Mid-Portion Achilles Tendinopathy Toolkit

Treatment Algorithm

Patient Presents with Achilles Pain

Take history* and perform physical assessment to confirm diagnosis

**History should include level of current loading & evaluation of potential risk factors associated with persistent pain*

Confirm Mid-Portion Achilles Tendinopathy

Baseline Assessment & Treatment Phase

Take patient reported or performance based outcome measures (e.g. VISA-A or Heel-rise test - see Section B – Outcome Measures – for more info)

Provide education (including advice to modify activities to those that cause less than 5/10 pain on the VAS)

Optimise gait biomechanics and posture using a comprehensive, individualized approach

Begin controlled tendon loading exercise as tolerated (See Section D – Exercise Programs)

**For those with acute or irritable symptoms, consider adjunct therapies: e.g. heel lifts*

Perform ongoing assessment of progress using appropriate patient reported and/or performance based outcome measure

Re-Assess Symptoms at 12 Weeks

Take record changes using previously selected outcome measure

Symptoms improving or resolved?

YES

Ongoing Management Advice

Progress home-based exercise and sport-specific activity

Advise on secondary prevention

Reassess as needed

NO

Gather Feedback & Apply Changes

Address ongoing load related or other risk factors

Revisit biomechanical exam

Progress exercise-focused treatment

Continue Therapy

Continue exercise-focused treatment

May **Consider** adding heel lifts, shockwave therapy, dexamethasone ionotophoresis or other adjunctive therapies

Consider biopsychosocial factors. Such as presence of fear avoidance, catastrophising, or low expectation of recovery

Symptoms Beyond 6 Months

Consider request for further investigation

Consider referral for further medical evaluation if no improvement or worse at 6 months

For more information refer to accompanying summary of interventions and appendix items using the link below:
https://physicaltherapy.med.ubc.ca/physical-therapy-knowledge-broker/tendinopathy-toolkit/

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Toolkit Design: Amir Doroudian, October 2021

Table 1. Potential Risk Factors Associated with Mid-Portion Achilles Tendinopathy

Non-Modifiable

Age:

mid-age 30-60 years[3,5]

Gender:

male>female[6]

Metabolic disorders:

Renal disease[3]

Urate deposits (tophi) in the Achilles tendon related to hyperuricemia (gout).[7]

Diabetes[3]

Family history:

Familial Hypercholesterolemia (HeFH)[3]

New onset of Achilles tendon pain is often the first sign of hypercholesterolemia and should be investigated for serum cholesterol levels.[7]

Tendon Xanthomas are fatty deposits from high cholesterol levels and commonly found at the Achilles tendon.

Genetic variants[2,3]

Certain genetic polymorphisms predispose tendon to altered collagen structure.

Systemic Inflammatory Disorder:

Seronegative Spondyloarthropathy (SpA)

98% of SpA have at least one enthesis disorder, commonly at the Achilles tendon.[9]

Consider use of SpA screening tools such as SCREEND'EM[9]

Modifiable

Lifestyle:

Smoking[2,8]

Obesity[3,7]

Alcohol (moderate consumption)[2]

Sedentary behaviour, inactivity[3]

Medications:

Fluoroquinolones[2]

Specifically, Ofloxacin was identified compared to similar anti-biotics from the same drug group.[1]

Systemic corticosteroid (long term Prednisone)[10]

Hormone Replacement Therapy (HRT)[5]

Previous lower extremity tendinopathy[1]

Footwear[2,4,5]

Biomechanics:

Limited dorsiflexion[2,4,5]

Decreased plantar flexor strength[2,4,5]

Limited hip mobility[2]

Altered gait pattern[2]

Foot posture and mechanics[5]

Static exam: hindfoot INV/EV (subtalar mobility)[5]

Dynamic exam: excess foot pronation[2]

Training Errors:

Training load

abrupt change in load, intensity, or volume[4]

Training environment

higher risk with cold weather and winter training season[1]

Subjective Symptoms[16]

1. Location - described in mid-portion of Achilles tendon.
2. Morning pain and stiffness – described on initial weight bearing upon rising from bed or following periods of inactivity.

History

1. Gradual onset of symptoms.
2. Pain with loading activity – sport or daily living.

Biopsychosocial Factors

1. Psychological factors, such as fear of movement (kinesiophobia),[11] as well as fears and beliefs about injury, may contribute to pain sensitivity.[12]
2. Nervous System Sensitivity is characterized by allodynia and hypersensitivity, and has been considered to be a factor in persistent Achilles tendon pain.[13,14,15]

Objective Signs

1. Biomechanical Impairments:[5]
   - Plantarflexor weakness
   - Dorsiflexion stiffness
   - Abnormal foot mechanics and lower limb abnormalities
2. Palpation tests:

   Localized tenderness in a zone 2-6 cm above calcaneal insertion in mid-portion of the Achilles tendon. Swelling or thickening may or may not be present. Some studies suggest that only palpation testing was found to be reliable and accurate for diagnosing Achilles tendinosis.[16,17,18] A combination of palpation tests is recommended in describing mid-portion Achilles tendinopathy.[17,18] A selection of the palpation tests are listed below:

A **Palpation** "pinch test"[17,18] = Prone lying, ankle relaxed with foot hanging freely. Most painful site located by pinch pressure applied from proximal to distal along the length of the Achilles tendon. Mid-portion Achilles tendinopathy is identified in a zone 2-6 cm above the calcaneal insertion.

