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# **JIANM**

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## The Editor's Desk

Shawn M. Neff, DC, MAS, FACO  
Editor-in-Chief



Welcome to the December 2020 issue of the Journal of the International Academy of Neuromusculoskeletal Medicine. I want to take the opportunity to thank all of you for your patience. In 2021 we will be shifting to a biennial release from our previous quarterly schedule. We will be working to finish the recovery of the lost archive issues and hope to have that completed before the summer 2021 issue is released.

We at the journal rely on you to not only read the research in the journal but also to produce the research. We look forward to helping you bring your studies, case reports and literature reviews to the profession to benefit the care provided to our patients.

Thank you as always to the dedicated editorial staff, editorial advisory board, and editorial review board, without your contributions we could not produce this journal. I also would like to say a special thanks to a group of doctors who acted as guest peer reviewers on this issue, the VA chiropractic residents, Hannah Tobiczky, DC, Margaret Sels, DC, Morgan Price, DC, M. Connor Jordan, DC, Casey Rogers, DC, Brian Davis, DC, Charbel Medlej, DC, and Brent Young, DC.

I hope you all enjoy this issue.

Sincerely,

-Shawn

## Alternative Management of Plantar Fasciitis: A Case Report

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### Abstract

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**Objective** To discuss the management of chronic plantar fasciitis in 44 year-old female using a multimodal treatment approach, including cupping therapy.

**Clinical Features** A 44-year-old female presented to a hospital-based chiropractic clinic with a chief complaint of bilateral plantar fasciitis. Due to the nature of the patient's occupation, she stood for 12-14 hours at a time and had not found relief with traditional plantar fasciitis management strategies.

**Intervention and Outcomes** The use of cupping therapy, in combination with instrument assisted soft tissue manipulation and manipulative therapy for plantar fasciitis management provided in a hospital-based chiropractic clinic resulted in subjective improvements in pain

during weight bearing and ambulation. Treatment occurred 2 times per month for two months, and then once every 6 weeks for 12 weeks, for a total of 6 visits

**Conclusion** The use of a non-traditional management strategy, including moving cupping, resulted in symptomatic relief and improved activity tolerance for a 44-year old female with chronic plantar fasciitis. This report provides a case for the use of alternative management strategies and suggests the need for further research in this area.

Key words: plantar fasciitis, chiropractic, manual therapy, cupping therapy

## Introduction

Plantar fasciitis is one of the most common causes of heel pain, affecting approximately 10% of the US population<sup>2,5</sup>. This condition is usually self-limiting; however, approximately 2/3 of patients with this diagnosis will seek care from an office-based physician<sup>3,10</sup>, with the other 1/3 seeking care from orthopedic surgeons<sup>10</sup>. Risk factors for developing plantar fasciitis include obesity, prolonged standing, inappropriate foot overpronation (pes planus) and excessive running<sup>3,5</sup>. Diagnosis of plantar fasciitis is largely based on history and physical examination, with most patients reporting heel pain during their first steps each morning or upon ambulation following prolonged sitting. Physical examination often demonstrates tenderness to palpation at the medial plantar calcaneal region, where the plantar fascia originates on the calcaneus<sup>3</sup>, as well as pain with active range of motion of the foot, specifically with dorsiflexion and plantarflexion. Plain film foot imaging is not necessary for diagnosis; however, diagnostic ultrasound and MRI may be obtained to rule out other conditions such as new bone formation or bone pathology<sup>3,9</sup>. Initial management strategies of this condition include rest, activity modification, ice massage, oral analgesics, and stretching of the plantar fascia and calf<sup>1,3,5</sup>. If pain persists, secondary

management strategies may include physical therapy modalities such as manual therapy and intrinsic foot muscle strengthening<sup>11</sup>, foot orthotics, night splinting, and corticosteroid injections<sup>3,5</sup>. It has been suggested that 90% of patients will improve with conservative therapy; however, patients with pain lasting longer than 6 months may consider extracorporeal shock wave therapy or surgical intervention via plantar fasciotomy as a last resort<sup>3,4</sup>.

Cupping therapy is an ancient therapeutic intervention, with many proposed mechanisms of action<sup>12</sup>. During a traditional cupping therapy treatment, a glass, plastic or bamboo cup is placed directly on the skin over a painful area or over an acupuncture point<sup>14</sup>, and then a suction mechanism is applied to draw the skin into the cup. There are several major types of cupping therapy<sup>16</sup>; descriptions of each type are described in Table 1<sup>16</sup>.

