Management of Hamstring Tendinopathy

VIEN VU

DOCTOR OF PHYSICAL THERAPY STUDENT

CERTIFIED STRENGTH AND CONDITIONING SPECIALIST
Objectives

• Definition and stages of tendinopathy
• Mechanisms of Injury
• Clinical presentation and diagnosis
• Current treatments
• Future considerations
Definition

Tendinopathy - An umbrella term that indicates a non-rupture injury to the tendon or paratendon that is exacerbated by mechanical loading and overuse
- Tendinosis – Chronic tendon pathology as described above
- Tenosynovitis – Pathology of a fully developed synovial sheath which typically presents with acute swelling with or without crepitus or triggering
- Paratendinitis – Inflammation or damage around the thin membrane of tendon

Scott et al, 2015
Pathology

- Tendinopathy is associated with disorganized collagen, increased neurovascular ingrowth, increased hydrated components of the extracellular matrix, and tissue breakdown.
  - Mesaplasia can occur which is when injured tendon tissue is replaced with tissue more similar to bone and fat; it does not handle load as well as normal tendon tissue.

- Type 3 collagen is laid down in place of Type 1
  - Does not adapt to load (can not be re-trained)
  - Can no tolerate load as good as Type 1

Malliaras et al, 2015; Scott et al, 2015

Source: Totallyphysio.wordpress.com
Pathology (cont.)

- Kalimo 1997 Grades of Hamstring Injuries
  - Mild, moderate, Severe (rupture)
  - (Lampainen, 2009)

- Nurschl’s Stages of Tendinopathy
  - (Lorenz & Reiman, 2011)

- Newer commentaries are now saying it is a continuum, not a stage by stage occurrence
Incidence

- 23% common tendon
- 41% biceps femoris
  - This muscle is likely most commonly injured since it works the hardest when a person reaches forward with their leg while running
- 29% Semimembranosus
- 6% Semitendinosus

Goom et al, 2016, Lorenz & Reiman 2011

Source: http://anatomybody101.com/sartorius-muscle-anatomy/
Mechanism

• Physiological Mechanism
  • Reactive/Degenerative Theory
    • Tension causes cells to react and release chemicals that breakdown health tendon tissue. Reactive occurs early on and is associated with pain; a person can train to repair normal tendon tissue. Degenerative is late stage, is not painful, and can not be repaired.
    • Only parts of the tendon is damaged, not the entire tendon
    • Other areas of the tendon can be trained to take load for the damaged area (there’s hope!)
  • Structural Theory
    • Tension causes structure to breakdown which attracts “bad” chemicals to the injury site.

• Mechanism of Injury
  • Tension
    • Overstriding (Late swing phase and early stance)
      • Chronically poor management of volumes or magnitudes of loading
  • Compression

Goom et al, 2016, Mallairas et al, 2015
Risk Factors

• Prior injury
  • Number one cause, ~30% of people will reinjure themselves with most within the first 2 weeks back into sport

• Participation in sports that involve sprinting

• Age
  • Research says those older than 23, but more likely due to their activity level

• Flexibility (?)
  • Researchers uncertain if lack of flexibility caused injury, or injury caused lack of flexibility

• High body fat, high cholesterol, and diabetes have been shown to be variable
  • All of these variables are also linked to inactivity, therefore it may be that inactivity and a sedentary lifestyle is what may be a risk factor

Lempainen, 2009
Symptoms

- Stiffness, especially in the morning
- Difficulty bearing weight
- Deep localized pain in the region of the ischial tuberosity (right under your butt muscle)
- Worsens AFTER running, lunging, squatting, and sitting; no problems during
- Hurts with sitting
- May be less painful with activities with low energy storage (walking, standing, and lying)
  - Steady state jogging may be okay if pain does not persist 24 hours after

Goom et al, 2016; Mallairas et al, 2015
Diagnosis

- Subjective History (best tool)
- Palpations (low specificity)
- Doppler ultrasound (expensive)
- Diagnostic ultrasound (expensive)
- T2-weighted MRI (expensive)
- Provocation tests (low accuracy)
- Gait and Running Analysis

- Use all of these together as a cluster

Source: Zissen et al, 2010
Source: Lee et al, 2012
Source: Souza, 2015
## Differential Diagnosis

<table>
<thead>
<tr>
<th>TABLE</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>DIFFERENTIAL DIAGNOSIS</strong></td>
</tr>
<tr>
<td><strong>IN PROXIMAL HAMSTRING TENDINOPATHY</strong></td>
</tr>
</tbody>
</table>

- Sciatic nerve irritation at the piriformis muscle or near the ischial tuberosity
- Ischiofemoral impingement
- Unfused ischial growth plate in a postadolescent athlete
- Apophysitis or avulsion among adolescents
- Deep gluteal muscle tear
- Posterior pubic or ischial ramus stress fracture
- Partial or complete rupture of the proximal hamstring tendon

Goom et al, 2016
Diagnosis: Provocation Tests

- Single leg bent knee bridge > long lever bridge > single leg deadlift
- PROM: bent knee stretch, modified bent-knee stretch, Puranen-Orava test (high validity and specificity if paired with Straight Leg Raise)
- Palpation for provocation has low specificity
Treatment and management

- Dry Needling and soft tissue = Low evidence and does not load tissue. Tissue NEEDS loading.
- NSAIDs = If no relief after 1-2 weeks, no need to use anymore. Continue to load tissue progressively.
- Immobilization = Not recommended. Load the tissue appropriately as soon as possible.
- Exercise = The best results, high evidence
  - Eccentrics
  - Heavy Slow Resistance
  - Standard periodization
- Stretching = Variable results
- Modifications = Use seat cushion if sitting helps
- Surgery = if conservative treatment fails
Why Isometrics and Eccentrics?

• Arguments for eccentrics
  • Muscle is strongest during eccentric contractions
  • Eccentrics allow for weighted exercise to begin early since muscle can tolerate it, and there would be no worry of chemical pain from tendons since tendons create significantly less byproduct than muscles
  • No human evidence of reorganizing tendon alignment. Eccentrics DO NOT re-organize tendon fiber directions

• These are all arguments for it, however all researchers did not utilize nor recommend eccentrics in isolation.

• Complete rest is not recommended, yet unloading is imperative.
  • Since that statement is contradicting, isometrics have been recommended for very acute painful cases
4-Stage Exercise Program (3-6 months)

- A person does not have to start at stage 1, if they can tolerate stage 2 or 3, start them there. Manage by symptoms (pain less than 3/10 24 hours after is okay)

  - Stage 1: Isometric hamstring loading
    - decrease pain

  - Stage 2: Isotonic hamstring with minimum Hip flexion
    - increase bulk and functional ROM
    - 3-4 exercises, 3-4 sets, 15 reps, 3x3 second count up and down

  - Stage 3: Isotonic in 70-90 degree hip flexion
    - functional training, hypertrophy, muscle strength, deeper flexion
    - Same dose as Stage 2

  - Stage 4: Energy Storage load
    - For those returning to competitive sport

(Lorenz & Reiman, 2011; Mallaras et al 2015; Goom et al, 2016;
Reasons for failure of optimal recovery

• Poor expectations of process and timeline – educate the patient.

• Centralized pain – most tissue heals within 3 months – educate patients that pain is not equal to tissue damage.

• Passive treatment – Use of ultrasound, soft tissue, manual therapy has low evidence of success and develops reliance of PT; independence is always the goal.

• Failure to address kinetic chain – Address muscles and joints above and below site of injury.

• Non-compliant patients – educate, set expectations, and encourage the patient to trust the process.
References


