Acta Scientific Orthopaedics (ISSN: 2581-8635)

Volume 5 Issue 8 August 2022

Case Report

Case Report: Limb Salvage with the Use of an Absorbable Antibiotic Cement Spacer

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Received: June 10, 2022

Published: July 15, 2022

Abstract

It is well established in the literature that systemic antibiotics are limited in treating diabetic foot infections. Seabrook studied the antibiotic level in a diabetic foot at the time of sepsis. He found that only 12/26 patients showed the presence of antibiotics in the surrounding muscle tissue of a septic diabetic patient when the antibiotic was administered an hour before surgery. Only six of the 26 patients were found to have therapeutic antibiotic levels within the foot. Due to the low level of systemic antibiotics found within the pedal bone and soft tissue, local antibiotics are a great addition to treating pedal osteomyelitis.

Polymethyl methacrylate (PMMA) antibiotic beads and cement have been widely used and accepted. However, there are a few issues with using non-absorbable antibiotic cement, including the need for antibiotic bead removal, inconsistent rate of drug elution and need for secondary operation for antibiotic bead/spacer removal, and high inflammatory reaction.

Keywords: Salvage; Cement Spacer; Absorbable Antibiotic

Introduction

It is well established in the literature that systemic antibiotics are limited in treating diabetic foot infections. Seabrook studied the antibiotic level in a diabetic foot at the time of sepsis [1]. He found that only 12/26 patients showed the presence of antibiotics in the surrounding muscle tissue of a septic diabetic patient when the antibiotic was administered an hour before surgery. Only six of the 26 patients were found to have therapeutic antibiotic levels within the foot. Due to the low level of systemic antibiotics found within the pedal bone and soft tissue, local antibiotics are a great addition to treating pedal osteomyelitis.

Polymethyl methacrylate (PMMA) antibiotic beads and cement have been widely used and accepted. However, there are a few issues with using non-absorbable antibiotic cement, including the need for antibiotic bead removal, inconsistent rate of drug elution and need for secondary operation for antibiotic bead/spacer removal, and high inflammatory reaction.

Absorbable antibiotic cement has extended the usage and minimized the issues related to non-absorbable antibiotic beads. There are two primary substances of absorbable beads: calcium sulfate and calcium phosphate. Calcium sulfate is an absorbable synthetic that can release antibiotics at a more constant rate after implantation. The advantages of absorbable beads include biofilm resistance [2], absorbability [3], low inflammatory response, minimal drainage, and minimizing the nidus for infection [3,4] Moreover, studies have also shown that the concentration of antibiotics released from calcium sulfate beads has been as high as three times that of antibiotics released from PMMA beads *in vitro* [5]. Absorbable antibiotic beads can slowly release high concentrations of antibiotics locally for up to 6-10 weeks and are known to dissolve into the surround-

ing tissue from that point onwards [6]. Contraindications include patient hypersensitivity to particular antibiotics, wounds not large enough to hold antibiotics, open wounds without a soft tissue envelope, and unsalvageable limbs.

The standard indications of antibiotic beads and cement today is to prevent infections (open fractures, bone infections, soft tissue infections), infected total joint replacements, or as a bone void filler for dead space management. Patients unable to tolerate systemic antibiotics or patients with kidney or hepatic disease can safely tolerate the local implantation of antibiotic beads/cement.

Below is a case report on a non-diabetic male with osteomyelitis after an arthrodesis procedure. With an absorbable antibiotic cement spacer, we salvaged the first ray, which is crucial in preventing subsequent foot and ankle issues and further amputations.

Case Report

The patient is a 67-year-old male with a past medical history significant for hypertension, arthritis, and gout. The patient had undergone a 1st metatarsophalangeal joint (MTPJ) fusion performed by another surgeon on 11/5/2020 with ensuing surgical dehiscence. The patient was immediately referred to infectious disease and placed on oral antibiotics. Despite conservative care and treating the soft tissue infection, the patient failed to improve and underwent removal of hardware and debridement of bone with bone biopsy on 12/23/2020. Bone biopsy at the level of the metatarsophalangeal joint was positive for acute osteomyelitis, resulting in bone excision at the level of the MTPJ and application of antibiotic cement spacer.

At his initial presentation to our clinic, he had developed a second surgical dehiscence after his last surgery. (Figure 1) Upon obtaining radiographs (Figure 2 and 3), the antibiotic spacer appeared more prominent than the void created from the debridement of the MTPJ area, which presumably led to wound healing issues.

