Lower Extremity Tendinopathy Management

Michael Reiman, PT, DPT, OCS, SCS, ATC, FAAOMPT, CSCS

@MikeReiman
Tendinopathy Etiology & Pathology
TENDON LOADING
Collagen synthesis and degeneration

Mechanotransduction

• Conversion of mechanical loading into a cell response
• Three phases
  – Mechanical trigger/mechanocoupling
  – Cell-to-cell communication
  – Effect response

Tendinopathy

- Clinical Signs/symptoms:
  - **Pain** with activity
  - **localized** tenderness to palpation
  - **swelling** and impaired functional performance

- Pain inhibits the athlete utilizing energy storage within the tendon, thereby compromising function and performance.

- Substantial matrix **disorganization** in degenerative pathology may result in areas of the tendon that are less capable of tolerating athletic load

Etiology

• True etiology not fully understood
• Many theories
  – Likely varies depending on individual factors such as genetics
Evolution of Tendinosis

• Pre-1990s
  – Inflammation was the driver “tendinitis”
  – Treatment focused on NSAIDs and corticosteroids

• 1990s
  – Histological findings showed little to no inflammatory mediators in chronic tendons
  – Abandoning of the term ‘tendinitis’

• 2000s
  – Degeneration without inflammation
  – Continuum of tendon degeneration
  – Multiple models approaching why tendons fail
  – Still not fully understood

Rees et al, 2012
MAIN THEORIES OF TENDINOPATHY
Main Theories of Tendinopathy

• 1 Mechanical Damage Theory
• 2 Changes in Nociceptor substance
• 3 Compression theory
• 4 Other Considerations
  – Genetics
  – Hypoxia
Mechanical Damage Theory
1. Mechanical Damage

Centers around the concept of overload

- Overload of the tendon
- Incremental weakening
- Continued overload without proper recovery time
- Eventual failure

Theory II: Changes in Nociceptive substances; Neuronal ingrowth Theory
Injury

Increased nerve ingrowth into tendon proper

Time-dependent expression of neuropeptides with healing

Nerve fibers retract out of tendon proper

Healing complete
Theory III: Compressive Load Induced Tendinopathy
Clinical Presentations

• Achilles insertional tendinopathy
  – Loaded dorsiflexion vs. heel lift
  – Stretching vs. cross friction massage

• Gluteal tendinopathy
  – Increased adduction
  – Lying on involved side at night
  – Crossing the legs

Cook J, et al 2012
Reducing Compression

• Change training strategies
• Reduce stretching
• Add heel raise
• Complete rest is contraindicated
  – Decreases mechanical strength of the tendon
  – Induce tendinopathic changes secondary to lack of mechanical stimulus

Cook J, et al 2012
Theory IV: Other
4. Other Theories

- **Genetics**
  - Poor production of collagen
  - Blood type? O

- **Gender**
  - Post-menopausal women more prone to AT rupture
  - Men more prone to tendinopathy

- **Hypoxia**
  - Older theory that tendinopathy arises after a lack of oxygen to the area
  - Not proven in the literature
  - Typically increased blood flow to injured area

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Where is pain coming from?

- **EXACT** nature of local pain unknown
- Signaling substances to local nerves and tenocytes implicated (Danielson et al. 2009)
  - Substance P, glutamate
- Changes to tendon pH implicated, but data lacking (Rio et al. 2014)
- Continuum model – irritable pain may be related to tenocyte overstimulation (Cook et al. 2009)
  - May explain pain in absence of imaging pathology
Differential Diagnosis

- Pain is rarely experienced in a resting state.
- Pain may improve with repeated loading ("warm up" phenomenon).
- Pain should increase when progressing from a shallow to deeper squat, and from a hop to a hop/land from a greater height.

Treatment
Active rest

• Necessary to reduce the patient’s regular activity when giving rehabilitation exercises.
• Worry of immobilization leading to further degradation of the tendon
Splinting/Bracing

• Sometimes used as a last resort
• No awareness of supporting evidence
• Expensive, immobilizing goes against the principles of tendon rehabilitation
Orthoses

- Orthotics would often be considered for foot alignment issues, temporary off-loading of the tendon and if taping had decreased the patient’s pain
- No good, supporting research specific to AT
- Lack of access, expensive, referral to podiatry time consuming
Ultrasound

• Not aware of any supporting evidence
Taping

• No supporting evidence for use with AT
• Kinesiotape to have no effect on hop distance, pain or motor-neuronal excitability in patients with AT (Firth et al. 2010)
Bracing, taping...