**Table 1**

| Type                                                                        | Description                                                                                                                                                |
|-----------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Retained cupping</b> <sup>16</sup>                                       | Basic suction mechanism where the cup is placed directly on the skin and suction is created by either heat or an air-tight pumping mechanism <sup>16</sup> |
| <b>Bleeding cupping</b><br><b>(also known as wet cupping)</b> <sup>16</sup> | A two-step process where a small incision is made in the skin before the suction mechanism is applied to a cup placed over the incision <sup>16</sup>      |
| <b>Moving cupping</b> <sup>16</sup>                                         | The practitioner gently moves the cup along the skin while the suction is applied to the area <sup>16</sup>                                                |
| <b>Empty cupping</b> <sup>16</sup>                                          | Cups are placed on the skin under suction and then immediately removed <sup>16</sup>                                                                       |
| <b>Needle cupping</b> <sup>16</sup>                                         | Acupuncture needle is inserted into the skin at a specific point and then a cup is placed over the inserted needle <sup>16</sup>                           |

**Medicinal (herbal) cupping<sup>16</sup>**

Practitioner uses a bamboo cup and boils the cup with herbal substances for therapeutic benefit before applying the cup to the skin<sup>16</sup>

There is little evidence demonstrating the use of cupping therapy for the management of plantar fasciitis. This is a case report describing an instance in which symptomatic relief and improved activity tolerance were achieved following a non-traditional treatment plan including moving cupping.

**Case Report**

A 44-year-old female presented to a hospital-based chiropractic clinic for evaluation of chronic bilateral plantar fasciitis, beginning 18 months prior with insidious onset. The pain was located at the plantar surface of the feet and calcanei bilaterally, with the right foot notably more painful than left. The pain was described as a constant burning and aching and, worse with the first few steps each morning. The condition was exacerbated by prolonged walking and standing, necessitated by the patient's occupation as a nurse. Functional limitations included inability to efficiently ambulate to codes in the hospital due to foot pain. Significant past medical history included obstructive sleep apnea, umbilical hernia, mixed hyperlipidemia, low back pain, Vitamin D deficiency, hypothyroidism and obesity. At the time of evaluation, there were no imaging studies pertinent to the patient's complaint available for review.

Previously trialed interventions included over-the-counter non-steroidal anti-inflammatory medications, compression stockings, Epsom salt bath soaks, as well as rolling her feet on a tennis ball and a frozen water bottle. She also reported a trial of topical camphor and menthol-based creams, none of which provided substantial or long-term symptom relief.

Her vital signs were grossly within normal limits (temperature: 98.1°F, pulse: 71 beats per minute, blood pressure: 121/81 mmHg, POX: 99%, height: 68 inches, weight: 288.6lbs, BMI



43.97). Physical examination and inspection demonstrated the skin of bilateral lower extremities to be warm, dry, and intact. There was no evidence of pes planus or pes cavus. There was tenderness to palpation along the longitudinal arches of both feet, with heel tenderness noted bilaterally but predominantly right-sided. There was decreased dorsiflexion at the talus bilaterally. Ankle stability testing was not demonstrative of ligamentous laxity. No bruising, edema or erythema was noted. Dorsal pedis and posterior tibial pulses were 2+ bilaterally. Myotomes were graded 5/5 for dorsiflexion (L4), plantarflexion (S1), and great toe extension (L5), bilaterally. Light touch sensation was grossly intact over bilateral lower extremities. Deep tendon reflexes were graded +2 at patellar (L4) and Achilles (S1) bilaterally. Laboratory testing was significant for triglycerides (high, value: 175 mg/dL, reference range (rr): 0.0 -150.00), LDL (high, value: 113 mg/dL, rr: 0.0-100) , HDL (low, value: 38 mg/dL, rr: 40-110) , CO2 ( low, value: 21 mmol/L, rr: 23-32), Vitamin D (low, value: 19 ng/mL, rr: >= 30); all other comprehensive metabolic panel (CMP), complete blood count (CBC), and urinalysis (UA) laboratory values were unremarkable.

Treatments, outcome, and subjective report at each clinic visit are listed in Table 2 below.

**Table 2**

| VISIT NUMBER |     | SUBJECTIVE REPORT PRIOR TO TREATMENT | TREATMENT*                                                                                                                                             | OUTCOME*                                                                                                                                                                                                        |
|--------------|-----|--------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1            | n/a |                                      | <ol style="list-style-type: none"> <li>1. IASTM plantar surface of bilateral feet, 8 minutes</li> <li>2. Right talus extremity manipulation</li> </ol> | <ol style="list-style-type: none"> <li>1. Immediate reduction of pain with ambulation per subjective report</li> <li>2. Improved ROM upon visualization of foot with dorsiflexion and plantarflexion</li> </ol> |

