

Arthroscopic Minimally Invasive Surgery for Septic Arthritis of the First Metatarsophalangeal Joint: A Case Report

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Abstract

The first metatarsophalangeal joint and tibiotalar joint account for the majority of foot and ankle septic arthritis cases which have an incidence of about 3-7%. Typical treatment of the first metatarsophalangeal joint septic arthritis consists of serial needle aspirations with irrigation or an open arthrotomy approach. Both of these treatment options can have complications such as, articular cartilage damage or wound healing complications, respectively. This case study discusses a 70-year-old diabetic male patient, who is high risk for wound complications that had septic arthritis of the first metatarsophalangeal joint. Here an uncommon treatment option was performed utilizing a minimally invasive approach via arthroscopy for debridement of septic arthritis due to the patient's comorbidities and to reduce postoperative complications. The patient was subsequently followed for 1-year post operatively and was noted to have complete range of motion restored to the first metatarsophalangeal joint, no recurring signs of infections and no pain. This report and technique guide shows how an arthroscopic approach for the treatment of septic arthritis in a small joint such as the first metatarsophalangeal joint, can be a viable treatment option especially as minimally invasive surgery is becoming more prevalent around the globe.

Keywords: Arthroscopy; Diabetic; Puncture Wound; Small Joint; Synovitis

Introduction

Information regarding arthroscopy of the first metatarsophalangeal joint (MTPJ) is sparse in the literature and was first described by Wanatabe in 1972, where he successfully performed it at the 1st MTPH as well as in other small joints [1]. Small joint ar-

throscopy can be utilized for septic arthritis, synovitis, osteochondral lesions, arthritis, and various other pathologies [2]. Cases for arthroscopic debridement of the first metatarsophalangeal joint for septic arthritis are rather rare. Ahn, who performed arthroscopy of the first MTPJ in 59 consecutive cases, found it to be safe and reproducible [3]. Septic arthritis is often erythematous, hot

and monoarticular with etiologies including direct inoculation, hematogenous, contiguous invasion or due to post-surgical infection. *S. aureus* is the most common infecting organism in patient populations. This case report discusses the use of arthroscopy for septic arthritis of the first MTPJ. A 70-year-old diabetic male presented after stepping on a nail, which punctured through his right shoe and into his right first MTPJ. An MRI was performed and it was consistent with septic arthritis of the first MTPJ. After an extensive discussion regarding open debridement versus a minimally invasive approach, small joint arthroscopy was chosen in an attempt to decrease the risk of complications such as wound dehiscence, infection, or even amputation.

Materials and Methods

Our patient was treated from April of 2019 and was followed up until April of 2020. This patient was a 70-year-old male who presented to the emergency department after a right foot puncture wound of a nail through his shoe a few days prior. After sustaining the injury, the patient went to his local urgent care where he was administered Amoxicillin-Clavulanate. However, a few days later he was still having pain, swelling and redness of the forefoot, which prompted him to present to the emergency department. The patient's tetanus status was up to date. He had a past medical history of diabetes mellitus, hypertension, anxiety/depression, vertigo, and was a former smoker. Patient was given ciprofloxacin 400mg IV once in the emergency department and then started on piperacillin-tazobactam 3.375g IV q8, insulin sliding scale, metoprolol 25mg PO qd, venlafaxine 225mg PO qd, vancomycin 1.25g IV q12, acetaminophen 650mg PO q4 PRN, and oxycodone-acetaminophen 5mg-325mg PO q6 PRN. He had no known drug allergies. At the time of evaluation, patient was noted to have right forefoot edema, erythema, warmth, and painful/limited range of motion at the first metatarsophalangeal joint. Erythema and edema was noted clinically even with adequate antibiotic administration (Figure 1). Around a week after admission, the patient continued to have pain, warmth and restricted range of motion to the site. The puncture wound was plantar to the right first metatarsophalangeal joint with signs of re-approximation with no drainage, no malodor, and no proximal streaking from the zone of injury. Three views of right foot radiographs showed no radiopaque material at the site of the puncture (Figure 2-4). An MRI was then obtained of the right foot. The MRI was consistent with right first metatarsophalangeal joint septic arthritis and no evidence of osteomyelitis (Figure 5-7). The patient presented with a white blood cell count of 11,000/ml, and erythrocyte sedimentation rate of 49mm, blood glucose of 174mg/

dL, a C-reactive protein of 3.8mg/dL, and a HgA1c of 8.1%. Due to the patient's comorbidities, this patient was noted to be high risk for further wound complications or amputation. Therefore, it was deemed appropriate to surgically treat this patient in a minimally invasive manner via arthroscopic debridement of the first MTPJ rather than an open arthrotomy approach.

