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PHYSICAL THERAPY INTERVENTION FOR A PATIENT WITH BILATERAL ACHILLES
TENDINOPATHY FOLLOWING PERIODS OF IMMOBILIZATION: A CASE REPORT

by

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Doctor of Physical Therapy Program

St. Catherine University

April 28, 2011

Research Advisor: Mary Weddle, PT, DSc

Abstract

Background and Purpose. Achilles tendinopathy is a chronic disorder resulting from stressing the tendon beyond its physiological threshold. Eccentric calf strengthening is a common intervention used to treat and prevent Achilles tendinopathy; however, the standard eccentric exercise model assumes unilateral involvement. The purpose of this case report is to describe the physical therapy intervention used to treat a patient with bilateral Achilles tendinopathy following two six-week periods of immobilization. **Case Description.** The patient was a 30 year old National Guard male soldier with a history of bilateral Achilles tendinopathy. The patient had difficulty participating in high-impact activities, secondary to pain. Previous physical therapy treatment attempts had failed, and the orthopedic physician recommended immobilization coupled with physical therapy intervention before considering surgery. Physical therapy intervention emphasized concentric and eccentric strength training and neuromuscular re-education. When the immobilization phases were complete, exercise progressed to prepare the patient for his demanding duties as a National Guard soldier. **Outcomes.** The patient reported decrease in pain and increased function in daily living and sporting activity as demonstrated by the Victorian Institute of Sport Assessment- Achilles questionnaire (VISA-A) questionnaire. The patient's VISA-A scores improved from 25/100 on the day of initial evaluation to a 76/100 after 18 weeks of physical therapy intervention and immobilization. The patient also demonstrated an improvement of 4 points on the Patient Specific Functional Scale, exceeding the minimal detectable change to demonstrate statistical improvement in running two miles. **Discussion.** The standard eccentric calf strengthening model is not applicable for a patient with bilateral Achilles tendinopathy or immobilization. Furthermore, current research challenges the effectiveness of eccentric exercise and recommends including sport-specific

functional strengthening and endurance programs in conjunction with eccentric exercise, instead of focusing on eccentric exercise alone. More research is needed to establish an exercise protocol specifically for patients with bilateral Achilles tendinopathy.

RESEARCH ADVISOR FINAL APPROVAL FORM

The undersigned certify that they have read, and recommended approval of the research project entitled...

PHYSICAL THERAPY INTERVENTION FOR A PATIENT WITH BILATERAL ACHILLES TENDINOPATHY FOLLOWING PERIODS OF IMMOBILIZATION: A CASE REPORT

submitted by
Alyssa Hageman

in partial fulfillment of the requirements for the Doctor of Physical Therapy Program

Primary Advisor Mary Swaddle Date 4.28.11

TABLE OF CONTENTS

CHAPTER I.	INTRODUCTION	1
CHAPTER II.	CASE DESCRIPTION	4
	A. PATIENT	4
	B. EXAMINATION	5
	C. EVALUATION/DIAGNOSIS	7
	D. PROGNOSIS	7
	E. INTERVENTION	7
CHAPTER III.	OUTCOMES	12
CHAPTER IV.	DISCUSSION	14
REFERENCES		18
TABLES		20
APPENDIX		21

CHAPTER I. INTRODUCTION

Tendons play an integral role in transmitting forces generated by muscles during movement. The Achilles tendons are especially important in absorbing forces during high impact activity like running and jumping. Studies show that Achilles tendons bear forces as great as 12.5 times one's body weight during sprinting.¹ At rest, the tendon's collagen fibers are arranged in a wavy, crimped pattern. As the gastrocnemius complex contracts during motion, the tendon fibers un-crimp, resulting in tendon lengthening. As the contraction increases, the ankle plantarflexes and the Achilles tendon shortens. During relaxation of the gastrocnemius complex, the Achilles tendon lengthens and the ankle dorsiflexes. The repetitive pattern of shortening and lengthening with increased load can stress Achilles tendons, eventually leading to pathology.

