

Conservative management of a chronic recurrent flexor hallucis longus stenosing tenosynovitis in a pre-professional ballet dancer: a case report

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Objective: *To describe the successful conservative management of a chronic recurrent flexor hallucis longus (FHL) stenosing tenosynovitis.*

Clinical Features: *A 20-year-old female pre-professional ballet dancer presented with medial ankle and mid-foot pain of 7.5 months duration. Pain was constant but exacerbated with training and assuming the en pointe and demi-pointe dance positions. Plantar flexion of the great toe was pain provoking. Triggering of the great toe and audible and palpable crepitus were noted with active and passive great toe range of motion. A diagnosis of a chronic recurrent FHL stenosing tenosynovitis was made based on the history and physical exam.*

Intervention and Outcome: *Soft tissue and joint mobilization and manipulation, laser therapy, kinesiology tape application and rehabilitative exercise was used over 4 months. The patient reported an*

Objectif : *Présenter le traitement conservateur efficace de la ténosynovite sténosante chronique récurrente du muscle long fléchisseur de l'hallus (MLFH).*

Caractéristiques cliniques : *Une danseuse de ballet préprofessionnelle de 20 ans avait depuis 7-½ mois une douleur à la partie médiale d'une cheville et à la partie moyenne d'un pied. Cette douleur était constante et exacerbée par l'entraînement, les positions sur pointes et les positions sur demi-pointes. La flexion plantaire du gros orteil déclenchait de la douleur. Un craquement audible et palpable de même que le déclenchement de la douleur au gros orteil étaient observés lorsque les amplitudes des mouvements passifs et actifs étaient effectuées. Le diagnostic de ténosynovite sténosante chronique récurrente du MLFH a été établi à la lumière de l'anamnèse et des résultats de l'examen physique.*

Intervention et résultat : *La mobilisation et la manipulation des tissus mous et des articulations, les traitements au laser, l'utilisation de bandes de kinésiologie et des exercices de rééducation ont été les stratégies d'intervention utilisées durant 4 mois. On a*

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8-point decrease in her numeric pain rating scale score and a 15-point improvement in her Lower Extremity Functional Scale score.

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KEY WORDS: chiropractic, stenosing tenosynovitis, ballet

Introduction

The flexor hallucis longus (FHL) is a muscle originating on the posterior aspect of the distal two-thirds of the fibula and interosseous membrane.¹ The FHL courses posterior and inferior to the medial malleolus through a fibro-osseous tunnel before attaching to the plantar surface of the distal phalanx of the great toe.¹ It functions primarily as a plantar flexor of the metatarsophalangeal (MTP) and interphalangeal joints of the great toe, however its orientation provides a secondary function as a torque producer through the subtalar joint and the joints of the first ray.²

Injury to the FHL can occur in those who perform activities involving repetitive, forceful or prolonged plantar flexion maneuvers.^{3,4} Ballet is one activity where the FHL is frequently injured due to the demanding foot and ankle positions required in the dance genre. En pointe and demi-pointe are two weight-bearing positions which can contribute to the development of an FHL injury (Figure 1). The en pointe position involves maximal ankle plantar flexion with the first MTP joint in a neutral position relative to the longitudinal axis while the demi-pointe position involves maximal ankle plantar flexion with 80-100° of extension at the first MTP joint.⁵ In both positions the FHL aids in ankle and foot stabilization and balance which lends credence to its reputation as the dancer's Achilles tendon.¹ En pointe and demi-pointe positions put substantial stress on the FHL, with muscles crossing both the ankle and the MTP joints working 2.5 to 3 times harder than muscles that cross the ankle only.^{1,5} En pointe work may be more provocative since the FHL tendon may become directly compressed as it passes through the flexor retinaculum that is posterior and inferior to the medial malleolus.^{2,3,5}

The frequency in which the FHL is injured in ballet

observé une réduction de 8 points du score obtenu sur l'échelle numérique d'évaluation de la douleur et une amélioration de 15 points du score obtenu sur l'échelle d'évaluation fonctionnelle des membres inférieurs.