|                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                 |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 2                                                                                                                                                                                                                                              | Patient noted only temporary reduction of bilateral foot pain following visit 1                                                                                                                                                        | <ol style="list-style-type: none"> <li>1. Retained cupping therapy at plantar aspect of calcaneus bilaterally, 8 minutes</li> <li>2. IASTM plantar surface of the feet bilaterally, 8 minutes</li> </ol>                                                                        | <ol style="list-style-type: none"> <li>1. Reduction in pain with standing and ambulation noted in clinic</li> </ol>                                                                                                                             |
| 3                                                                                                                                                                                                                                              | Patient reported significant relief of foot pain for three days and reported that she was able to reduce frequency and quantity of NSAID consumption following treatment due to reduction of pain and improved ability to ambulate     | <ol style="list-style-type: none"> <li>1. Moving cupping therapy over bilateral calcaneal region, 8 minutes</li> </ol>                                                                                                                                                          | <ol style="list-style-type: none"> <li>1. Patient's subjective report included the following statement "that feels amazing"; upon standing, pain in left heel was abolished and only mild pain in right heel notable with ambulation</li> </ol> |
| 4                                                                                                                                                                                                                                              | Patient noted mild plantar fascia pain after working three, 12-hour shifts; however, subjective pain score remained at 8/10, rather than 10/10; frequency of NSAID usage continued to decrease                                         | <ol style="list-style-type: none"> <li>1. Moving cupping therapy, bilateral heels, calcaneal region, 8 minutes</li> </ol>                                                                                                                                                       | <ol style="list-style-type: none"> <li>1. Less pain with weight bearing and ambulation immediately following treatment</li> </ol>                                                                                                               |
| <p>She was able to walk for longer periods of time at work with less discomfort. She reported that she was able to run to a code in the hospital due significant improvement in her symptoms. Previously she was unable to run due to pain</p> |                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                 |
| 5                                                                                                                                                                                                                                              | Patient presented with increase in discomfort after not being seen for 6 weeks due to work schedule. She noted her usual presentation of bilateral heel pain, along with tightness along the tibialis anterior musculature bilaterally | <ol style="list-style-type: none"> <li>1. Moving cupping therapy , bilateral heels, calcaneal region, 8 minutes</li> <li>2. IASTM bilateral tibialis anterior, 8 minutes</li> <li>3. Discussed home-exercise program (HEP) of gastrocnemius and hamstring stretching</li> </ol> | <ol style="list-style-type: none"> <li>1. Less pain with walking in clinic</li> <li>2. Immediate relief upon standing and weight bearing in clinic</li> </ol>                                                                                   |

|   |                                                                                                                                                                                                                                                                                                                                       |                                                                         |                                                  |
|---|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------|--------------------------------------------------|
| 6 | Patient presented to clinic after 6 weeks of not being seen. She reported that she continued to do self-care as listed above. She admitted to not routinely doing home exercises. She stated that cupping therapy provided the more substantial relief than self-care measures. First steps in the morning were not nearly as painful | 1. Moving cupping therapy, bilateral heels, calcaneal region, 8 minutes | 1. Reduction in pain during ambulation in clinic |
|---|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------|--------------------------------------------------|

\* In the treatment column, treatment listed as “1” was the first treatment performed at the visit, with the outcome of that treatment listed as “1” in the outcomes column. Each additional therapy provided follows numerical value as described in the same manner.

The patient continued to present to clinic on an as needed basis, noting subjective improvement in pain and activity tolerance following each cupping therapy treatment. The relief following treatment lasted as long as several weeks. Lower extremity functional score assessments were not obtained from the patient; however, her subjective report and improvement in function with ADLs were most notable.

## Discussion

This case described the use of cupping as part of a multimodal treatment plan to manage chronic plantar fasciitis. Cupping therapy represents a non-invasive option for management of a condition responsible for approximately 600,000 visits to primary care providers each year, affecting approximately 10% United States of the population<sup>5</sup>.

Cupping therapy has been used to treat a number of conditions including low back pain, headache and dermatologic conditions<sup>7</sup>, with the most significant evidence supporting its use for pain management<sup>8</sup>. It has been proposed that the vacuum created by cupping promotes circulation at the location of cup placement, and that this phenomenon results in symptom modification<sup>6</sup>. Another theory is that cupping therapy lifts connective tissue and loosens adhesions<sup>8</sup>, reducing peripheral nociception. Research regarding the use of cupping therapy for plantar fasciitis is limited; however, one group compared dry cupping therapy to electrical