- Weak evidence showed that foot orthoses were equivalent to PT, and equivalent to no treatment.
- Very weak evidence supported the use of adhesive taping alone or when combined with foot orthoses.
- Weak evidence showed that an ankle joint dorsiflexion night splint was equally effective to a calf muscle eccentric exercise programme, and strong evidence showed that this intervention was not beneficial when added to a calf muscle eccentric exercise programme.

Deep Friction Massage

• “Not sufficient evidence to determine the effects of deep transverse friction on pain, improvement in strength, and functional status for patients with lateral elbow tendinitis or knee tendinitis, as no evidence of clinically important benefits was found.”

Joint and/or soft tissue mobilizations

- Generally considered for treating AT if decreased ankle joint range of movement observed
- Evidence viewed as anecdotal for AT
Stretching

- Conflicting views on using stretches.
- No good evidence for use with AT
- Stretching was not advised to avoid compressing tendon, loss of strengthening and exacerbating pain
Eccentric or concentric? More work to be done!!!

• No convincing evidence that isolated eccentric loading exercises improve the clinical outcome more than other loading therapies.

• Great variation and sometimes insufficient reporting of details of treatment protocols hamper the interpretation of what may be the optimal exercise regime.

Eccentric or Concentric Exercises for the Treatment of Tendinopathies?
4 phase program

Phase I: Isometric muscle load to reduce pain

Phase II: Isotonic muscle load with minimal tendon compression/tensile load

Phase III: Isotonic exercises in positions of increased tendon load

Phase IV: Energy storage loading

Sports specific/elastic function
‘GENERAL’ PROTOCOL
## Phase I: Isometrics to reduce pain

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  70-80% MVC  
  • 4 – 5 times/day  
  • 2 minutes rest between sets | • Different ranges  
  • Achilles – midsubstance vs. insertion  
  • No tendon bounce  
  • Postural exercise  
  • Single leg if possible  
  • Can start stage 2 on contralateral side, rest of kinetic chain |
Eccentric overload training for patients with chronic Achilles tendon pain – a randomised controlled study with reliability testing of the evaluation methods

K. Grävare Silbernagel¹, R. Thomeé², P. Thomeé¹, J. Karlsson³

[Diagram showing a scale from 0 to 10 with labels: No pain, Acceptable zone, High risk zone, Pain as bad as it could be]
24 hour pain behavior

• Guide to tendon load and overload on day to day basis
  – How it feels today reflects response to the load yesterday

Silbernagel et al.; Cook & Purdham, Rio et al, multiple sources
Tolerance to load test

- If the pain score on the load test has returned to baseline within 24 hours of the activity or rehabilitation session, the load has been tolerated.
- If the pain is worse, load tolerance has been exceeded.
# Phase II: Strength (isotonics)

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Can’t do daily

Faster stairs
Split squats
Skipping
Phase IV

*Energy storage loading*

*Sports specific/elastic function*
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- Duration
- Frequency
- Change of direction
- Speed
General ideas for various lower extremity tendinopathies

- EDUCATION!!!
- Return to sport/function phase
- Dynamic warm-up
- Neural ‘Re-programming’
  - Central vs peripheral mechanisms
Client education

• Are they listening?
• Discuss load tolerance paradigm
• Discuss compression & tension positions for tendon
• Discuss need for patience
• What is their goals?

REALISTIC?
Phase IV

Energy storage loading

Sports specific/elastic function
Dynamic Warm-Up
Neural ‘Re-programming’
Achilles Tendinopathy

- Most commonly affected lower extremity structure
- Encompasses peritendinitis and tendinosis and is the most commonly diagnosed Achilles disorder (55%–65%), followed by insertional pathology (retrocalcaneal bursitis, bone spurs, and insertional tendinopathy, 25%)

Achilles Tendinopathy

- 9% of elite athletes in sports involving running or jumping
- 33% are sedentary individuals, particularly men aged between 35 and 45 years.

