

Post-surgical care of a professional ballet dancer following calcaneal exostectomy and debridement with re-attachment of the left Achilles tendon

Bradley Kobsar, DC*
Joel Alcantara, DC*

The extraordinary physical demands placed upon ballet dancers are only now being appreciated as comparable to that of other highly competitive athletic pursuits. The professional ballet dancer presents with an array of injuries associated with their physically vigorous performance requirements. In keeping with evidence-based practice, we describe the chiropractic care of a professional ballet dancer following surgical calcaneal exostectomy and debridement with re-attachment of the left Achilles tendon. The care provided involves an array of modalities from exercise and rehabilitation to spinal manipulative therapy.

(JCCA 2009; 53(1):17-22)

Les contraintes physiques extraordinaires imposées aux danseurs de ballet commencent à peine, de nos jours, à se mesurer aux efforts que doivent faire les athlètes sportifs pour atteindre les sommets dans le milieu très compétitif de l'athlétisme. Les danseurs de ballet professionnels sont exposés à une panoplie de blessures associées aux exigences de performances physiques vigoureuses. En harmonie avec la pratique fondée sur l'expérience clinique, nous décrivons le traitement chiropratique administré à un danseur de ballet professionnel ayant subi une opération à l'épine calcanéenne et un débridement, suivi d'un greffage du tendon d'Achille gauche. Le traitement prodigué s'est traduit par une gamme de pratiques, allant de l'exercice à la réadaptation en passant par la manipulation vertébrale.

(JACC 2009; 53(1):17-22)

KEY WORDS: ballet, injury, chiropractic, Achilles tendon

MOTS CLÉS : ballet, blessure, chiropratique, tendon d'Achille

Introduction

Similar to other high caliber athletes, the professional ballet dancer experiences an array of injuries associated with their physically vigorous performance requirements. These injuries are mostly of the musculoskeletal type and like many athletes of all caliber, many seek the care of a chiropractor. Based on an appreciation of structure and function, chiropractors have demonstrated their effectiveness in the realm of musculoskeletal care. Some of these

are well documented in the scientific literature such as that for neck pain and low back pain.^{1,2} However, to the best of our knowledge; this is the second reporting in the scientific literature as it pertains to an Achilles injury and the first regarding the care of a professional ballet dancer under the auspices of chiropractic care. In a case report format, we describe the post-surgical care of a professional ballet dancer following calcaneal exostectomy and debridement with re-attachment of the left Achilles tendon.

* Private Practice of Chiropractic, San Jose, CA.

This study was funded by the Health and Wellness Care Center, San Jose, CA, USA.

Corresponding Author: Bradley Kobsar, DC, Clinic Director, The Health and Wellness Care Center, San Jose, 95126. 408-294-2322 e-mail: drkobsar@gmail.com www.hawcc.org

© JCCA 2009.

Case Report

The patient is a professional ballet dancer that presented to the Health and Wellness Care Center for evaluation and treatment with a work-related injury of left foot pain. As a ballet dancer, his work was physically demanding and involved jumping maneuvers, Pointe work, partnering, etc. He performed lifting and carrying of objects weighing an average of 49.90 kg with a maximum weight at 90.72 kg for durations of up to 3 hours per day while walking over a distance of 9.14m during each lift. The patient estimated that he performed this lifting and walking task approximately 30-40 times daily. The injury to his left foot occurred while performing a quick jump maneuver.

Physical examination revealed a well proportioned 41-yr-old male patient at 1.7m tall and weighing 63.5kg. The patient demonstrated an antalgic walk, favoring the left ankle. Digital palpation of the left foot revealed tenderness at the Achilles myotendinous junction, hypertonicity and tenderness at the ipsilateral soleus, posterior tibialis, flexor hallucis, peroneal, and gastrocnemius muscles. Varus stress testing with eversion/ inversion motion of the left ankle evoked pain on the lateral side. Passive plantar flexion and extension evoked pain at the left heel. Gait analysis incorporating a single frame digital advancement of the patient's videotaped gait indicated a left medial heel strike phase rather than lateral. At the mid-stance phase, the left foot completely collapsed into hyperpronation. The toe phase push-off occurred on the lateral aspect of the left foot as opposed to a supination over the second toe. Petrometer range of motion analysis on plantar and dorsal flexion of the left and right ankle are shown in Table 1.

