

Two-stage Management of Forefoot Osteomyelitis in an Immunocompetent Young Adult: A Case Report

Venkataram Vellaipandi¹ , Kamal Dureja²

ABSTRACT

Background: Chronic osteomyelitis of metatarsals is commonly seen in patients with diabetic foot disease or following open fractures of the foot. However, it is extremely rare for chronic osteomyelitis of the forefoot to occur in the absence of an immunocompromised state. There has been one case report describing osteomyelitis of the first metatarsal head in an immunocompetent female. Here we present a case report of a young female without any immunocompromise presenting with forefoot osteomyelitis managed successfully in a staged manner.

Case description: A 34-year-old woman presented to our Outpatient department with pain involving her right forefoot for the past 14 weeks and discharging sinus on the sole for the past 6 weeks. Clinical examination revealed the instability of the first three metatarsophalangeal (MTP) joints. Radiological and hematological investigations confirmed forefoot osteomyelitis. Local and systemic immunocompromise was ruled out by a detailed evaluation. AOFAS Hallux score was recorded as 36. In the first stage, she underwent debridement and trans-articular K-wire fixation of the affected joints. Later she was taken up for a fusion of the first MTP joint using Synthes Hallux locking fusion plate. Clinical and radiological fusion was discernible by the end of 12 weeks. AOFAS Hallux score at the end of 6 months and 12 months was 84 and 92, respectively. There was no sign of recurrence of infection until the last follow-up.

Conclusion: Chronic osteomyelitis of the forefoot in immunocompetent individuals is a rare clinical presentation. A satisfactory outcome in the form of a pain-free functional foot can be achieved by either joint fusion or salvage provided the infection is controlled.

Clinical significance: Thorough evaluation is needed to rule out a local or systemic immune compromise in forefoot osteomyelitis in the absence of trauma. Regardless of the underlying etiology, the principles of management should be infection control and stabilization of the involved joints.

Keywords: Forefoot, Fusion, Immunological competence, Metatarsophalangeal joint, Osteomyelitis, Precontoured locking plates.

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BACKGROUND

Chronic osteomyelitis of metatarsals is most commonly seen as sequelae of nonhealing ulcers in Diabetics or following open fractures of the foot.¹ Treatment strategies range from extensive debridement with prolonged culture-specific antibiotics to amputation depending on the severity and extent of involvement of the surrounding soft tissue.²⁻⁴ The combination of peripheral neuropathy and microvascular disease in diabetics makes this a complicated condition to manage. Staged procedures are performed to avoid amputations wherever possible. However, it is extremely rare for chronic osteomyelitis of the forefoot to occur in the absence of an immunocompromised state. There has been one case report describing osteomyelitis of the first metatarsal head and infection of the first metatarsophalangeal joint in an immunocompetent female.⁵

Here we present a case report of a 34-year-old female with no history of any co-morbidities or trauma diagnosed with chronic osteomyelitis of the first three metatarsals of her foot. She was successfully treated in a staged manner to achieve a painless and functional foot free of infection.

CASE DESCRIPTION

A 34-year-old female presented to our Outpatient department with pain involving her right forefoot for the past 14 weeks and discharging sinus on the sole for the past 6 weeks. At the time of the presentation, she was walking on the lateral border of her foot with great difficulty. On examination, she had minimal warmth and tenderness over her forefoot corresponding to the first three

¹Department of Orthopaedics, Mahatma Gandhi Medical College and Research Institute, Puducherry, Puducherry, India

²Department of Orthopaedics & Joint Replacement, Max Institute of Musculoskeletal Sciences, New Delhi, Delhi, India

Corresponding Author: Kamal Dureja, Department of Orthopaedics & Joint Replacement, Max Institute of Musculoskeletal Sciences, New Delhi, Delhi, India, Phone: +91 9811078320, e-mail: kdureja@gmail.com

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metatarsophalangeal joints. Abnormal mobility and pain were present in the first two metatarsophalangeal joints. On the plantar aspect, a discharging sinus was found corresponding to the 2nd joint. The AOFAS Hallux score was recorded as 36.

She was further investigated with radiographs of the right foot. The first three MTP joints were found to be dislocated with extensive lysis and destruction involving the heads of the metatarsals (Fig. 1).

Routine blood investigations revealed elevated WBC count (13,800 cells/cu. mm) with neutrophilia (85% - neutrophils). ESR and CRP were also found to be elevated. As per history patient was not diagnosed as a diabetic and was not on any immunosuppressive medications. Random blood glucose and HbA1c were found to be within normal limits. Viral markers were also negative.

The patient was explained about her diagnosis and the need for surgical debridement. After obtaining consent she was taken up for surgery. Two separate incisions, one over the medial aspect of the first MTP joint and the other in the space between the first and second MTP joints were given under tourniquet control. The heads of the first three metatarsals were excised along with the surrounding capsular and synovial tissue until healthy tissue margins were seen.