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MOTS CLÉS : chiropratique, ténosynovite sténosante, ballet

led to the term dancer's tendonitis being used as early as the 1970's to describe aggravation of this structure.⁶ Dancer's tendinitis is a layman term for FHL injuries and not all cases of dancer's tendinitis are true cases of tendinitis. Reports of partial longitudinal tears, stenosing tenosynovitis, and intrasubstance degeneration of the FHL are documented in the literature.² In the case of stenosing tenosynovitis, chronic irritation of the FHL tendon between the sesamoids of the first MTP joint, along the knot of Henry or under the flexor retinaculum can lead to swelling, nodule formation, hypertrophy and tearing of the FHL as it courses through its synovial sheath.^{3,5,7} This can result in pain and limited passive and active first MTP range of motion and may be accompanied by triggering

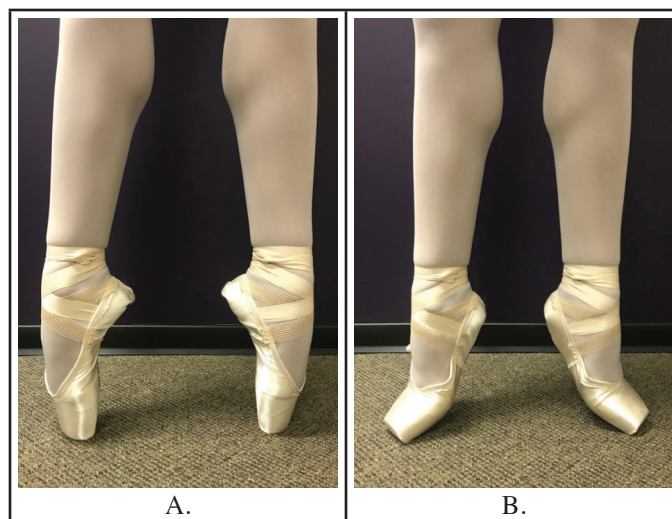


Figure 1.

A) En pointe position. B) Demi-pointe position.

of the great toe and audible and palpable crepitus over the FHL tendon.^{3,5,7}

Conservative measures are recommended for the initial management of FHL injuries. Resting the affected structure^{1,3-5,7-9}, anti-inflammatory medication^{1,3-5,7,8}, massage³, subtalar and first MTP joint mobilization¹, ultrasound³, physical therapy⁵, stretching³, core strengthening⁴, and correcting biomechanical faults related to forcing turn-outs⁵ are recommended.

Surgical intervention should be considered if three to six months of conservative measures have failed⁴, if there is triggering with great toe range of motion^{5,8}, a full rupture of the FHL is suspected⁴, the injury is disabling or recurrent^{7,9,10}, or if the patient is not compliant with activity restriction⁴.

The purpose of this case report is to present the successful rehabilitation of a chronic recurrent FHL stenosing tenosynovitis in a pre-professional ballet dancer who presented with several of the aforementioned factors that are recommended for the consideration of surgical intervention.

Case Presentation

A 20-year-old female pre-professional ballet dancer presented with right medial ankle and mid-foot pain of 7.5 months duration. The patient reported that the pain started gradually with continued training after incurring a right-sided lateral ankle sprain several weeks prior. Initially, the pain was sharp and stabbing with dance and a constant dull ache with daily activities that worsened at night. At its peak, her pain was rated as an 8/10 on a numeric pain rating scale (NPRS). The patient continued dancing five to six hours per day five days per week and was forced to take six weeks of rest after four months of failed conservative management. The conservative management of her injury continued during her forced break from dance which consisted of daily foot and ankle exercises and regular strength Ibuprofen in the evenings. At the end of her break, she reports her pain diminished to a 4/10 on an NPRS with exercise and walking for long periods and a 2/10 on an NPRS with other activities of daily living. Upon returning to dance, she reported a snapping sensation in the medial ankle that accompanied the pain. The patient took a two week break a month and a half after resuming dance which was unrelated to her injury. Her injury was then re-aggravated to an 8/10 pain