Achilles Tendinopathy

- Achilles pathology occurs more frequently in men.
- Asymptomatic Achilles tendon pathology is more than twice as likely to occur in men.

Gaida JE, et al. BMC Musculoskelet Disord. 2010
Etiology

• Multifactorial
  – Overuse, adverse lower limb biomechanics (e.g. excessive foot pronation), and inappropriate footwear

Conservative Management of Midportion Achilles Tendinopathy
A Mixed Methods Study, Integrating Systematic Review and Clinical Reasoning

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Victoria Rowe, Stephanie Hemmings, Christian Barton, Peter Malliaras, Nicola Maffulli and Dylan Morrissey
Differential Diagnosis

• Haglund deformity &/or “bursitis”
• Posterior ankle impingement
• Neural
• MTSS &/or “shin splints”
• Peroneal or tibial tendon dysfunction
• Plantar fasciopathy
• Achilles tendon tear
Diagnostic Accuracy

Pathology

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<th></th>
<th>Present (+)</th>
<th>Absent (-)</th>
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<td>Test (+)</td>
<td>True positive</td>
<td>a</td>
</tr>
<tr>
<td>Test (-)</td>
<td>False negative</td>
<td>c</td>
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Sensitivity (Sn) = \( \frac{a}{a+c} \)

Specificity (Sp) = \( \frac{d}{b+d} \)

(+) LR = Sn/(1-Sp)

(-) LR = (1-Sn)/Sp

Sn Nout

Sp Pin
Respect the role of tendon compression
(Cook & Purdam, 2012)
# Table 2  The compressive anatomy of tendons susceptible to enthesopathy

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JL Cook,¹ C Purdam²  
Control Compressive Loads

• Gastroc stretch
• Soleus stretch
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<td>Decline squat</td>
<td>High single leg jump, landing from a height</td>
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<td>Single leg bent knee bridge</td>
<td>Single leg dead lift</td>
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Low Load

High Load
## Phase I: Isometrics to reduce pain

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  • No tendon bounce  
  • Postural exercise  
  • Single leg if possible  
  • Can start stage 2 on contralateral side, rest of kinetic chain |
Ankle PF isometrics
-shortened ROM
### Phase II: Strength (isotonics)

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Phase II: Strength (isotonics)

- Examples – weighted calf raises (concentric/eccentric), seated calf raise
- Kinetic chain
  - Address deficits – functional exercises once weight exercises are good
  - Add endurance
    - Achilles – going up stairs on toes
      - NOT down – energy storage
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• May take a long time  
• Good strength  
  • 25 calf raises  
  • 1.5x BW leg press | • Every 2-3 days  
• Assess response (24 hour, etc)  
• Must keep strength going  
• Consider neural ‘reprogramming’ | • Add/modify one variable at a time  
• Break up absorption/loading and propulsion phases initially; combine later in phase III |

**Can’t do daily**

Faster stairs  
Split squats  
Skipping
### Phase IV:

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- Don’t add speed & load together  
- May mix phase III & IV exercises  
- Consider tendon capacity |

- Duration  
- Frequency  
- Change of direction  
- Speed
Patellar Tendinopathy

- Relatively young (15-30 year old) athletes, especially men who participate in sports such as basketball, volleyball, athletic jump events, tennis, and football, which require repetitive loading of the patellar tendon


Specific & defining hallmark features

1. Pain localized to the inferior pole of the patella
2. Load related pain that increases with the demand on the knee extensors, notably in activities that store and release energy in the patellar tendon

Differential Diagnosis

- Pain is rarely experienced in a resting state
- Pain may improve with repeated loading ("warm up" phenomenon)
- Pain should increase when progressing from a shallow to deeper squat, and from a hop to a hop/land from a greater height

Differential Diagnosis

• Patellofemoral pain syndrome
• Fat pad syndrome
• L3 dermatome
• Osteoarthritis/Intra-articular pathology
• Osgood-Schlatter’s disease
Patellar tendinopathy

• Subjective:
  – **Localized** pain
  – History of **changes to training** to cause pain
  – Night pain rare
  – Warm-up reduces pain and will be worse the next day
  – Pain with stairs, sitting and squats