Watch Video

B **Arc Sign**[17,18] = Prone lying, ankle relaxed with foot hanging freely. Pinch pressure exploring for palpable thickness, swelling or nodule within mid-portion of Achilles tendon. In absence of thickness, a default area 3cm above the calcaneal insertion is located. The client is asked to perform active ankle dorsiflexion/plantarflexion cycles, palpating tendon movement under fingertips. Positive sign when tendon abnormality is felt to move concurrent with active movement. If thickened tissue moves independently or remains stationary, consider lesion to be instead within the para-tendon (synovial sheath) or outside of the tendon structure.

Watch Video

(Cont.)

C **Royal London Hospital test**[17,18] = Prone lying, ankle relaxed with foot hanging freely. Palpate 'pinch test' to locate most tender site of mid-portion of Achilles tendon. Active dorsiflexion results in less tenderness/absence of tenderness at pinch site.

Watch Video

Functional Tests: Tendon Loading Tests

1. **Heel Rise Test** – single leg = A positive test is the report of pain in Achilles tendon upon repeated active plantar flexion on the symptomatic side during a single leg heel rise.[17]
2. **Hop Test** – single leg = A positive test is the report of pain in Achilles tendon upon hopping or shortly after hopping on the symptomatic side. Test has been described as repeated hopping in place; or performing a single forward hop onto symptomatic side.[17]

Differential Diagnosis

Palpation of surrounding tissue assists to rule out disorders that have alternate locations for tenderness experienced outside the zone of mid-portion Achilles tendinopathy symptoms, but which may be confused due to overlapping or similar pain presentations.[7,16,17]

Table 2. Differential diagnosis of conditions which may be mistaken for Mid-Portion Achilles Tendinopathy

Retro-calcaneal bursitis	Sural nerve irritation (neuropathy)
Calcaneal stress fracture	Tarsal tunnel syndrome
Os trigonum	Flexor hallucis longus tendinopathy
Calcaneal or Tibial stress fracture	Tibialis posterior tendinopathy or rupture
Ankle arthritis	Anomalous or accessory Soleus
Talus osteochondral defect	Plantaris tendon injury (adjacent to Achilles tendon)
Posterior ankle joint impingement	Achilles tendon acute partial tear or rupture
Plantar Fasciitis	Exercise-related compartment syndrome of the deep flexor compartment
Pain referral from lumbar-sacral segments	Achilles para-tendonitis and crepitus
Insertional Achilles tendinopathy (enthesopathy)	Haglund's deformity
Calcaneal apophysitis (Sever's disease)	Calcaneal tumor

Imaging Studies: Physical exam using palpation provides comparable accuracy to medical imaging for diagnosis of mid-portion Achilles tendinopathy (Ultrasonography or MRI).[16] Up to 25% of asymptomatic subjects may have structural changes on imaging, highlighting that expensive and often unwarranted imaging should be limited to cases where diagnosis is uncertain.[17]

The following **patient-reported** and **performance-based** outcome measures have been selected as they are:

- commonly reported in the literature
- supported by expert opinion
- or often used clinically

Patient-Reported Outcome Measures - PROMs

Population Specific Outcome Measures: (Designed and validated for Achilles tendinopathy)

1 Victoria Institute of Sports-Achilles - VISA-A (1)

- 8-item scale. Max score= 100
- 3 domains: pain, function, activity.
- Clinically, scores ≥90 suggest full recovery.[2]
- The VISA-A is the only questionnaire validated specifically for mid-portion Achilles tendinopathy. Recommended as the primary outcome measure in clinic and research setting for mid-portion Achilles tendinopathy.[3]
- Minimal Clinically Important Difference (MCID) = 15.[4]
- No Minimal Detectable Change (MDC) to report for mid-portion Achilles tendinopathy.[3]

Click here for a copy of the VISA-A.

2 VISA-A (sedentary) (5)

- Developed to evaluate response to treatment in a sedentary population. It has been estimated that up to 33% if mid-portion Achilles tendinopathy cases occur in non-active individuals.[6]
- No MCID or MDC available to report specific to this population.[5]

Click here for a copy of the VISA-A (sedentary).

Patient-Reported Outcome Measures - PROMs

Generic Outcome Measures: (Not designed specifically for Achilles Tendinopathy)

1 Numeric Pain Reporting Scale - NPRS (0-10)

- Measures pain intensity only.
- Although not validated for Achilles tendinopathy, the psychometric properties of the NPRS are consistent across a variety of other musculoskeletal conditions.[7]

(Cont.)

- It has been considered as a useful tool to measure immediate response to functional testing or post-treatment response for mid-portion Achilles tendinopathy.[3]
- MDC=2; MCID = 2

2 Lower Extremity Functional Scale - LEFS

- 20 item scale. Max score = 80.
- Expert opinion supports the LEFS as an outcome measure for mid-portion Achilles tendinopathy, but the LEFS has not been specifically validated in this population.[8]
- General lower extremity disorders.[9]
- MDC= 6; MCID= 9

Click here for a copy of the LEFS.