Figure 1: Erythema and edema was noted to recede after adequate antibiotic therapy was initiated.

Figure 2: Anteroposterior radiograph of right foot.



Figure 3: Medial oblique radiograph of right foot.

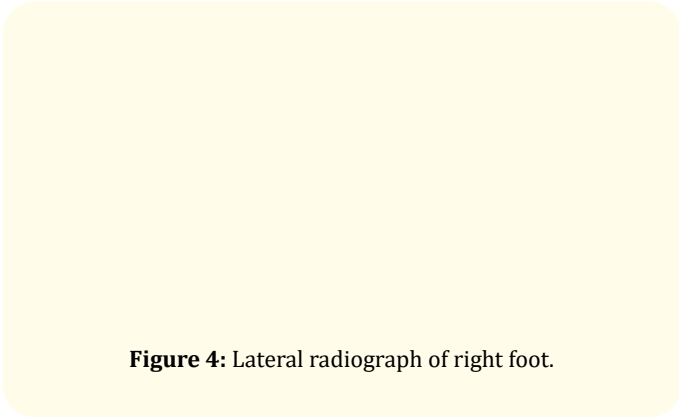


Figure 4: Lateral radiograph of right foot.

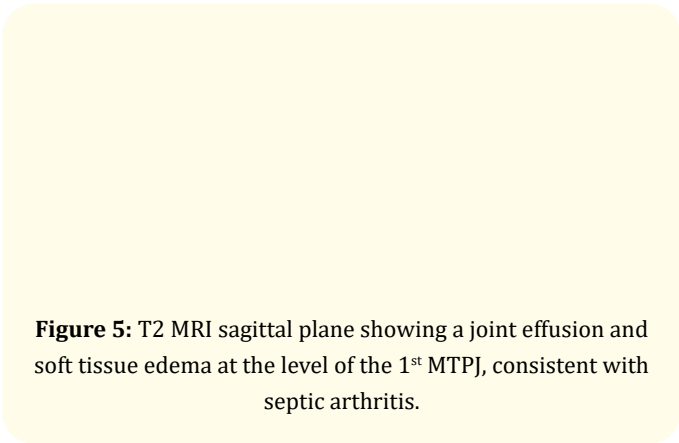


Figure 5: T2 MRI sagittal plane showing a joint effusion and soft tissue edema at the level of the 1st MTPJ, consistent with septic arthritis.