stimulation, noting no significant difference between treatments in management of plantar fasciitis pain<sup>6</sup>. In this case moving cupping was utilized, which consisted of placing PerformanceHealth™ “deep prep” emollient on the skin, applying the suction mechanism to the cup (“**MMT Professional 17 Piece Cupping Set with Pump Gun**”, 1.37” and 1.18” cup sizes were used) and then actively gliding the cup longitudinally along the plantar surface of the foot and along the medial, posterior and lateral aspects of the calcanei bilaterally. The speed of the glide was consistent throughout treatment. Differential diagnoses of heel pain are discussed in Table 3<sup>5</sup> and are important to consider when evaluating patients with pain involving the heel. Based on history and clinical presentation, the symptoms of the patient presented in this case best parallel a diagnosis of plantar fasciitis. Traditional management strategies of plantar fasciitis include rest, activity modification, ice massage, oral analgesics and stretching of the plantar fascia and gastrocnemius<sup>1,3,5</sup>, all of which were trialed by this patient without substantial relief. This patient’s positive response suggests a need for further exploration to evaluate the clinical effectiveness of cupping therapy in the management of plantar fasciitis. Research is needed to assess for both efficacy and safety of cupping therapy; however, the purpose of this report is to highlight a therapy which may provide relief for patients with plantar fasciitis. Future research may include more specific data related to duration of functional improvements and would

include data from a lower extremity functional scoring outcome assessment to qualify therapeutic effectiveness. Future research comparing cupping therapy alone to other forms of manual therapy may provide more substantial evidence for the therapeutic benefit of cupping therapy.

## Limitations

This study is limited in that the outcome reported is based on the subjective report of one patient and not

on a validated outcome measure. Therefore, the results of this case may not be generalizable to other patients with plantar fasciitis pain. The patient described in this case was not optimally compliant with her home exercise program and presented for treatment at infrequent intervals, sometimes as long as 6 weeks, which may have impacted her outcome. Additionally, the use of multiple treatment modalities throughout may serve as a confounder when attempting to assess the contribution of cupping therapy to the outcome.

Table 3<sup>5</sup>

| Differential Diagnosis of Heel Pain                                     |                                                                                                     |
|-------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------|
| Condition                                                               | Characteristics                                                                                     |
| <b>Neurologic</b>                                                       |                                                                                                     |
| Abductor digiti quinti nerve entrapment                                 | Burning in heel pad                                                                                 |
| Lumbar spine disorders                                                  | Pain radiating down the leg to the heel, weakness, abnormal reflexes                                |
| Problems with the medial calcaneal branch of the posterior tibial nerve | Medial and plantar heel pain                                                                        |
| Neuropathies                                                            | Common in patients who abuse alcohol and in patients with diabetes<br>Diffuse foot pain, night pain |
| Tarsal tunnel syndrome                                                  | Pain, burning sensation, and tingling on the sole of the foot                                       |
| <b>Soft tissue</b>                                                      |                                                                                                     |
| Achilles tendonitis                                                     | Pain is retrocalcaneal                                                                              |
| Fat pad atrophy                                                         | Pain in area of atrophic heel pad                                                                   |
| Heel contusion                                                          | History of trauma                                                                                   |
| Plantar fascia rupture                                                  | Intense tearing sensation on bottom of foot                                                         |
| Posterior tibial tendonitis                                             | Pain on the inside of the foot and ankle                                                            |
| Retrocalcaneal bursitis                                                 | Pain is retrocalcaneal                                                                              |
| <b>Skeletal</b>                                                         |                                                                                                     |
| Calcaneal epiphysitis (Sever's disease)                                 | Heel pain in adolescents                                                                            |
| Calcaneal stress fracture                                               | Calcaneal swelling, warmth, and tenderness                                                          |
| Infections                                                              | Osteomyelitis<br>Systemic symptoms (e.g., fever, night pain)                                        |
| Inflammatory arthropathies                                              | More likely with bilateral plantar fasciitis<br>Multiple joints affected                            |
| Subtalar arthritis                                                      | Heel pain is supracalcaneal                                                                         |
| <b>Miscellaneous</b>                                                    |                                                                                                     |
| Metabolic disorders                                                     |                                                                                                     |
| Osteomalacia                                                            | Diffuse skeletal pain, muscle weakness                                                              |
| Paget's disease                                                         | Bowed tibias, kyphosis, headaches                                                                   |
| Sickle cell disease                                                     | Acute episodes of pain involving long bones, pelvis, sternum, ribs<br>Dactylitis in young children  |
| Tumors (rare)                                                           | Deep bone pain, night pain, constitutional symptoms                                                 |
| Vascular insufficiency                                                  | Pain in muscle groups that is reproducible with exertion, abnormal vascular examination             |
| Information from references 4 through 8.                                |                                                                                                     |

### **Conflict of interest**

The author denies competing interests.

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### **Consent**

Written informed consent was obtained from the patient for publication of this case report and any accompanying images. A copy of the written consent is available for review by the Editor-in-Chief of this journal.

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## Midfoot Stress Fractures in a Patient with Recurrent Gout:

### A Case Report

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### ABSTRACT

**Objective:** The purpose of this case report is to describe the presentation of stress fractures in a patient with recurrent acute gout attacks.