Performance-Based Outcome Measures: (Clinician-Reported)

1 Heel-Rise test (10-14)

Indications: Suggested as the main impairment measure for Achilles tendinopathy.[11]

Measures a combination of load tolerance and calf muscle endurance. It aims to challenge the stretch-shorten cycle (SSC) of plantarflexors required for functional activity of the Achilles tendon.[12] The test is considered reliable[9] and requires no additional equipment for clinical use.

Description: Unilateral test, single leg stance, start position in neutral ankle or 100 incline. Metronome assists in pacing at 60 reps/minute.[12,13] Balance with light hand support on wall acceptable. Plantarflex to maximum height each repetition, until loss of performance by fatigue.

Healthy individuals (age 20-59) achieved a wide range of scores (6 to 70 repetitions)[10], with original studies suggesting a score of 25 = 'Normal' and described as comparable to muscle grading level 5/5.[10,12]

Test speed, age, gender, BMI and activity level have been suggested to influence Heel Rise test scores, with updated data reported that considers these factors.[13] In healthy individuals, minimum side-to-side differences were recorded. Data was reported for decade and gender. Test results declined with older age, higher BMI, and lower activity lifestyle.

(Cont.)

Table 1: Median scores for Heel-Rise test by decade and gender in healthy subjects.[13] **Scores have been 'rounded off' from published data for convenient clinical application.**

AGE (Decade)	MALE (Reps)	FEMALE (Reps)
20	37	30
30	33	27
40	28	25
50	24	22
60	19	19
70	14	17
80	10	14

For symptomatic individuals, comparison is made between leg scores and to track improvement over time.

Pain levels can be assessed during testing using NPRS for immediate feedback.

Click here to see a video of how to correctly perform the Heel-Rise test.

Performance-Based Outcome Measures: (Clinician-Reported)

2 Single Leg Hop Test

Assesses energy storage-release function of tendon, and the stretch-storage cycle (SSC) required for cyclic weightbearing activities such as running.[14]

Description: Single leg, similar to skipping, pace 2 jumps/second.

The goal is to achieve 25 'pain-free' hops. The reference point will be the asymptomatic side.

- In the case of bilateral tendinopathy, compare the least symptomatic side to the worst leg.[14] Pain levels can be assessed during testing using the NPRS for immediate feedback.

It is also worth noting if the quality of the hop decreases markedly with fatigue on either leg.

SECTION C Summary of Evidence & Recommendations for Interventions

Intervention	State of Pathology	Clinical Research Evidence	Published Expert Opinion	Take Home Message	Clinical Implication
Load Management (often labelled **activity modification**)* *Includes sport, work and lifestyle factors	Acute	No	Yes 2 CPG	Expert opinion and clinical practice guidelines recommend that advice and education should be given to maintain pain levels of 5/10 or below on a VAS/NPRS for all activities	**May consider** maintenance of daily activity during an acute phase, alongside advice to reduce loading from symptomatic (painful) activities to 5/10 on the VAS/NPRS
	Chronic	Yes 2 CPG 1 RCT	Yes	Two clinical practice guidelines, one RCT and expert opinion recommends that advice and education should be given to maintain pain levels of 5/10 or below on a VAS/NPRS for all activities	**May consider** maintenance of daily activity during an acute phase, alongside advice to reduce loading from symptomatic (painful) activities to 5/10 on the VAS/NPRS
Exercise	Acute	No	Yes	A small amount of expert opinion exists to support the use of stretches in the acute stage. No evidence to support or refute the use of isometric exercise in the acute phase.	**May consider** a trial of using stretching exercises in the acute stage. No prescription parameters are provided. ACSM recommends 10-30 sec hold, 2-4 repetitions.
	Chronic	Yes 9 SR 1 RCT	Yes	There is a large amount of clinical research evidence to support the use of exercise in the chronic stage but the precise parameters to ensure effectiveness are not clear. Eccentric exercise in particular is supported although some protocols use both concentric and eccentric exercise. One RCT showed heavy slow resistance training is equally as effective as eccentric training and appears to have higher compliance than eccentric training	**Strongly consider** using strengthening exercise in the chronic stage.

CPG - Clinical practice guideline; MA - Meta-Analysis; RCT - Randomized controlled trials; SR - Systematic reviews

*Other study designs (e.g. Cohort, case control, case series, quasi-experimental studies, etc).