• Overload
  – Change in training schedule
  – Return to sport from Holiday

• Intrinsic factors
  – Reduced dorsiflexion ROM
  – Lower foot arch height
  – Leg length discrepancy
  – Muscle recruitment

• Extrinsic factors
  – Shoe support
  – Jumping surface
Low Load

High Load

The quality of movement can be assessed with various single-leg hop tests and specific change of direction tasks. Record pain (VAS) and function at take off and landing, and note if more load induces more pain. If possible, measurement of angles and individual joint moments through video/biomechanical analysis can help with more elite athletes. Hop tests for height and distance can also be used to assess kinetic chain quality, as well as providing an objective means of monitoring progress.

Muscle strength, assessed through clinical and functional measures (repeated calf raise and decline squats), is useful to assess the level of unloading in the essential muscles. Dorsiflexion range of movement is a critical assessment, as the ankle and calf absorb much of the landing energy.

Imaging with traditional ultrasound and magnetic resonance can identify the presence of pathology in the tendon. Ultrasound tissue characterisation, a novel form of ultrasound, can quantify the degree of disorganisation within a tendon and may enhance clinical information from imaging (Figures 3 and 4). Imaging will nearly always demonstrate tendon pathology, regardless of the imaging modality used. The presence of imaging abnormality does not mean that the pathology is the source of the pain so clinical confirmation, as described above, is essential. More importantly, the pathology is commonly degenerative, often circumscribed and does not change over time, so imaging the tendon as an outcome measure is unhelpful, as pain can improve without positive changes in tendon structure on imaging.

In elite jumping sports, imaging...
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Quad isometrics
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Spanish wall squats
Strengthen antagonist
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- Pain is stable on initial loading in morning (may not be pain free)
- May take a long time
- Good strength
  - 25 calf raises
  - 1.5x BW leg press

**Implementation**
- Every 2-3 days
- Assess response (24 hour, etc)
- Must keep strength going
- Consider neural ‘reprogramming’

**Considerations**
- Add/modify one variable at a time
- Break up absorption/loading and propulsion phases initially; combine later in phase III

---

*Can’t do daily*

**Faster stairs**
**Split squats**
**Skipping**
**Phase IV:**

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| • Pain is stable on initial loading in morning (may not be pain free)  
• May take a long time  
• Good strength – same  
• Need power | • Every 2-3 days  
• Assess response  
• Must keep strength going | • Add/modify one variable at a time  
• Don’t add speed & load together  
• May mix phase III & IV exercises  
• Consider tendon capacity |

• Duration  
• Frequency  
• Change of direction  
• Speed
Iliopsoas Tendinopathy

Insertional tendinopathy with the iliopsoas tendon being subject to compression in flexion or tensile compression with hip extension.


http://www.arthroscopichipsurgeon.com/
Risk Factors

• Tendon compression with flexion
  – Mechanical cause (inflammation, FAI, etc)
• Tensile compression with extension, ER, swayback posture
Capsule and Muscular Stabilization

• Iliopsoas muscle is also an important muscular stabilizer of the hip joint  (Torry et al. Clin Sports Med. 2006; Babst et al. CORR. 2011)
Differential Diagnosis

- Non-MSK issues
- Groin pain....ugh!
- L2-3 dermatome
- FAI/Labral tear
- Iliopsoas impingement
- Subspine impingement
- Hip laxity
Non-MSK issues

- Peritonitis/appendicitis
- Gynecological issues in females
Groin Pain

Consensus statement
Doha agreement meeting on terminology and definitions in groin pain in athletes

L2-3 dermatome

SN 100 (NR), SP 22 (NR), +LR 1.3, -LR 0.0, QUADAS 11

SN 100 (NR), SP 12 (NR), +LR 1.1, -LR 0.0, QUADAS 10
FAI/Labral tear

C-sign
Control Compressive Loads

• Hip flexor & quad stretch
• Yoga/ballet/sport?
  – Shorten ROM?
Low Load

High Load
# Phase I: Isometrics to reduce pain

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• No tendon bounce  
• Postural exercise  
• Single leg if possible  
• Can start stage 2 on contralateral side, rest of kinetic chain |
Hip flexion isometrics
-shortened ROM
Strengthen antagonist
**Phase II: Strength (isotonics)**

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**Can’t do daily**

Faster stairs
Split squats
Skipping
# Phase IV:

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- Duration
- Frequency
- Change of direction
- Speed
Proximal Hamstring Tendinopathy

Insertional tendinopathy with the hamstring tendon being subject to compression from the ischial tuberosity during hip flexion.