Achilles tendinopathy is theorized to be caused by overuse injuries, degenerative changes, muscle imbalances, tendon tightness, or ankle malalignment.² It is important to note, however, that physical activity is not thought to be correlated with the extent of Achilles tendinopathy, but rather physical activity likely provokes the symptoms of the underlying pathology.³ Excessive loading of tendons during vigorous physical activity beyond physiological threshold can elicit degeneration. Normal collagen patterns become replaced with disorganized arrays of collagen, proliferative extracellular matrix, and calcification, eventually resulting in decreased tensile strength and elasticity.¹ Additionally, repeated microtrauma stresses tendons and does not allow time for adequate tendon repair.

The primary complaint of patients with Achilles tendinopathy is pain. Currently, the pain mechanism for Achilles tendinopathy is not completely understood as there is no evidence of inflammation in cases of Achilles tendinopathy. It is widely believed that chemical irritants and neurotransmitters may have a role in pain. Higher concentrations of the excitatory neurotransmitter glutamate have been found in patients with Achilles tendinopathy, which may be linked to increased pain modulation.⁴ It is also thought that nerve structures in close proximity to blood supply in the Achilles tendons associated with neovascularization may contribute to increased pain.³

Traditionally, conservative measures are taken to optimize tendon healing before considering surgery. Conservative treatment methods include activity modification, orthotics, stretching, massage, modalities, strengthening, and medication. Favorable outcomes generally occur following traditional conservative treatment attempts; however, 30% of patients with Achilles tendinopathy are unsuccessful with conservative treatment and patients are faced with considering other nonsurgical methods like corticosteroid injections, extracorporeal shock wave therapy, sclerosing agents, electrocoagulation, topical glyceryl trinitrate, aprotinin injections, low-level laser therapy, and prolotherapy.² Surgery is indicated when nonoperative approaches fail to reduce pain and dysfunction.

Eccentric calf strengthening is a common intervention used to treat and prevent Achilles tendinopathy. Although the mechanism of recovery is not entirely understood, a commonly accepted theory is that eccentric loading disrupts the extracellular matrix and the disorganized collagen fibers, thereby facilitating the collagen fibers to properly align in a more parallel fashion according to the lines of stress imposed during eccentric

loading. Furthermore, eccentric exercise stimulates tissue regeneration and lengthens the Achilles tendon in a manner that is optimal for torque generation.¹

The standard eccentric training model proposed by Alfredson et al (1998) recommends intensive and repetitive eccentric lowering with no concentric plantarflexion of the injured leg.⁵ Patients are instructed to bear weight through the non-injured leg during the concentric rise only and then switch to the injured leg for eccentric lowering. The eccentric exercises described by Alfredson et al are not applicable for bilateral Achilles tendinopathy intervention since the patient would need to use an injured leg to work concentrically to lift the body up to prepare for eccentric lowering.⁶ Presently, there is little evidence to outline specific exercise protocols for treatment of bilateral Achilles tendinopathy, given that concentric plantarflexion is not recommended as part of a typical eccentric calf strengthening program. The purpose of this case report is to describe the physical therapy intervention used to treat a National Guard soldier with bilateral Achilles tendinopathy following six-week periods of immobilization.

CHAPTER II. CASE DESCRIPTION

Patient

Information regarding the patient's injury and physician visits was obtained from medical chart review in a manner that complied with the Health Insurance Portability and Accountability Act requirements for disclosure of protected health information. A case report consent form was explained verbally to the patient and he agreed to participate by signing the statement of consent. See Appendix.

The patient was a 30 year old National Guard male soldier seen in an orthopedic outpatient physical therapy clinic for Achilles tendinopathy treatment. The patient reported first experiencing bilateral heel pain while training for deployment to Iraq. He persisted through his pain during boot camp with no relief of symptoms. Once deployed, the patient's pain symptoms improved because he was on convoy escort duty and his Achilles tendons were able to rest from the high impact activities. Later, his duties changed, and he resumed more physical activity and developed shooting pain into both Achilles. The patient was seen abroad by a physician's assistant for assessment and was told that his Achilles tendons were in a pre-rupture state. He was treated for several weeks with physical therapy in the US on an Army base, however the patient reported the intervention was too aggressive and his symptoms significantly worsened. He was then sent home on medical leave for further assessment to pursue options of immobilization or surgery.

