



ELSEVIER

Chiropractic management of pediatric plantar fasciitis: a case report

Clinton J. Daniels DC, MS^{a,*}, Adam P. Morrell DC, MS^b

^a Doctor of Chiropractic, Logan College of Chiropractic, Chesterfield, MO 63006-1065

^b Resident, Department of Rehabilitation, Logan College of Chiropractic, Chesterfield, MO 63006-1065

Received 24 February 2011; received in revised form 21 May 2011; accepted 20 June 2011

Key indexing terms:

Manipulation;
Athletic injuries;
Plantar fasciitis;
Chiropractic;
Rehabilitation

Abstract

Objective: The purpose of this report is to present the case of a 10-year-old football player with bilateral plantar fasciitis who improved with a multimodal conservative approach using chiropractic treatment.

Clinical Features: The patient presented with bilateral plantar heel pain at the origin of the plantar fascia with a duration of 3 weeks.

Intervention and Outcome: Treatment was provided for 6 visits over a 6-week period. Chiropractic care consisted of manipulative therapy, soft tissue therapy, and home rehabilitation exercises. The soft tissue technique (Graston Technique) was performed to the origin of the plantar fascia and the triceps surae bilaterally. High-velocity, low-amplitude manipulation was applied to the restricted ankle mortise joint. After 6 treatments, the patient reported resolution of foot pain bilaterally and improvements in activities of daily livings. Three months later, the patient reported no further complications and the absence of pain.

Conclusion: This patient with bilateral plantar fasciitis improved after a course of a multimodal treatment approach using chiropractic manipulation and soft tissue therapy in addition to exercise and stretching therapies.

© 2012 National University of Health Sciences.

Introduction

Musculoskeletal pain is a frequent complaint in childhood, affecting 7% to 15% of school-aged children.¹⁻⁵ Of the children affected with musculo-

skeletal complaints, 28% have a mechanical overuse etiology (chondromalacia patella, mechanical plantar fasciitis, tenosynovitis, muscle pain).¹

Plantar fasciitis or heel pain is a commonly seen condition and can occur among all age groups, sex, ethnicity, or activity levels.^{6,7} It is most frequently seen in overweight male runners (body mass index >25 kg/m²) older than 30 years. Although plantar fasciitis occurs most commonly in the adult population,

* Corresponding author. 3106 Wyoming St, Saint Louis, MO 63118. Tel.: +1 314 600 6677.

E-mail address: clintdanielsdc@gmail.com (C. J. Daniels).

a study of 1000 consecutive pediatric musculoskeletal cases presented this condition as having a prevalence of 8.2%.¹ Plantar fasciitis is considered to be an overuse syndrome. It develops over time, and repeated stress likely plays a role in the etiology. As this stress compounds, it will exceed the body's inherent capacity to repair and adapt, which eventually leads to the failure of ligaments, bones, and muscles.⁵

In young athletes, plantar fasciitis usually corresponds with calcaneal apophysitis and rarely exists by itself.⁸ The calcaneal apophysis serves as attachment for the Achilles tendon superiorly and for the plantar fascia and the short muscles of the sole of the foot inferiorly.^{8,9} The os calcis (calcaneus) secondary center of ossification appears at age 9 years and usually fuses at 16 years old. Pediatric athletes with closed physes will typically present with medial arch or heel pain.^{8,10,11} Symptoms of plantar fasciitis most often occur during weight bearing and may be exacerbated by climbing stairs or weight bearing on dorsiflexed toes. Morning foot pain and stiffness are an additional common complaint. Inflammation is usually secondary to repetitive stretching of the plantar fascia between its origin at the anterior plantar rim of the calcaneus and its insertion into the metatarsal heads. Tenderness is most commonly palpated along the medial edge of the fascia or at its origin on the anterior edge of the calcaneus.^{8,11,12} Activities such as jumping, hill running, or speed work may predispose athletes to a higher risk of developing plantar fasciitis.^{8,10,11} Various anatomical factors such as pes cavus or varus hindfoot may also put the athlete at risk.¹⁰