**Clinical Features:** A 39-year-old male with a history of acute gout attacks presented with intense pain, swelling, and redness of the right midfoot. History revealed no incidence of trauma. The patient reported that previous gout flares had resolved over several days, yet this had

persisted for several weeks with greater pain, swelling, and redness. X-ray examination showed no appreciable gouty arthropathy.

**Intervention and Outcome:** The patient was referred for MRI examination of the right foot. MRI revealed nondisplaced stress fractures of the cuboid and lateral cuneiform.

**Conclusion:** Gout is a fairly common condition in which repeated attacks may compromise structural integrity of affected regions. Practitioners must be aware of the potential for further complications, including stress fractures, in the recurrent acute gout patient.

**Key Words:** Gout, stress fractures, chiropractic

## BACKGROUND

Gout is a common form of inflammatory arthritis that occurs due to the deposition of monosodium urate crystals in synovial and other tissues.<sup>1-3</sup> A common pathogenic factor with gout is hyperuricemia (>6.8 mg/dl), although only 10-15% of patients with hyperuricemia develop gout.<sup>1-3</sup> Gout is further defined by four distinct stages of disease progression: asymptomatic, acute, intercritical or interval, and chronic (tophaceous).<sup>2,3</sup> In asymptomatic hyperuricemia approximately 85-90% of patients with elevated serum uric acid do not develop gout. Acute gout can be characterized by specific signs and symptoms such as severe pain, erythema, and swelling that typically begins in the early morning or middle of the night. Acute gout is also considered monoarticular occurring most commonly in the lower extremity (e.g., first metatarsophalangeal joint, midfoot, ankle, knee) and is typically self-limiting with spontaneous resolution.<sup>2,3</sup> Intercritical gout is defined by the intervals between the attacks which

are referred to as intercritical periods. Over time, subsequent attacks may increasingly involve more joints and have a longer duration as crystals persist allowing a more definitive diagnosis.<sup>2,3</sup> Chronic (tophaceous) gout takes several years to progress. It is associated with chronic joint pain, reduced activity, and structural damage, along with more frequent attacks that can become disabling due to erosive and destructive arthritis.<sup>2,3</sup>

Over the past 20 years, the prevalence rate of gout has increased world-wide.<sup>5,6</sup> From an epidemiological standpoint, men are most affected by gout (2-6 times higher incidence), as well as older patients (increasing incidence until age 70), those living in developed countries (North America, Western Europe), and certain ethnicities (Taiwanese, Pacific Islanders, New Zealand Maori).<sup>1,2,4</sup> Increased risk of gout is associated with obesity, hypertension, high consumption of alcohol and high-purine foods, and family history of gout.<sup>1-3</sup> Low-dose aspirin and several types of antihypertensive medications including diuretics, beta-blockers, and most of the renin-angiotensin system agents also increase risk.<sup>1-3</sup>

One of the most common initial presentations of gout is a self-limiting acute attack. The classic signs and symptoms include severe pain, erythema, warmth, swelling of one or more joints, and skin desquamation, which may occur over the inflamed area.<sup>1,2</sup> The gold standard for diagnosis of gout is demonstration of monosodium urate crystals in synovial fluid analysis or in tophus by polarized light microscopy, however gout is most commonly diagnosed based upon history and examination along with response to treatment.<sup>1-3</sup>

While most acute attacks of gout will spontaneously resolve in 7-14 days, early treatment to hasten the resolution of symptoms with allopurinol is recommended within 12 hours.<sup>7,8</sup> In

patients experiencing mild-moderate pain, monotherapy with allopurinol, nonsteroidal anti-inflammatory drugs, corticosteroids, or intra-articular corticosteroid injection is recommended.<sup>7,8,9</sup> Non-pharmacologic treatments in addition to medication include rest, ice, and elevation of the affected joint(s).<sup>7,8</sup>

The literature is inconclusive as to the relationship between gout and the incidence of fracture. A mechanism of bone weakening due to inflammation from repeated gout flare-ups has been suggested by a Taiwanese population-based cohort study which concluded that gout increases the risk of fracture.<sup>10</sup> Yet a recent meta-analysis came to the conclusion that gout is not associated with fracture risk.<sup>11</sup> This case study suggests a relationship between mid-foot stress fractures and possible bone weakening due to recurrent acute gout flares.