Upon completing a thorough exam, a US orthopedic physician recommended strict 24-hour a day immobilization in a controlled ankle motion (CAM) boot, followed

by a physical therapy protocol to stretch and strengthen the Achilles. Given that his symptoms were equal on both sides but immobilization of bilateral ankles would be impractical, the physician recommended starting with immobilizing the left side in a CAM walker boot and dispensing night splints to be worn at bed times on both sides. While the left side was immobilized, he would undergo physical therapy intervention on the right side. After immobilization of six weeks on the left side, the right side would be immobilized for six weeks and physical therapy would begin on the left side. After the removal of the right boot, physical therapy would continue with a focus to gradually return to activities.

Prior to his injury, the patient was very physically active with no significant past medical history. He was motivated to return to his active lifestyle, but he was cautious about overexerting himself too quickly and further complicating the rehabilitation process. The patient's goal for physical therapy was to return to his previous level of function at the standard that the US Army required with minimal pain.

Examination

The patient was seen with his left foot immobilized in a CAM boot initially. A physical therapy evaluation, systems review, and chart review were completed together by a physical therapist and student physical therapist intern.

Differential diagnosis. X-Rays were negative for acute fractures, dislocations, joint effusion, and thickening of the Achilles tendons. A previous MRI done at the US army base did not show a rupture of the Achilles but did indicate scarring suggestive of

repeated microtearing. Results were negative for the Thompson test, thus ruling out Achilles tendon rupture.⁷ This test has excellent validity.³

Musculoskeletal. Pes cavus was observed in both feet, a risk factor commonly associated with Achilles tendinopathy.⁸ Despite the patient's muscular stature, according to his body mass index of 29 kgm², he was considered overweight and at increased risk for Achilles tendon injury.^{8,9} Ankle strength and range of motion were assessed, according to Reese and Norkin & White, respectively.^{10,11} Manual muscle testing of the ankle revealed 4/5 strength bilaterally with dorsiflexion and 3/5 strength bilaterally with plantarflexion. The patient demonstrated 5/5 muscle strength with hip and knee manual muscle testing. The patient's ankle range of motion was limited bilaterally in dorsiflexion, plantarflexion, eversion, and inversion (See Table 1), with no difference noted between ankles.

Neuromuscular. Sensation was intact to light touch in both lower legs and feet. The patient reported pain over both Achilles tendons with palpation, approximately 4 centimeters proximal to the calcaneal insertion, indicating non-insertional Achilles tendinopathy.¹ The patient experienced increased pain after only one single-leg heel raise and one single-leg hop, bilaterally. He also reported 4/10 pain with running and jogging activities using the verbal pain rating scale.¹²

Integumentary. There were no apparent lesions, abrasions, or rashes on either foot. No nodules or masses were present. There was no swelling or thickening noted along the tendons bilaterally.

Functional Mobility. The patient was independent with all activities. The patient's gait pattern appeared antalgic, however the unevenness of his gait may have been due in part

to his difficulty adapting to the relative leg-length difference as a result of wearing the CAM boot.

Evaluation/Diagnosis

The patient had difficulty ambulating and running secondary to decreased ankle range of motion, decreased strength, and increased pain; mobility was complicated by the immobilization in the CAM boot. As a result of the aforementioned impairments and functional limitations, the patient had difficulty participating in National Guard Soldier duties. Examination findings were consistent with *Guide to Physical Therapist Practice Practice Pattern 4E Impaired Joint Mobility, Motor Function, Muscle Performance, and Range of Motion Associated with Localized Inflammation*.¹³

Prognosis

Given the patient's long history of Achilles tendinopathy and previous failed treatment attempts at rehabilitation, the patient's prognosis was considered fair. The option of surgery was discussed with the patient by his physician as an alternative to consider if the immobilization and physical therapy regimen was unsuccessful.

Intervention

The patient was seen for 30 minutes once a week for 6 weeks with the left foot immobilized and for an additional 6 weeks with the right foot immobilized. The following short-term goals were established to address the patient's impairments while wearing the CAM boot.

- The patient will be independent with a home exercise program (HEP) and self management in order to increase strength, alleviate painful symptoms, and prevent progression of injury.
- The patient will be able to walk for at least 20 minutes without pain in order to complete errands around the community while wearing a CAM boot.