Plain film radiography typically does not contribute to the diagnosis of plantar fasciitis. Heel spurs may result from this condition; however, spurs are not recognized as the likely pain generator.^{11,13} Treatment of plantar fasciitis in young athletes commonly includes any of the following: rest, ice, Achilles tendon stretching, heel cups, nonsteroidal anti-inflammatory drugs, correcting training errors, orthotics, and steroidal injections.¹⁰ Surgical plantar fascia release may be used in extremely complicated cases.¹²

To our knowledge, only one study has discussed the use of Graston Technique (GT) (Fig 1) in a multimodal approach to plantar fasciitis; but no studies have addressed this approach in the pediatric population.¹⁴ Therefore, the purpose of the study was to describe a multimodal approach to the management of plantar fasciitis in a pediatric patient using Graston instrumented-assisted soft tissue technique, chiropractic extremity manipulation, and an exercise protocol.



Fig 1. Graston Technique instruments and emollient.

Case report

A 10-year-old little league football player presented to the clinic at the Logan College of Chiropractic. At the time of the examination, he was 129 lb and 5'1" tall (body mass index, 24.4 kg/m²). His chief complaint was bilateral plantar foot pain of 3 weeks' duration. The onset of symptoms began at the start of his football season. His football position was lineman; and inherently, he spends the majority of time pushing forward against an opponent weight bearing with his metatarsophalangeal joints dorsiflexed, placing the plantar fascia and triceps surae under tension via the windlass effect.¹⁵ No prior treatment had been administered to treat his foot pain before he presented to the clinic.

His pain was described as worse in the morning and during football practices. The pain would gradually resolve as the day progresses and after football sessions commenced. The verbal rating scale for pain was a 6 of 10, and he described the pain as a sharp sensation. The patient denied any awareness of numbness or tingling. When asked where the pain was located, he pointed to the anteromedial calcaneus and along the plantar fascia bilaterally. There were no observable signs of warmth, erythema, or effusion.

The standard protocol for ankle/foot injuries at the clinic was performed on the initial visit. This consisted of a regional examination including gait assessment, sensory and motor testing, ranges of motion, orthopedic examination, motion palpation, and functional examination. The orthopedic tests included anterior/posterior drawer, medial/lateral stability, Tinel foot, Thompson, Achilles Tap, Buerger test, Homan Sign, and Morton

test. Functional examination at this visit included Modified Thomas and squat movement.^{16,17} Result of motor and sensory testing was within normal limits. All of the above orthopedic tests had a negative result and did not reproduce the patient's chief complaint. Muscle/fascia palpation revealed tenderness of the plantar fascia, most notably at the proximal insertion, as well as tenderness in the triceps surae. Joint motion palpation revealed decreased joint end feel of the ankle dorsiflexion.

Gait examination revealed early heel rise as he was approaching toe-off. The modified Thomas test exposed tight anterior hip flexors on the left. When asked to squat, the patient revealed a faulty pattern wherein the patient elected a movement that was quadriceps dominant, translating the knees forward and raising the heels off the ground. The gait assessment and squat movement pattern are both suggestive of tight triceps surae, which correlate with the palpation of tension and tenderness in these muscles. He was diagnosed with bilateral plantar fasciitis associated with hypertonic triceps surae complex.

Based upon this diagnosis, the patient was treated once a week for 6 weeks. Initially, he was treated with chiropractic manipulation of the ankle mortise bilaterally, GT of the gastrocnemius and soleus muscles (Fig 2), and stretching of the triceps surae and plantar fascia on a wobble board (Fig 3). The patient was instructed to continue the stretching routine at home. During his third office visit, squat retraining and glute-bridging exercises were added to his home exercise program. After 6 treatments, the patient reported verbally that his symptoms were



Fig 2. Graston Technique applied to the gastrocnemius and soleus muscles.



Fig 3. Use of wobble board to enhance stretching of the gastrocnemius muscle.

