Managing the load – Evidence-based management of tendinopathy

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Thank you for the invitation!
Objectives

1. To review evidence pertaining to rehabilitation of Achilles tendinopathy

2. To explore the contents of the Achilles and Lateral Elbow Tendinopathy Toolkits
The Prescription

Take Two of These and Call Me in the Morning!
Do 90 of these a day and call me in two weeks
What is tendinopathy?

A clinical syndrome defined by tendon pain and thickening

Tendinopathy: no longer a ‘one size fits all’ diagnosis

Jill Cook

As a clinically focused journal, BJSM only publishes animal studies that are of particular relevance to patients in the short term and the rabbit research in this issue does shed light on human tendinopathy. Commonly, individuals have unilateral symptoms, although often bilateral pathology is evident on imaging. This seems
Failed healing model of tendinopathy

- Repetitive mechanical loading of a tendon and its attachments
- Continued loading
- Accumulation of:
  - microinjury to collagen / tenocytes
  - Injury of biomechanical weakpoints (attachments)
  - Low level activation of inflammatory paths
  - Accumulation of inferior repair tissue
    - -> paratendinitis +/- tendinosis

Overuse injury

Adaptation

Cellular-matrix response
Important variants of tendinopathy

• Anatomic location
  ➢ what is the normal function of the tendon?
• Acuity
• Extent
• Involvement of adjacent tissues
• Patient characteristics
Activity profile

Biomechanics
Becker et al, AJSM 2017

Genetic profile
Brown et al, J’Sports Sci 2017

Gender?

Hormonal status
Finni et al, JAP 2009

Cholesterol levels
Tilley et al, BJSM 2015

Diabetes

Medications

Psycho-social attributes
Mellows et al, BJSM 2017
What is the load-history of this patient’s tendon?
Collagen type I synthesis

(36 k run; Langberg 1999)

(12 weeks training; Langberg 2003)
Increased tendon size following strength training

(12 weeks/70% 1RM)

(Kongsgaard et al, JAP 2006)
Determinants of tendon adaptation are being revealed

- High intensities are more potent (MVC >70%)
- Mode of muscle activity doesn’t matter (eccentric, concentric, isometric)
- Longer duration (e.g. 7s) is better than short duration (3s or plyometrics)
- Rest periods between contractions may be important

Bohm et al  Sports Med Open 2015
Take home message

• Tendons are adaptable to the amount of load they see
  – Some of the clinical benefit of exercise for tendinopathy is thought to be due to a beneficial, local effect on the tissue
Exercise vs “wait and see”

<table>
<thead>
<tr>
<th>Baseline</th>
<th>Exercise</th>
<th>No treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age, mean (SD), y</td>
<td>48.1 (9.9)</td>
<td>46.4 (11.4)</td>
</tr>
<tr>
<td>Women, no. (%)</td>
<td>16 (64)</td>
<td>16 (64)</td>
</tr>
<tr>
<td>Duration of symptoms, mean (SD), mo</td>
<td>10.9 (7.7)</td>
<td>9.2 (10.5)</td>
</tr>
<tr>
<td>Nonathletic patients, no. (%)</td>
<td>16 (64)</td>
<td>18 (72)</td>
</tr>
<tr>
<td>Athletic patients, no. (%)</td>
<td>9 (36)</td>
<td>7 (28)</td>
</tr>
<tr>
<td>Affected foot, no. (%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Left</td>
<td>12 (48)</td>
<td>14 (56)</td>
</tr>
<tr>
<td>Right</td>
<td>13 (52)</td>
<td>11 (44)</td>
</tr>
<tr>
<td>Previous treatment, no. (%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>NSAIDs</td>
<td>25 (100)</td>
<td>25 (100)</td>
</tr>
<tr>
<td>Physical therapy</td>
<td>25 (100)</td>
<td>25 (100)</td>
</tr>
<tr>
<td>Orthotics</td>
<td>25 (100)</td>
<td>25 (100)</td>
</tr>
<tr>
<td>Stretching exercises</td>
<td>25 (100)</td>
<td>25 (100)</td>
</tr>
<tr>
<td>Injections</td>
<td>25 (100)</td>
<td>25 (100)</td>
</tr>
<tr>
<td>≥2 cortisone injections</td>
<td>16 (64)</td>
<td>10 (40)</td>
</tr>
</tbody>
</table>