Proximal Hamstring Tendinopathy

• Common in distance runners and athletes doing COD (Fredericson et al. Phys Sportsmed. 2005; Lempainen et al. AJSM. 2009)

• Can also affect those not in sport
  – Commonly bilateral in this cohort (de Jesus et al. 2015; Lempanien et al. AJSM 2009; Puranen & Orava. AJSM. 1988)
Proximal Hamstring Tendinopathy

• Extrinsic factors:
  – Overload training volume or too quickly, especially sprint work, hills, lunges, hurdles. (Docking et al. 2013, Soslowsky et al. 2002)
  – Yoga – sustained end range hip flexion
  – Sitting
    (Lempainen et al. AJSM. 2009)
Differential Diagnosis

• Subjective
  – Localized ischial tuberosity pain
  – Less symptomatic after easy running warm-up, but worse afterwards
  – Activities with deeper hip flexion (squatting, lunging, deadlifts) typically produce greater discomfort
Differential Diagnosis

• More diffuse symptoms (Durrani et al. 1991; Meknas et al. 2003; Puranen & Orava. 1988)
  – may indicate lumbar, hip or SIJ referral
Lumbar Spine Related
SLR Test

**SN 97%, SP 57%, +LR 2.3, -LR 0.05, QUADAS 10**

Slump Test

SN 83%, SP 55%, +LR 1.8, -LR 0.31, QUADAS 11

FAIR Test

Patient position: Sidelying on contralateral side with the hip and knee slightly bent for stability. Trunk is in normal postural alignment.

Clinician position: Standing directly behind patient at the level of the hips.
Movement: Clinician brings leg to be tested into a position of flexion, adduction, and internal rotation (FAIR).

Assessment: Considered a (+) test if pain is elicited at the intersection of the sciatic nerve and the piriformis.

SN 88, SP 83, +LR 5.2, -LR .14

Pelvic Girdle Diagnosis

• Signs and symptoms

• Special Testing
  – Static anatomical position testing
  – Motion palpation testing
  – Pain provocation testing
SI Joint – Thigh Thrust Test

**SN 88; LR- 0.17**

- The patient is supine and the hip and knee are flexed to 90°. The examiner provides compression along the long axis of the femur using a hand under the patient’s sacrum as a wedge to create shearing force at the SIJ.

- 30 seconds
- Thrust at end

Diagnostic accuracy of clinical tests for sciatic nerve entrapment in the gluteal region

Hal D. Martin · Benjamin R. Kivlan · Ian J. Palmer · RobRoy L. Martin

active piriformis test

seated piriformis stretch test
Provocative Clinical Tests

• Low-load clinical test
  – Single-leg bent knee bridge

• High-load clinical test
  – Single leg dead lift

**FIGURE 1**  A) Single leg, bent knee bridge, example of a low load clinical test  
B) Long lever bridge, example of a moderate load clinical test
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JL Cook,¹ C Purdam²  
Control Compressive Loads

- Hamstring stretch
- Sitting
- Deadlifts
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Gradually progress loading into positions of hip flexion while monitoring symptom response
Phase I: Isometrics to reduce pain

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  • Single leg if possible  
  • Can start stage 2 on contralateral side, rest of kinetic chain |
Hamstring isometrics

- shortened ROM
Strengthen antagonist
# Phase II: Strength (isotonics)

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## Phase III:

### Indications
- Pain is stable on initial loading in morning (may not be pain free)
- May take a long time
- Good strength
  - 25 calf raises
  - 1.5x BW leg press

### Implementation
- Every 2-3 days
- Assess response (24 hour, etc)
- Must keep strength going
- Consider neural ‘reprogramming’

### Considerations
- Add/modify one variable at a time
- Break up absorption/loading and propulsion phases initially; combine later in phase III

