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Case Report

Nuances in detecting retained foreign bodies: a case report of a glass shard embedded in a child's scalp ☆,☆☆

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ABSTRACT

Foreign bodies (FBs) are a relatively common reason for admission to the emergency department, with subacutely embedded FBs presenting a diagnostic challenge to physicians. Retained FBs may cause the patient harm and result in litigation when missed. Diagnostic imaging is a powerful tool for localization of FBs and a physician's choice of modality should reflect its anticipated composition. This case report pertains to a 2-year-old boy with a glass shard embedded in his retro auricular scalp who presented with a painful subcutaneous lesion months after an overlying laceration repair at an outside emergency room. The attending neurosurgeon was able to identify a glass shard both on physical examination and axial T2-weighted MRI. Surgical exploration resulted in the removal of a 1-cm square glass shard. Key to the diagnostic potential of imaging is knowledge of a patient's relevant medical history and the composition of the suspected FB. Herein, we describe imaging modalities and their utility in the context of retained glass FBs.

Introduction

Foreign bodies (FBs) are a relatively common reason for admission to the emergency department, with retained FBs presenting a significant challenge to physicians. Retained FBs may cause a patient serious harm and lead to costly malpractice litigation. Diagnostic imaging is a powerful tool for proper localization of FBs and a physician's choice of modality must reflect the anticipated composition of the FB. Though imaging is often instrumental to the diagnostic process, there are instances in which it may be misinterpreted or misleading and times

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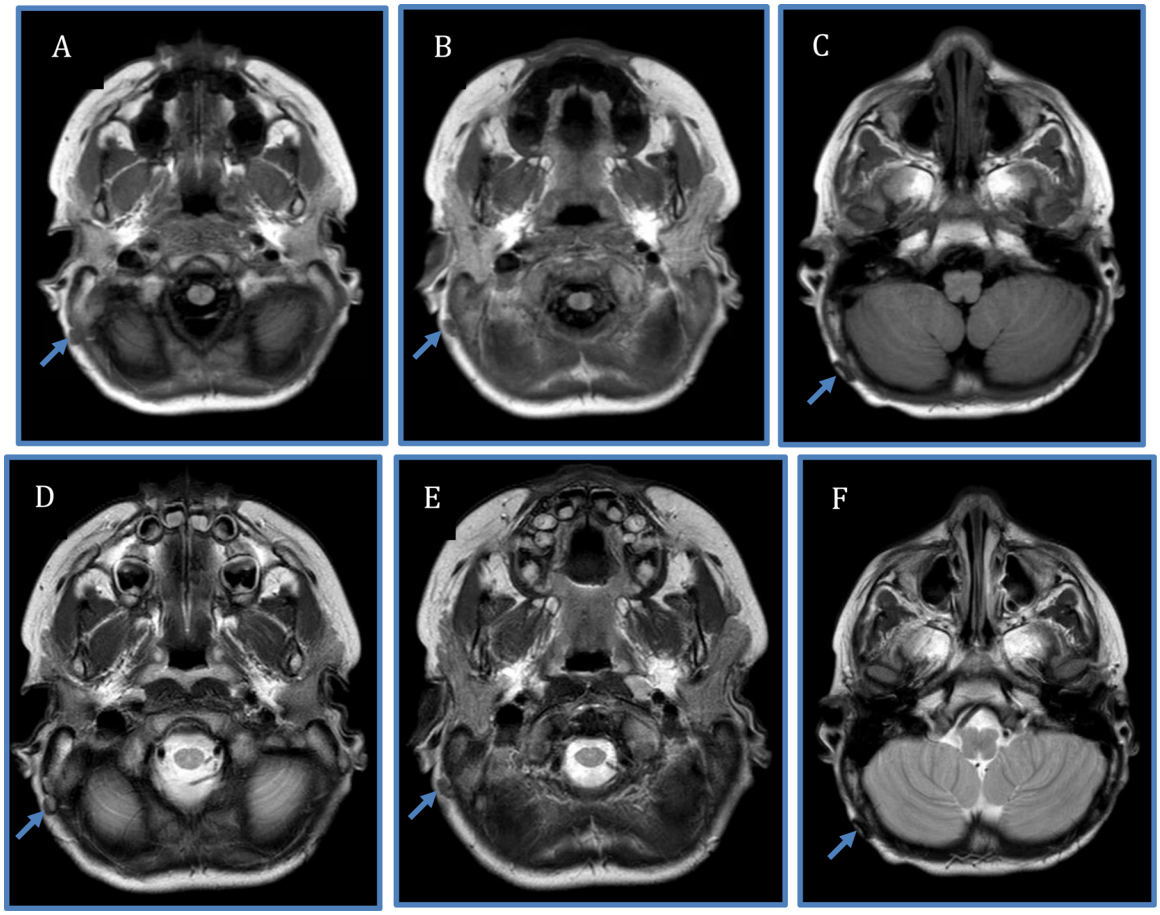

Fig. 1. (A, B) – Axial T1-weighted MRI demonstrating ovoid, soft tissue nodules/lymph nodes; (C) Axial T1-weighted MRI demonstrating glass shard; (D, E) Axial T2-weighted MRI demonstrating ovoid, soft tissue nodules/lymph nodes; (F) Axial T2-weighted MRI demonstrating glass shard.

when it may be contraindicated. To exemplify, we present a case report of a 2-year-old male with a previously missed FB and the diagnostic and treatment considerations that should occur with similar patients.