Strength testing of the lower extremities using the Dynatron Mini 2000 [Dynatronics; Salt Lake City] are provided in Table 2. The lower extremities demonstrated severe weakness with the left side when compared to the right side; particularly on hip flexion, left external and internal rotation about the left hip.

Based on the history and physical examination findings, a radiographic examination and magnetic resonance imaging (MRI) of the left foot were performed. The 2-view radiographs revealed calcifications within the distal left Achilles tendon in addition to bony lucencies at the posterior aspect of left calcaneus which were consistent with Achilles tendonitis. Bony structures were otherwise intact with the talo-crural joint space maintained. The MRI of the left foot (see Figure 1) revealed a diffused

Table 1 Active range of motion analysis of the left and right ankle

	Right Ankle	Left Ankle	Reference ROM
Dorsi Flexion	2°	10°	15°
Plantar Flexion	65°	61°	50°

Table 2 Strength testing of the lower extremities (*involved side)

Motion	Left Side* lbs/kg	Right Side lbs/kg
Adduction	33.8/15.32	28.0/12.70
Abduction	29.7/13.47	27.9/12.66
Internal Rotation	21.8/9.89	17.8/8.07
External Rotation	20.6/9.34	21.0/9.53
Extension	38.3/17.37	28.0/12.70
Flexion	27.8/12.61	25.6/11.61

thickening of the distal Achilles tendon approximately 6cm from the calcaneal insertion. There was a moderate-sized retrocalcaneal bursal fluid collection that was compatible with an on-going inflammatory process (bursitis) and secondary to osteitis and/or stress reaction at the posterior aspect of the calcaneus. Furthermore, there was thickening of the lateral posterior tibial tendon sheath and stenosing tenosynovitis at the level of the subtalar joint. There was talo-crural joint and subtalar joint effusion with the tear identified at the anterior margin. Given the above findings, the patient was diagnosed with chronic left Achilles tendonitis with a partial (Grade 1) tear. A diagnostic impression of tendinopathy prior to the tear is supported by the patient's history.

Treatment consisted of the use of physiotherapy modalities, including interferential current, ultrasound, heat and ice for pain and inflammatory control and progressive restoration of motion in the left ankle. Massage, myofascial release, joint mobilization, spinal and extraspinal manipulation, manual traction and stretching of the lower extremities and lumbosacral spine were performed. To begin, isometric open-chain maneuvers were performed



Figure 1 A magnetic resonance imaging of the patient's left foot

which progressed to static stabilization exercises and then eventually, dynamic stabilization maneuvers in a closed-chain loop. Both concentric and eccentric exercises were incorporated with an emphasis on eccentric maneuvers due to the thinking that this method attains pain control and strength at a faster rate, particularly for conditions involving tendinopathy.³ Isolation exercises were provided through manual resistance techniques and a functional emphasis was performed on a Pilates reformer to simulate a shuttle jumping technique that also provides the benefit of an explosive plyometric exercise at a reduced risk of re-injury. Swiss ball, Pilates, and a biomechanical ankle platform system (i.e., BAPS board) for postural and balance training, as well as the Nautilus and free weight exercises, were utilized in the rehabilitation of the patient. Following 6 weeks of care, the patient returned to work with instructions of "no jumping". Three weeks later, he was allowed to work "without limitations".

