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Case report

Retained rubber foreign body mimicking mid foot multi focal osteomyelitis – A case report

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ABSTRACT

Background: Retained rubber foreign bodies following penetrative foot trauma are rare. The subsequent tissue reaction that develops in response to encapsulating it results in a foreign body granuloma, which clinically and radiologically mimics various infective and tumorous conditions of bone. The possibility of having retained foreign bodies should be considered years after injury, clinical and radiological findings should be differentiated from multifocal chronic osteomyelitis.

Case report: An 18-year-old male presented with left midfoot pain, swelling, and discharging sinus since 1 year in 2020. He had sustained a wood splinter injury through his rubber footwear in 2017 and developed foot pain and swelling which on investigation revealed mid-foot bony lesions. With indigenous treatment, he reported extrusion of a small wooden splinter from the foot. On presenting with the above complaints, new investigations revealed bony lesions with surrounding soft-tissue edema, abscess, and sinus tract. Considering it to be chronic osteomyelitis, debridement and curettage were performed, and unexpectedly a rubber foreign body was identified and microbiological tests with histopathology findings confirmed an aseptic foreign body reaction.

Conclusion: With penetrative foot injuries, the possibility of having more than one radiolucent foreign body (wood and rubber) retained, following a single impaling injury and its osteolytic lesions could be a sequela of foreign body granuloma presenting years later.

1. Introduction

In India, penetrating foot wounds are common with retained foreign body (FB) most often being thorn tips, fragments of wood, and metallic pieces among a large list.[1] Retained rubber FB after penetrative foot trauma has rarely been reported.[2–4] FB granuloma develops as a tissue reaction, due to "frustrated phagocytosis" attempt to encapsulate the FB.[2] Clinical presentations vary from acute painful soft tissue mass in the foot with or without local inflammatory signs or as late presenters with chronic foot pain, soft tissue mass, abscess and/or discharging sinus many months or years later of a definitive or forgotten trauma.[1,5] Its nonspecific clinical presentation and associated bony lesions can mimic various infective and tumorous conditions,[2,4] which if neglected or improperly managed can cause extensive bone and joint destruction thereby causing significant morbidity. With a history of antecedent penetrating trauma, even after its removal, a high index of suspicion should be maintained to the possibility of having a retained radiolucent FB. With meticulous evaluation the FB needs to be identified, soft tissue swelling and radiological lesions need to be evaluated and distinguished from chronic osteomyelitis, other bone[5,6] or tumorous conditions.[2–4,7] Histopathological examination (HPE) is the ultimate diagnostic tool to identify FB granuloma. Herein, we present a case of a 3-year-old retained rubber FB that presented clinically and radiologically as mid-foot multifocal osteomyelitis with abscess, undetected by Magnetic resonance imaging (MRI) and unexpectedly identified during debridement and curettage of the osteomyelitis focus.

2. Case report

An 18-year-old male, presented with left mid-foot pain, and dorsal swelling with discharging sinus for 1 year as shown in Fig. 1. He sustained a penetrative wood splinter injury through his rubber footwear in 2017, which he immediately removed. The wound healed, yet he continued to have persistent mid-foot pain. In 2018, he sought medical

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Fig. 1. Clinical image of the left foot showing diffuse mid-foot swelling with discharging sinus over the cuboid and hyperpigmentation of surrounding skin.

help when his foot pain persisted and noted a painful swelling around the puncture site with local inflammatory signs. Radiographs revealed extensive osseous erosions involving metatarsal heads, and midfoot joints as shown in Fig. 2A and B. MRI findings were supportive, revealing bony destruction with altered marrow signals of midfoot bones, surrounding soft-tissue edema, and effusion in mid-talar joints and intertalar joints, suggestive of infective pathology as shown in Fig. 2C and D. The patient opted for indigenous treatment and reported the bursting of the swelling on his sole, wherein a small wood splinter was extruded. His pain then gradually subsided, the wound healed and he returned to an active life. He then presented to us with the above complaints in September 2020.

3. Clinical findings

On examination, a dorsal diffuse swelling in the midfoot with discharging sinus was noted, adherent to the underlying cuboid bone and tenderness elicitable over the other midfoot bones.

