Underlying Bone Marrow Lesion in Recalcitrant Plantar Fasciitis and the use of Subchondroplasty: A Novel Technique

ABSTRACT

Plantar fasciitis is one of the most common chief complaints seen in the foot and ankle clinic. With a relatively benign course, most cases are self-limiting or amenable to conservative therapy; around 90% of all plantar fasciitis cases respond to these methods. When conservative treatment and time fail, surgical intervention may be necessary to improve outcomes. We present a novel method of utilizing subchondroplasty along with revision fasciotomy in a case where initial fasciotomy had failed. This technique involves injecting calcium phosphate into bone marrow lesions to stimulate long term bone repair. At nine months after the procedure, the patient remained pain free and able to return to running. This surgical treatment should be considered as an adjunctive procedure in those patients with identifiable bone marrow lesions on MRI with continued pain.

BACKGROUND

- In the United States, approximately one million patients per year are treated by primary care physicians and specialists for plantar fasciitis (1). The majority of acute symptoms will resolve within 10 months utilizing conservative care options such as low dye strapping, stretching, physical therapy, night splints, anti-inflammatory agents, corticosteroid injections, orthoses, and extracorporeal shock wave therapy (2,3). Despite noninvasive treatments, approximately 10% of patients will endure persistent symptoms (2).
- Patients who do not respond to conservative treatment may consider surgical intervention. Surgical options have included open fasciotomy, endoscopic plantar fasciectomy, and in-step fasciectomy among others (4,5). Alternatively, orthopedic literature has been evaluating the role of bone marrow edema found on MRI as a source of pain (6,7,8,9).
- In this case report, the patient failed conservative care and subsequently underwent an open fasciotomy for her chronic plantar fasciitis. Unfortunately, her symptoms did not improve after surgery, even with adjunctive conservative modalities. The purpose of this case study was to introduce a novel technique for the treatment of recalcitrant plantar fasciitis with an underlying bone marrow lesion (BML).

CASE REPORT

- A 57 year old female presented with right heel pain. She reported that the pain had been present for six months and did not recall any inciting trauma. She stated that most of her pain occurred while barefoot in the morning or with running, and that Advil or Tylenol alleviated some of her pain. Significant pain was elicited upon palpation of the right medial calcaneal tuberosity. Weight bearing radiographs demonstrated a small plantar calcaneal spur without evidence of fracture or osseous tumor. Initially, she was treated conservatively for plantar fasciitis which included steroid injections, physical therapy, night splints, and orthotics. Conservative treatments, however, failed to provide her consistent pain relief for her daily activities and an MRI was obtained. The results of the MRI demonstrated plantar fasciitis with faint underlying bone marrow edema.
- Six months after surgery, however, her pain returned, worsened, without any new inciting trauma. She was compliant with using a night splint and attending physical therapy. A repeat MRI was ordered after failing continued care, which showed increased bone marrow edema, abnormal thickening of the fascia, and increased signal intensity across the proximal central plantar fascia with early intrafascial partial tearing. Due to her recalcitrant plantar fasciitis and bone marrow edema with microtrabecular injury, surgery was offered again to address both of those problems.

PATIENT IMAGES

From left to right and top to bottom
1. Initial weightbearing lateral radiograph
2. Initial oblique weightbearing radiograph
3. Initial T2 fat suppressed MRI after conservative therapy attempts
4. T2 Fat Suppressed sagittal MRI six months s/p fasciectomy
5. Intra-operative placement of cannulas
6. Intra-operative fluoroscopy identifying cannula placement
7. Injection of flowable calcium phosphate
8. Immediate post op non weight bearing lateral demonstrating blanching of calcium phosphate material

SURGICAL TECHNIQUE & RESULTS

- The surgical plan consisted of repeat plantar fascia release via an in-step approach and ankle clinic. With a relatively benign course, most cases are self-limiting or amenable to conservative therapy; around 90% of all plantar fasciitis cases respond to these methods. When conservative treatment and time fail, surgical intervention may be necessary to improve outcomes. We present a novel method of utilizing subchondroplasty along with revision fasciotomy in a case where initial fasciotomy had failed. This technique involves injecting calcium phosphate into bone marrow lesions to stimulate long term bone repair. At nine months after the procedure, the patient remained pain free and able to return to running. This surgical treatment should be considered as an adjunctive procedure in those patients with identifiable bone marrow lesions on MRI with continued pain.

- The patient was kept non weight bearing for three weeks and then transitioned to protected weight bearing in a tall CAM boot. At four weeks she was given a prescription for physical therapy for six weeks with two visits per week. Over the next year, she presented to clinic intermittently for follow up with improvement of her plantar fascial symptoms. At nine months, the patient was pain free and had been able to return to running without any issues.

DISCUSSION

- Initial, non-surgical treatment is always attempted for plantar fasciitis and is successful in 85-90% of patients within two to three months, increasing up to 95% efficacy at one year (10). In the event that conservative care and time are not effective, surgical intervention is warranted. Open and endoscopic plantar fasciotomies have documented success rates of 76% (5,11) in these recalcitrant patients. Our case failed both conservative and initial surgical intervention, with continued pain and disability. The enlarged presence of bone marrow edema on her follow-up MRI led us to attempt this novel technique.
- MRI is not routinely needed to diagnose plantar fasciitis, but after failing conservative care, it is useful to rule out other possible conditions. BMLs are a known source of pain in knee osteoarthritis (12,13) and have been identified on a large percentage of patients with plantar fasciitis. In a series of patients with plantar fasciitis, 56% had identifiable bone marrow lesions; 100% of the patients who required surgical intervention for treatment of continued symptoms had identifiable BMLs (14).
- Injection of calcium phosphate was seen as a potentially viable treatment option; though this has not been previously described in the literature for recalcitrant plantar fasciitis with underlying BML. Subchondroplasty is a term to describe the technique of injecting a flowable calcium phosphate synthetic bone void filler, into the space between the trabeculae of cancellous bone in the subchondral region. The calcium phosphate undergoes an exothermic reaction while micromilling the strength and porosity of normal cancellous bone. Over the next several months, osteoclasts or osteoblasts can utilize this scaffold-like implant to remodel local bone (15).

REFERENCES