INTRODUCTION

Penetrating wounds to the extremities are common and foreign bodies retained in the soft tissue are occasionally encountered. They are most frequently seen in the hand, because it is easily exposed to injury (1, 2). The foot is the second most common site (1, 3). Rarely, foreign bodies may be retained within the bone and they cause confusion among the radiologists and physicians with respect to the diagnosis. As far as the English literatures are concerned, thorns, glass, needles or wooden fragments are the main foreign bodies that are retained in the foot bones (4, 5), and a wooden foreign body retained in the calcaneus has rarely been reported (6).

We report a rare case of an unrecognized wooden foreign body retained in the calcaneus with a review of the literatures of foreign bodies retained in the foot bones.

This case report was approved by the Institutional Review Board of our institution and the requirement for obtaining the patient’s informed consent was waived.

CASE REPORT

A 9-year-old boy presented with pain on the plantar aspect of the right heel for 7 days. He described that his pain aggravated after running and he denied any history of trauma or injury. Physical examination showed a healthy-looking appearance without any previous medical history. Local tenderness was observed over the plantar aspect of his right heel area, but there was no evidence of swelling or erythema in this region. Laboratory findings revealed a normal white blood cell count, a normal C-reactive protein level, and a slightly increased erythrocyte sedimentation rate (33 mm/hr; normal range: 3–13 mm/hr).

Radiographs showed a tubular geographic osteolytic lesion in the anterior body of the right calcaneus with surrounding sclerotic change (Fig. 1A). T2-weighted MRI showed an approxi-
Fig. 1. A 9-year-old boy with an unrecognized foreign body retained in the calcaneus.

A. Plain radiographs with axial and standing lateral views of the right foot show a tubular geographic osteolytic lesion in the anterior body of the right calcaneus (arrows) with an ill-defined margin and surrounding sclerotic change.

B. Sagittal T2-weighted MR image shows a low signal intensity tubular lesion in the anterior body of the calcaneus (arrow) with surrounding high signal intensity tissue (arrowheads).

C. Sagittal fat-saturated enhanced T1-weighted MR image reveals non-enhancement of the tubular lesion, suggesting a foreign body (arrow), whereas the surrounding soft tissue is strongly enhanced (arrowheads), suggestive of a foreign body reaction. Note edematous bone marrow enhancement in the body of the calcaneus (open arrows).

D, E. Coronal T1-weighted (D) and fat-saturated enhanced T1 weighted (E) MR images show a cortical defect (arrows) on the plantar surface of the calcaneal body, just below the retained foreign body. Note the focal defect with enhancement in the overlying plantar fascia (arrowheads).

F. A gross photograph of the extracted wooden foreign body.
A Case of an Unrecognized Foreign Body Retained in the Calcaneus

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Dedicated in the bone is difficult than that of a foreign body embedded fragment. Making a diagnosis of a retained foreign body is normal, and the retained foreign body was a radiolucent wooden us. In addition, the skin over the injured area in the patient was remember the cause of the foreign body retained in the calcaneus. The foreign body was removed and curettage of the granulation tissue was performed. Pathology report showed chronic active inflammation caused by the foreign body, suggestive of a plant. A gram stain and AFB stain of the foreign body were negative for bacteria and yeast, and a gram stain and AFB stain of the granulation tissue were also negative.

However, the patient and his parents could not remember any occurrence of a penetration injury to the heel, in spite of intensive inquiry after the removal of the foreign body.

DISCUSSION

Most foreign bodies retained in the extremities are superficial and they cause temporary discomfort (7). They are most frequently seen in the hand, followed by the foot (1-3). Making a diagnosis of acute foreign body injury is quite easy based on the history, but it becomes difficult to diagnose it in neglected or chronic cases. Clinical manifestations can appear years after the initial injury, and the patient or the patient’s parents might not remember anything about the injury. This can lead to misdiagnosis of the lesion and it may result in unnecessary workup and inadequate treatment for the nonexistent pathology.

Our patient also denied any history of trauma and he failed to remember the cause of the foreign body retained in the calcaneus. In addition, the skin over the injured area in the patient was normal, and the retained foreign body was a radiolucent wooden fragment. Making a diagnosis of a retained foreign body embedded in the bone is difficult than that of a foreign body embedded in the soft tissue, and it is more difficult in the case of a radiolucent foreign body.

Most of the previously reported cases of foreign bodies retained in the foot bones occurred in the metatarsal bones (4, 5), and a case of a wooden foreign body retained in the calcaneus has rarely been reported (6). The soft tissue in the forefoot and the midfoot is thinner and softer than that in the heel, and therefore, the foreign body can easily reach the bone. In addition, theoretically, it is difficult for the foreign body to penetrate the calcaneus unless a vertically loaded strong force is applied. In the present case, the wooden foreign body was also vertically orient- ed in the calcaneus. Although in the present case we could not accurately identify the foreign body, whether it was a toothpick or just wood, since the child and his parents completely forgot about the penetration injury, we assume that the tip of the wooden foreign body must have been sharp enough to penetrate the calcaneal cortex and there must have been a vertically oriented strong impact like weight bearing over the foreign body. Therefore, the foreign body might have been embedded momentarily within the calcaneus just after penetrating the calcaneal cortex.

According to the published literatures, most of the identified foreign bodies retained in the foot bones are thorns (8), wood (9) or toothpicks (4). Therefore, radiographic findings are usually negative except for osteolytic change. In these cases, computed tomography (CT) and MRI would help to detect the retained foreign body and would lead to appropriate treatment. In our case, the wooden fragment was not detected by the radiograph, but MRI revealed a retained foreign body with a surrounding inflammatory granuloma in the calcaneus. The foreign body was hypo-intense on T1- and T2-weighted images, and a rim-like enhanced lesion around the foreign body was seen after contrast enhancement. Peterson et al. (10) also reported two patients with wooden foreign bodies and their MRI’s revealed a target appearance with the central foreign body appearing as a signal void or a hypointense area in contrast to the surrounding hyper-intense inflammatory tissue. However, in some cases, high signal intensity of the granulation tissue on T2-weighted image may outshine the retained foreign body and may make identification difficult (3). When the wooden foreign body is small and there is no inflammatory response, detection of the retained wooden foreign body may be difficult on MR imaging. In these cases, CT scan may be useful and it may facilitate the diagnosis of a sus-
pected wooden foreign body. Ultrasonography is also known to be useful in detecting a hidden non-radiopaque foreign body in the soft tissue, but it may not be helpful for detection of a foreign body embedded within the bone.

In conclusion, we reported a rare case of an unrecognized wooden foreign body retained in the calcaneus and showed the usefulness of MRI in its evaluation. Radiologists need to be familiar with the characteristic MRI findings and they should be able to suggest the diagnosis of a retained foreign body in spite of the unknown history.

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