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Intervention	State of Pathology	Clinical Research Evidence	Published Expert Opinion	Take Home Message	Clinical Implication
Joint mobilizations	Acute	No	Yes 1 CPG	There is no clinical research evidence available to guide recommendations in the acute stage. There is a biomechanical rationale and published expert opinion that supports the use of mobilization if mobility impairments are found on assessment	**May consider** a trial of joint mobilizations in the acute stage to improve mobility and function if impairments are identified after undertaking a comprehensive biomechanical evaluation of the hip, knee, foot and ankle.
	Chronic	Yes 1 CPG 3 Other*	Yes	There is a small amount of clinical research evidence and more substantial expert level consensus to support the use of joint mobilizations to address physical impairments to improve mobility and function and this may enhance rehabilitation.	**May consider** a trial of joint mobilizations in the chronic stage to improve mobility and function if impairments are identified after undertaking a comprehensive biomechanical evaluation of the hip, knee, foot and ankle. Combining with a strengthening exercise program may or may not produce superior results.
Soft tissue techniques	Acute	No	Yes 1 CPG	There is no clinical research evidence available to guide recommendations in the acute stage. There is physiological rationale and published expert opinion that supports the use of soft tissue techniques to increase range of motion.	**May consider** a trial of soft tissue techniques, such as frictions or pressure massage, to improve range of motion.
	Chronic	Yes 1 CPG 1 RCT 1 Other*	Yes	There is a small amount of clinical research evidence and expert level consensus that supports the use of soft tissue techniques to increase range of motion.	**May consider** a trial of soft tissue techniques, such as frictions or pressure massage in the chronic stage to increase range of motion. Combining with a strengthening exercise program may or may not produce superior results.

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Intervention	State of Pathology	Clinical Research Evidence	Published Expert Opinion	Take Home Message	Clinical Implication
Low Level Laser Therapy (LLLT)	Acute	Yes 2 Other	Yes	There is no clinical evidence, but there is a physiological rationale, and multiple animal studies to support the use of LLLT in the acute stage.	**May consider** a trial of LLLT in the acute stage at the doses recommended by the World Association for Laser Therapy (www.walt.nu) i.e., 2-4 J/point (not per cm2)*, minimum 2- 3 points. *See Appendix B for further details on calculation of dosage.
	Chronic	Yes 1 MA 8 RCT 3 Other	Yes	There is conflicting clinical evidence and conflicting expert opinion to support the use of LLLT in the chronic stage. Two recent studies involving the use of higher energy (J) per treatment demonstrate improvements in pain scores.	If Class IIIB, **may consider** a trial of LLLT in the chronic stage at the following parameters: 0.9 J/point (not per cm2)*; 6 points on tendon. If Class IV, **may consider** a trial of LLLT in the chronic stage at 450J – 520J per treatment over the whole tendon. *See Appendix B for further details on calculation of dosage.
Therapeutic Ultrasound (US)	Acute	No	No	There is no clinical evidence, but there is physiological rationale, to support the use of US in the acute stage.	**May consider** a trial of US in the acute stage at a low to moderate dose (0.5 - 1.0 W/cm2, pulsed 1:4-1:1, 3 MHz, 5 mins for each treatment area equivalent in size to transducer head).
	Chronic	No	No	There is no clinical evidence and no physiological rationale to support the use of US in the chronic stage.	No evidence to support or refute the use of therapeutic ultrasound in the chronic phase.

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*Other study designs (e.g. Cohort, case control, case series, quasi-experimental studies, etc).

Summary of Evidence & Recommendations for Interventions

Intervention	State of Pathology	Clinical Research Evidence	Published Expert Opinion	Take Home Message	Clinical Implication
ESWT (Extra-corporeal Shock Wave Therapy)	Acute	No	No	There is no clinical evidence and no physiological rationale to support the use of ESWT in the acute stage.	**Consider NOT** using Extracorporeal Shock Wave for the acute stage.
	Chronic	Yes 2 CPG 1 MA 1 SR 1 Other*	Yes	There is conflicting evidence to support the use of **high or low energy** ESWT devices in the chronic stage. The evidence suggests that outcomes are dependent upon the **dosage** (measured in mJ/mm² or Bars) rather than the **type** of shock wave generation (focused or radial ESWT vs. radial pulsed-pressure ESWT). Local anesthetic required in high energy protocols may decrease the effectiveness of ESWT. Therefore, using low energy ESWT protocols without the need for anesthetic are recommended as more practical, more tolerable, and less expensive with equivalent results to high energy protocols. Low energy protocols could apply to focused or radial ESWT; or radial pulsed-pressure ESWT devices. Because of heterogeneity in study designs, the optimum protocol has yet to be determined.	**Consider** a trial of ESWT in the chronic stage for refractory cases that have failed to resolve with other conservative treatment. Recommended parameters: Focused or Radial ESWT, including pulsed-pressure ESWT devices. Low energy: EFD (energy flux density) 0.10 – 0.28 mJ/mm² (equivalent to approximately 2-4 Bars using a pulsed-pressure device) 1500-3000 shocks 4-15 Hz 3-5 sessions, weekly intervals. ESWT may enhance outcomes compared to exercise alone, therefore patients should be instructed to continue with a well-designed exercise program. Appropriate time intervals for follow-up should be delayed in the short term (within 3 months of starting ESWT treatment) to allow for cellular repair models to be influenced through the mechanotransduction action of ESWT. The benefit of ESWT may further improve in the medium (6 months) and long term (12 months).

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*Other study designs (e.g. Cohort, case control, case series, quasi-experimental studies, etc).