Approximately 6 months following his initial visit, the patient re-injured following a slip and fall. A podiatric referral was made where a diagnosis of a partial tear of the



Figure 2 The left foot following calcaneal exostectomy and debridement with re-attachment of the left Achilles tendon

left Achilles tendon was made. The patient was provided the care options of casting or surgery. The patient opted for a left foot calcaneal exostectomy and debridement and reattachment of the left Achilles tendon. After 4 weeks, the patient returned for post-surgical rehabilitation of the left foot (see Figure 2). Initial care consisted of avoidance of weight-bearing on the left ankle with medications for pain management. Passive care modalities using ice massage, continuous ultrasound and interferential current to reduce inflammation and the use of a limited AROM boot. After 2 weeks, the boot was replaced with a shoe and heel lift. Active ROM of the left ankle was limited to less than 10° of plantar flexion. A graduated resistance program using Pilates-based exercises on the reformer, rotating discs and "combo chair" in conjunction with isometric manually assisted resistive exercises incorporating proprioceptive neuromuscular facilitation for the ankles and hip patterns were initially used. As the patient's response to care progressed, the Nautilus equipment and free weights were incorporated with the Pilates-based isotonic exercises as well as the

wobble board and styrofoam roller for proprioceptive training. A stationary bike and the Stairmaster for cardiovascular conditioning was incorporated as well as the treadmill with an emphasis on toe walking and limited dorsiflexion of the ankles.

Following three months of post-operative care, the patient returned to work with restrictions of “no jumping”. Following another month of care (and 4 months since initiating post-operative care), the patient was re-evaluated using the Mazur Ankle Grading Scale as developed by Kaikkonen and colleagues.⁴ The patient attained a Mazur ankle grading of 74 and a performance testing for ankle injuries of 45 (see Table 3). Following another three months, the patient worked “without restrictions.” Approximately one year since his initiation for post-operative care, the Mazur ankle grading and performance testing was again used with scores of 65 and 79. At 4-year follow-up, the patient was performing in the role of a principal dancer for San Jose Ballet. A remarkable feat considering what was considered a career-ending injury. The patient continues to be a patient of the attending chiropractor to address minor injuries and the “aches and pains” of being a principal ballet dancer.

Discussion

There are many aspects of the case presented that merit discussion in the care of patients with Achilles tendon injury. However, for brevity, we focus on the clinical aspects of care and their implications for chiropractors.

The extraordinary physical demands placed on ballet dancers are only now being appreciated as comparable to that of other highly competitive athletic pursuits.^{5,6} These physical demands result in an array of musculoskeletal disorders. According to Quirk, there are four main causes of injury to the ballet dancer.⁷ They are physique, technique, overuse and mishaps. As they pertain to the case presented, the above causes are likely contributing factors to the patient’s Achilles tendinopathy with a partial tear.

Commonly associated with strenuous physical activity, Achilles tendinopathy is highest among individuals who participate in middle and long distance running, orienteering, track and field, badminton, volleyball and soccer.⁸ According to Johansson⁹ and Lysholm and Wiklander,¹⁰ the annual incidence of Achilles disorders is between 7–9% among top-level runners. The etiology of the Achilles tendinopathy is known to be multi-factori-

Table 3 *The Mazur Ankle Grading Scale*

		Scoring
1	Subjective Assessment of the Injured Ankle	
	No Symptoms of any kind	15
	Mild Symptoms	10
	Moderate Symptoms	5
	Severe Symptoms	0
2	Can you walk Normally?	
	Yes	15
	No	0
3	Can you Run Normally?	
	Yes	10
	No	0
4	Climbing Down stairs?	
	Under 18 sec	10
	18–20 sec	5
	over 20 sec	0
5	Rising on heel with injured leg	
	Over 40 times	10
	30–39 times	5
	under 30 times	0
6	Rising on toes with injured legs	
	Over 40 times (10)	10
	30–39 times (5)	5
	under 30 times	0
7	Single-limbed stance with injured leg	
	Over 55 seconds	10
	50–55 seconds	5
	under 50 seconds	0
8	Laxity of the ankle joint	
	Stable (5mm)	10
	Moderate instability (6-10mm)	5
	Severe instability (10mm)	0
9	Dorsiflexion ROM	
	10 ⁰	10
	5 ⁰ –9 ⁰	5
	<5 ⁰	0