The patient was seen twice a week for 30 minutes for 18 weeks after the patient had completed the immobilization stages. The following long-term goals were established to prepare the patient for gradual return to activity.

- The patient will increase his ankle dorsiflexion by 15 degrees bilaterally in order to clear his toes while walking.
- The patient will increase his ankle plantarflexion by 15 degrees bilaterally in order to push off from stance while running.
- The patient will run 2 miles in 14 minutes in order to comply with Army standards.
- The patient will complete a ruck march for 12 miles while carrying 60 pounds of gear in 4 hours in order to comply with Army standards.

Phase 1 (weeks 1-6; left ankle immobilized, treatment of right ankle)

Therapeutic Exercise. The patient warmed-up on the Nu Step* recumbent bike machine at the beginning of every session to increase blood flow, reduce stiffness and to maintain aerobic conditioning. Given the exercise restrictions as a result of being immobilized, it was important to the patient to maintain his cardiovascular endurance. He worked for 5

minutes at level 6. A BOSU** ball was used for quadricep and calf strengthening. The patient was instructed in forward step-ups, lateral step-ups, retro step-ups, and squats on the BOSU ball while focusing on balance and eccentric control with the descent. The patient was also instructed in seated ankle exercises with elastic bands for dorsiflexion, plantarflexion, eversion, and inversion. The patient's HEP included calf stretching with a towel, calf stretching against a wall, and dynamic heel raises with elastic bands. The patient was asked to perform heel raises against the resistance of the elastic bands in four different 90 degree angle positions. Because purely eccentric exercises were not possible at this time due to the CAM boot on the contralateral limb, concentric and eccentric strengthening exercises were paired together in his HEP.

*NuStep, Inc., 5111 Venture Drive, Suite 1; Ann Arbor, MI 48108

**TEAM BOSU , 1400 Raff Road ; Canton, Ohio 44750

Neuromuscular Re-education. While standing on his right foot, the patient was instructed to throw a two pound ball onto an upright trampoline and catch the ball on its rebound. The patient performed this perturbation exercise while facing the trampoline and also turned at a 90 degree angle to the left and right. This exercise challenged the patient's ability to maintain his balance by recruiting muscles to support his stance during perturbation.

Ultrasound. Therapeutic ultrasound was applied to the right Achilles tendon for pain relief after exercising. The duty cycle was 100%; frequency: 1MHz; intensity: 1.4w/cm; time: 8 minutes.¹⁴ Therapeutic ultrasound has been shown to reduce swelling in the acute inflammatory phase and improve healing by stimulating collagen synthesis and stimulating cell division.¹⁵ The patient tolerated the treatment well but did not note

significant decrease in pain, and ultrasound was discontinued as a result after two sessions. It is possible that therapeutic ultrasound was not effective for him because his injury was more chronic rather than acute.

Phase 2 (weeks 7-12; right ankle immobilized, treatment of left ankle)

All exercises that were previously done on the right were instead performed on the left ankle while the right ankle was immobilized in Phase 2. Exercises were presented more aggressively when treating the left ankle during Phase 2 because the left Achilles had recently had a healing period while being immobilized in Phase 1 and would, we hypothesized, be able to tolerate a greater intensity of exercise. Exercises during this phase progressed more quickly. It is important to note, the right ankle was completely immobilized during this phase and no exercises were performed on the right.

Therapeutic Exercise. The NuStep recumbent bike use was continued in phase 2 for aerobic conditioning. The BOSU ball exercises as described in Phase 1 were performed on the right LE, with repetitions increasing as the weeks progressed. Lunges on the BOSU ball were also added. The patient was challenged to perform single leg squats on the flat surface of the BOSU ball. The patient's HEP for the left ankle remained the same as prescribed previously for the right ankle.

Neuromuscular Re-education. The perturbation exercise with the weighted ball and trampoline from Phase 1 was continued in tandem stance during Phase 2 using a nine pound ball and increased repetitions. The activity was also repeated while standing on the flat surface of the BOSU ball. In addition, the patient was instructed in static standing balance exercises in single leg stance on foam with eyes closed.