## **CASE PRESENTATION**

A 39-year-old Caucasian male had first experienced symptomatology in the right midfoot consistent with acute gout in 2014 and was diagnosed with gout by his primary care physician in 2015. The diagnosis of gout was based on history and physical examination. Laboratory values for CBC were within normal limits and serum uric acid was measured at 8.1mg/dL (normal range 3.7 – 8.6mg/dL). The patient reported a family history of gout in both the mother and father. Other known factors that contribute to increased risk of gout were absent. The appearance of gout in this patient was consistent with the classic presentation of a self-limiting acute attack. The gout attack symptoms would typically present in the middle of the night and would cause the patient to wake from sleep. The pain was sharp and severe, with redness, heat, and swelling of the right calcaneus and right dorsal midfoot. Upon the onset of a gout attack, weight bearing and ambulation were precluded by pain. The pain intensity was rated at an 8/10 on an 11 point

numeric scale with 0 being no pain and 10 being the most intense pain imaginable. The patient reported taking 800 mg of ibuprofen at the onset of a gout attack, with minimal palliative effect. This describes the self-management of gout attacks during 2014, prior to diagnosis.

After the diagnosis of gout was made, management changed to 50 mg of prednisone 1 time per day for 3 days. The prednisone allowed the patient to return to normal activities of daily living with minimal pain and discomfort within 3 days when taken at the onset of an attack. However, these therapies did not influence the long-term management of gout, as the frequency of the attacks remained static at several per year.

The patient had been provided with dietary advice regarding common dietary triggers for gout such as meat, seafood, and alcoholic beverages. He stated overall poor compliance with these dietary recommendations.

The patient experienced what appeared to be his most severe midfoot acute gout attack in 2018. Management with 50 mg of prednisone 1 time per day for 3 days did not result in resolution of the typical signs and symptoms of gout as it had in the past. The pain, swelling, and redness lingered for several weeks. (Figures 1 & 2)

Figure 1. Two weeks after onset of attack



Figure 2. Two weeks after onset of attack



Due to the nature of the presentation and concern over structural changes, radiographs of the foot were taken. Dorsoplantar, lateral, and oblique images of the right foot (Figures 3, 4, & 5 respectively) demonstrated adequate bone density, normal joint spaces, and no appreciable gouty arthropathy.

Figure 3.



Figure 4.



Figure 5.



After a negative x-ray examination, advanced imaging was ordered. MRI examination revealed moderately intense marrow edema of the cuboid and lateral cuneiform as well as patchy linear sclerosis within the trabecula suggestive of nondisplaced and/or stress fractures of the cuboid and lateral cuneiform. (Figures 6, 7, & 8)

Figure 6.

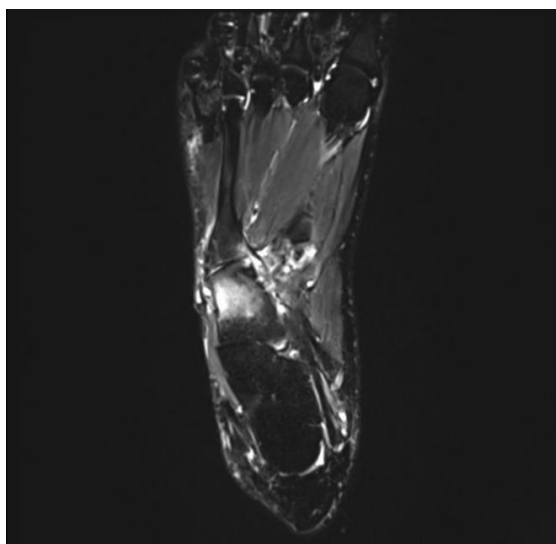




Figure 7.