al and involve both extrinsic and intrinsic factors. Intrinsic factors include general factors (i.e., gender and age, being overweight, etc.) and anatomic factors (i.e., malalignments, leg length discrepancy, muscle weakness and imbalance, decreased flexibility and joint laxity). Of particular interest to chiropractors is hyperpronation of the feet which is said to affect subtalar joint mobility and limited ROM of the ankle. In the patient presented, gait analysis indicated hyperpronation of the left foot. Leg length discrepancy may also be a potential contributing factor. Although controversial, the classic orthopedic point of view with respect to leg length inequality (LLI) is that discrepancies less than 20 mm are not clinically relevant. In elite athletes, an LLI of more than 5–6 mm may be symptomatic while an LLI of >10 mm may require orthotic inserts to prevent overuse syndromes. While this may follow the thinking among chiropractors, it is not without controversy in the medical literature.¹¹ Extrinsic factors include the consequences of certain medications (i.e., anabolic steroids, antibiotics, etc.) and anatomic variables such as biomechanical factors, training errors, equipment failure and adverse environmental conditions. With respect to Achilles tendon ruptures, the incidence is difficult to accurately determine but is generally agreed upon that it is on the increase in most industrialized countries.^{12–15}

Conservative Management of Achilles Tendinopathy: Implications for Chiropractic Care

The approach to the care of this patient was multi-disciplinary under the direction of a chiropractor from the patient's diagnosis, referral for surgery and eventual post-surgical rehabilitation. To the best of our knowledge, this is the first reporting of its kind (i.e., chiropractor as the primary care physician), particularly involving a high caliber athlete/dancer. This may reflect the developing role of chiropractors in the care of elite athletes.¹⁶

A Medline search [1966–2006] using the subject headings “ballet AND chiropractic” revealed no publications under these subject headings. A search of MANTIS [1965–2006] using a similar search pattern revealed one paper in the peer-reviewed chiropractic literature. A paper by Palladino¹⁷ described the care of a ballet dancer with cuboid subluxation and pronation. With respect to Achilles tendon injuries, a Medline search [1965–2006] using the subject headings “Achilles tendon AND chiro-

practic”, “Achilles tendon tear AND chiropractic”, and “Achilles tendinopathy AND chiropractic” (limited to the English language) revealed no publications. A search of MANTIS [1965–2006] using the same subject headings (limited to the Chiropractic Discipline and the English language) revealed the following publications in the peer-reviewed literature. Souza¹⁸ addressed the conservative care of various orthopedic conditions in the lower extremities, including disorders involving the Achilles tendon. Brantingham et al.¹⁹ described the successful chiropractic care (i.e., 70% reduction of pain) of a patient with Achilles tendinopathy following 3 years of failed medical care. Co and Pollard²⁰ described the care of a patient with heel pain due to retrocalcaneal bursitis, Achilles tendonitis, and partial rupture of the tendon. Carter and Carter²¹ are advocates for chiropractic care in a multidisciplinary approach in patients with tendinopathy as did Cook et al.²² Gaymans and Till²³ investigated the efficacy of manipulating the foot and ankle joint fixations compared to placebo in the treatment of chronic Achilles tendonitis. Ramelli²⁴ described the successful chiropractic post-surgical care of a 25 yr-old male to repair a complete Achilles tendon separation. The case presented herein is the second of its kind in the realm of post-surgical rehabilitation following Achilles tendon repair.

Conclusion

This case report provides supporting evidence on the role of chiropractic in a multi-disciplinary setting, particularly in the care of patients with Achilles tendon disorders. We advocate continued documentation in the scientific literature to examine the role of chiropractors in the care of Achilles tendon injuries from the simple sprains/strains to post-surgical rehabilitation.