4. Diagnostic assessment

Blood investigations were essentially normal other than an elevated Erythrocyte sedimentation rate (ESR) of 27mm/hour. In 2020, the plain radiograph of the left foot showed cortical irregularity with sclerosis involving medial cuneiform with obliteration of joint space between the medial cuneiform and navicular bone as shown in Fig. 3A and B. MRI of the left foot (2020) also revealed findings similar to previous MRI, along with diffuse soft tissue and subcutaneous edema, well-defined localized collection on the lateral aspect of midfoot, and linear sinus tract extending from abscess to underlying involved bones suggestive of multifocal osteomyelitis with abscess.

5. Differential diagnosis

The differential diagnosis of a bony reaction to an unrecognized FB can include osteoid osteoma, chronic and acute osteomyelitis, tuberculosis granuloma, aneurysmal bone cyst, simple bone cyst, and neoplasms.

6. Therapeutic intervention

With the above working diagnosis, the patient underwent abscess drainage, sinus excision, debridement, and curettage. Using a dorsal incision, the abscess was drained with approximately 1ml of pus, and its fibrotic walls along with the sinus tract were excised as shown in Fig. 4A. Gross destruction and collapse of the bones of the midtarsal joints were noted. Unhealthy granulation, fibrous tissue, and necrosed bone in the surrounding area were debrided. Unexpectedly during curettage, a bluish-black rubber FB measuring approximately 5 × 5 mm was

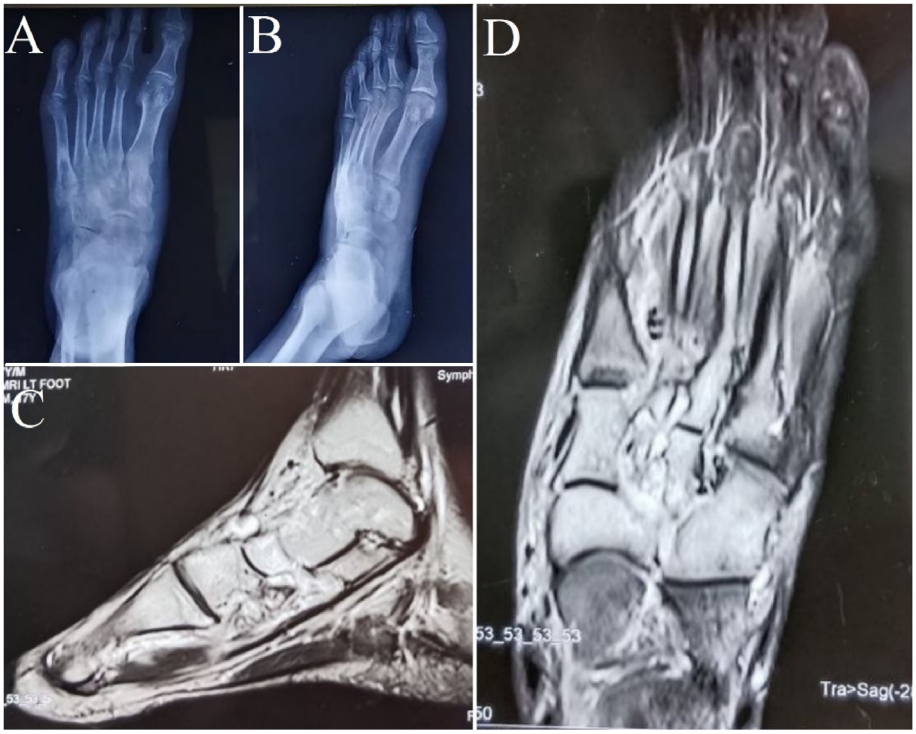


Fig. 2. A & 2B (2018) show extensive osseous erosion involving metatarsal heads, intertarsal, talonavicular, and calcaneocuboid joints in plain radiograph of the left foot, and 2C & 2D show altered marrow signals of bones of midfoot joints with surrounding soft tissue edema and effusion in subtalar and intertalar joints in sagittal and coronal sections in the MRI of left foot.

evacuated as shown in Fig. 4b. The debrided metatarsal heads and remaining midtarsal bones were stabilized with 2 K wires as shown in Fig. 5.

7. Follow-up and outcomes

Samples of pus and debrided tissue did not indicate any infective organisms. Histopathology of the excised specimen revealed the features consistent with granuloma without necrosis showing fibro-collagenous tissue infiltrated with mixed inflammatory cells and congested blood vessels within, suggestive of aseptic FB granuloma reaction.

