TENDINOPATHY CLINICAL PRACTICE GUIDELINE

Disclaimer

Progression is time and criterion-based, dependent on soft tissue healing, patient demographics and clinician evaluation. Contact Ohio State Sports Medicine at 614-293-2385 if questions arise.

Background

Tendinopathy is a common clinical condition characterized by painful mechanical loading of an involved tendon associated with significant limitations in daily or sport activities. Etiology is multifactorial and typically includes extrinsic and intrinsic factors. Tendinopathy has been described as a continuum of tissue pathology which can include reactive or reactive-on-degenerative phases.[1] A key determinant in rehab progression of tendinopathy is whether or not a tendon reacts, or develops an increase in pain that does not return to baseline pain levels within 24 hours.[2]

Progressive mechanical loading has been found to be an effective management strategy. Different modes of strength training, including isometric, isotonic, isolated eccentric, and isokinetic, can be used to control pain, improve motor control, and enhance function in pathological tissue. Although traditional rehabilitation approaches have focused on isolated eccentric tissue loading, recent literature suggests that isolated eccentric exercise may not be a superior choice to the other types of loading, particularly heavy-slow resistance (HSR) loading (resistance performed up to an individual's 6RM).[3] In fact, eccentric-based exercise may contribute to worse outcomes for an in-season athlete.[4] Heavy-slow resistance loading is designed to target both concentric and eccentric strength deficits, which both commonly present in cases of tendinopathy. HSR loading also has been found to promote better collagen turnover than isolated eccentric loading.[3] The selection and timing of the type of load applied to the involved tendon may be critical to restoring function. For instance, isometrics have been found to reduce pain while reducing cortical inhibition of muscles.[4]

Tendinopathy can have profound negative effects on an individual's function and ability to participate in and return to their previous level of activity. Emerging research is indicating the presence of changes in central pain processing, such as central sensitization, in some cases of tendinopathy.[5] In such cases it would be beneficial to consider the inclusion of cognitive-behavioral therapy and graded exposure.[6] Generally, clinical management of tendinopathy should include aspects of pain management and education, progressive mechanical loading, treatment of kinetic chain deficits, and a graded return to activity. Adjunct treatments, such as joint mobilizations and friction massage, can be used in combination with a progressive resistance program, especially if joint or muscle dysfunction is contributing to altered movement patterns and abnormal tendon loading.

Definitions

- *Strong level evidence*: supported by systematic review, meta-analysis, or >5 RCT
- *Moderate level evidence*: supported by 3-4 RCT
- *Low level evidence*: supported in 1-2 RCT or clinical case series
- *Expert opinion*: supported by case studies, expert opinions or opinions of the authors

Summary of Recommendations

Risk Factors	• General overuse • Repetitive tensile loading • Combination of tensile, shear, and compressive forces
Differential Diagnosis	• Partial to full tendon ruptures • Muscle strain • Stress reaction/fracture • Nerve entrapment
Examination	• Outcome Measure: VISA (Victorian Institute of Sport Assessment, body-part specific measure • Impairments and functional limitations • Isolated muscle/kinetic chain deficits
Classification	• Reactive • Reactive-on-degenerative
Phases of Progression	• Pain Reduction and Load Management (isometric loading and avoiding positions of compression) – refer to appendix • Isotonic Loading (Heavy- slow resistance through concentric-eccentric phases) • Energy-Storage Loading (plyometric loading) • Return to Activity/Sport
Interventions	• Patient education • Prolonged isometric contractions of moderate intensity (40-70%) with tendon in shortened range throughout entirety of rehab • Progressive muscle-tendon loading program • Correction of kinetic chain deficits • Joint/soft tissue mobilizations to adjacent areas • Return to activity/sport progression
Criteria for Discharge	• Full and symmetrical ROM and strength/power • Pain-free high load resistance test to muscle-tendon unit • Return to sport/activity without reactive pain • Proper long-term maintenance program implemented for self-management of symptoms