SECTION C Summary of Evidence & Recommendations for Interventions

Intervention	State of Pathology	Clinical Research Evidence	Published Expert Opinion	Take Home Message	Clinical Implication
Iontophoresis using dexamethasone	Acute	Yes 2 CPG 1 RCT	Yes	There is a small amount of evidence to support the application of iontophoresis using dexamethasone in the acute stage.	**Consider**, in the acute stage, a trial of iontophoresis, 0.4% dexamethasone (aqueous), 80 mA-min; 6 sessions over 3 weeks. A program of concentric-eccentric exercises should be continued in combination with iontophoresis, if exercise loading is tolerated.
	Chronic	No	No	There is no evidence or expert opinion that anti-inflammatory intervention with iontophoresis using dexamethasone has a useful role in the chronic stage.	No evidence to support or refute the use of iontophoresis in the chronic phase.
Rigid taping	Acute	Yes 1 CPG	Yes	There is expert opinion to support the use of rigid taping in the acute stage.	**May consider** a trial of rigid taping in the acute stage.
	Chronic	Yes 1 CPG 1 SR 2 Other*	Yes	There is expert opinion and a small amount of clinical evidence to support the use of rigid taping in the chronic stage.	**May consider** a trial of rigid taping in the chronic stage.

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*Other study designs (e.g. Cohort, case control, case series, quasi-experimental studies, etc).

SECTION C Summary of Evidence & Recommendations for Interventions

Intervention	State of Pathology	Clinical Research Evidence	Published Expert Opinion	Take Home Message	Clinical Implication
Orthotics	Acute	Yes 1 CPG 1 Other*	Yes	There is a small amount of clinical evidence to support the use of orthotics in the acute stage in specific cases, to reduce load through the Achilles tendon.	**May consider** a trial of orthotics in the acute stage – may consider taping first to assess potential response to orthotics.
	Chronic	Yes 1 CPG 2 SR 2 RCT 6 Other*	Yes	There is inconsistent evidence and expert opinion regarding the effectiveness of orthotics in the chronic stage.	**May Consider** a trial of orthotics in the chronic stage to reduce strain in the Achilles tendon, if indicated by the clinical assessment.
Night splints	Acute	No 1 CPG	Yes	Clinical practice guidelines recommend against the use of night splints for Achilles tendinopathy.	**Consider NOT** using night splints in the acute stage.
	Chronic	Yes 1 CPG 2 SR 3 RCT 1 Other*	Yes	There is a small amount of evidence and expert opinion that adding a night splint to eccentric exercise provides **no benefit**.	**Consider NOT** using night splints in the acute stage.

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*Other study designs (e.g. Cohort, case control, case series, quasi-experimental studies, etc).

SECTION C — Summary of Evidence & Recommendations for Interventions

Intervention	State of Pathology	Clinical Research Evidence	Published Expert Opinion	Take Home Message	Clinical Implication
Bracing	Acute	No 1 CPG	Yes	There is expert opinion to consider using a brace (Airheel) in the acute stage.	**May consider** trialing a brace in the acute stage.
	Chronic	Yes 1 CPG 1 SR 3 RCT	Yes	There is a small amount of evidence suggesting that adding a brace (Airheel) to eccentric exercise provides **no benefit**. There is expert opinion that a brace (Airheel) may be considered in the chronic stage.	**May consider** trialing a brace in the chronic stage.
Heel raise inserts	Acute	No	No	There is physiological rationale that the application of heel inserts can reduce load on the Achilles tendon	**May consider** a trial of inserts in the acute stage to reduce loads through the Achilles tendon.
	Chronic	Yes 1 CPG 2 RCT 2 Other*	Yes	There is conflicting evidence and expert opinion for and against the use of heel inserts in the chronic stage.	**Consider** a trial of heel inserts in the chronic stage.
Dry needling techniques**	Acute	No	No	There is no evidence or published expert consensus to support the use of acupuncture or other needling techniques in the acute stage.	**Consider NOT** using dry needling in the acute stage.
	Chronic	Yes 1 RCT	No	There is a small amount of evidence that dry needling (Gunn intramuscular stimulation) provides no additional benefit to exercise.	No high-quality evidence to support or refute the use dry needling in the chronic stage.

CPG - Clinical practice guideline; MA - Meta-Analysis; RCT - Randomized controlled trials; SR - Systematic reviews

*Other study designs (e.g. Cohort, case control, case series, quasi-experimental studies, etc).

**"Dry needling is a broad term that refers to a treatment technique that uses solid filament needles to puncture the skin for therapeutic purposes. It includes a range of approaches, such as acupuncture, trigger point dry needling, intramuscular stimulation, or similar treatment..." – *The Safe Practice of Dry Needling in Alberta. Health Quality Council of Alberta, 2014*

1 Phased Achilles Tendon Loading Program*

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

*As per Silbernagel et al. Continued sports activity using a pain monitoring model during rehabilitation in patients with Achilles tendinopathy. Am J Sports Med. 2007;35(6):897-905.

Phase 4 Week 12–6 months (longer if needed)

Patient status: Minimal symptoms, morning stiffness not every day, can participate in sports without difficulty

Goal: Maintenance exercise, no symptoms

Treatment program: Perform exercises 2-3 times/week

- One-legged heel raises standing on edge of stair with added weight (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)

2 12 Week Eccentric Loading Program*

3 x 15 repetitions twice per day with extended knee, and another 3 x 15 repetitions twice per day with a flexed knee. All exercises were 7 days per week. Patients were told to continue to exercise with pain unless it became disabling. Patients were allowed to jog during their 12-week rehabilitation so long as it caused only mild discomfort.

