Research

Conservative Treatment of Chronic Traumatic Ankle Arthropathy: A Case Report

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Abstract

Introduction: This paper reports on a 47-year-old Caucasian female who presented to a chiropractic college teaching clinic with pain and unresolved functional deficits from an untreated traumatic calcaneal fracture of 10 years duration diagnosed by radiograph.

Case Presentation: The patient had altered gait, range of motion deficits in the right ankle, hypesthesia and weakness in the right lower leg, and sacroiliac joint pain provoked with lumbar ranges of motion and orthopedic testing. The chiropractic diagnosis was traumatic right ankle arthropathy, pain in the right ankle, myalgia of the right lower extremity, as well as lumbosacral joint dysfunction.

Intervention and Outcomes: Conservative treatment included chiropractic manipulation of the lower extremity and lumbosacral spine, acupuncture in the right ankle region for pain control, soft tissue techniques including myofascial release and instrument-assisted soft tissue mobilization, adjunctive therapies (heat, interventional current and ice massage) and rehabilitative exercises. Outcome measures included the numerical rating scale (NRS) for pain, the Lower Extremity Functional Scale (LEFS), and the Revised Oswestry. The patient attained clinically significant improvement in her NRS and LEFS scores.
Discussion: Untreated traumatic structural changes in the calcaneus can produce chronic pain, inflammation and adhesions along with restricted movement resulting in arthropathy. A combination of conservative therapies and rehabilitation was successful in reducing functional deficits and pain in this patient.

Introduction

Heel pain is a common presenting symptom in a chiropractic office, which is often attributed to mechanical etiology, including fracture. Presenting fractures of the calcaneus are more often a result of chronic repetitive force (stress fracture) than acute injury and result in pain with weight bearing activities.\(^1\) The calcaneus is the most frequent fracture of the tarsals, with the calcaneal tuberosity accounting for only 1-3% of all calcaneal fractures.\(^2,3\) Posterior calcaneal tuberosity fractures are more likely the result of an avulsion fracture; however, traumatic blunt force to the region may also produce a fractured fragment.\(^4\)

The most common intervention for a posterior calcaneal tuberosity fracture involves surgical techniques with hardware to manage the pull on this region from the Achilles tendon. Post-surgery, a period with protected weight-bearing protocols may optimize fracture healing while avoiding displacement.\(^5\) If left untreated, calcaneal fractures may not heal properly due to weight-bearing and lack of vascularization to the posterior aspect of the calcaneus. In addition, they result in chronic pain in an area demonstrated to negatively impact general quality of life with distinct patterns of disability.\(^6\)

There are many non-surgical treatment options for manual therapy practitioners to use for pain associated with chronic musculoskeletal dysfunction. These include mobilization of joints and soft tissue, thermotherapy, cryotherapy, ultrasound, electric stimulation, acupuncture and therapeutic exercise.\(^7-9\) The purpose of this case report is to present clinical findings and a conservative management approach of a patient with an unresolved calcaneal fracture of 10 years duration. Consent was provided by the patient to publish her health information in this format along with institutional review board approval.

Case Presentation

The patient, a 47-year-old Caucasian female, presented to a chiropractic college teaching clinic with a primary complaint of right ankle pain of 10 years duration. The initial injury was a result of a blunt force trauma due to impact with a sledgehammer, which created a fracture of her right calcaneus. She did not seek treatment at the time of injury. Recent radiographs suggested a fibrous reattachment of the fragment with a structural change to the calcaneus. Though she sought treatment more recently prior to presenting to this clinic, only anti-inflammatories and pain medication had been offered. The patient preferred to avoid use of regular medications, whether prescription or over-the-counter pain relievers or anti-inflammatories. She had not had any other injuries to the ankle. She did admit to concomitant lumbar pain and problems with balance.

Upon initial presentation, the patient complained of right ankle pain rated 5/10 on average with a variation of 3/10 to 10/10 at its worst (with 0 being no pain and 10 being worst pain possible on the numerical rating scale (NRS)). Wearing high-heel shoes could increase her pain to 10/10 and exacerbations could last for several days afterward. Prolonged standing and walking were provocative, and rest was palliative. She described the pain as constant, cramping, aching and burning from her mid-
calf down to her toes on her right lower extremity. She was limited functionally in her ability to perform activities of daily living including getting in and out of a car or bathtub, standing for prolonged periods, squatting, running, walking more than 2 blocks, and going up and down stairs. Her lower extremity functional scale (LEFS) was scored at 48.7% of full function.

The patient had three radiographs (lateral, AP and oblique) of her right ankle. The radiographs revealed a large calcaneal enthesophyte as well as a large fragment at the posterior superior calcaneal tuberosity (Fig. 1). The fragment measured 18.7mm by 7.4mm with much smaller fragments superiorly. The fragment was closely approximated to the calcaneus with sclerotic and irregular borders indicating significant chronicity. The large fragment was joined to the calcaneus by a fibrous union and appeared stable.

Fig. 1. Lateral radiograph of the right ankle demonstrating chronic arthropathy from an unresolved calcaneal fracture of 10 years duration.