The tissue was sent for culture and histopathological examination. Thorough saline irrigation was done and the first three MTP joints were then stabilized by trans-articular K-wires as shown in Figure 2. Spacers in the form of bio-absorbable antibiotic eluting beads were initially planned to be placed in the defects created post debridement. It was however deferred due to financial constraints.

The wound was closed over a drain and a below-knee slab was applied. The drain was removed after 24 hours. The patient was initially started on broad-spectrum parenteral antibiotics. The wound was inspected at the end of 48 hours and 96 hours. Culture grew Klebsiella which was sensitive to Amikacin and Levofloxacin. Parenteral amikacin was given for 2 weeks and oral Levofloxacin was given for a total duration of 6 weeks.

Suture removal followed by cast conversion was done at the end of 2 weeks and after ensuring complete healing of both the surgical

wound and sinus on the sole. The patient was kept on complete nonweight bearing for 6 weeks. Regular monitoring was done by weekly C-reactive protein testing. The values returned to normal by the end of 5 weeks.

After K-wires were removed the first MTP joint was still found to be unstable and the patient had pain on weight-bearing. The patient was then counseled for a fusion of the first MTP joint as instability could lead to the recurrence of infection.

After three consecutive normal reports of CRP levels, the patient was taken up for the removal of the K-wires and arthrodesis of the first metatarsophalangeal joint in the 8th week. Synthes Hallux locking fusion plate was the implant used. Compression across the cancellous surfaces of the first metatarsal and proximal phalanx was achieved with ball wires and compression forceps. Fixation was done using a combination of 2.7 mm cortical and 2.4 mm locking screws. Figure 3 shows the postoperative X-ray.

Wound closure was done after securing hemostasis. A below-knee slab was given for the first 2 weeks until suture removal. Repeat intra-operative tissue cultures were negative and antibiotics were stopped after 1 week. Fiberglass cast conversion was done at the end of suture removal. The patient was kept on nonweight bearing for 8 weeks. A forefoot offloading orthosis was given for



Fig. 1: AP and Oblique views of the foot showing dislocation of first three Metatarsophalangeal joints with lysis and destruction



Fig. 2: Post op X-ray showing K-wire fixation for trans-articular stabilization

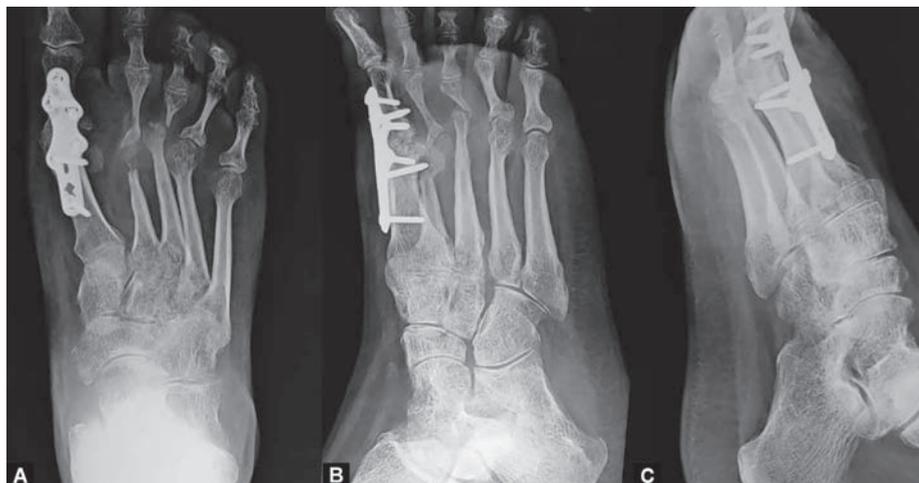


Fig. 3: Post-op AP and Oblique views showing Synthes Hallux locking plate for 1st MTP fusion

another 4 weeks. Regular clinical and radiological monitoring was done at the end of 4, 8, and 12 weeks.

Clinical and radiological evidence of fusion was discernible by the end of 12 weeks. Weight-bearing was allowed as tolerated in a normal shoe. Solid fusion was confirmed radiologically taken at the end of 6 months as shown in Figure 4.

AOFAS Hallux score done at the end of 6 months and 12 months from the primary surgery was 84 and 92, respectively. There has been no recurrence of infection until her latest follow-up as shown in Figure 5.

We have been able to achieve a good functional outcome by a staged fusion of the first MTP joint.

DISCUSSION

Chronic metatarsal osteomyelitis is seen in about 10–20% of all cases of Diabetic Foot ulcers.¹ However, it can also be seen in those with local or systemic immunocompromise such as Chronic renal disease, Liver cirrhosis, peripheral arterial disease, and hypertension. The management in such a scenario is usually aggressive often leading to severe soft tissue scarring or even ending in amputation. The poor vascularity combined with decreased sensation contributes to the decreased healing and poor infection control necessitating more aggressive management strategies.