Phase I: Pain Reduction and Load Management

Indications	1. Patient experiences reactive pain (More than 3/10 pain during or after activity/isotonic loading that lasts greater than 24 hours). Range of acceptable pain levels may vary dependent on patient tolerance and understanding of therapeutic ranges. 2. Unable to maintain current activity levels due to pain 3. Localized tenderness at tendon
Activity Modifications *expert opinion*	1. Reduced loading, modified volume of activity, and avoidance of tendon in compressive positions including end-range stretching 2. Patient Education: expected recovery progression, cognitive behavioral therapy if indicated
Prolonged Isometric Contractions *strong level evidence*	Perform with tendon in shortened/non-compressed position. *Prescription*: 5 repetitions of 45-60 seconds, 2-3 times per day, progressing from 40% to 70% maximal voluntary contraction. 1-2 minute rest periods between contractions. Daily.
Treatment of Kinetic Chain Impairments *expert opinion*	Assessing and treating local and regional movement impairments
Criteria to Progress to Phase 2 *expert opinion*	1. Can complete isotonic loading with minimal reactive pain (<3/10 pain or no increase in baseline pain lasting longer than 24 hours) 2. Decreased pain with ADLs

Phase II: Isotonic Loading Progression

Indications	1. Strength deficits of the involved muscle-tendon unit 2. History of painful loading
Heavy, Slow Resistance Exercise (HSR) *strong level evidence*	*Prescription*: 3-4 sets of concentric-eccentric exercise starting at 15 repetitions and progressing to 6 repetitions, performed every other day. Initially, complete exercise in modified ROM to avoid compression of tendon then progress into full ROM as strength and pain levels allow.
Stretching Exercises *low level evidence*	Performed to address ROM deficits. Should not create reactive pain > 24 hours.
Prolonged Isometric Contractions *strong level evidence*	Perform with tendon in shortened/non-compressed/mid-range position. *Prescription*: 5 repetitions of 45-60 seconds, 2-3 times per day, progressing from 40% to 70% maximal voluntary contraction. 1-2 minute rest periods between contractions. Daily.
Cognitive Behavioral Therapy/Graded Exposure *low level evidence*	Only indicated for cases of chronic pain or central sensitization.
Criteria to Progress to Phase 3	1. Able to complete 3-4 sets of 6 repetitions throughout full ROM with minimal pain and no increase in pain lasting greater than 24 hours (patients should be at about 7/10 on Borg Rate of Perceived Exertion scale for strengthening purposes) 2. No pain with ADLs

Phase III: Energy Storage Loading Progression (Plyometrics)

Indications	1. Symmetrical strength bilaterally (recommended strength tests: 10 RM, Manual muscle testing, and/or isokinetic testing) 2. Tolerates introduction of energy storage exercises with minimal pain
Sport or Activity-Specific Movements *expert opinion*	Progressing volume then intensity. *Prescription*: every third day, progressing to a volume required by the sport/activity
Heavy, Slow Resistance *strong level evidence*	*Prescription*: 3-4 sets of concentric-eccentric exercise starting at 15 repetitions and progressing to 6 repetitions, performed every other day. Initially, complete exercise in modified ROM to avoid compression of tendon then progress into full ROM as strength and pain levels allow.
Prolonged Isometric Contractions *strong level evidence*	Perform with tendon in shortened/non-compressed/mid-range position. This is done as needed at this phase for pain management. *Prescription*: 5 repetitions of 45-60 seconds, 2-3 times per day, progressing from 40% to 70% maximal voluntary contraction. 1-2 minute rest periods between contractions. Daily.
Criteria to Progress to Phase 4 *expert opinion*	Ability to complete energy storage exercises with minimal pain and at a volume that would replicate the demands of the sport/activity

Phase IV: Return to Sport/Activity

Indications	1. Can complete introduction of sport/activity-specific exercise with minimal pain
Proper Warm-up Routine *expert opinion*	Gentle, dymanic movement relevant for the sport or activity
Sport or Activity-Specific Drills *expert opinion*	Reintegration into competition (no greater than every three days initially)
Heavy, Slow Resistance *strong level evidence*	*Prescription*: 3-4 sets of concentric-eccentric exercise starting at 15 repetitions and progressing to 6 repetitions, performed at least twice per week. Initially, complete exercise in modified ROM to avoid compression of tendon then progress into full ROM as strength and pain levels allow.
Prolonged Isometric Contractions *strong level evidence*	Perform with tendon in shortened/non-compressed/mid-range position. This is done as needed at this phase for pain management. *Prescription*: 5 repetitions of 45-60 seconds, 2-3 times per day, progressing from 40% to 70% maximal voluntary contraction. 1-2 minute rest periods between contractions. Daily.
Criteria for Discharge *expert opinion*	1. Full ROM and strength/power 2. Pain-free high load resistance test, ensuring no pain in positions that normally compress the tendon 3. Full training with minimal pain