100% improved and that he was no longer experiencing pain in the morning or during his activities of daily livings (ADLs), such as playing football. He was contacted by phone 3 months later and reported that he had not experienced any exacerbations of pain and that he was independently managing his home exercises (Table 1). The patient's guardian provided consent for this study.

Discussion

The differential diagnosis in plantar foot pain includes plantar fasciitis, stress fracture, sesamoiditis, bursitis, Achilles tendinopathy, tarsal tunnel syndrome, lumbar radiculopathy, and systemic metabolic conditions. Therefore, a thorough workup of the patient with plantar foot pain, including careful neurological examination and assessment of the lumbar spine and lower extremity and its related muscles, is indicated.

Despite plantar fasciitis being a relatively common disorder, little is known about its etiology and pathogenesis.¹⁸ The initiation of conservative treatment soon after the onset of symptoms is assumed to provide cure in the majority of patients by 6 weeks, and more than 90% are cured with nonoperative care by 12 months.^{13,19-23} However, recovery from acute plantar fasciitis is frequently slow and may require consistent

Table 1 Progression of office visit treatments and symptoms

Visit number ^a	Treatment applied	Symptoms
1	Manipulate ankle mortise joint, GT, stretching	Pain 6/10, morning pain, pain affecting ADL (football), palpable tenderness in plantar fascia and gastrocnemius/soleus
2	GT, stretching	Subjective decreased in pain, minimal morning discomfort, pain affecting ADLs (football), palpable tenderness in plantar fascia and gastrocnemius/soleus
3	GT, squat training, glute bridge	Morning pain resolved, pain affecting ADLs (football)
4	GT, squat training, glute bridge	No pain with ADLs (football), palpable tenderness gastrocnemius/soleus, no pain in plantar fascia
5, 6	Manipulation, GT, review home exercise	100% Resolution of symptoms
Follow-up (3 mo)	Independently managing home exercises	No exacerbations

^a All office visits at 1-week increments.

treatment and encouragement by a physician for the duration of symptoms.^{20,23}

A multimodal conservative approach seemed to be effective at resolving the patient's pain and allowing him to return to football. Graston Technique is a procedure used to treat soft tissue problems involving muscles, tendons, ligaments, and nerves. The goal of GT is to release soft tissue tension by lengthening shortened muscles and connective tissue. In addition, GT works to create a controlled inflammatory environment to facilitate the healing process. This patient's plantar fascia and triceps surae were found to be shortened/hypertonic, resulting in pain at the medial calcaneus and into the plantar fascia. The use of GT with joint manipulation and exercise appeared to result in expedited decrease of pain in the plantar fascia.

Graston Technique uses specially designed stainless steel instruments with beveled edges to improve a practitioner's ability to perform soft tissue mobilization. The instruments are used in a multidirectional stroking fashion applied to the skin at a 30° to 60° angle at the treatment site to mechanically mobilize scar tissue, increasing its pliability and loosening it from surrounding healthy tissue. It is hypothesized that, for degenerated connective tissue, GT reinitiates the inflammatory process by introducing a controlled amount of microtrauma to the affected area.²⁴⁻²⁶ Perhaps, the initiation of this controlled microtrauma in an area of scar tissue or excessive fibrosis ultimately results in tissue remodeling through proper alignment of collagen fibers.^{14,27,28} Additional studies have shown clinical efficacy using GT for the treatment of plantar fasciitis, tibialis posterior strain, carpal tunnel syndrome, lumbar compartment syndrome, and trigger thumb.^{14,25,29-31}

Grade 5 high-velocity, low-amplitude manipulation was applied to the talocrural (ankle mortise) joint in an effort to alleviate perceived restriction of dorsiflexion movement as assessed by motion palpation.³²⁻³⁵ Glute-bridging exercise, squat movement pattern correction, and triplanar gastrocnemius/soleus stretching were integrated into the patient's treatment protocol to promote normal tissue function and flexibility.³⁶