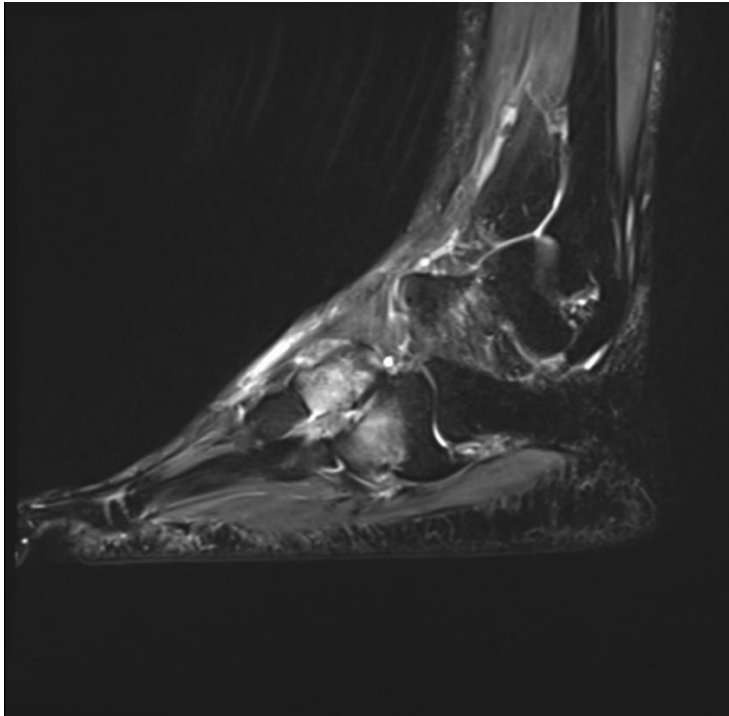
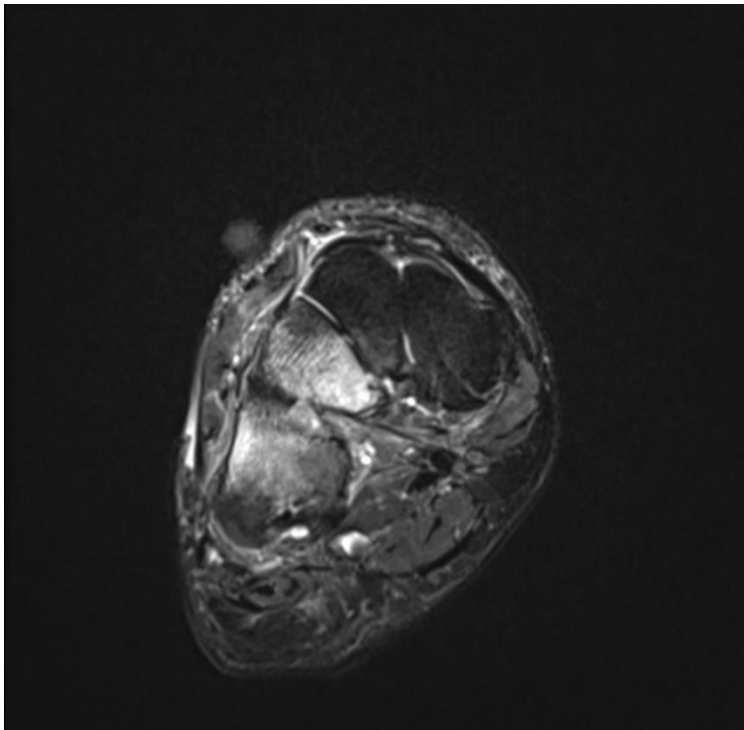


Figure 8.



The patient was advised to avoid strenuous exercise as well as extended time on his feet for 6 weeks to allow healing of the fractures, and was referred for nutritional counseling with the goal of lessening the frequency of future gout attacks. Over the next 2 months the symptoms slowly abated and the patient was able to return to normal activities of daily living.

## **DISCUSSION**

This case describes the presentation of midfoot stress fractures in a patient with recurrent acute gout. The cuboid and lateral cuneiform are uncommon areas for stress fracture to occur.<sup>12</sup> Furthermore, the patient did not have a history of engagement in activities typical of an overuse injury such as high intensity repetitive force exercise.<sup>13</sup> This suggests a relationship between the midfoot stress fractures and the recurrent acute gout attacks in that area. Inflammatory reactions causing joint deterioration and bone remodeling in the hands and feet is well evidenced in cases of rheumatoid arthritis.<sup>14</sup> This case hypothesizes structural weakening leading to stress fractures as a result of recurrent inflammation from acute attacks of gout. Future research into the structural effects of recurrent acute gout attacks may identify a particular mechanism and address the current gap in knowledge. Also of interest is the patient's use of prednisone. Long-term corticosteroid use is associated with reduced bone density and increased risk of fracture.<sup>15</sup> However, the available literature is focused on ongoing daily corticosteroid therapy, as opposed to short-term as needed use over a period of several years as described in this study.<sup>16</sup> Further research may elucidate a relationship between short-term as needed prednisone use and decreased bone mineralization that can increase fracture risk.

## **CONCLUSIONS**

While gout is a common condition, this case presents an uncommon complication. The literature remains inconclusive and repeated attacks may compromise the structural integrity of affected areas. Practitioners should be aware that the potential exists for further complications, including stress fractures, in the recurrent acute gout patient.

## **LIMITATIONS**

This case report is limited in scope and stress fractures are not part of the classic presentation of gout. Current literature is inconclusive as to the relationship between gout and stress fractures.

## **CONSENT**

Written consent for publication was obtained from the patient.

## **COMPETING INTERESTS**

The authors declare that they have no competing interests.