Phase 3 (weeks 13-18; no immobilization, gradual return to activity)

Therapeutic Exercise. The patient slowly progressed with light jogging on a treadmill, eventually working toward running. Pain symptoms were monitored carefully. Braided ambulation and side shuffling were added to challenge the patient's agility. Plyometric exercises were also implemented; the patient was instructed to jump side to side and front to back across a taped line, simulating the ballistic forces that may have lead to injury. In single leg stance, the patient was instructed to jump forward and in diagonals. The patient performed single leg dead lifts with a weighted ball while reaching various directions. Strength training progressed to include leg press and calf raises on a leg press machine. Leg press exercises were also performed with balance discs under his feet to add an additional balance and proprioceptive challenge. Starting a walking program at home was recommended for the first 5 weeks during this phase. By week 6, he was advised to begin running short distances, starting with 1 mile initially. He was also encouraged to use the NuStep machine at the gym for conditioning and to add the leg press, squats, and lunges on the BOSU to his workout routine every other day. The patient was educated about the importance of eccentric exercise and his dynamic heel raises were modified accordingly to emphasize eccentric more than concentric exercise.

Neuromuscular Re-education. The patient was instructed in tandem stance and single leg stance on a foam roll. The patient continued with balance and proprioception activities with the trampoline and weighted ball in single leg stance on the flat side of the BOSU ball. Another dynamic balance activity was added that required the patient to run three steps and land in a single stance position on the BOSU ball while catching a thrown ball.

CHAPTER III. OUTCOMES

After 18 weeks of physical therapy intervention and periods of immobilization, the patient had made significant progress in achieving the goals established in the plan on care. The patient met all of the short-term goals, and continued in progressing toward meeting the long-term goals. The patient was educated about how to progress his exercises in a way that would optimize his recovery and allow his return to duties as a National Guard soldier.

The Victorian Institute of Sport Assessment- Achilles questionnaire (VISA-A) was used to quantify the clinical severity of the patient's Achilles tendinopathy as he progressed through physical therapy. This questionnaire assesses domains of pain, function in daily living, and function in sporting activity. The VISA-A questionnaire has good test-retest ($r=0.93$), intrarater ($r=0.90$), and interrater ($r=0.90$) reliability. Additionally, the VISA-A questionnaire was found to have good construct validity when comparing scores of treatment and control groups ($p<0.001$).¹⁶ The patient was asked to complete the VISA-A questionnaire at the end of his PT intervention, at which time he was also asked to complete it retrospectively, recalling his status at the beginning of physical therapy. Recalling his initial status, the patient scored 25/100 and improved to 76/100 after 6 weeks of being without immobilization.

The Patient Specific Functional Scale (PSFS) was used to assess the patient's functional progress. The patient was instructed to identify an important activity that he had difficulty performing. Because of his active lifestyle, the patient selected running as this activity. He retrospectively rated his level of difficulty with running as a 3/10 on an

11-point scale with zero being “unable to perform activity” to 10 “able to perform the activity at per-injury level.” In order for a minimal detectable change to be observed for one activity, the patient needed to improve by at least 3 points.¹⁷ After 18 weeks of physical therapy, the patient reported 7/10 difficulty, indicating a statistically significant improvement of 4/10. The patient expressed his own personal goal to score 8-9/10 on the PSFS before returning to his Army duties. The patient reported 8/10 on the function scale during a 3-month follow-up, thus meeting his goal.

Additionally, the patient’s pain decreased from a 4/10 to 1/10 on the verbal pain reporting scale over the 18 weeks of his physical therapy intervention. His ankle range of motion improved as well, however not to the extent anticipated in the plan of care goals (See Table 2).

At the 3-month follow-up, the patient reported that he had experienced one setback involving a bad muscle strain or a small tear in his calf since discontinuing PT. The patient reported still having pain and tightness but was able to monitor his symptoms and modify his workouts accordingly. At the time of the follow-up, the patient reported that he had returned to the National Guard and anticipated being able to resume full duty soon. He admitted his biggest battle was trusting his body:

“It seems that every time I push too hard something goes wrong. This is making it difficult for me to completely let it go and just go for it during a workout. I’ll get there though. It just might take some more time.”