on an NPRS with a quick return to dance after the shorter second break. This pain consisted of a more pronounced snapping sensation in the medial ankle and triggering of her great toe with flexion. From the seven-month mark to the date of her initial appointment, she had modified her dance training to two hours per day five days a week. She also modified the volume of her ballet-related jumping exercises from nine to ten exercises per day to two to three exercises per day. Each exercise consisted of ten to twelve repetitions per leg, per exercise. From the onset of her pain to the date of her initial examination, her pain was most pronounced while assuming the en pointe and demi-pointe positions.

A Lower Extremity Functional Scale (LEFS) of 55/88 and an NPRS score of 8/10 was obtained during the initial examination. Rest was the only relieving factor reported by the patient. A secondary complaint consisting of a non-painful difficulty in “turning out” the right hip was described by the patient.

No red flags were identified during the initial examination. The patient reported weekly cardio and strength training outside of her dance training. The patient reported an alcohol consumption of one to two glasses of wine per week and no cigarette use or caffeine consumption. No allergies were reported. The only medication or supplement use reported was 2000IU of Vitamin D3 daily and regular strength Ibuprofen in the evenings when her pain was 8/10 on an NPRS. No past or present conditions, illnesses or surgeries were reported. The patient reported a history of minor ankle, low back, mid back and neck injuries, all of which have been managed conservatively.

Clinical Findings

Visual inspection revealed mild oedema around the right medial malleolus over the tarsal tunnel and was void of any bruising or rubor. The patient’s pain was provoked by passive great toe extension with the ankle in dorsiflexed, neutral and plantar flexed positions and resisted great toe flexion in weight bearing and non-weight bearing positions. Triggering of the great toe was noted with passive great toe flexion and extension and was accompanied by audible and palpable crepitus posterior to the medial malleolus and in the tarsal tunnel. Range of motion testing for the right lower extremity revealed limitations in subtalar supination and adequate active and passive internal and external hip rotation with a patient-reported increased dif-

difficulty in reaching end range in both internal and external right hip range of motion. All other passive and active lower extremity ranges of motion were unremarkable.

Using the Total Tenderness Scale (TTS), palpation revealed grade 1 tenderness through the superficial posterior compartment of the right leg and grade 2 tenderness through the right deep hip external rotators, posterior hip capsule, anterior fibers of the right gluteus medius, gluteus minimus and tensor fascia lata. Moderate pain provocation and moderate mechanical tension was noted with palpation of the deep posterior compartment of the right leg. The patients' pain was most pronounced with palpation of the flexor hallucis longus as it coursed from the posterior aspect of the medial malleolus into and distal to the tarsal tunnel. Flexor hallucis longus tenderness was minimal at and distal to the Knot of Henry.

Neurological testing of the lower extremities including percussion of the posterior tibial nerve was unremarkable.

Therapeutic Intervention

The patient underwent a course of 25 treatments over the span of four months. Treatment consisted of seven minutes of laser therapy at 8W for a total of 3240.0 J (LiteCure Lightforce™ Pro) along the length of the flexor hallucis longus tendon posterior and distal to the right medial malleolus, kinesiology taping application to the right ankle and foot (Figure 2), Functional Range Release® tech-



Figure 2.

Kinesiology tape application to the FHL. The ankle was dorsiflexed and pronated with no stretch in the tape as it was applied. This application provided a “lifting” of the skin as the patient assumes a plantarflexed ankle position.

niques to the affected soft tissues, mobilization and manipulation of the right subtalar joint, mobilization of the right hip using a mobilization strap and a gradual introduction to a series of exercises based on Functional Range Conditioning® principles. The patient was also given a 30-day course of a natural anti-inflammatory product (Douglas Laboratories Quercetin Bromelain Complex) to be taken during the initial stages of her treatment.

