applying the appropriate loads

C) if you allow the tendon to enter a state of degenerative tendinopathy, you cannot restore the tendon to a normal state as reversibility is impeded by vascularisation enabled by the matrix disruption.

Quantifying the Load

- Tensile Load - maintains fibrous tissue
- Compressive Load - forms & maintains cartilage
- Friction or Shear Load
- Combination Loads - maintains bone

Load Influence on Tendons

- Mid tendon - affected by tensile load, but it is only the Achilles that will fail in the mid substance
- Insertion - affected by compressive load, but actually usually just proximal to the bone tendon junction
- Peritendonopathy - affected by friction & shear load, usually impacting the posterior gliding membranes & anterior fat structures

Practical Implications - Tensile

- Any activity requiring a tendon to store & release energy (stretch-shorten cycle) can be considered a high tensile load for a tendon
- Anything else (high weight, eccentric activity) is easy
- Long thin springs are vulnerable to overload in the middle – Achilles
- Short thick springs are vulnerable to overload at the insertions – Patella

Practical Implications - Tensile

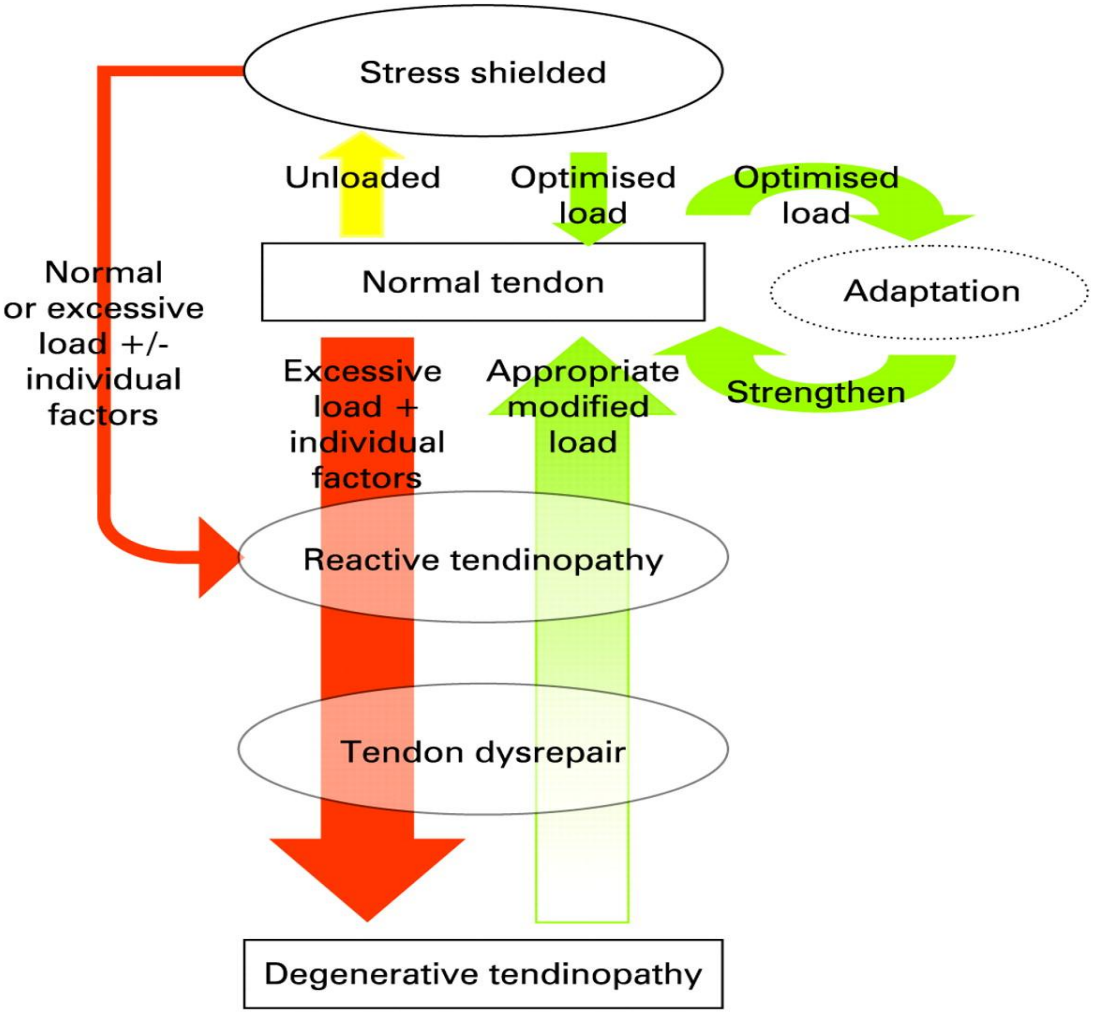
Practical Implications - Compressive

- Compressive load will affect the fulcrum proximal to the insertion
- Tendons that act over a fulcrum - Glute Med/Min, Achilles (Haglunds), Supraspinatus, Adductor Longus, Hamstring (upper), Tib Post (at malleolus), Peroneii, Quads (femoral condyle in deep knee flexion)