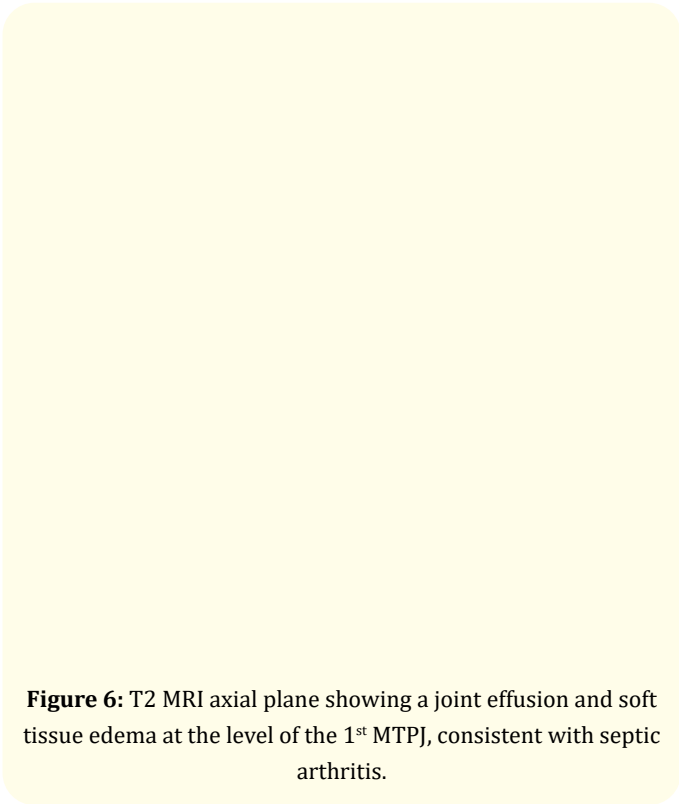


Figure 6: T2 MRI axial plane showing a joint effusion and soft tissue edema at the level of the 1st MTPJ, consistent with septic arthritis.

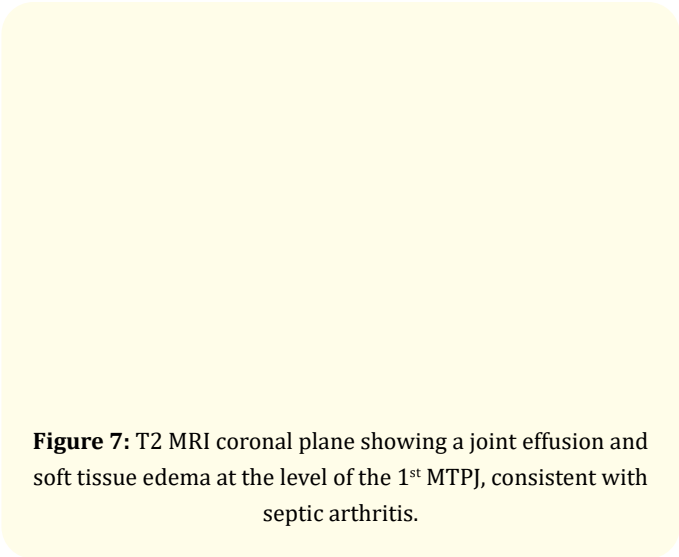


Figure 7: T2 MRI coronal plane showing a joint effusion and soft tissue edema at the level of the 1st MTPJ, consistent with septic arthritis.

For this procedure technique, the patient was placed on the operating table in a supine position. General anesthesia was used for this patient. A leg holder was placed at the level of the right calf. 20cc of 1% lidocaine without epinephrine and 0.5% bupivacaine without epinephrine (1:1) was injected into the right foot in a mayo block fashion. The operative foot was then scrubbed,

prepped and draped in the usual aseptic manner. A pneumatic ankle tourniquet was utilized and the right foot was exsanguinated and the tourniquet was insufflated to 250 mmHg. The extensor hallucis longus tendon was identified at the level of the 1st metatarsophalangeal joint and marked with indelible ink. The right hallux was then distracted utilizing a kerlix gauze (Covidien®, Dublin, IE) wrapped around the hallux and attached to the ankle distractor (Arthrex®, Naples, FL). The dorsolateral and dorsomedial portals were identified and marked with indelible ink medial and lateral to the extensor hallucis longus tendon at the level of the first MTPJ. Puckering was noted dorsomedially and dorsolaterally when the hallux was distracted which verified the joint space. Synovial fluid was extracted from the joint with an 18g needle. The fluid appeared dark yellow and cloudy and was sent for analysis. The joint was then insufflated with 3cc's of normal sterile saline using the same 18g needle which was left in from the aspiration in order to prevent multiple insertions. A stab incision was made at the dorsomedial portal utilizing a #11 blade. The obturator (Smith and Nephew®, London, UK) was first inserted dorsomedially to ensure the integrity of the portal. Due to the patient's size, we were able to comfortably use a 30° 2.7mm arthroscope (Smith and Nephew®). Next, the obturator was removed and the arthroscope was inserted with the cannula (Smith and Nephew®) into the medial portal. The joint was well visualized and a second stab incision was made at the dorsolateral portal by directing the arthroscope laterally. A 1-liter bag of normal sterile saline mixed with 80mg/L of gentamicin was used for the arthroscope under gravity. Upon entry with the arthroscope, synovitic tissue (Figure 8) was visualized along with yellow fluid. The 1.9mm (Arthrex®) shaver was inserted at the dorsolateral portal and visualized on the camera. The shaver was utilized for debridement at the level of the first MTPJ. No articular cartilage defects were noted pre and post procedure (Figure 9 and 10). The portals were closed with 4-0 nylon suture (Figure 11) and sterile gauze, kerlix and ACE bandage were placed on the patient's right foot. The post-operative course consisted of weight bearing as tolerated in a surgical shoe for 2 weeks, suture removal at 2 weeks and transition to a wide toe box shoe. The patient was subsequently followed for 1 year postoperatively and was noted to be pain free and had full range of motion to his first MTPJ seven days after surgery. The patient had a preoperative AOFAS score of 47/100 and it was noted to have improved to 93/100 12 months after the surgery. He did not report any stiffness or pain on subsequent follow-up visits.