CHAPTER IV. DISCUSSION

The purpose of this case report was to describe the rehabilitation for a patient with bilateral Achilles tendinopathy treated with two periods of immobilization and 18 weeks of physical therapy. The patient progressed well through the phases of his rehabilitation and demonstrated good motivation to resume his physically demanding role as a National Guard soldier. Considering the fitness demands of being a National Guard soldier, intervention strategies were designed to be complex and challenging. Following short periods of immobilization and physical therapy intervention throughout, the patient had favorable outcomes in regards to decreased pain and increased function.

Eccentric calf muscle exercises are commonly prescribed to treat patients with Achilles tendinopathy, and evidence supports its efficacy in improving symptoms.^{1-3,5,6,8,15,18,19,21} Eccentric calf muscle exercises have been shown to alter Achilles tendon structure at the cellular level. Ultrasonography has demonstrated localized decreased tendon thickness and normalized tendon structure following a 12-week eccentric training program.¹⁸ Eccentric calf muscle exercise is thought to elicit a response that normalizes the concentration of glycosaminoglycans and fiber arrangement, resulting in localized decreased tendon thickness.

Rees et al explored the physiological loading response that occurs during eccentric exercise and developed an evidence-based rationale for the mechanism of eccentric exercise effectiveness.¹⁹ When comparing eccentric and concentric physiological loading responses, it has been found that there is no statistically significant difference in the magnitudes of force generated or changes in tendon length. Therefore,

the benefit of eccentric exercise versus concentric exercise can not be explained strictly based on force production and length changes. Researchers have observed a sinusoidal waveform movement pattern of force during eccentric lowering, indicating repeated loading and unloading. In contrast, the force production during concentric exercise is very smooth. When comparing eccentric control among healthy and injured subjects, data showed that injured patients had impaired eccentric control and consequently more force fluctuations. Researchers theorized that the fluctuations demonstrated during eccentric lowering may be therapeutic in the remodeling of tendons with tendinopathy pathology, although the specific mechanism is not yet fully understood. Additionally, eccentric exercise may reduce tendon stiffness, decrease tendon stress, and increase tensile strength, thereby decreasing the risk of further injury and optimizing the potential for tendon re-modeling.

Despite the strong evidence supporting eccentric calf strengthening, the Alfredson protocol⁵ assumes unilateral Achilles tendinopathy. In patients with bilateral Achilles tendinopathy, different exercise modifications must be made as they are unable to avoid concentrically raising the body on an injured limb. In this case report, a variety of intervention strategies was used. A strong emphasis was placed on strength progression, both concentric and eccentric. Recent research by Allison & Purdam challenges the rationale behind eccentric strengthening programs and suggests that the mechanism behind eccentric exercises is more of a passive stretch than true strengthening.²⁰ They argue that eccentric strengthening is not optimal for production of muscle hypertrophy or tensile strength. Additionally, eccentric exercise is not specific to the stretch shortening

cycle observed in the Achilles tendons and does not maximally load the tendon through the range of motion. The researchers recommend including sport-specific functional strengthening and endurance programs in conjunction with eccentric exercise, instead of focusing on eccentric alone.

Research does not support prolonged immobilization as the most effective means to treat Achilles tendinopathy. Immobilization can result in atrophy and decreased structural strength, further predisposing the tendon to injury when stressed after immobilization.²¹ Immobilization can, however, be effective in reducing pain by removing the loading stress. The patient in this case report had failed previous conservative treatment attempts, and immobilization was deemed the most appropriate option before considering surgery due to the risk of tendon rupture with aggressive physical therapy.

There are several limitations to this case report. First, it is difficult to discern whether immobilization alone, physical therapy intervention alone, or a combination of immobilization and intervention contributed most to the patient's recovery. Additionally, in evaluating this patient, a greater emphasis could have been placed on identifying the source of his Achilles tendinopathy as it is possible that the patient had an impairment at his hips, knees, or feet that could have resulted in altered running mechanics and subsequently lead to increased stress on the Achilles tendons. Also, the patient was asked to retrospectively assign a rating for the VISA-A and PSFS outcome measure, and his report may have been inaccurate.