The patient had failed multiple efforts at conservative wound care management. The patient was taken back to the operating room on 02/26/2021 for an exchange of antibiotic cement spacer, bone biopsies, and the application of a mini-rail external fixator

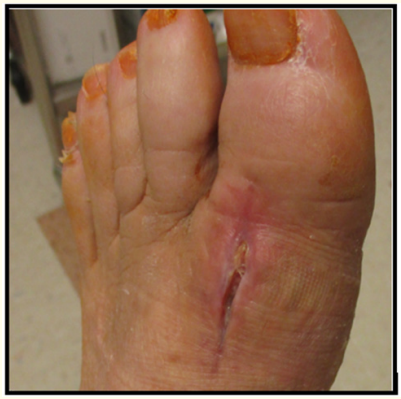

Figure 1: Initial clinical presentation with surgical dehiscence that probed to the bone.

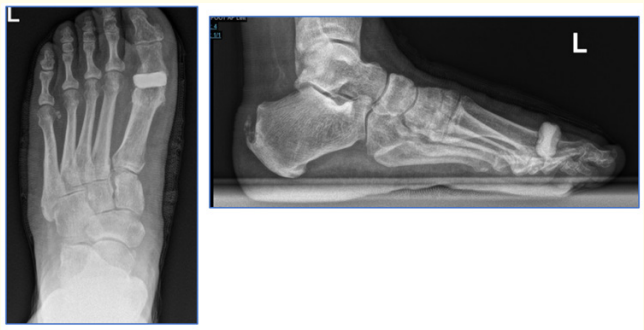

Figure 2 and 3: Initial preoperative radiographs AP and lateral with a 2.3 cm x 1.2 cm antibiotic cement spacer.

(Figure 4 and 5). Bone biopsies were obtained both at the metatarsal and at the proximal phalanx. Bone biopsy resulted in chronic focal osteomyelitis. The patient was treated locally with vancomycin-infused absorbable calcium phosphate antibiotic cement spacer and systemically with 6-8 weeks of IV antibiotic therapy. The patient was allowed to ambulate in a surgical shoe with a cutout for the external mini rail.

The patient returned to the operating room for bone biopsies on 4/2/21 at the level of the metatarsal and base of the proximal phalanx. Biopsies at this time were negative for acute or chronic osteomyelitis.

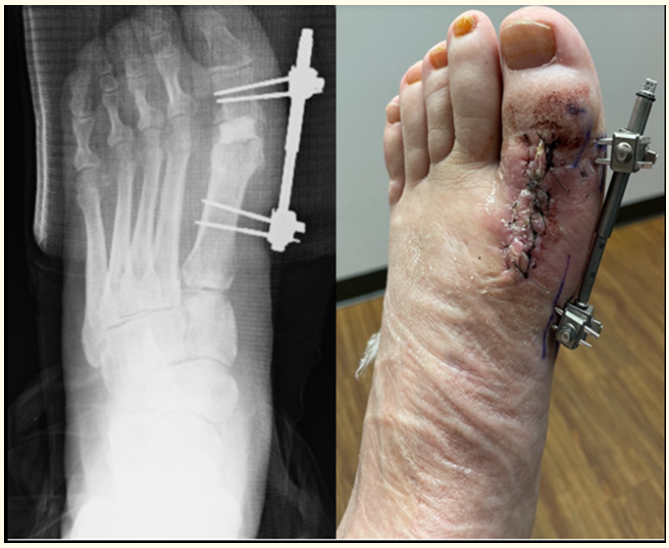

Figure 4 and 5: Immediate post-operative radiograph and clinical image. Patient underwent an exchange of non-absorbable to absorbable antibiotic cement spacer.

The patient was planned to have a staged procedure with the removal of an antibiotic cement spacer and application of a bone graft to fuse the metatarsophalangeal joint. However, the patient wanted to wait until retirement before the final reconstruction. We discussed the risks, benefits, and alternatives of leaving the antibiotic cement spacer, and the patient understood and wanted to proceed with a later operation date.

Conclusion

At the patient's final follow-up six weeks after mini rail removal, the patient ambulates in custom orthotics and has been wound and pain-free (Figure 6). The patient is happy with his recovery as he has returned to his prior activity level, including playing sports such as golf.

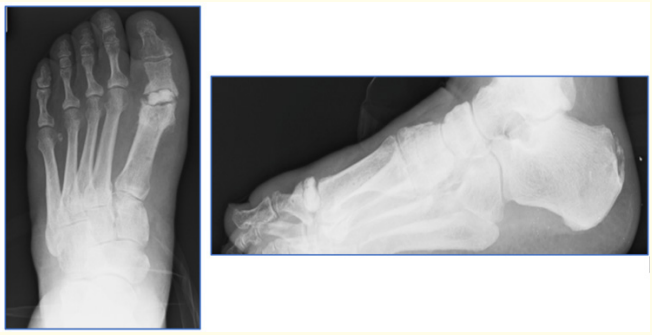

Figure 6 and 7: Final post-operative radiographs at 6 weeks of AP and lateral with resorption at the metatarsophalangeal joint.

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