The case

A 2-year-old male with an uncomplicated developmental history presented with a laceration of the right occiput after falling onto and shattering a wine glass at an unspecified date. He was taken immediately to an outside emergency room where the wound was debrided and a 0.75 cm laceration was sutured. At a routine pediatric check-up, his mother commented on a non-painful, non-erythematous lump that had persisted at the site of the aforementioned injury. Nine months later during the next pediatric visit, the mother was again concerned about the subcutaneous lump, stating that it was now occasionally painful to the touch. The child was subsequently referred to our Pediatric Neurosurgery service. Physical examination revealed a minimally mobile mass with sharp edges. Due to an abundance of caution, an MRI was obtained to ensure that there was no intracranial extension of the glass shard or any other unexpected findings. The MRI report identified 2-3 ovoid, soft tissue nodules that were most likely lymph nodes in the retro auricular, right occipital region (site of prior injury, Figs. 1A, B, D, E). Further examination of axial T2-weighted MRI by the attending neurosurgeon revealed the presence of a retained FB (Fig. 1F).

The patient was then taken for surgical exploration, which revealed, as expected, a 1-cm square glass shard lying superficially to the skull (Fig. 2). The shard was extracted as a single piece and the wound was cleaned and sutured. The patient's post-operative course was uneventful, and he was discharged in a matter of hours with pain resolution.

Discussion

FBs are a relatively common phenomenon in the emergency room, with one study by Steele et al. finding a 15 percent incidence of retained glass FBs [1]. Depending on their location and depth, FBs can present physicians with a plethora of challenges. FBs may introduce bacteria or other infectious agents into deep tissues, resulting in a festering abscess or possibly sepsis. FBs, if missed, may result in injury and litigation. Of note, 5%-20% of emergency department malpractice lawsuits revolve around wound care and retained FBs [2].

Fig. 2 – Intraoperative imaging demonstrating the position of the shard in the scalp and its size.

Physicians must be meticulous in the care and debridement of any open wound with suspected FB. A physician's choice of imaging is dependent upon the characteristics of the patient, the suspected composition of the FB, and its location as related to the underlying anatomic structures. Ultrasound is a versatile modality capable of accurately visualizing a wide variety of FBs, from glass to graphite, regardless of radiolucency. Furthermore, ultrasound may be utilized at the bedside or in the operating room without undue inconvenience. X-rays and CTs are, unlike ultrasound, unable to image radiolucent FBs. Yet, ultrasound's difficulty visualizing FBs within air-filled cavities such as sinuses, as well as the need for lower frequency transducers when imaging deep FBs, limit its utility. CT may be utilized when a more complete understanding of the FB's orientation in the anatomy is required but delivers a relatively high dosage of radiation that may not be suitable for children. In fact, a routine head CT scan can expose a patient to 2 millisieverts (mSv) of radiation, thereby increasing a child's lifetime malignancy risk [3,4].

MRI, though expensive, is a powerful imaging modality. However, if ferromagnetic material is present, tissue damage may occur. Furthermore, MRI requires that the patient remain still, which in the case of children may necessitate anesthesia. Unfortunately, it has been reported that children younger than 4-years-old who have undergone surgery with anesthesia have significantly lower IQs than those of unexposed children [5].

In this case, the emergency room clinicians failed to detect the glass shard. The child's pediatrician referred the patient to pediatric neurosurgery after two office visits and the onset of significant pain. To our knowledge, no imaging up to this point had been performed. Although on the MRI report the lesion was initially described as probable lymph nodes, an attending neurosurgeon was able to locate the glass fragment upon further examination of the imaging.

Normal lymph nodes are isointense or slightly hyperintense to fat on T2-weighted MRI sequences whereas glass appears as hypointense on T1 and T2, as was the case here (Figs. 1C, F) [6,7]. Studies of an in vitro/ex vivo model of the orbit and pig eyes have shown that even small amounts of lead within glass may result in artifacts on MRI appearing as areas of hypointensity surrounded by hyperintensity [8]. Paramagnetic elements including silicon, aluminum, and oxygen have also been shown to produce artifacts on MRI. Given the fact that glass commonly contains Al_2O_3 and SiO_2, it is unsurprising that glass FBs typically generate artifacts that may cause them to be missed or diagnosed as other anatomical structures [9].

Clinical correlation of imaging findings to medical history as well as physical examination findings is an integral component of the diagnostic process. Due to our desire to avoid unnecessary pediatric radiation exposure, MRI was chosen instead of CT to rule out intracranial extension or bony infiltration. The existence of the glass FB was self-evident, and notwithstanding the initial read, surgical exploration of the area was successfully carried out.

Conclusion

FBs are a relatively common reason for admission to the emergency department and a physician's failure to locate them may result in injury, infection, and possible litigation. Diagnostic imaging is a powerful tool for proper localization of FBs and a physician's choice of modality should reflect the anticipated composition of the FB. In the reported case, there was a failure to work-up a subcutaneous mass for a prolonged period, resulting in pain and a subsequent referral to pediatric neurosurgery. The glass FB, though not initially identified on imaging, was ultimately localized on MRI by the surgeon and excised thereafter. Knowledge of a patient's pertinent medical history is invaluable in the successful interpretation of diagnostic imaging. As the physician's armamentarium of diagnostic tools ever expands, he or she must continue to allow clinical intuition to drive decision-making.

Ethics approval

N/A

Patient consent statement

Written, informed consent for publication of their case was obtained from the patient.

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