The same cannot be said for forefoot osteomyelitis in an immunocompetent individual where the healing ability is usually intact. Though quite rarely seen there have been reports of its incidence in both adults and children with normal immunity.⁵

Anagnostakos and Koch in their case report discuss a joint salvage procedure for osteomyelitis of the first metatarsal head in an immunocompetent person.⁵ They had emphasized the early presentation of the disease as a key determinant of joint salvage. The later the disease presentation higher the chance for more radical procedures like an amputation. The patient had presented at 8 weeks which could enable them to preserve the joint and achieve a good functional outcome.

In contrast, our case had presented 14 weeks after the onset of symptoms. From history, it was obvious that the source of infection was hematogenous. From the clinical presentation, it was also apparent that the patient had forefoot osteomyelitis with possible septic arthritis of the first two metatarsophalangeal joints as evidenced by pain and instability. A further radiological

investigation confirmed the involvement of the first three metacarpal heads and proximal phalanges. The combined picture of instability and plantar ulcer initially made us suspect diabetic foot.

However, the patient had normal foot sensation and intact vascularity with both posterior tibial and dorsalis pedis pulsation well felt. Complete blood workup revealed that the patient was nondiabetic. Intact sensation and good vascularity are considered good prognostic indicators in forefoot osteomyelitis independent of diabetic status.

The surgery was planned with the aim of infection control and forefoot stabilization to achieve a painless functional foot. We decided to embark on the above in a phased manner. The first surgery was infection control by debridement and temporary stabilization with K-wires across the involved joints. The first three MTP joints which showed involvement could not be salvaged. Hence the affected joint surfaces were debrided. Stabilization was achieved by trans-articular K-wires passed across the joints.

Antibiotic spacer usage is well documented after infected bone resection in Diabetic foot osteomyelitis.⁴ They are usually in the form of calcium sulphate/hydroxyapatite bio-composites which are either available with pre-mixed antibiotics (Cerament G) or can be prepared with the desired antibiotics at the time of surgery (Stimulan). Niazi et al. in a multicenter study found them to be highly efficacious in diabetic foot ulceration with osteomyelitis. They helped in controlling infection and reduced reinfection rates as well.⁶ Cost is however a factor limiting its usage.

Infection control was monitored by regular wound monitoring as well as hematological parameters evaluation. Fujii et al. showed that preoperative and postoperative C-reactive protein (CRP) levels showed a significant difference in those who had good control of infection in diabetic foot osteomyelitis.² It is also a sensitive and specific marker for follow-up in comparison to ESR which shows a much slower return to normal despite adequate healing and infection control.⁷

In addition to clinical assessment, we relied on weekly CRP levels to guide us with regard to infection control and healing. From the outset, it was evident that the joints could not be salvaged. The eventual plan was to achieve fusion of the involved joints to attain a stable forefoot.

The 2nd and 3rd MTP joints were clinically found to be stable by the end of 8 weeks despite the absence of radiological fusion. Moreover, the 2nd–4th metatarsals are inherently more stable than



Fig. 4: Radiographs at the end of 6 months showing complete fusion of 1ST MTP joint



Fig. 5: Clinical picture at the latest follow-up showing completely healed forefoot with no signs of recurrence

the 1st and 5th metatarsal since they are firmly attached to their bases and have no independent mobility.⁸ Hence no attempt was made to surgically fuse these joints.

The first MTP joint however showed no signs of fusion. Fusion was planned using Synthes Hallux locking fusion plate. Locking plates have been found to be quite successful in achieving fusion in MTP joint arthrodesis.⁹ Dorsal Plate constructs are more rigid than screws alone. However soft tissue problems were encountered more with plates.¹⁰ The advent of low-profile locking plates has been well-tolerated and made them more acceptable now.¹¹

Fusion was achieved by the end of 12 weeks and the patient was allowed full weight-bearing after that. We also quantified the result by using the AOFAS Hallux score which is a reliable and reproducible tool to assess functional outcomes following MTP fusion.¹² The scores were 84 and 92 at the end of 6 months and 12 months, respectively. Scores above 90 are considered excellent and those between 80 and 90 are considered good. There was also no recurrence of infection.

Despite being unable to salvage the first three MTP joints we were able to achieve an excellent functional outcome by ensuring infection eradication and sound fusion of the affected joint.

CONCLUSION

Chronic osteomyelitis of the forefoot in immunocompetent individuals is a rare clinical presentation, especially in the absence of preceding trauma. The management should be primarily centered on infection control and forefoot stabilization utilizing minimally invasive fixation techniques. A satisfactory outcome in the form of a pain-free functional foot can be achieved by either salvage or fusion of the involved joints provided infection has been controlled by adequate debridement and appropriate usage of antibiotics.

Clinical Message

Osteomyelitis of the forefoot is extremely rare in immunocompetent individuals. A thorough evaluation is needed to rule out a local or systemic immune compromise. Regardless of the underlying etiology, the principles of management should be infection control and stabilization of the involved joints to ensure a pain-free and functional foot.

ORCID

Venkataram Vellaipandi <https://orcid.org/0000-0003-1236-9350>

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