---

Can’t do daily

- Faster stairs
- Split squats
- Skipping
Negative Work – Brake Knee Extension

Conceptual Framework for Strengthening Exercises to Prevent Hamstring Strains

Kenny Guex · Grégoire P. Millet
The ‘Diver'

GMax and GMed activity (59 and 58% MVIC)

Reiman, et al., 2012

Hams 56-73% MVIC; flexion range 65-66°

Zebis, et al., 2013
<table>
<thead>
<tr>
<th>Parameters</th>
<th>Start position</th>
<th>Range of motion</th>
<th>End position</th>
</tr>
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<tbody>
<tr>
<td>Contraction type</td>
<td>Eccentric</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Load (%)</td>
<td></td>
<td>≥100 % of 1 RM</td>
<td></td>
</tr>
<tr>
<td>Range of motion</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hip position (°)</td>
<td>80</td>
<td>0</td>
<td>80</td>
</tr>
<tr>
<td>Knee position (°)</td>
<td>130</td>
<td>110</td>
<td>20</td>
</tr>
<tr>
<td>Elongation stress</td>
<td>−50</td>
<td></td>
<td>+60</td>
</tr>
<tr>
<td>Angular velocity</td>
<td></td>
<td>Slow to moderate</td>
<td></td>
</tr>
<tr>
<td>Uni/bilateral exercise</td>
<td></td>
<td>Unilateral</td>
<td></td>
</tr>
<tr>
<td>Kinetic chain</td>
<td></td>
<td>Open</td>
<td></td>
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*RM* repetition maximum
Increase Range of Flexion during Loading
Acute hamstring injuries in Swedish elite football: a prospective randomised controlled clinical trial comparing two rehabilitation protocols

Carl M Askling,¹,² Magnus Tengvar,³ Alf Thorstensson¹


The “Glider”
As hip flexion increased, hamstrings peak torque increased

## Phase IV:

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- Duration
- Frequency
- Change of direction
- Speed
Gluteal Tendinopathy

• Differential Diagnosis
• Bursitis – rare, etc.
Gluteal Tendinopathy

• A history of lateral hip pain & pain on palpation of the lateral hip are consistently reported as signs and symptoms of GTPS

Differential Diagnosis

• Bursitis – rare, etc.
• Trigger points
• Upper lumbar dermatome(s)
• Osteoarthritis
• FAI/Labral pathology
• Piriformis syndrome
Bursitis?

- Tendinopathy common finding for patients with lateral hip pain
- Frequent cause of GTPS

Trochanteric Bursitis-Last Great Misnomer?

• Suggests that there is no inflammatory component to so-called trochanteric bursitis
• Casts doubt on both the terminology and the existence of this condition as a separate clinical entity.

Board TN, Hughes SJ, Freemont AJ. Trochanteric bursitis: the last great misnomer
Hip Int 2014; 24(6): 610 - 615
Trochanteric bursitis: refuting the myth of inflammation.

• Strongly suggest that there is no etiologic role of bursal inflammation in GTPS

Tender to palpation?

- **SN 80%, SP 47%, +LR 1.5, -LR 0.4**
  Grimaldi et al.

- If not tender to palpation, less likely to have **gluteal tendinopathy**
Hip OA “Gold Standard”

• Individuals with hip pain and hip IR ROM > 15° with pain, morning stiffness ≤ 60 minutes, and were 50 y.o. or older could be identified as having hip OA
SN = 86%; SP = 75%, +LR 3.4, -LR 0.19

OR

• If hip IR ROM was < 15° and hip flexion ≤ 115°
SN = 86%; SP = 75%, +LR 3.4, -LR 0.19

Greater trochanteric pain syndrome: defining the clinical syndrome

Angela M Fearon,1,2 Jennie M Scarvell,1,2,3 Terry Neeman,1 Jill L Cook,5 Wes Cormick,6 Paul N Smith1,2

Lateral hip pain

Positive

| Faber painful

Negative

GTPS

OA


Angela M Fearon,¹,² Jennie M Scarvell,¹,²,³ Terry Neeman,¹ Jill L Cook,⁵ Wes Cormick,⁶ Paul N Smith¹,²