The patient continued with two hours of dance training daily during the first two months of treatment. Triggering of the great toe was absent after the fourth treatment. The audible and palpable crepitus along the FHL tendon was absent after the fifth treatment. The swelling around the tarsal tunnel lessened over this time.

The patient gradually increased in the number of ballet-related jump exercises from two to three exercises per day during the first visit to six to seven exercises by the sixth visit, eight exercises by the ninth visit and nine exercises by the eleventh visit. All exercise progressions were made without pain provocation. The patient reported a notable increase in hip strength and mobility by the seventh visit and improvements in muscular strength and endurance while in the en pointe and demi-pointe positions by the tenth treatment. The patient gradually increased her rehearsal time over the last two months to a maximum of 6 hours per day with no re-aggravation of her condition.

The patients NPRS score dropped from 8/10 to 0/10 and the LEFS score improved from 55/80 to 70/80 by the 25th treatment.

Discussion

The collective incidence of musculoskeletal (MSK) injuries in pre-professional and high-school level dancers ranges from 17% to 90% and the lifetime prevalence of MSK injury in university and pre-professional dancers ranges from 26% to 51%.^{11,12} The majority of these injuries occur around the ankle and are often attributed to overuse.¹¹⁻¹⁴ Motta-Valencia (2006) suggests this may be due to dancers continuing to dance and train despite injury for reasons including emotional, financial and social well-being.⁹

Despite some general conservative treatment recommendations being proposed^{1,3-5,7-9}, there is a paucity of detailed and well researched conservative treatment protocols on FHL stenosing tenosynovitis available to al-

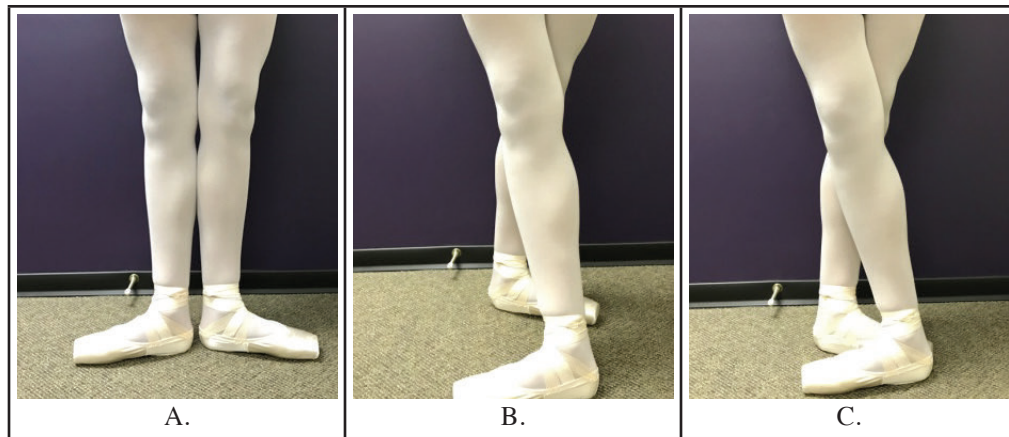


Figure 3.

*Foot and ankle placements requiring turn out of the hip.
A) First Position B) Fourth Position (Croisé) C) Fifth Position.*

lied health professionals. Surgical intervention has been recommended if three to six months of conservative treatment has failed⁴, if there is triggering of the great toe^{5,8}, if the injury is disabling or recurrent^{7,9,10}, and if the patient is noncompliant with activity restriction⁴. Although the patient presented with a number of variables that suggest the consideration of surgical intervention, the patient opted for conservative management due to dance obligations.