Most manipulative therapy applied to the foot and ankle disorders is delivered as multimodal therapy, blending exercise, soft tissue treatment, modalities, or multiple extremity joint and/or combined spinal and extremity joint manipulative therapy, and is usually condition and patient specific.³² The use of conservative methods, with a stretching protocol that is regarded as the mainstay of nonoperative treatment, alleviates the condition in most patients.³⁷ It appears that manipulative therapy with stretch is superior to either therapy alone in increasing range of motion.³²

The authors hypothesize that the patient's mechanism for perceived benefit included improved mobility of the plantar fascia, ankle mortise joint, and gastrocnemius/soleus through the application of joint manipulation, GT, and stretching routine. In addition, it is believed that squat training and glute-bridging exercises enabled the patient to engage an improved motor pattern and decrease strain on the affected area.

To the best of our knowledge, this is the first report to review the use of GT and joint manipulation on a pediatric patient with plantar fasciitis. Further research in the form of additional case reports, case series, or small-scale clinical trials could add evidence to the literature about these treatments and better demonstrate their efficacy within a pediatric population.

Limitations

Lack of objective outcome measurements throughout the case is a fault of this report. Recognizing the natural history of plantar fasciitis, it is possible that the patient's outcome was due to spontaneous remission and not the intervention that was provided. The treatment of this case was multimodal; there is no way to determine the extent to which any individual treatment modality may or may not have contributed to the perceived beneficial outcome. The findings from one patient may not necessarily be applicable to others.

Conclusions

The case report describes a conservative approach for the management of a pediatric patient experiencing plantar fasciitis. In this patient's case, the combination of joint manipulation, GT, and a targeted home exercise program seemed effective.

Acknowledgment

The authors thank Dr Miranda Davis, DC, for her contribution to this manuscript.

Funding sources and potential conflicts of interest

No funding sources or conflicts of interest were reported for this study.