Practical Implications - Sheer

- The combination of compressive & tensile load will give sheer load
- Stretching or loading at length may aggravate an insertional tendinopathy
- Therefore, change the stretch position & relieve the active tensile load
- Avoid eccentric Achilles loading programmes (especially beyond neutral) & introduce a heel raise acutely

A Proposed Continuum for Tendon Pathology



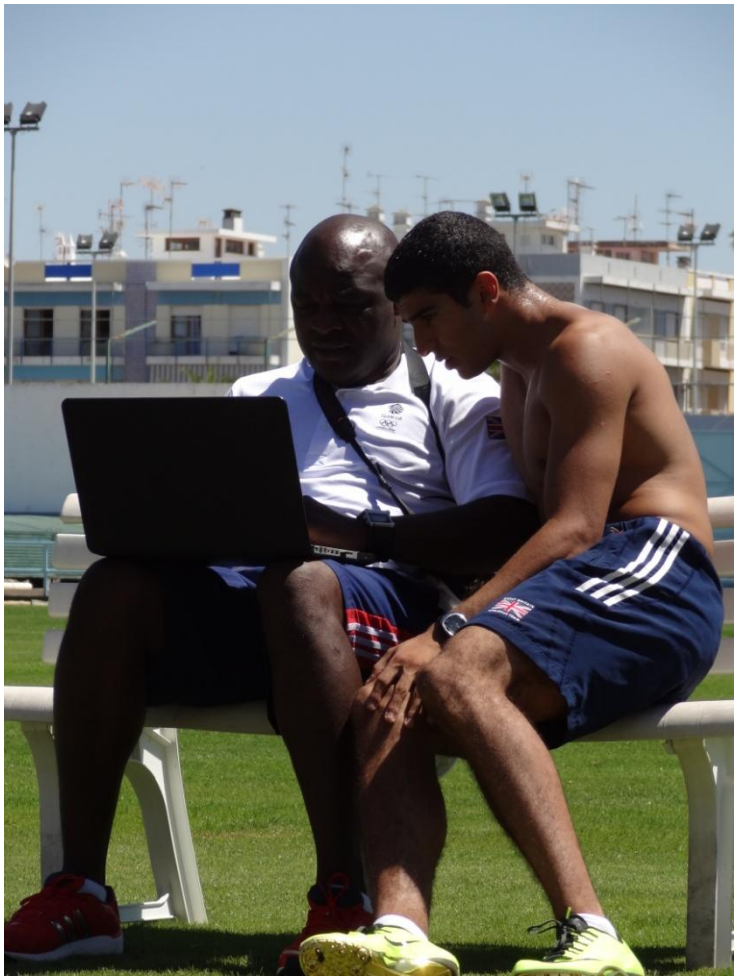
Cook & Purdam, 2009

Modifying the Load

- Know what load is detrimental
  Volume/frequency/intensity/type

- Manage the load
  Reduce energy storage/release, allow at least 2 days between loads, reduce load at length, reduce compression at insertion

Modifying the Load



Why?

- Avoid exacerbation of the tendon cell activity
- Reduce sensitisation of the tenocytes to reduce protein production
- Allow remodelling of the matrix (collagen)

Clinical Presentations

Reactive tendinopathy "I did something crazy yesterday"

Degenerative tendinopathy "I've had a tendon that has grumbled for about 20 years but I can manage it ok & it doesn't give me too many issues"

Time Scale & Treatment Aim

- True reactive:
  6 – 8 weeks
  Manage load (slow & heavy), RTS progression

- Reactive on degenerative:
  7 days
  Address contractile deficits, graduate tendon load

Basic Treatment Framework

- Modify load
- Get strong
- Static slow tendon loads early
- Progress speed of loading
- Progress volume of functional activities
- Introduce elastic load