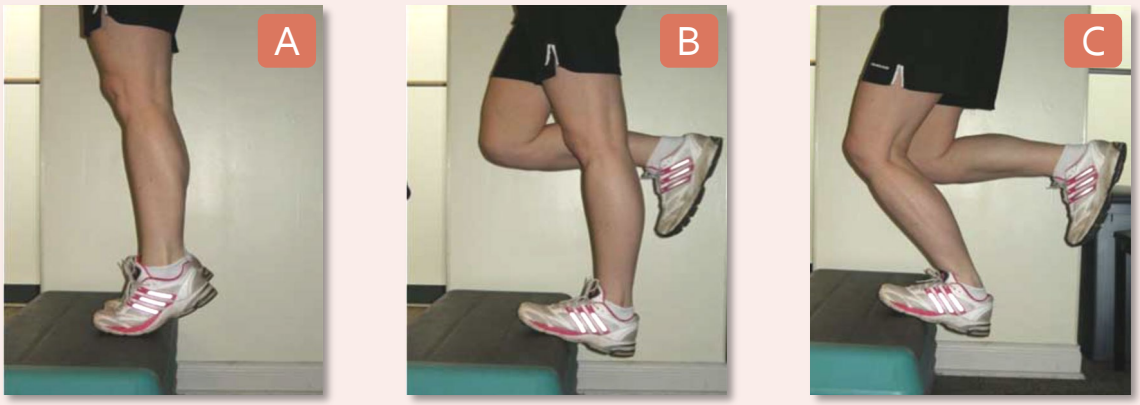

Figure 1. From an upright body position and standing with all body weight on the forefoot and the ankle joint in plantar flexion lifted by the non-injured leg (A), the calf muscle was loaded eccentrically by having the patient lower the heel with the knee straight (B) and with the knee bent (C).

Figure 2. Once the eccentric loads were performed at body weight without any discomfort, subjects were given a backpack that was successively loaded with weight. In this way their eccentric loading was gradually increased. If very high weights ended up becoming needed then the subject used a weight machine.

*As per Alfredson H, Pietila T, Jonsson P, Lorentzon R. Heavy-load eccentric calf muscle training for the treatment of chronic Achilles tendinosis. Am J Sports Med. 1998; 26(3): 360-66.)

SECTION E

Low Level Laser Therapy Dosage Calculation

Current recommendations specify that LLLT dosage be provided **in Joules (J, total energy)**, rather than the previous recommended Joules/cm2 (J/cm2, energy density). Use **Joules** *rather than Joules/cm2* to specify how much energy is delivered in a treatment.

In Laser devices that do not calculate Joules automatically, dose can be determined in seconds of exposure required to give the desired Joules by using the following calculation:

Joules = watts.seconds
Hence, **Seconds = Joules/watts**

Example

For a 50 mW Laser (= 0.050 Watts), with a required dose = 2 J per point...

Seconds exposure = 2 / 0.05 = 40 secs.

This change is very important clinically as the use of the previously recommended Joules/cm2 resulted in confusion when comparing dosages between protocols. The resultant dose in Joules/cm2 could be the consequence of a number of different treatment options.

For example, 4 J/cm2 can be delivered by:

Option #1: a 20 mW Laser with a beam cross section of 0.5 cm2 in 100 seconds

i.e., 4 = (0.02/0.5 x 100)

Option #2: a 10 mW laser with a beam cross-section of 0.25 cm2 in 100 seconds

i.e., 4 = (0.01/0.25 x 100)

In **Option #1**, the total energy delivered would be 2 J

In **Option #2** the total energy would be 1 J

This example illustrates that using Joules/cm2 resulted in one patient receiving twice the total amount of energy that is received by the other patient!

Therefore, all physical therapists using LLLT should be delivering dosages based on Joules rather than Joules/cm2.

Using Joules rather than Joules/cm2 will enable better standardization of dosage and permit comparison across different treatment regimes.

The World Association of Laser Therapy (WALT) provides dosage guidelines using Joules for various conditions. These dosage guidelines are based upon the best evidence from the literature in conjunction with expert opinion.

Physical Therapists are encouraged to set LLLT dose according to the WALT guidelines found at:

http://waltza.co.za/documentation-links/recommendations/dosage-recommendations
(Note that the WALT guidelines are given for surface exposure.)

Developed 2012. Updated Sept 2016 and October 2021 by the BC Physical Therapy Tendinopathy Task Force: Dr. Joseph Anthony, Dr. Allison Ezzat, Dr. Angela Fearon, Carol Kennedy, Dr. Alex Scott, Michael Yates, Paul Blazey, Alison Hoens. Graphic design by Amir Doroudian.
A Physical Therapy Knowledge Broker project supported by: UBC Department of Physical Therapy, Physiotherapy Association of BC, Vancouver Coastal Health Research Institute and Providence Healthcare Research Institute, and Arthritis Research Canada.