Postoperatively, the foot was supported with a below-knee posterior slab and non-weight bearing for 6 weeks. The patient was treated with intravenous antibiotics for 5 days according to our post-operative protocol as there was no septic focus. At 2 years follow up, there is no recurrence of symptoms, and has been active comfortably.

8. Discussion

Penetrating foot trauma with retained FB is not uncommon.[1,6–8] In India, a vast majority reside in suburban or rural areas, also kneeling, ground working and sitting practices are common social requirements and religious customs, and most walk or play barefoot or use open footwear for daily activities.[1] This predisposes them to a wide range of injuries ranging from simple cuts, and abrasions to deep penetrative wounds of the foot caused by date thorns,[1,6,7] nails,[3] or wooden splinters.[1,4,8] As most injuries are minor, with minimal short-term discomfort further medical attention is rarely sought. Late presentation is usually due to negligence of the patient when pain, inability to bear weight, and impaired mobility force him to seek medical help. In most cases, with an embedded FB, infection or inflammation will follow in a few days, or the symptoms may quickly subside and remain silent for days, months, and rarely evenly years.[4,6] Such patients with chronic foot pain, the possibility of small pieces of footwear being implanted into the foot by impaling objects is often not considered and these seemingly innocuous puncture wounds can lead to serious infective complications.[9]

The median time of injury to detection of osseous lesions is variable from months to years (4 months–20 years) and many times the injury is forgotten.[10] Although our patient presented 3 years later, he developed osteolytic lesions within a year of injury and despite the removal of the wooden splinter persisted to have chronic foot pain. When he developed dorsal foot swelling and sinus with pus discharge, he sought medical help. Following his initial trauma, he assumed that the wood splinter was removed, hence the possibility of another FB or a part of the same FB being retained within his foot was not considered and since he was asymptomatic, no further investigation was carried out.

FB granuloma develops as a body's reaction in an attempt to phagocytize it, but failing to do so will result in encapsulation by fibrous tissue.[3] The tissue reaction to a retained FB depends on its size, type, location with bone, joint or soft tissue, and the virulence of the associated organisms.[2] Organic objects (thorns, spines, and twigs) unlike metallic FB cause more severe inflammatory reactions and infections as it provides an ideal culture medium for bacteria.[3] Retained organic FB in or near the bone, will incite inflammatory changes inducing osteoblastic[3] or osteolytic changes[6,10] on radiographs thereby mimicking bone tumors[4,7,8] or have resulted in chronic osteomyelitis with abscess and discharging sinuses.[1,5,6,9] Sometimes, signs of chronic inflammation or superinfection (soft tissue swelling, calcifications, and osseous erosions) can be seen with long-standing cases of retained FB, wherein such findings may be mistaken as a more sinister disease (soft tissue or osseous neoplasm's) prompting further investigations.[11] Delayed presentations are a significant marker for deep-seated infection with further infection