Reactive Tendon Management

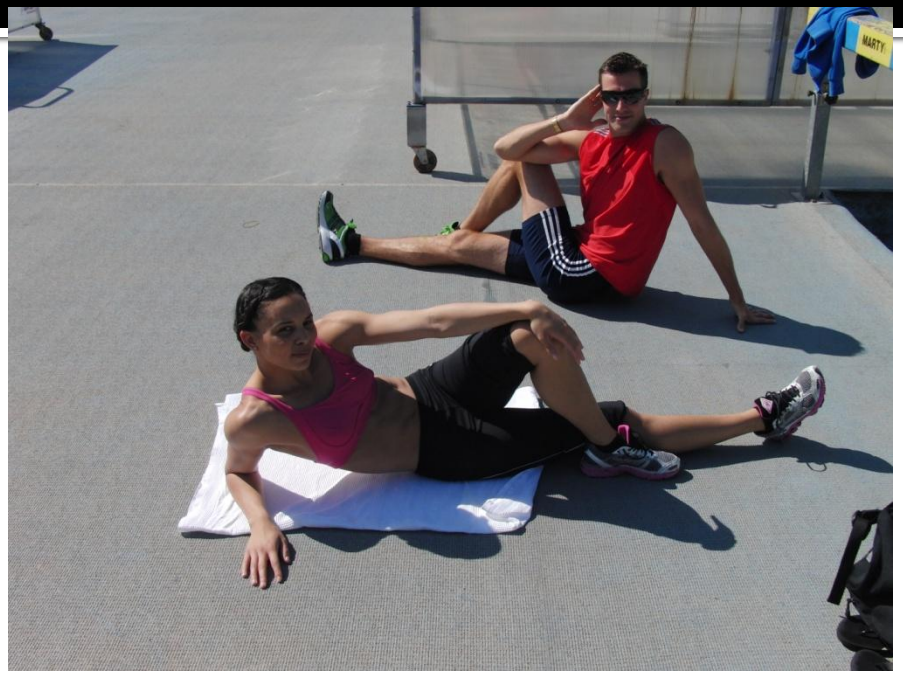
- Modify load & allow to settle for 7 - 10 days (tenocytes)
- Heel raise insertional & plantaris presentations (not boot)
- Resting position (avoid resting PF)
- Education

Medical Management of Reactive Tendons

- Tenocyte inhibitors – ibuprofen, corticosteroids (short acting) - Dexamethasone is useful as an anti-proliferative, anti-cell activity & anti-protein accumulative agent
- Aggrecan inhibitors – ibuprofen, naproxen sodium, indomethacin (Dingle, 1999; Riley, 2001)
- TNF α inhibitors – doxycycline (Fallon et al, 2008), green tea (Cao et al, 2007), fish oils (Mehra et al, 2006) – Triple therapy (Fallon et al, 2008)
- TGFB inhibitors – ACE inhibitors, curcumin

Reactive Tendon Management

Partial Tendon Rupture



- Rest for a week
- Return to a loading environment
- Treat symptomatically

Acute Peritendonopathy Management

- Remove stimulus
- Topical heparin can be very useful

Stage 1 Rehabilitation

Reactive Tendon Settling

- Aim: Switch down tendon sensitisation
- Time frame: 0 – 1 months
- Exercise frequency: 1 – 4 times daily
- Exercise intensity: isometrics (sustained loads in inner range), progressing to very slow isotonics, maximal tolerable weight

Stage 1 Exercise

- 30-60 second isometrics, 4-6 reps
- 2-3 times a day
- Double leg seated calf raise
- Double leg leg press calf raise in knee extension
- Single leg seated calf raise
- Single leg leg press calf raise in knee extension

Stage 2 Rehabilitation

Strengthening

- Aim: Improve neuromuscular pathways, increase muscle strength, hypertrophy
- Time frame: 0 – 6 weeks
- Exercise frequency: 3-5 sessions per week
- Exercise intensity: Moderate to high weight, 60 second time under tension, high lactate (induce contractile modification), isotonic

Stage 2 Exercise

- 10 reps, 6 second conc/ecc, 3-5 sets
- Partial recovery between sets (30 seconds)
- Increase load, decrease duration & reps, increase sets
- Double leg seated calf raise
- Double leg leg press calf raise in knee extension
- Single leg seated calf raise
- Single leg leg press calf raise in knee extension

Stage 3 Rehabilitation

Functional Strengthening

- Aim: apply sustained load to tendon in functional position & continue motor retraining
- Time frame: 2 – 4 months
- Exercise frequency: Every other day
- Exercise intensity: low – moderate resistance, progress to outer range, at slow speed, progress to eccentric motion

Stage 3 Exercise

- 12 reps, slow conc/ecc, 3 – 5 sets
- Partial recovery between sets (30 seconds)
- Increase load, decrease duration & reps, increase sets
- Stair walks
- Heel lowers straight leg
- Heel lowers bent leg
- Split squat
- Sled walk pushes

Stage 4 Rehabilitation

Functional Speed

- Aim: introduce speed to movement
- Time frame: 2 – 4 months
- Exercise frequency: Every 2/3 days
- Exercise intensity: no/low resistance, controlled range (limit end range/compression), pain free, fast push off but no elastic demand