References

- Inocencio J. Musculoskeletal pain in primary pediatric care: analysis of 1000 consecutive general pediatric clinic visits. *Pediatrics* 1998;102.
- Vital and health statistics. Patient's reasons for visiting physicians: National Ambulatory Medical Care Survey, US 1977-78. DHHS publication 82-1717. Hyattsville, MD: National Center for Health Statistics; 1981.
- Øster J, Nielsen A. Growing pains: a clinical investigation of a school population. *Acta Paediatr Scand* 1972;61:329-34.
- Naish J, Apley J. Growing pains: a clinical study of non-arthritic limb pains in children. *Arch Dis Child* 1951;26:134-40.
- Goodman J, McGrath P. The epidemiology of pain in children and adolescents: a review. *Pain* 1991;46:247-64.
- Costa I, Dyson A. The integration of acetic acid iontophoresis, orthotic therapy and physical rehabilitation for chronic plantar fasciitis: a case study. *J Can Chiropr Assoc* 2007;51(3):166-74.
- Kahn J. Principles and practice of electrotherapy. New York: Churchill Livingstone; 1987.
- Omey M, Micheli L. Foot and ankle problems in the young athlete. *Med Sci Sports Exerc* 1999;31(7):S470-86.
- Mafulli N. Intensive training in young athletes. *Sports Med* 1990;9:229-43.
- Schepesis A, Leach R, Gorzyca J. Plantar fasciitis: etiology, treatment, surgical results, and review of the literature. *Clin Orthop* 1991;266:185-96.
- Teitz CC. Sports medicine concerns in dance and gymnastics. *Pediatr Clin North Am* 1982;29:1399-421.
- Furey J. Plantar fasciitis: the painful heel syndrome. *J Bone Joint Surg* 1975;57(A):672.
- Neufield S, Cerrato R. Plantar fasciitis: evaluation and treatment. *J Am Acad Orthop Surg* 2008;16:338-46.
- Looney B, Srokose T, Fernandez-de-las-Penas C, Cleland J. Graston instrument soft tissue mobilization and home stretching for the management of plantar heel pain: a case series. *J Manipulative Physiol Ther* 2011;34(2):138-42.
- Carlson R, Fleming L, Hutton W. The biomechanical relationship between the tendon Achilles, plantar fascia and metatarsophalangeal joint dorsiflexion angle. *Foot Ankle Int* 2000;21(1):18-25.
- Harvey D. Assessment of the flexibility of elite athletes using the modified Thomas test. *Br J Sports Med* 1998;32(1):68-70.
- Magee D. Orthopedics of physical assessment. 5th ed. St. Louis: Elsevier; 2008. p. 692-3.
- Wearing S, Smeather J, Urry S. The pathomechanics of plantar fasciitis. *Sports Med* 2006;36:585.
- Rompe J, Cacchio A, Weil L, Furia J, Haist J, Reiners V, et al. Plantar fascia-specific stretching versus radial shock-wave therapy as initial treatment of plantar fasciopathy. *J Bone Joint Surg Am* 2010;92:2514-22.
- Davis P, Severud E, Baxter D. Painful heel syndrome: results of nonoperative treatment. *Foot Ankle Int* 1994;15:531-5.
- Buchbinder R. Clinical practice. Plantar fasciitis. *N Engl J Med* 2004;350:2159-66.
- Singh D, Angel J, Bentley G, Trevino S. Fortnightly review. Plantar fasciitis. *BMJ* 1997;315:172-5.
- Toomey E. Plantar heel pain. *Foot Ankle Clin* 2009;14(2):229-45.
- Hammer W. The effect of mechanical load on degenerated soft tissue. *J Bodywork Move Ther* 2008;12:246-56.
- Howitt S, Jung S, Hammonds N. Conservative treatment of a tibialis posterior strain in a novice triathlete: a case report. *J Can Chiropr Assoc* 2009;53(1):23-31.
- Carey M. Graston technique instruction manual; 2001. Indianapolis, IN.
- Davidson C, Ganion L, Gehlsen G, et al. Rat tendon morphological and functional changes resulting from soft tissue mobilization. *Med Sci Sports Exerc* 1997;29:313-9.
- Gehlsen G, Ganion L, Helfst R. Fibroblast responses to variation in soft tissue mobilization pressure. *Med Sci Sports Exerc* 1999;31:531-5.
- Burke J, Buchberger D, Carey-Loghmani M, et al. A pilot study comparing two manual therapy interventions for

- carpal tunnel syndrome. *J Manipulative Physiol Ther* 2007;30:50-61.
30. Hammer W, Pfefer M. Treatment of a case of subacute lumbar compartment syndrome using the Graston technique. *J Manipulative Physiol Ther* 2005;28:199-204.
 31. Howitt S, Wong J, Zabukovec S. The conservative treatment of trigger thumb using Graston techniques and active release techniques. *J Can Chiropr Assoc* 2006;50:249-54.
 32. Dananberg H. Manipulation of the ankle as a method of treatment for ankle and foot pain. *J Am Podiatr Med Assoc* 2004;94(4):395-9.
 33. Dananberg H, Shearstone J, Guiliano M. Manipulation method for treatment of ankle equinus. *J Am Podiatr Med Assoc* 2000;90(8):385-9.
 34. Dimou E, Brantingham J, Wood T. A randomized, controlled trial (with blinded observer) of chiropractic manipulation and Achilles stretching vs orthotics for the treatment of plantar fasciitis. *J Am Chiropr Assoc* 2004;41:32-42.
 35. Kavcic N, Grenier S, McGill S. Determining the stabilization role of individual torso muscles during rehabilitation exercises. *Spine* 2004;29(11):1254-65.
 36. Brantingham J, Globe G, Pollard H, Hicks M, Korporaal C, Hoskins W. Manipulative therapy for lower extremity conditions: expansion of literature review. *J Manipulative Physiol Ther* 2009;32:53-71.
 37. Rompe J, Schoellner C, Bernhard N. Evaluation of low-energy extracorporeal shock-wave application for treatment of chronic plantar fasciitis. *J Bone Joint Surg Am* 2002;84-A(3):335-41.