Another limitation of this study is the inability to generalize results from this case report. Due to the nature of the research design as a case report, a specific causal relationship cannot be determined for the outcomes. The patient presented in this case report was a very young, motivated, physically fit gentleman. He was excited about exercise and had very specific fitness goals. Inactive and less motivated patients may not experience similar outcomes.

Future research is needed to explore the effects of immobilization coupled with physical therapy intervention in cases of bilateral Achilles tendinopathy. Furthermore, establishing an exercise protocol for bilateral Achilles tendinopathy would be beneficial, since the standard eccentric exercise model is not applicable to patients with immobilization due to bilateral injury.

References

1. McShane J, Ostick B, McCabe F. Noninsertional Achilles tendinopathy: pathology and management. *Cur Sp Med Rep*. 2007;6(5):288-292.
2. Lake J, Ishikawa S. Conservative treatment of Achilles tendinopathy: emerging techniques. *Foot Ankle Clin*. 2009;14(4):663-674.
3. Alfredson H, Cook J. A treatment algorithm for managing Achilles tendinopathy: new treatment options. *Br J Sports Med*. 2007;41(4):211-216.
4. Sharma P, Maffulli N. Basic biology of tendon injury and healing. *Surgeon*. 2005;3(5):309-316.
5. Alfredson H, Pietilä T, Jonsson P, Lorentzon R. Heavy-load eccentric calf muscle training for the treatment of chronic Achilles tendinosis. *Amer J Sp Med*. 1998;26(3):360-366.
6. Meyer A, Tumilty S, Baxter G. Eccentric exercise protocols for chronic non-insertional Achilles tendinopathy: how much is enough? *Scand J Med Sci Sports*. 2009;19(5):609-615.
7. Magee MJ. *Orthopedic Physical Assessment*. 5th ed. Philadelphia, PA: Saunders; 2006.
8. Rompe J, Furia J, Maffulli N. Mid-portion Achilles tendinopathy--current options for treatment. *Disabil Rehab*. 2008;30(20-22):1666-1676.
9. American College of Sport's Medicine. *ACSM's Guidelines for Exercise Testing and Prescription*. 7th ed. Baltimore, MD: Lippincott Williams & Wilkins; 2006.
10. Reese NB, *Muscle and Sensory Testing*. 2nd ed. Philadelphia, PA: Saunders; 2005.
11. Norkin CC, White DJ. *Measurement of Joint Motion: A Guide to Goniometry*. 3rd ed. Philadelphia, PA: F.A. Davis; 2003.

12. Herr K, Spratt K, Mobily P, Richardson G. Pain intensity assessment in older adults: use of experimental pain to compare psychometric properties and usability of selected pain scales with younger adults. *The Clin J Pain*. July 2004;20(4):207-219.
13. American Physical Therapy Association. *Guide to Physical Therapist Practice*. 2nd ed. American Physical Therapy Association; 2001.
14. Cameron MH. *Physical Agents in Rehabilitation*. 3rd ed. Philadelphia, PA: Saunders; 2008.
15. Rompe J, Nafe B, Furia J, Maffulli N. Eccentric loading, shock-wave treatment, or a wait-and-see policy for tendinopathy of the main body of tendo Achillis: a randomized controlled trial. *Amer J Sp Med*. 2007;35(3):374-383.
16. Robinson J, Cook J, Purdam C, et al. The VISA-A questionnaire: a valid and reliable index of the clinical severity of Achilles tendinopathy. *Br Journal Sports Med*. 2001;35(5):335-341.
17. Stratford, P., Gill, C., Westaway, M., & Binkley, J. Assessing disability and change on individual patients: a report of a patient specific measure. *Physiotherapy Canada*. 1995; 47: 258-263.
18. Ohberg L, Lorentzon R, Alfredson H. Eccentric training in patients with chronic Achilles tendinosis: normalised tendon structure and decreased thickness at follow up. *Br J Sports Med*. 2004;38(1):8-11.
19. Rees J, Lichtwark G, Wolman R, Wilson A. The mechanism for efficacy of eccentric loading in Achilles tendon injury; an in vivo study in humans. *Rheumatology*. 2008;47(10):1493-1497.
20. Allison G, Purdam C. Eccentric loading for Achilles tendinopathy--strengthening or stretching? *Br J Sports Med*. 2009;43(4):276-279.
21. Stanish W, Rubinovich R, Curwin S. Eccentric exercise in chronic tendinitis. *Clin Ortho*. 1986;(208):65-68.