4 months

<table>
<thead>
<tr>
<th></th>
<th>Exercise</th>
<th>No treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>VISA-A score [0-100]</td>
<td>75.6 (18.7; 28-100)</td>
<td>55.0 (12.9; 35-82)</td>
</tr>
<tr>
<td>Likert scale [1-6]</td>
<td>2.7 (1.5; 1-6)</td>
<td>4.3 (1.6; 1-6)</td>
</tr>
<tr>
<td>Load-induced pain, NRS [0-10]</td>
<td>3.6 (2.3; 0-8)</td>
<td>5.9 (1.8; 3-9)</td>
</tr>
<tr>
<td>Pain threshold [kg]</td>
<td>3.1 (1.1; 1.4-4.2)</td>
<td>2.1 (1.0; 0.8-3.4)</td>
</tr>
<tr>
<td>Tenderness</td>
<td>1.7 (3.9; 0-5)</td>
<td>4.3 (7.0; 0-9)</td>
</tr>
</tbody>
</table>
Study design: comparison of eccentric exercise with heavy slow resistance training

**CORT**
- N = 12
- 2 peritendinous corticosteroid injections
- 4 weeks between each injection
- US-guided

**ECC**
- N = 12
- Training 2 times each day.
- 3 x 15 unilateral eccentric squats on 25 deg. decline board.
- Load progressively increased

**HSR**
- N = 13
- Training 3 times per week
- Leg-press, squat and hackt-squat
- 3 x 6-15RM
- SLOW movements (6 sec.)

Corticosteroid injections, eccentric decline squat training and heavy slow resistance training in patellar tendinopathy

M. Kongsgaard, V. Kovanen, P. Augaard, S. Duecking, P. Hansen, A. H. Laursen, N. C. Kaldau, M. Kjaer, S. P. Magnuson
Treatment satisfaction – ½ yr follow-up

CORT - FOLLOW-UP  ECC - FOLLOW-UP  HSR - FOLLOW-UP

36%  22%  73%

Satisfied  Not Satisfied

Corticosteroid injections, eccentric decline squat training and heavy slow resistance training in patellar tendinopathy

M. Kongsgaard¹, V. Kovanen², P. Aagaard¹ ², S. Doessing¹, P. Hansen¹, A. H. Laursen¹, N. C. Kaldau¹, M. Kjaer¹, S. P. Magnusson¹
** Function

** VISA-p

- ** Sign different from pre
- § Sign different from 12 wks
Imaging as outcome measure?

- Tendon structure typically returns to asymptomatic values in non-operatively treated Achilles tendinopathy, but is not associated with symptoms (de Jonge et al 2015 AJSM)
How to optimize biomechanics?

• Conduct a dynamic movement assessment, looking for known deficits associated with Achilles tendinopathy
  • (Munteanu & Barton systematic review, 2011)
    – Rear foot eversion
    – Reduced dorsiflexion
    – Flexed knee during running
  • Apply corrective intervention if possible
  • Taping can be used to trial success of orthotics
Extra exercise allowed during rehabilitation?
Prevention of Achilles tendon problems

- Balance training in soccer players reduced the incidence of Achilles and patellar tendinopathy

- Pre-exercise stretching in military recruits had no protective effect
  Aust J Physiother, 44 (3) (1998), pp. 165-172

- Shock-absorbing insoles in military recruits reduced incidence of AT

- Providing customized online information reduces number of running injuries
  Hespanhol et al, BJSM 2017
Evidence-based advice...

If you are new to running (<1 year)
Consistently follow a walk-run program

If you have experienced a running injury in the past 12 months
Seek advice from a Health Professional who specializes with runners to properly recover

Wear running shoes that feel most comfortable to you.

Alternate between two or more different pairs of shoes.

All running sessions should include a warm-up (around 10min) and a cool-down (around 5 min). Warm-up and cool-down can include walking, slower running than your average speed, and/or dynamic stretching.

Include interval training into your program. This also keeps your training more interesting!

Running volume (time or distance) or intensity (how hard you are running) should not be increased by more than 10% per week.