Medical and Surgical Interventions

Last updated as part of the 2015 toolkit

The purpose of this document is to summarize common medical and surgical interventions which may be considered for the management of Achilles tendinopathy – particularly if it is not responding adequately to more strongly supported conservative management strategies (see "Achilles Tendinopathy: Summary of the Evidence for Physical Therapy Interventions").

Pharmacological Approaches

Intervention	Method	Proposed Mechanism	Benefits	Evidence	Take Home Message Implications for Physiotherapy
NSAIDs	Short term benefit in the acute stage of tendinopathy to minimize inflammatory process.	Interrupts the chemical pathway of inflammation.	**PROS:** • Inexpensive, easily accessible. **CONS:** • Precautions and contraindications that accompany specific medications. • Inhibition of inflammation may delay repair of muscle tissue or tendon insertion.	Limited evidence for a modest effect of topical or oral NSAIDs in acute stage in Achilles tendinopathy.	PTs are involved in the treatment of tendon pain at all stages of recovery. General knowledge of commonly used NSAIDS is important for treatment planning.
Corticosteroid (injection)	Short-term benefit in acute stage. In chronic tendinopathy, the rationale for the use of anti-inflammatory injections is controversial.	Injection into the paratendon to interrupt the inflammatory process.	**PROS:** • Easily accessible. • Careful administration outside the structure of the tendon is considered 'safe' i.e., in the paratendon sheath. **CONS:** • Risk of infection (1%) • Destructive; risk of tendon rupture; impairs tendon tissue repair mechanism.	There is a lack of high quality evidence to support the use of local corticosteroid injections in chronic Achilles tendon lesions. Generally, lack of well designed clinical trials.	PTs are involved in the treatment of tendon pain at all stages of recovery. There are animal studies that suggest risk of tendon rupture after corticosteroid injection. Caution is recommended in progressing the loading of the tendon within two weeks of a corticosteroid injection (exercise precautions).

Pharmacological Approaches (cont.)

Intervention	Method	Proposed Mechanism	Benefits	Evidence	Take Home Message Implications for Physiotherapy
Glycerol Trinitrate (GTN)	Nitro-glycerine patches applied over tendon to enhance healing.	Nitric oxide may increase blood flow to the tendon and stimulate repair by enhancing fibroblast proliferation.	**PROS:** • GTN may improve outcomes compared to exercise alone. • Increased compliance because of ease of application. Self-applied. • Non-invasive. **CONS:** • Labour- intensive; requires repeated applications over 12 weeks. • Potential headache as a side effect of nitro patch.	Conflicting evidence limits conclusions and widespread use.	If prescribed by a physician may be applied by a physiotherapist and used in conjunction with an eccentric exercise program.

Injection Therapies

Chronic Achilles tendinopathy is associated with abnormal proliferation of neovessels in the ventral portion of the tendon, and along with accompanying neural tissue, is associated with pain in tendinopathy. The presence of neovessels can be visualized by use of ultrasound (US) (sonography). Grey-scale US is a reliable method to assess tendon structure. Color Doppler or power Doppler has also been used to visualize blood flow.

Conservative treatment for Achilles tendinopathy is unsuccessful in 24-45% of cases. US-guided injections are becoming increasingly considered as part of 'best practice' for treatment of tendinopathies that have failed to respond to other conservative treatment.

Polidocanol	Originally developed as an anaesthetic, and widely used as a sclerosing agent in the treatment of varicose veins.	There is a body of literature that supports the use of US guided injections of polidocanol to disrupt neovessels and accompanying nerve structures associated with chronic tendinopathy.	**PROS:** • Increasingly used, registered drug with few side-effects. • No need to use additional anaesthetic, as it has its own aesthetic properties. **CONS:** • Expensive sonography equipment, requiring an experienced operator.	Conflicting evidence limits conclusions and widespread use.	PTs should have knowledge of more invasive techniques to help to facilitate referral of patients to other procedures when conventional treatment fails to result in a sufficient positive response.

Injection Therapies (cont.)

Intervention	Method	Proposed Mechanism	Benefits	Evidence	Take Home Message Implications for Physiotherapy
Prolotherapy	Injecting a small volume of an irritant solution at multiple sites around a tendon insertion to induce a 'pro-inflammatory' proliferative cell response. One study used hyperosmolar dextrose while another used hypertonic glucose, both with a small amount of anaesthetic.	Fibroblast proliferation, collagen maturation and resolution of neovessels are observed, with near normal appearance of tendon tissue structure observed with US. New viable tissue hypothesized to result from local release of cell growth factors. Medical dextrose also has a weak sclerosing effect on vessels.	**PROS:** • Can be performed with or without US-guided localization. **CONS:** • Not covered by medical plans (BC); usually requires a private fee that reflects the expertise of the practitioner. • Requires three or more repeated treatments.	Limited evidence suggests that prolotherapy combined with eccentric exercise for Achilles tendon loading may provide more rapid improvement in symptoms than eccentrics alone, although long-term VISA-A scores are similar.	Prolotherapy may enhance outcomes compared to using eccentric exercise, alone.
Platelet Rich Plasma (PRP) and Autologous Whole Blood	Autologous blood injections involve the reinjection of a patient's own whole blood. In PRP the autologous blood is centrifuged to collect a concentrate of the platelets and plasma. This is then injected back into the patient's tendon.	Cellular and humoral (blood) mediators promote healing in areas of tendon degeneration.	**PROS:** • Non-surgical option • Can be performed with or without US-guide localization **CONS:** • RCT-level evidence of lack of effectiveness • Requires expensive blood processing equipment and centrifuge.	Two high-quality RCTs have shown both PRP and autologous whole blood injection to be ineffective.	PTs are part of a treatment team when treating tendon injury. General knowledge of PRP and relevant high quality RCTs is important to assist patients in decision-making.
High Volume Injection(HVI) OR **Hydrostatic Dissection**	Small volume of anaesthetic/steroid and high volume of saline, delivered by US-guided imaging.	The pressure created by the volume of substance into the tendon sheath is proposed to disrupt the neovessel ingrowth in Achilles tendinopathy.	**PROS:** • Non-surgical option. **CONS:** • Requires sonography equipment.	Limited evidence of effectiveness.	Potential treatment option for Achilles tendinopathy that has failed to respond to a more conservative approach.