Examination findings revealed an altered gait favoring her right leg with her right hip externally rotated. Local deformity from the exostosis noted on radiograph was visible on the posterior calcaneus. No pes cavus, pes planus, edema or color changes were noted in the right lower extremity. Her dorsalis pedis and posterior tibialis pulses were normal bilaterally. Vitals were normal except for an elevated body mass index of 38.4. The patient had tenderness throughout the right lower leg with her right ankle
region particularly hypersensitive over the Achilles tendon and the lateral malleolus. The patient had significantly reduced dorsiflexion of the right ankle measured at 5 degrees compared to the left at 20 degrees. She had reduced eversion, inversion and toe extension with a 5-10 degree decrease from right to left.

Orthopedic testing revealed inability to perform both heel and toe walking bilaterally due to lack of strength as well as pain on the right foot and ankle. Anterior and posterior drawer tests, Thompson’s test and the inversion/eversion stress tests for the ankle were negative bilaterally. The squeeze test of the metatarsals was provoking on the right side to the plantar surface under the 3rd through 5th metatarsals.

Neurological testing found hypesthesia from L4 to S1 on the right and the patient commented, “it felt like a knife was slicing the leg open with the pinwheel”. Deep tendon reflexes for the patellar and Achilles reflexes were graded 2+ bilaterally. Muscle testing of the lower extremity including psoas, hip abductors, hip adductors, hamstrings, and extensor hallucis longus were 5/5 bilaterally. Rectus femoris and tibialis anterior on the right were graded 4/5 and on the left 5/5. Resisted ranges of motion for plantar flexion, dorsiflexion, eversion and inversion of the ankles were graded 4/5 on the right and 5/5 on the left. Romberg’s revealed a slight clockwise sway, and the patient indicated she felt very unbalanced with her eyes closed.

Examination of the lumbopelvic region revealed tenderness at the right posterior superior iliac spine (PSIS) along with an extension restriction of the right sacroiliac joint. The patient had decreased lumbar ranges of motion with pain in the right SI joint upon flexion, extension and left lateral flexion. Bilateral rotation and right lateral flexion in the lumbar spine were within normal limits and non-provoking. Gaenslen’s and Yeoman’s on the right were provocative for pain in the right sacroiliac joint, in addition to Double Leg Raise. Ely’s and Hibb’s were negative. Spinal restrictions were palpated in the upper lumbar region. Her Revised Oswestry Low Back Pain and Disability Index (ODI) score was 16% disability (mild).

The main findings of the examination were altered gait, range of motion deficits in the right ankle, hypesthesia and weakness in the right lower leg, and sacroiliac joint pain provoked with lumbar ranges of motion and orthopedic testing. The patient was diagnosed with chronic post-traumatic right ankle arthropathy, pain in the right ankle, myalgia of the right lower extremity, as well as lumbosacral joint dysfunction. The initial focus of treatment was to decrease pain and improve range of motion for the right ankle and lumbosacral region using a multi-faceted approach to address the patient’s neuromusculoskeletal dysfunction.

**Intervention and Outcomes**

As part of the initial treatment, acupuncture was incorporated for pain control in the right ankle region. Lumbosacral and right ankle joint mobilization and soft tissue techniques including targeted stretching, myofascial release and instrument-assisted soft tissue mobilization (ISTM) were applied to the patient’s tolerance to improve joint mobility. Acupuncture was utilized locally at the right ankle at three of the first four visits to control pain. Thermotherapy and a five to ten minute stationary bicycle warm-up was used to soften tissues prior to soft tissue techniques and chiropractic adjustments; and interferential current along with ice massage was used post-treatment to help reduce inflammation and minimize bruising. The patient was prescribed exercises for the lower extremities including the alphabet
exercise, toe flexion/grab, ankle pump, one legged standing in a doorway, plantar fascia stretching and at-home ice massage. She was progressed to more challenging stretching, strengthening and balance exercises as her symptoms improved. Ultimately her treatment included high-velocity, low amplitude adjusting of her ankle joints and lumbosacral spine to restore global and segmental range of motion.

The patient was initially seen twice per week for six weeks. After six weeks the patient started a new job and reduced her treatments to once per week or once every other week. A new position as a child-day-care worker involved standing on her feet, lifting, and carrying, which intermittently exacerbated both her right lower leg and lumbosacral complaints. The total course of treatment for this patient lasted ten months. She was released from care for meeting maximal medical improvement (MMI).

At her final re-examination, the patient’s LEFS had increased from 48.7% (39/80) to 77.5% (62/80) of maximal function (minimal detectable change is 9 points). Her ODI score was 10%, decreased from 16%. The patient’s NRS for the right ankle and lumbar spine was 0/10, with average pain rated at 1/0, 0/10 at best, and 10/10 at worst, although she admitted she had not had 10/10 pain in a significant amount of time. A pain improvement of 4 represents a minimally clinical important change for chronic musculoskeletal pain intensity. She stated that the right ankle pain she experienced at the end of the day was greatly reduced, and she was able to walk and chase after children at the day care without being hindered by pain. She also felt that her sense of balance was greatly improved.