Add a cross-training session once a week such as water running, cycling, or swimming in addition to your running sessions.

Listen to Your Body!
Is my body ‘protesting’ because the training is too hard?
If the answer is yes, you should decrease running time or intensity during the next 1-2 running sessions until you feel back to normal.

After a running session, does my body feel overloaded or stressed?
If the answer is yes, you should consider taking a longer recovery time until the next session.
Summary

• Individualized, progressive rehabilitation programs are a key part of effective tendinopathy treatment

• “Eccentrics” alone are probably not a good enough exercise prescription to
  – get maximum tendon adaptation
  – address biomechanical causes
  – Navigate successful return to activity, and
  – Achieve patient satisfaction
Evidence-base for upper and lower extremity tendinopathy management

**Lateral Epicondyle Tendinopathy (LET) Toolkit**

The BC Physiotherapy Tendinopathy Task Force is pleased to share with you the attached final version of the Lateral Epicondyle Tendinopathy (LET) Toolkit – [Tennis Elbow Toolkit].

The purpose of the toolkit is to provide clinicians with information (both evidence-informed and expert-informed) to facilitate clinical decision-making regarding the management of tendinopathy of the lateral epicondyle.

The toolkit is comprised of the following components:

**Achilles Tendinopathy Toolkit**

This toolkit was developed by the Tendinopathy Task force:

Dr. Alex Scott, Dr. Joseph Anthony, Diana Hughes, Michael Yates JR Justesen and Alison Ezzat.

This toolkit includes:
A knowledge translation initiative to enhance evidence-informed clinical management of Achilles tendinopathy: The purpose, process and outcomes of the BC Tendinopathy Toolkit.

A Scott – Assistant Prof, UBC
A. Hoens – PT Knowledge Broker, Clinical Professor, UBC
A. Ezzat – PT, Doctoral Candidate UBC
OUTLINE

- The impetus
- The team
- The process
- The contents
THE IMPETUS

- It takes 17 years to get 14% of research findings adopted into practice (Westfall et al 2007)

- Call for PT Knowledge Broker projects in March 2011

- Selection process undertaken by the PT KB Steering Committee & PT KB
THE TEAM

- 1 Assistant Professor
- 1 PhD in cell signaling
- 1 MSc candidate/ Clinician
- 4 clinicians with expertise in tendinopathy
- 1 PT Knowledge Broker
THE PROCESS

Scope
- Define

Synthesize
- Acquire, Appraise

Refine
- Discuss, Invite

*Process successful with previous KT projects to support clinical decision-making
Community of Practice

- Etienne Wenger (1998)
- Group of people who share a craft or profession
- Evolves naturally due to common interest
- Sharing of experience and information leads to professional development
- Can be online, in the clinic, the coffee room, etc
DEFINING THE SCOPE

- **Location**
  - Achilles
  - Mid substance

- **Acuity**
  - Acute
  - Chronic

- **Interventions**
  - Common / unusual
  - Expertise of team

- **Outcome measures**
  - Condition specific
  - Patient specific
SYNTHESIS

- Literature search process
- Appraisal (quality)
  - Level
  - Strength
    * Appendix
- Take home messages
- Implications for practice
  - Criteria: ‘Consider’ vs Consider ‘not’
CPG on Achilles tendinopathy

- Developed by orthopaedic section APTA
- Published 2010
Clinical Implications

- **Strongly consider:** High level/high quality evidence that this should be included in treatment.

- **Consider:** Consistent lower level/lower quality or inconsistent evidence that this should be included in treatment.

- **May Consider:** No clinical evidence but expert opinion and/or plausible physiological rationale that this should be included in treatment.