Figure 8: Shows synovitic tissue within the first metatarsophalangeal joint.

Figure 9: Post arthroscopic debridement of the first metatarsophalangeal joint. Articular cartilage is intact and free of any defects.

Results and Discussion

As minimally invasive surgery is gaining traction around the World, we found that utilizing a minimally invasive arthroscopic approach to debride the first MTPJ is a safe and viable alternative

Figure 10: Post arthroscopic debridement of the first metatarsophalangeal joint. Articular cartilage is intact and free of any defects.

Figure 11: Postoperative arthroscopic debridement of first metatarsophalangeal joint. Dorsolateral and dorsomedial portal sites can be noted by the sutures in place medial and lateral to the Extensor Hallucis Longus tendon.

to an open incision and debridement in the case of a septic joint in an elderly diabetic patient. This method was better for this patient and according to Ahn who performed arthroscopy of the first MTPJ in 59 consecutive cases, found it to be safe and reproducible [3]. In this case, the intraoperative aspiration and arthroscopy was performed after cellulitis to the portal sites had resolved to avoid any further inoculation of bacteria into the joint. The aspiration of the joint resulted in numerous white blood cells with dark yellow cloudy fluid; however, a negative culture. The negative culture was something we knew might arise due to the patient's treatment initially with oral and then intravenous antibiotics. We were also able to avoid any potential cartilage damage by avoiding an alternative technique of multiple repeated needles aspirations and irrigation. We employed the use of gentamicin in our normal sterile saline due to the fact that this was a puncture wound through the patient's shoe where *P. aeruginosa* is a common infecting organism. Yazdi, *et al.* found that the incidence rate of septic arthritis after arthroscopic ACL reconstruction was significantly lower ($P < 0.05$) when irrigated with gentamicin solution than merely with saline solution [4]. The sutures at the portal sites were removed on post-operative day 14. The patient was pain free by post-operative day 7 and range of motion to the joint had been restored. Additionally, the preoperative AOFAS score of 47/100 improved to 93/100 12 months after the surgery. Debnath, *et al.* found that Arthroscopic surgery resulted in pain free first metatarsophalangeal joints in 95%; 19 of 20 patients [5]. The patient was subsequently followed for 12 months and no clinical or radiological signs of infection were noted during this time period. The patient was noted to be pain free during this time as well. We believe that utilizing this approach obviated the need for a future amputation in a high-risk patient. Care was taken during the procedure to ensure the patient's articular cartilage was not violated (Figure 9 and 10). This indicates that this technique can be applied not only to cases such as septic joints, but also in synovitis, osteochondral lesions, arthritis, and others.

Conclusion

Arthroscopy of small joints has become a promising tool with increased interest and improved technology [6]. Furthermore, minimally invasive surgery is gaining popularity across the globe and this article helps to add to the sparse literature that is out there in regard to this while also providing a technique guide for surgeons in regard to 1st MTPJ arthroscopy. We saw here that utilizing

a minimally invasive arthroscopic approach for the first MTPJ is a safe and feasible alternative to an open incision and debridement in the case of a septic joint in an elderly diabetic patient. There are limited studies of small joint arthroscopy in the foot, especially in regards to septic arthritis treatment, but with suitable patient selection, this can be an invaluable technique as shown in this study, with a potential to decrease the risk that is associated with more invasive procedures.

Acknowledgements

None.

Conflict of Interest

No financial interest nor any conflict of interest exists.

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