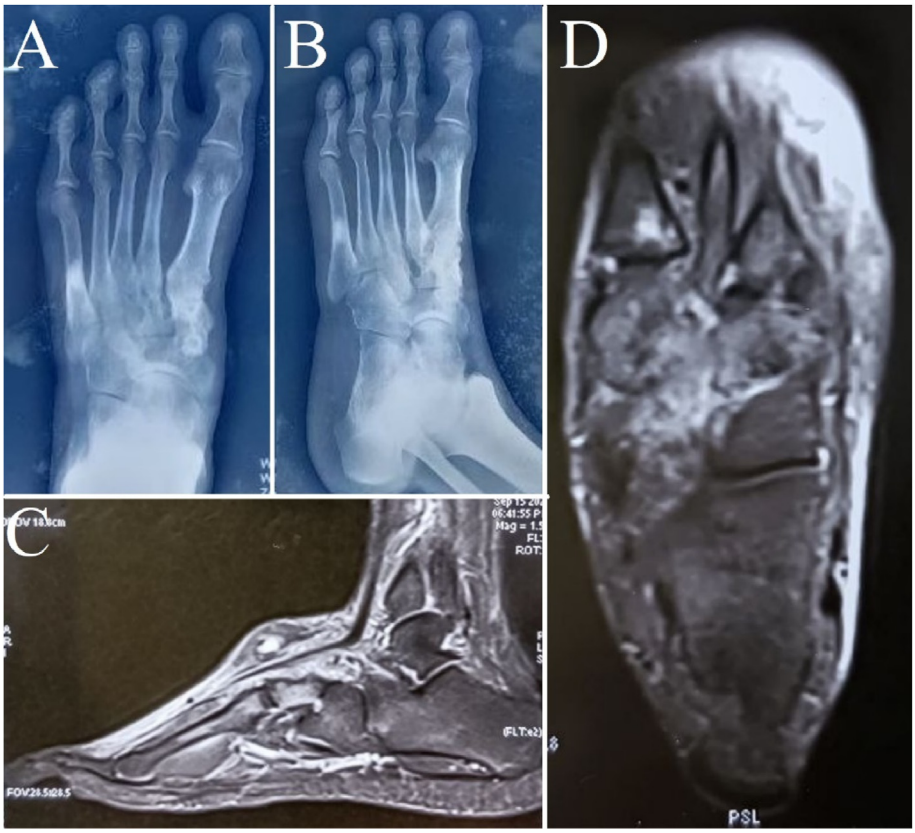


Fig. 3. A & 3B (2020) show cortical irregularity with sclerosis involving medial cuneiform with obliteration of joint space between the medial cuneiform and navicular bone in plain radiograph of the left foot and 3C & 3D show multifocal osseous involvement with cortical erosions and irregularities in bones of midfoot with diffuse soft tissue and myofascial edema and abscess in sagittal and axial sections in the MRI of left foot.

or relapse after initial improvement, pointing to osteomyelitis or retained foreign body.[6]

In the first instance, our patient presented elsewhere with persistent foot pain and swelling, whereby a splinter of wood extruded itself following indigenous treatment. His investigative findings, history, and clinical presentation suggested a retained FB with chronic osteomyelitis or FB tissue reaction to the wooden splinter on retrospection. With FB extrusion, his symptoms in the foot subsided and later resurfaced with swelling and sinus which when investigated, revealed osteolytic lesions and abscess suggestive of chronic osteomyelitis. Foot osteomyelitis secondary to infection following penetrative injury is the most probable diagnosis, a retained FB was not considered as the patient confidently assured the removal of a wooden splinter on two earlier occasions from his foot.

Plain radiograph of the foot may sometimes help in identifying FB due to density difference from surrounding soft tissue.[9] Metal and ceramics are easy to identify but plastic, rubber, wood, and organics are more challenging being radiolucent and having matching densities to soft tissue.[4] The object's size also limits its visibility on radiographs.[12] On reviewing patients' radiographs, no FB was identified, since both wood and rubber are radiolucent, the chances of its detection are poor. MRI in our patient was done to delineate the extent of bony lesions and soft tissue involvement and is an essential component in the evaluation of suspected osteomyelitis or abscess.[1] MRI provides detailed images of bone and soft tissues, shows sinus tracts, abscess, soft-tissue edema, and sometimes even radiolucent FB,[4] and even guides the surgical approach for its retrieval.[7] MRI shows the FB typically as low intensity or signal void to the muscles on T1-weighted images (WI) and T2-WI.[2,8] However identification of FB on MRI is difficult when the bodies are small.[3,8,9] MRI helps to characterize mass lesions, but it does not always differentiate between foreign body–associated masses and tumorous lesions.[12,13] In our patient, both wood and rubber FB were undetectable on MRI, possibly due to their small size, and neither did we suspect its existence. Another possible reason for its undetectability is the migration of the FB along anatomic planes of potential spaces which could explain the FB's apparent absence.[3]

The surgical procedure was carried out to excise abscess and sinus tract, debride the pathological site and collect appropriate tissue samples for microbiological testing and HPE. In long-standing cases, retained rubber FB fragmentation secondary to continued walking occurs with tattooing into the surrounding soft tissue, so debridement surgery should include the excision of a cuff of tissue surrounding the FB so that residual pieces are not retained.[9] Our debridement and curettage extended to the plantar aspect of tarsal bones to evacuate any remnants, considering the above possibility. The incidental finding of a retained rubber FB was surprising, as the patient's confident assurance of earlier retrieval was misleading and the possibility of having another type of FB implanted during the primary injury was not considered. The type of FB, nature of the injury, immunological response to the FB, and the possible earlier resolution or lack of infection led to the delayed presentation that clinically and radiologically mimicked multifocal osteomyelitis. The most precise method for confirmation of FB granuloma is biopsy with HPE revealing a granulomatous reaction consisting of histiocytes, fibroblasts, and angiogenesis is seen.[2,3,12,13] Samples for microbiological testing of our patient did not reveal any infective organism and HPE findings were consistent with an aseptic FB granuloma.