The patient’s follow-up neurological exam showed lower extremity sensory, motor and reflexes all normal bilaterally. Active ankle ranges of motion were full and non-provoking bilaterally. Resisted ranges of motion in the right ankle were 5/5 but pain was provoked with resisted plantar flexion on the right localized to the posterior aspect of the calcaneus. The patient was able to perform both heel and toe walk within 5 months of starting treatment, but continued to have pain in the right calcaneus with toe walking. Lumbar active ranges of motion were full with some provocation of pain with extension, left lateral flexion and left rotation in the left lumbar region.

**Discussion**

The recommended treatment for non-displaced calcaneal fractures in the acute stages is nonsurgical with cast immobilization. Larger fragments warrant open reduction and internal fixation. Untreated calcaneal fractures can be a source of significant pain, functional impairment and disability as well as complications such as compartment syndrome of the lower leg and foot with neurovascular dysfunction and deformities. Unresolved fractures may respond to late surgical intervention, but risks include those associated with surgery and wound healing. Without surgical intervention, patients may experience biomechanical changes that lead to additional lower extremity musculoskeletal dysfunction, altered gait patterns and adhesions in soft tissue.

There are other causes for posterior heel pain that include Achilles tendinopathy, retrocalcaneal bursitis, Haglund deformity, posterior ankle impingement, neuroma, Achilles tendon ossification, compartment syndrome of the lower leg, osteomyelitis and systemic inflammatory disease. These causes in this case could be ruled out as primary diagnoses based on the radiographic findings as well as the known trauma. Due to the chronicity of the patient’s biomechanical and structural alteration, these differentials may have also been considered as co-existing conditions that would warrant similar treatment, but could also include co-management or referral to other specialists such as an orthopedic surgeon. Pharmacological management would include corticosteroids and non-steroidal anti-inflammatory
drugs.\(^9\) Magnetic resonance imaging (MRI) would have been indicated if the patient did not experience improvement or if treatment exacerbated her condition.\(^8\) MRI may have helped to diagnose co-existing conditions, specifically in the soft tissue of the ankle and foot.

There is no proven conservative approach for an unresolved fracture of the calcaneus. This case report presented the clinical findings and chiropractic management of a patient who had not sought medical care beyond radiographs and pain control for ongoing pain and functional deficits from an unresolved posterior calcaneal tuberosity fracture. Her residual symptoms had significant improvement with the utilization of chiropractic, acupuncture, and rehabilitative therapies.

The use of medical acupuncture to decrease initial pain was found useful in the conservative management of Achilles tendinopathy and was also found to decrease pain this case.\(^8\) Mobilization and manipulation of the joints and soft tissue in the calcaneal region is theorized to help decrease pain through improvement in circulation, mobility, function and stimulation of mechano-receptors in joints.\(^15\)\(^\text{-}\)\(^17\) ISTM, in particular, has demonstrated clinical efficacy for a variety of soft tissue disorders with similar symptomology to induce healing with controlled microtrauma that encourages fibroblastic proliferation.\(^7\)\(^\text{-}\)\(^9\),\(^18\) This fibroblastic stimulation has the potential to physiologically and structurally improve the alignment of collagen fibers in the soft tissue with the use of ISTM.\(^7\),\(^19\)

Rehabilitative therapies including stretching and balance exercises for patients with posterior heel or ankle pain have also been reported as favorable in the literature.\(^8\) A randomized control trial found that patients receiving a combination of self-stretching and soft tissue interventions resulted in a greater improvement in physical function with a greater reduction in pain compared to only a self-stretching protocol for plantar heel pain.\(^6\) Case reports with similar pain presentations also supported the use of soft tissue techniques combined with targeted stretching, strengthening and balance and proprioceptive training programs to help restore tensile strength to connective tissue and prevent re-injury.\(^7\),\(^9\),\(^19\),\(^20\) Functional taping would have been another option to promote healing, stability, facilitate neuromuscular rehabilitation, and reduce pain but was not used with this patient.\(^21\) The patient’s presenting symptoms improved while undergoing a non-invasive, non-pharmacological treatment approach.

A single case study cannot suggest the management approach for all unresolved calcaneal fractures or arthropathies resulting from such, although a conservative approach should be considered before more invasive procedures are pursued in patients with similar case presentations. The range of therapy approaches may be considered a limiting factor in understanding what therapy or combination of therapies would have had the most significant effect. The length of treatment time for this patient was very drawn-out due to the occupation and availability of the patient. Additionally, with the lack of vascularity to the posterior heel and specifically to the Achilles tendon, prolonged inflammation and delayed healing for that region may be expected.\(^8\)

Ultimately, the goal of treatment was to improve tissue and joint function through reducing tissue stiffness, fibrosis and adhesions in the posterior lower leg that could be contributing to the patient’s pain and ongoing biomechanical dysfunction. Untreated traumatic structural changes can produce chronic pain, inflammation and adhesions along with restricted movement resulting in arthropathy. A combination of conservative therapies and rehabilitation was successful in reducing functional deficits and pain in this patient.
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References