Medical and Surgical Interventions

Last updated as part of the 2015 toolkit

Dry Needling

The term 'dry needling' has been used to describe several techniques that involve insertion of a needle without injection of a substance. Needling of the tendon has been described by a number of practitioners using a hypodermic needle. The technique is described below.

Intervention	Method	Proposed Mechanism	Benefits	Evidence	Take Home Message Implications for Physiotherapy
Surgical Dry Needling Using a Hypodermic Needle ('Tendon Fenestration')	Tissue trauma from the cutting edge of the needle/lumen.	Repeated lancing of abnormal tendon tissue creates haemorrhage followed by an inflammatory response, granulation and healing. Some needling techniques employ US to guide the needle (percutaneous needle tenotomy).	**PROS:** • Invasive treatment that avoids full surgical exposure and risks **CONS:** • Requires sonography equipment • Potential to permanently injure the tendon	Limited evidence of effectiveness	An invasive treatment with limited evidence.

Surgical Approaches

Surgical success rates are reported at 85% for Achilles tendinopathy that have failed to respond to conservative measures.

Percutaneous tenotomy	Techniques include closed dissection of the tendon sheath by US-guided percutaneous longitudinal internal tenotomy; or open surgical exposure of the tendon.	Surgical trauma creates granulation and repair, and interrupts fibrous adhesions.	**PROS:** • Simple procedure that can be done as an outpatient. **CONS:** • Risk of infection	Satisfactory outcomes for selected patients that do not have complicated Achilles pathology, and have failed to respond to a conservative treatment approach. Treatment seems to be effective in the long-term with regard to returning to pre-injury level of functioning. Paratendinopathy is a negative prognostic factor.	PT may be involved in the post-op rehabilitation following surgery.

Surgical Approaches (cont.)

Intervention	Method	Proposed Mechanism	Benefits	Evidence	Take Home Message Implications for Physiotherapy
Surgical Debridement	Central longitudinal incision to expose the tendon, with excision of disorganized and fibrotic tendon tissue and adhesions. Additional diathermy to destroy neovessels.	Surgery creates granulation and repair, and removes fibrotic tissue.	**PROS:** • High success rates reported by some centres in terms of reducing pain and improving functionality. **CONS:** • Risk of infection. • Long post-op recovery of 3-6 months.	Surgery may be a successful option for patients that have failed to respond to conservative treatment, or have complicated Achilles tendon pathology.	PT may be involved in the post-op rehabilitation following surgery.
Minimally Invasive Stripping	Small incision is made allowing a probe or scalpel to be inserted ventral to the tendon. The area of neovascularisation is stripped.	Disrupts abnormal blood/nerve supply, releases adhesions.	**PROS:** • High success rates reported. • Minimal trauma to tendon. • Quick return to sport. • Reduced risk of infection comparing to open surgery **CONS:** • Risk of infection. • Potential loss of gliding function due to long term increased fibrosis around tendon.	Retrospective, short-term studies only.	PT may be involved in the post-op rehabilitation following surgery.

Developed by Michael Yates, PT. BC Physiotherapy Tendinopathy Task Force. April 2012.
Updated by Alexandra Kobza, Dr. Alex Scott. July 2015.
Updated October 2021

Developed by the BC Physical Therapy Tendinopathy Task Force: Dr. Joseph Anthony, Dr. Allison Ezzat, Prof. Alex Scott, Prof. Angie Fearon, JR Justesen, Carol Kennedy, Michael Yates, Alison Hoens & Paul Blazey

A Physical Therapy Knowledge Broker project supported by: UBC Department of Physical Therapy, Physiotherapy Association of BC, Vancouver Coastal Research Institute, Providence Healthcare Research Institute, and Arthritis Research Canada.

Toolkit Design: Amir Doroudian, October 2021

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Clinical Practice Guideline

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Clinical Practice Guideline

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IONTOPHORESIS WITH DEXAMETHASONE

Clinical Practice Guidelines

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TAPING

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NIGHT SPLINTS

Clinical Practice Guideline

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BRACES

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