An assortment of treatment methods were used to address the patient's complaints. Some treatments were directed at the injured tissue and a large focus was put on working on the tissues and joints proximal and distal to the painful region. It is interesting to note that although the patient related a gradual onset of symptoms following a lateral ankle sprain she incurred several weeks prior, she also had reported difficulty in assuming turnout positions with her right lower limb. Turnout requires the lower limbs to be externally rotated so the feet are placed 90 degrees from the sagittal plane (Figure 3).⁵ The hips should contribute 60% of the external rotation for the turnout position with the remaining 40% coming from the knees, ankles and feet.⁹ In the event that the dancer cannot achieve 60% of the turnout position through the hips, the dancer may force the position by placing increased stress on the medial side of the foot, ankle, tibia and knee which amplifies the injury potential for the tissues spanning these areas.^{5,9} Over time, forcing turnouts can make the ligaments and musculature of the medial foot, ankle

and leg weak and fatigued and subsequently lose their ability to support the medial arch of the foot.¹⁵ It is possible that the dancer's secondary complaint contributed to the development of her chronic recurrent FHL stenosing tenosynovitis and may explain why the injury could not be resolved with prior conservative management.

The lack of right subtalar motion is a possible contributor to the patient's FHL stenosing tenosynovitis. Ahonen (2008) reports that subtalar supination is needed to create force closure of the midtarsal joints and is always linked to external rotation of the lower limb.¹⁵ A disconnect between these two variables may contribute to a lack of control in the demi-pointe position and put undue stress on the ankle-foot complex.¹⁵ It is interesting to note that the patient reported more ease in the en pointe and demi-pointe positions when mobilization of the subtalar joint was introduced by the eighth treatment.

Graded rehabilitative exercise was lacking from the patient's original management. The dancer was given a series of ankle, foot and great toe open kinetic chain Thera-band exercises which provided little relief in the short and long term. She continued with these exercises while new exercises were prescribed throughout the management of this case. The new exercises were based on concepts and principles that are discussed in the Functional Range Conditioning® certification. The progression of the exercises prescribed, in addition to the other treatment modalities used during the management of this case was

based on the practitioner's clinical experience rather than a protocol template. Despite the patient continuing with the initial exercises she was prescribed, it is unlikely they had a significant influence on her improvement given that she had experienced little improvement with them since the onset of her symptoms.

The author acknowledges this case was not without its limitations. Despite the recommendation that disorders of the FHL require relative rest as a part of a conservative management approach^{1,3-5,7-9}, the patient continued to train and rehearse despite injury. While the outcome of this case may signify the efficacy of the treatment provided, it is possible that resting the injured tissues may have accelerated the recovery time. The absence of imaging to determine the extent of the injury or the presence of complicating factors is also a likely limitation of this case. MRI and diagnostic ultrasound are two imaging modalities that are frequently used to help diagnose FHL disorders. The presence of an accessory FHL muscle¹⁶, bony edema^{4,8,9}, fluid collection along the FHL tendon^{4,8,9}, os trigonum⁹, or a partial or complete tear of the FHL⁹ can be visualized using MRI and may help explain the painful condition. Diagnostic ultrasound can provide a dynamic and cost-effective means to assess the FHL for tendinosis⁴ or a partial or complete tear⁹. In the event that early conservative treatment was unsuccessful, imaging modalities could have been recommended for further investigation. It should also be noted that the patient received five acupuncture treatments throughout the management of this case. The acupuncture treatment was focused on the patient's chief complaint and was not rendered by the professional depicted in this manuscript. The points needled during these sessions are unknown.

Summary

FHL stenosing tenosynovitis is a common and often debilitating dance injury. There is a paucity of definitive conservative treatment protocols for FHL stenosing tenosynovitis and a number of recommendations on when surgical interventions should be considered. This case demonstrates successful conservative management of a chronic recurrent FHL stenosing tenosynovitis in a pre-professional ballet dancer who presented with several indicators for surgical candidacy. It is important for clinicians to understand the injury mechanism and the biomechanical and physiological demands of the patient's

sport or activity. Clinicians should address both the injured tissue and any painful or non-painful dysfunctions above and below the injury site. In the case of FHL stenosing tenosynovitis, hip mobility and subtalar motion should be assessed and treated accordingly.

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