Appendix 1: Example of Initial Weekly Structure at Phases 3 and 4

Day 1	Plyometrics/Return to Play, Isometrics if needed
Day 2	Strengthening, Isometrics if needed
Day 3	Isometrics
Day 4	Rest
Day 5	Plyometrics/Return to Play, Isometrics if needed
Day 6	Strengthening, Isometrics if needed
Day 7	Isometrics

Appendix 2: Common Sites of Tendon Compression

Tendon	Site of Compression	Position of Compression	Modification
Achilles Insertion	Superior calcaneus	Ankle dorsiflexion	Heel raise
Tibialis Posterior	Medial malleolus	Anatomically permanent pivot	Orthotics and heel raise
Long Head of Biceps	Bicipital groove	Shoulder extension	Modify resting shoulder positions
Suprasinatus	Greater tuberosity	Shoulder adduction	Modify resting shoulder positions
Pectoralis	Humeral tuberosity	External rotation	Modify upper extremity activities
Proximal Hamstrings	Ischial tuberosity	Hip flexion	Limit sitting/ lunging
Gluteus Medius and Minimus	Greater trochanter	Hip adduction	Lumbopelvic control, sleep supine
Adductor Longus/rectus abdominus	Pubic ramus	Hip abduction/ extension	Limit loads in abduction/ extension
Peroneal Tendons	Lateral malleolus	Anatomically permanent pivot	Heel raise
Quadriceps	Femoral condyle	Deep knee flexion	Limit loads in deep knee flexion

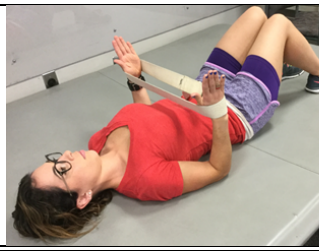
(Modified from Goom 2013)

Appendix 3: Isometric/Isotonic loading suggested positions (initial setup to be progressed)

Isometric: 5 repetitions of 45-60 seconds, 2-3 times per day, progressing from 40% to 70% maximal voluntary contraction.
Isotonic: 3-4 sets of concentric-eccentric exercise starting at 15 repetitions and progressing to 6 repetitions, performed every other day

Rotator Cuff Tendinopathy

- Resisted ER/IR
- Scapular stabilization
- Closed kinetic chain resistance including proprioceptive-enriched exercise like Bosu push-ups



Lateral Epicondylosis

- Wrist extension in full elbow extension
- Wrist extension at 90 degrees elbow flexion
- Wrist neutral pronated curls

Medial Epicondylosis

- Wrist flexion in full elbow extension
- Wrist flexion at 90 degrees elbow flexion
- Wrist neutral supinated curls

Proximal Hamstring Tendinopathy

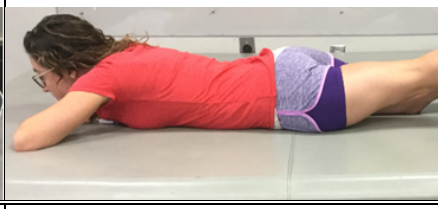
- Physioball hamstring curls
- Glute bridges
- Nordic curls
- Askling's glide
- Prone/seated leg curls

Gluteal Tendinopathy

- Physioball glute bridges
- Monster walks / band squats
- Lumbopelvic stability training

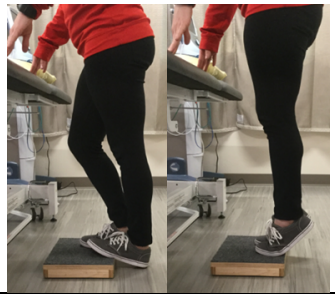
Quad / Patellar Tendinopathy

- Quad extension
- Slant board single leg squats
- Leg extension



Midsubstance Achilles Tendinopathy

- Traditional Alfredson heel drop

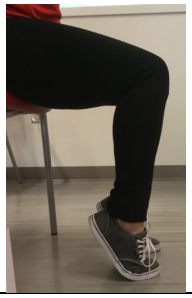


Insertional Achilles Tendinopathy

- Modified Alfredson heel drop (stopping at neutral)

Plantar fasciopathy

- Foot intrinsic (Seated relevé)
- Calf raises



Author: J.J. Kuczynski, PT, DPT
Reviewers: Matt Longfellow, PT, DPT; Thomas Best, MD, PhD; Stephanie Di Stasi Roewer, PhD, PT; Daniel Chelette, PT, DPT; Sarah Miller, PT, DPT; Chelseana Davis, PT, DPT; Michael Baria, MD; John DeWitt, PT, DPT, AT
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