References

- 1 Vernon HT, Humphreys BK, Hagino CA. A systematic review of conservative treatments for acute neck pain not due to whiplash. *J Manipulative Physiol Ther.* 2005; 28(6):443–448.
- 2 Haas M, Sharma R, Stano M. Cost-effectiveness of medical and chiropractic care for acute and chronic low back pain. *J Manipulative Physiol Ther.* 2005; 28(8):555–563.
- 3 Wasielewski NJ, Kotsko KM. Does eccentric exercise reduce pain and improve strength in physically active adults with symptomatic lower extremity tendinosis? A systematic review. *J Athl Train.* 2007; 42(3):409–21

- 4 Kaikkonen A, Kannus P, Jarvinen M. A performance test protocol and scoring scale for the evaluation of ankle injuries. *Am J Sports Med.* 1994; 22(4):462–469.
- 5 Micheli LJ, Gillespie WJ, Walaszek A. Physiologic profiles of female professional ballerinas. *Clin Sports Med.* 1984; 3(1):199–209.
- 6 Koutedakis Y, Jamurtas A. The dancer as a performing athlete: physiological considerations. *Sports Med.* 2004; 34(10):651–661.
- 7 Quirk R. Common foot and ankle injuries in dance. *Orthop Clin North Am.* 1994; 25(1):123–133.
- 8 Jarvinen TA, Kannus P, Maffali N, Khan KM. Achilles tendon disorders: etiology and epidemiology. *Foot Ankle Clin.* 2005; 10(2):255–266.
- 9 Johansson C. Injuries in elite orienteers. *Am J Sports Med.* 1986; 14:410–415.
- 10 Lysholm J, Wiklander J. Injuries in runners. *Am J Sports Med.* 1987; 15:168–171.
- 11 Kannus P. Etiology and pathophysiology of chronic tendon disorders in sports. *Scand J Sports Med.* 1997; 7(2):78–85.
- 12 Kvist M. Achilles tendon injuries in athletes. *Ann Chir Gynaecol.* 1991; 80(2):188–201.
- 13 Leppilahti J, Puranen J, Orava S. Incidence of Achilles tendon rupture. *Acta Orthop Scand.* 1996; 67(3):277–279.
- 14 Maffulli N, Waterston SW, Squair J, Reaper J, Douglas AS. Changing incidence of Achilles tendon rupture in Scotland: a 15-year study. *Clin J Sport Med.* 1999; 9(3):157–160.
- 15 Houshian S, Tscherning T, Riegels-Nielsen P. The epidemiology of Achilles tendon rupture in a Danish county. *Injury.* 1998; 29(9):651–654.
- 16 Rosenberg HA, Green BN. Contents for chiropractors' athletic event emergency bags. *J Manipulative Physiol Ther.* 2002; 25(9):1–8.
- 17 Palladino J. Cuboid subluxation and pronation in the classical ballet dancer. *Chiropractic Sports Medicine.* 1989; 3(2):38–45.
- 18 Souza T. Conservative management of orthopedic conditions of the lower leg, foot and ankle. *Topics in Clinical Chiropractic.* 1994; 1(2):61–75.
- 19 Brantingham J, Silverman J, Deliman A, Snyder R, Wong J. Chiropractic management of Achilles tendonitis. *J Neuromusculoskeletal System.* 1994; 2(2):52–55.
- 20 Co V, Pollard H. Management of Achilles tendon disorders. A case review. *Australian Chiropractic and Osteopathy.* 1997; 6(2):58–62.
- 21 Carter S, Carter AJ. Chiropractic management of Achilles tendinopathy. *Sports Exercise and Injury.* 1997; 3(3):108–110.
- 22 Cook JL, Khan KM, Purdam C. Achilles tendinopathy. *Manual Therapy.* 2002; 7(3):121–130.
- 23 Gaymans J, Till G. The efficacy of manipulation in the management of Achilles tendonitis. *J Chiropr Educa.* 2003; 17(1):9–10.
- 24 Ramelli FD. Diagnosis, management and post-surgical rehabilitation of Achilles tendon rupture: a case report. *J Can Chiropr Assoc.* 2003; 47(4):261–268.

CanadaHelps.org

Make a donation and help chiropractic

Canadian Chiropractic Research Foundation