Stage 4 Exercise

- 20 reps, 5 sets, fast push off but no elastic demand

- Step ups
- Double leg box jump ups
- Spotty dog holds
- Sled walk pushes

Stage 5 Rehabilitation

Athletic Function

- Aim: progress loading to functional levels of speed, sport specific strength, capacity to absorb repeat elastic load
- Time frame: 2 – 3 months (maintain stage 3 & 4)
- Exercise frequency: Schedule H, M, L Load Days
- Exercise intensity: functional strength, propulsion, increased loading speed, lower weight, conc/ecc turnaround, combinations, increase jump height, progress to accel/decel, change of direction

Stage 5 Exercise

- Pool jumps
- Bounds
- Slow skips
- Alternate legs
- Scooters

Stage 5 Exercise

Progressions

- Block starts
- Uphill bounds
- Skips
- High skips
- Accelerations
- Decelerations

Key Points

- Early intervention with thorough assessment
- Monitor with standardised, provocative tests
- Accept pain during, monitor latent pain (24hr)
- Planning (realistic, coach buy in)
- Individualise – avoid recipes
- Strategic – entry point, end point
- Education – self management
- Prehabilitation

Avoid

- High load, poor recovery
- Painful eccentric programmes
- Isolated exercise types
- Ultrasound & frictions (tenocyte activation)
- Rest
- Splints
- Plyometrics

Occlusion Training

- 3-4 sets to failure, with 30 second recovery between sets but no release of cuff pressure
  Achieves massive revascularisation in addition to exercise benefit
- 3-4 sets of 15 reps, with 60 second recovery between sets with cuff pressure released
  Suited to high intensity strength training, allowing for increased volume – gentler & so can do 2 sets in a day

  Gualano (2010), Loenneke (2009), Takarada (2000)

Compex

- Stage 1: endorphinic
- Stage 2: capillarisation, muscle atrophy
- Stage 3: strength
- Stage 4: potentiation
- Stage 5: plyometric

Ultrasound Characterisation Technique

- Dr Hans van Schie (Netherlands)
- Standard grey scale ultrasound imaging
- Used with a tracker (600 axial images, every 0.2mm over 12 cm & reconstructs in the sagittal & coronal planes)
- Correlates pixel brightness & collates results
- Distinguishes between intact, discontinuous, mainly fibrillous, mainly cellular & fluid

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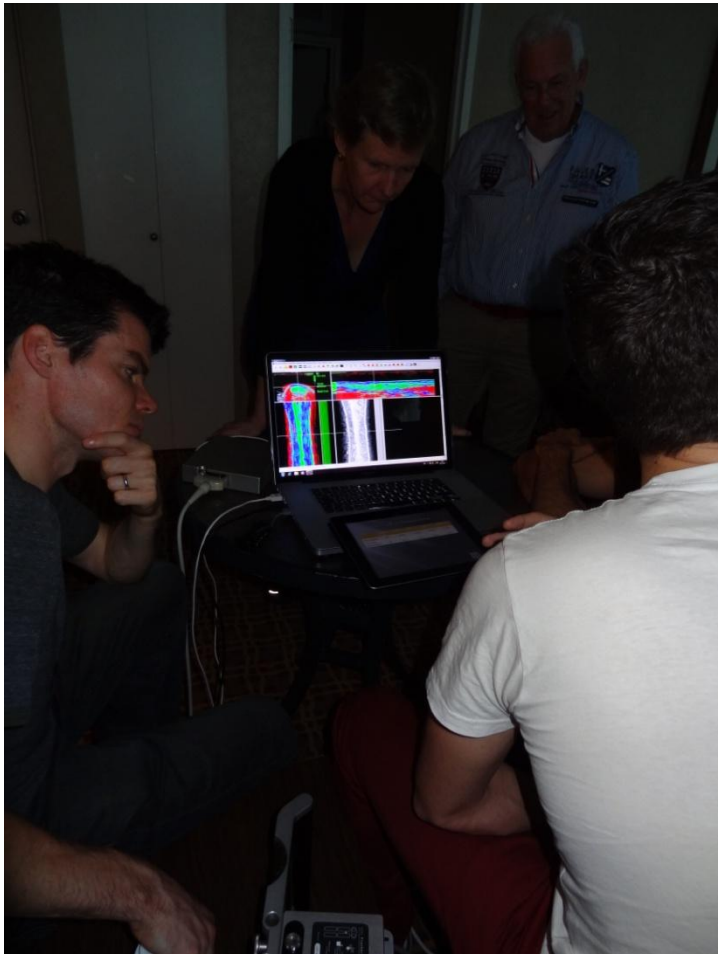

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Thank You

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