Table 1.

Initial Ankle Range of Motion .

	Right	Left
Dorsiflexion with knee extended	0°	0°
Plantar flexion	30°	30°
Inversion	12°	12°
Eversion	5°	5°

Table 2.

Ankle Range of Motion Outcomes

	Right		Left	
	At 17 weeks	Goal	At 17 weeks	Goal
Dorsiflexion	8 °	8 °	8 °	15°
Plantarflexion	35°	45°	40°	45°

APPENDIX

**Case Report
Information and Consent Form**

Introduction:

You are invited to be the subject of a case report to be written by

_____, Doctor of Physical Therapy
graduate student/s from St Catherine University, under the

supervision of Mary Weddle, PT, DSc, Doctor of Physical Therapy program faculty member, and _____, the student's clinical instructor/s. You were selected as a possible subject for this case report because your course of physical therapy care would be of interest to physical therapist students and physical therapists. Please read this form and ask questions before you agree to be the subject of this case report.

Background Information:

The purpose of this case report is to describe the physical therapy care you are receiving and how you respond to the care you are receiving at

(name and address of facility).

For example, the case report would describe the following:

1. why you are receiving physical therapy at this time;
2. the kinds of physical therapy treatment/s you are receiving at this time;
3. the effectiveness of the physical therapy treatment for you at this time.

This case report will help others better understand how physical therapy may help other people like you.

Procedures:

Your decision about participation will not affect your physical therapy care in any way. If you decide to participate, your physical therapy care will proceed just as it would if you were to decide not to participate. If you decide to participate, you may choose whether or not you will allow the following:

1. whether your photograph can be taken and used in public presentation and/or publication of this case report;
2. whether what you say can be quoted directly in the case report.

You may be given an opportunity to read or review parts, or all, of the case report prior to its completion, so that you can make suggestions to the student about the accuracy of the information described in the case report. You are not obligated to read/review the case report, however.

The case report will be read by the student's faculty supervisor, Mary Weddle. This case report may be read by the physical therapist/s supervising the student at this facility. The case report will be presented publicly by the student/s at St Catherine University Doctor of Physical Therapy Program Research Day. This case report would be available for students and faculty at the St Catherine University to read. The case report may also be published in a scientific journal and/or presented at a professional meeting locally or nationally.

Risks and Benefits:

There are no risks or benefits to you for participating in this case report.

Confidentiality:

Any information obtained in connection with this case report that could identify you will be disclosed only with your permission. Unless stated otherwise, your name, or names of your family members, will not be used in any way in the case report.

Voluntary nature of this case report:

Participation in this case report is voluntary. Your decision whether or not to participate will not affect your future relations with the St Catherine University, or with the facility at which you are receiving physical therapy. If you decide to participate, you are free to discontinue participation at any time without affecting these relationships.

Contacts and questions:

You are encouraged to ask the student or the physical therapist supervising the student any questions about this case report, at any time. You may also contact the student's faculty supervisor, Mary Weddle, if you have any questions, at any time.

You may keep a copy of this consent form for your records.

See next page for Statement of Consent

Statement of Consent:

You are making a decision whether or not to participate in this case report. Your signature indicates that you have read this information and your questions have been answered. Even after signing this form, please know that you may discontinue your participation in this case report, at any time.

I agree to participate in this case report. Yes ___ No ___

I agree to being quoted directly in this case report. Yes ___ No ___

I agree to being photographed and having the photographs included in the public presentation and/or publication of this case report. Yes ___ No ___

If the student wishes to have me read or review the case report prior to its completion, the student may contact me, after my course of physical therapy is complete. If I check no, that means I do not want the student to contact me at any time, after my course of physical therapy is complete.

Yes ___ No ___

Signature of subject

Date

Student's signature

Date

Faculty member supervising the student:

Mary Weddle, PT, DSc
 Associate Professor and Director of Clinical Education
 Doctor of Physical Therapy Program
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