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## Ortho Quiz

by Steven L. Kleinfield DC, FIANM(us)

1. Perkin's Line is drawn on a radiograph:
  - a. Horizontally through the inferior aspect of both triradiate cartilages
  - b. Horizontally through the superior aspect of both triradiate cartilages
  - c. Vertically from the lateral most aspect of the acetabular roof
  - d. Vertically from the medial most aspect of the acetabular roof
2. Hilgenreiner Line is drawn on a radiograph:
  - a. Horizontally through the inferior aspect of both triradiate cartilages
  - b. Horizontally through the superior aspect of both triradiate cartilages
  - c. Vertically from the lateral most aspect of the acetabular roof
  - d. Vertically from the medial most aspect of the acetabular roof
3. Perkin's Line used in conjunction with Hilgenreiner Line is helpful in diagnosis which of the following conditions:
  - a. Lumbar Spinal Retrolisthesis
  - b. Acetabular Dysplasia
  - c. Osteitis Condensans Illium
  - d. Otto's Pelvis
4. Shenton's Line is used radiographically to diagnose:
  - a. Lumbar Spinal Retrolisthesis
  - b. Acetabular Dysplasia
  - c. Osteitis Condensans ilii
  - d. Otto's Pelvis
5. Bohler's angle is used to evaluate for which condition:
  - a. Anterior Talo-Fibular Sprain
  - b. Deltoid Ligament Sprain
  - c. Lateral Malleolar Fracture
  - d. Calcaneal Fracture

## Current Events

### ❖ Diplomate testing

#### ○ **Part I Examination Dates:**

Three hours are allotted to take the Part I online examination during one of the following test window dates:

##### ▪ **2021:**

Thursday, January 14, 2021 – 4:00 PM to 7:00 PM EST

Friday, February 19, 2021 – 11:00 AM to 2:00 PM EST

Saturday, March 20, 2021 – 11:00 AM to 2:00 PM EDT

Wednesday, April 21, 2021 – 4:00 PM to 7:00 PM EDT

Thursday, May 13, 2021 – 4:00 PM to 7:00 PM EDT

Friday, June 18, 2021 – 11:00 AM to 2:00 PM EDT

Saturday, July 17, 2021 – 11:00 AM to 2:00 PM EDT

Wednesday, August 18, 2021 – 4:00 PM to 7:00 PM EDT

Thursday, September 9, 2021 – 4:00 PM to 7:00 PM EDT

Friday, October 8, 2021 – 11:00 AM to 2:00 PM EDT

- To begin the IANM Diplomate application process, [register and pay your non-refundable \\$95 application fee.](#)

- [Practice Tests available for all candidates and potential candidates.](#)

- The initial Part I Payment of \$475 is due 90 days prior to examination. The final Part I Payment of \$475 is automatically billed to the same card 45 days prior to the Part I IANM Diplomate examination date.

[Pay your Part I Exam Fee.](#)

#### ○ **Part II Examination Dates:**

The Part II test will be a timed examination consisting of three OSCE modules in a four hour period. The Part II test window dates are:

##### ▪ **2021:**

Thursday, Nov 11, 2021 – 9:00 AM to 5:00 PM EDT

Friday, Nov 12, 2021 – 9:00 AM to 5:00 PM EDT

Saturday, Nov 13, 2021 – 9:00 AM to 2:00 PM EDT

- The initial Part II Payment of \$475 is due 90 days prior to examination. The final Part II Payment of \$475 is automatically billed to the same card 45 days prior to the Part II IANM Diplomate examination date.

**[Pay your Part II Exam Fee.](#)**

- Successful completion of the IANM Part I examination is required. The Part II fee is \$950.00, plus any testing center/proctor fees. Qualified candidates may [contact us](#) for more information.

- Please [contact the Academy](#) as soon as you can with your notice of intent to sit the Academy Board examination.

- ❖ Apply for the Lipe Scholarship  
Details at <http://www.accoweb.org/lipescholarship.html>



## Answers to Ortho Quiz

Questions for JACO by Steven L. Kleinfield DC, FIANM(us)

1. Perkin's Line is drawn on a radiograph:

***c. Vertically from the lateral most aspect of the acetabular roof***

<https://radiopaedia.org/articles/perkin-line?lang=us>

2. Hilgenreiner Line is drawn on a radiograph:

***a. Horizontally through the inferior aspect of both triradiate cartilages***

<https://radiopaedia.org/articles/hilgenreiner-line>

3. Perkin's Line used in conjunction with Hilgenreiner Line is helpful in diagnosis which of the following conditions:

***b. Acetabular Dysplasia***

[https://www.meded.virginia.edu/courses/rad/peds/ms\\_webpages/ms3bddh.html](https://www.meded.virginia.edu/courses/rad/peds/ms_webpages/ms3bddh.html)

4. Shenton's Line is used radiographically to diagnose:

***b. Acetabular Dysplasia***

<https://www.ncbi.nlm.nih.gov/pubmed/21543686>

5. Bohler's angle is used to evaluate for which condition:

***d. Calcaneal Fracture***

<https://radiopaedia.org/articles/bohler-angle-2?lang=us>