- **Consider NOT:** High level / high quality evidence that this should not be included in treatment.
REFINE

- Multiple iterations
- Piloting in multiple settings
- Dissemination and call for feedback from PTs throughout BC
CONTENTS OF THE TOOLKIT

- **Summary** Table of Evidence for Physical Therapy Interventions
  - Manual therapy
  - Exercise
  - Taping
  - Orthotics, braces, heel raise inserts, night splints
  - Ultrasound, LLLT, ESWT
  - Needling techniques
  - Iontophoresis
CONTENTS OF THE TOOLKIT

- An **algorithm** providing guidance on when to consider using an intervention.
1. Phased Achilles Tendon Loading Program

(As per Silbernagel et al.\textsuperscript{[1]})

**Phase 1: Weeks 1–2**

**Patient status:** Pain and difficulty with all activities, difficulty performing ten 1-legged heel raises

**Goal:** Start to exercise, gain understanding of their injury and of pain-monitoring model

**Treatment program:** Perform exercises every day

- Pain-monitoring model information and advice on exercise activity
- Circulation exercises (moving foot up/down)
- Two-legged heel raises standing on the floor (3 sets of 10–15 repetitions/set)
- One-legged heel raises standing on the floor (3 sets of 10)
- Sitting heel raises (3 sets of 10)
- Eccentric heel raises standing on the floor (3 sets of 10)

**Phase 2: Weeks 2–5**

**Patient status:** Pain with exercise, morning stiffness, pain when performing heel raises

**Goal:** Start strengthening

**Treatment program:** Perform exercises every day

- Two-legged heel raises standing on edge of stair (3 sets of 15)
- One-legged heel raises standing on edge of stair (3 sets of 15)
- Sitting heel raises (3 sets of 15)
- Eccentric heel raises standing on edge of stair (3 sets of 15)
- Quick-rebounding heel raises (3 sets of 20)

**Phase 3: Weeks 3–12 (longer if needed)**

**Patient status:** Handled the phase 2 exercise program, no pain distally in tendon insertion, possibly decreased or increased morning stiffness

**Goal:** Heavier strength training, increase or start running and/or jumping activity

**Treatment program:** Perform exercises every day and with heavier load 2–3 times/week

- One-legged heel raises standing on edge of stair with added weight (3 sets of 15)
- Sitting heel raises (3 sets of 15)
- Eccentric heel raises standing on edge of stair with added weight (3 sets of 15)
- Quick-rebounding heel raises (3 sets of 20)
- Plyometric training
Outcome measures

For any intervention selected by the clinician, it is strongly recommended that the clinician use one or more of the following outcome measures.

A. Patient reported outcome measure

Such as:

- A global measure of lower extremity function: e.g., The Lower Extremity Functional Scale (LEFS) - not specific to Achilles tendinopathy
  - Available here
- Detailed questionnaire, specific to Achilles tendinopathy e.g. the VISA-A questionnaire
  - Available here (Click on ‘view questionnaire’)

B. Patient specific functional outcome measure

Such as:

- How much weight can be applied to the plantar flexed foot on a weighing scale before the onset of pain
- The number of heel raises before the onset of pain
- The number of heel drops before the onset of pain
- The number of heel drops with a specific weight in a backpack before the onset of pain
- How far can the client walk or run before the onset of pain
CONTENTS OF THE TOOLKIT

Appendices

A. Exercise parameters
B. Laser dosage calculation
C. Details on the individual articles
D. Summary of the major medical and surgical interventions
Achilles Tendinopathy Toolkit: Appendix D

**NSAIDS[1]**

<table>
<thead>
<tr>
<th>Method</th>
<th>Short term benefit in the acute stage of tendinopathy to minimise inflammatory process.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Proposed Mechanism</strong></td>
<td>Interrupts the chemical pathway of inflammation.</td>
</tr>
<tr>
<td><strong>Benefit: Pros/Cons</strong></td>
<td><strong>Pros:</strong> Inexpensive, easily accessible.</td>
</tr>
<tr>
<td></td>
<td><strong>Cons:</strong></td>
</tr>
<tr>
<td></td>
<td>- Precautions and contraindications that accompany specific medications.</td>
</tr>
<tr>
<td></td>
<td>- Inhibition of inflammation may delay soft tissue repair by impairing fibroblastic proliferation.</td>
</tr>
<tr>
<td><strong>Evidence</strong></td>
<td>Weak evidence for a modest effect in acute stage in Achilles tendinopathy.</td>
</tr>
<tr>
<td></td>
<td>Recommendation for a short course of NSAIDs for acute symptoms within 14 days.</td>
</tr>
<tr>
<td></td>
<td>No difference between oral or topical application.</td>
</tr>
</tbody>
</table>

Bussin ER¹, Cairns B²,³, Bovard J⁴, Scott A¹.