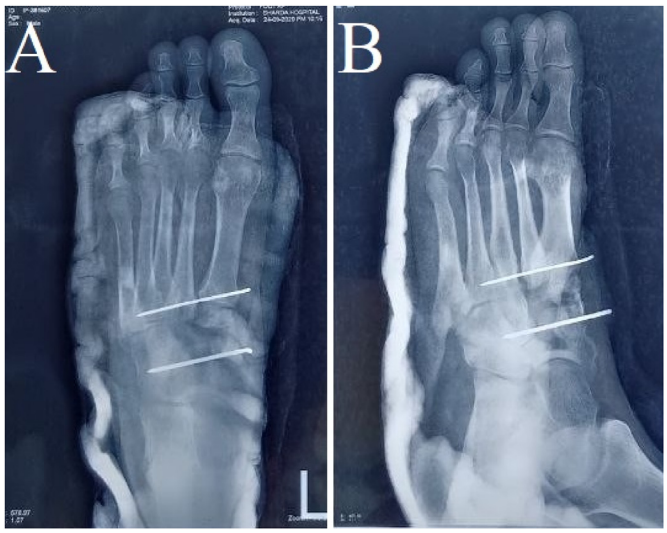


Fig. 5. Postoperative plain radiograph showing K-wire stabilization of the debrided metatarsal head and remaining metatarsal bones.

To summarize, the patient's with past penetrative foot trauma presenting with persistent pain, swelling, discharging sinus, and osteolytic lesions should be reviewed carefully with retained FB high on the differential list, despite the patient giving a definitive history of its removal. The trauma history should include the type of footwear, if worn during the injury as rarely, there may be two different types of retained FB that may have been introduced during a single impaling incident and subsequently have distinct presentations as highlighted in this case.

9. Conclusions

Penetrative injuries through footwear should result in high suspicion of retained radiolucent FB of more than one type (wood and/or rubber) which can become symptomatic many years later. When swelling or discharge, following removal of a FB has been diagnosed, this could be a

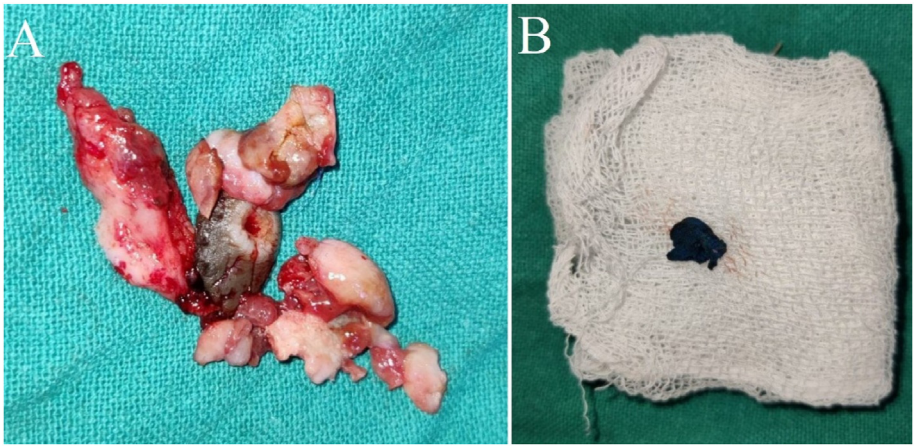


Fig. 4. A showing excised sinus track, abscess, and fibrotic wall, and 4B shows the excised rubber foreign body incidentally found during curettage.

recurrent infection or FB granuloma secondary to a retained FB. Adequate exploration and complete removal of FB with debridement and curettage is the key to successful treatment and alleviating symptoms.

Informed consent

An informed consent was obtained from the patient for this publication.

Declaration of patient consent form

The patient declares no conflict of interest in publishing the case report for academic purposes.

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Nil.

Author contributions

(I) Conception and design: Albert D'souza and Madhan Jeyaraman.; (II) Provision of study materials or patients: Albert D'souza, Naveen Chauhan, Ankit Pathak.; (III) Collection and assembly of data: Albert D'souza and Madhan Jeyaraman.; and (IV) Manuscript writing: All authors. All authors have read and agreed to the published version of the manuscript.

Declaration of competing interest

Nil.

Acknowledgments

Nil.

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