Donning and doffing shoes
• More likely indicative OA
GTPS vs. OA

- GTPS can be differentiated from hip OA based on two history questions; walking duration and ease of manipulation of shoes and socks; and one clinical test—the FABER test, paying attention to the location of pain reproduction. We propose that the clinical definition of GTPS should be a history of LHP and no difficulty with manipulating shoes and sock together with clinical findings of pain reproduction on palpation of the greater trochanter and lateral pain reproduction with the FABER test."
Trendelenburg’s Sign

Pooled analysis: SN 61 (46-75), SP 92 (83-97), +LR 6.83, −LR 0.25

Reiman MP et al. BJSM. 2013
## Resisted External Derotation Test

<table>
<thead>
<tr>
<th>Authors</th>
<th>SN/SP</th>
<th>LR+/LR-</th>
<th>QUADAS</th>
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<tr>
<td>Lequesne (2008)</td>
<td>88/97</td>
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Provocative Clinical Tests

Low Load

High Load

Hop
Respect the role of tendon compression
(Cook & Purdam, 2012)
Table 2  The compressive anatomy of tendons susceptible to enthesopathy

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Hip abductor isometrics -shortened ROM

Ekstrom R, et al. 2008
Ekstrom R, et al. 2007

GMed: 74±30
Phase II: Strength (isotonics)

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<td>• Encourage exercise in the evening to avoid muscle fatigue during day</td>
</tr>
<tr>
<td></td>
<td>• Single-leg</td>
<td></td>
</tr>
</tbody>
</table>
## Phase III:

### Indications
- Pain is stable on initial loading in morning (may not be pain free)
- May take a long time
- Good strength  
  - 25 calf raises
  - 1.5x BW leg press

### Implementation
- Every 2-3 days
- Assess response (24 hour, etc)
- Must keep strength going
- Consider neural ‘reprogramming’

### Considerations
- Add/modify one variable at a time
- Break up absorption/loading and propulsion phases initially; combine later in phase III

---

Can’t do daily

- Faster stairs
- Split squats
- Skipping
## Phase IV:

<table>
<thead>
<tr>
<th>Indications</th>
<th>Implementation</th>
<th>Considerations</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Pain is stable on initial loading in morning (may not be pain free)</td>
<td>• Every 2-3 days</td>
<td>• Add/modify one variable at a time</td>
</tr>
<tr>
<td>• May take a long time</td>
<td>• Assess response</td>
<td>• Don’t add speed &amp; load together</td>
</tr>
<tr>
<td>• Good strength – same</td>
<td>• Must keep strength going</td>
<td>• May mix phase III &amp; IV exercises</td>
</tr>
<tr>
<td>• Need power</td>
<td></td>
<td>• Consider tendon capacity</td>
</tr>
</tbody>
</table>

- Duration
- Frequency
- Change of direction
- Speed
Other Treatments
Extracorporeal Shockwave Therapy

• Originally used for the treatment of kidney stones
• Now used for several orthopaedic conditions, with level 1a evidence
• Recently established for the treatment of calcific rotator cuff tendinosis

ESWT - GTPS

- Moderate evidence - more effective than home training and corticosteroid injection in the short (<12 months) and long (>12 months) term.
ESWT - PT

- Limited evidence - more effective than nonsteroidal anti-inflammatory drugs, physical therapy, and an exercise program and equal to patellar tenotomy surgery in the long term.
ESWT - AT

- Moderate evidence - more effective than eccentric loading for insertional AT and equal to eccentric loading for midportion AT in the short term.
ESWT - AT

- Moderate evidence that combining ESWT and eccentric loading in mid-portion AT may produce superior outcomes to eccentric loading alone.
Platelet-Rich Plasma (PRP)

• PARot study - showed PRP has a damaging effect on tissue!

Platelet-Rich Plasma (PRP)

- Insufficient evidence to support use of PRP for MSK soft tissue injuries

• Overall, currently insufficient evidence to support the use of PRT for treating musculoskeletal soft tissue injuries.
• There is need for standardization of PRP preparation methods.

Since review – more higher quality studies show worse results for PRP in tendinopathy
Corticosteroid Injection

• Short term benefit – especially pain
• Not curative (not long-term benefit)
• May be worse in long term

THANK YOU!

@MikeReiman