Surgical Removal of a Retained Glass Foreign Body Using Point of Care Ultrasonography

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Abstract

A 20-year-old female had a forearm laceration closed in the ED. Subsequent radiographs revealed a retained a foreign body, which was assumed to be glass as the injury occurred breaking a glass window. Two weeks later, in the operating room, the foreign body was not palpable and fluoroscopy was not immediately available. As an alternative, point of care ultrasound was used to precisely localize the foreign body. This permitted a minimal incision to be made, thereby limiting surgical trauma to the forearm. The FB was easily removed. In cases where a foreign body cannot be localized by exam, ultrasound may provide an available and accurate means to locate the mass and facilitate removal in real time in the operating room.

INTRODUCTION

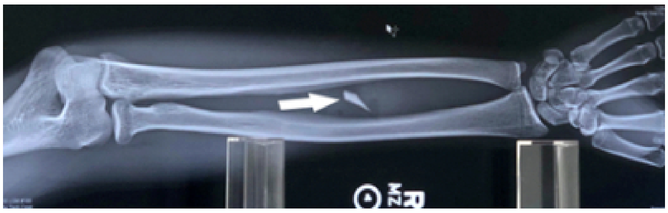
Retained foreign bodies (FB) from traumatic injury can be problematic, especially when they are radiolucent. Some materials like metal or bone are readily evident on x-rays, while some like glass, plastic or wood can be completely radiolucent. Blind exploration can cause traumatic injury and may not result in removal of the object. Ultrasound (US) imaging has been shown to be useful in identifying the retained FB, even in cases where x-rays cannot. In the present case, a glass FB was seen on x-ray, but on initial exploration in the emergency department it could not be located or removed. It was also not palpable on subsequent physical exam. We present the use of point-of-care US in the operating room to assist localizing a glass FB, and to aid in its removal while minimizing surgical exposure.

CASE REPORT

A 20-year-old female incurred a 2.5 cm deep laceration to the volar aspect of the right forearm. The injury occurred when she punched through a glass window. She was seen in the emergency department immediately following the injury where radiographs of the forearm revealed a shard of glass retained in the area of the wound (Figure 1).

Figure 1

Radiograph of right forearm. Foreign body seen in the center of the image (white arrow)



Exploration and debridement in the emergency department revealed lacerated muscle and tendon, but the FB, was unable to be located. Due to concerns for damage to other nearby structures, the decision was made to close the wound and refer the patient to a surgeon for possible re-exploration and removal of the foreign body.

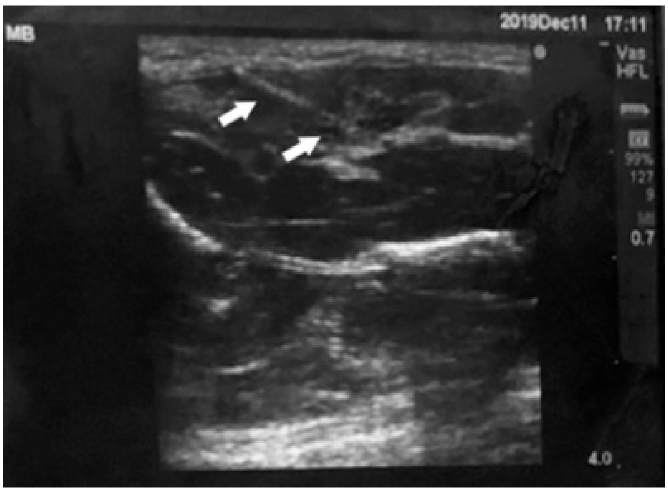
After evaluation by an orthopedic hand surgeon, it was decided to proceed with re-exploration and extraction of the foreign body. Sixteen days after the injury the patient presented for surgery. The glass fragment was not palpable on physical exam in the pre-operative area or in the operating room after induction of general anesthesia. Because examination of the extremity failed to reveal the exact location of the glass, there was concern that the foreign body may have moved. At this particular time in the OR, fluoroscopy and x-ray were not immediately available. To examine the arm, localize the foreign body and minimize anesthesia and operative time, the OR team decided to use point-of-care ultrasound to which was readily available in the OR suite (Figure 2). The ultrasound examination was accomplished using a 13- to 6-MHz 38-mm linear array ultrasound transducer (Edge II; SonoSite, Bothell, WA) to scan the forearm. After scanning in multiple planes, the FB was easily imaged and its location was precisely marked in the overlying skin (Figure 3). The FB's relationship to other critical structures was examined and it was found not to be near a major nerve, or blood vessel.

Figure 2

The ultrasound examination was accomplished using a 13- to 6-MHz 38-mm linear array ultrasound transducer (Edge II; SonoSite, Bothell, WA)

Figure 3

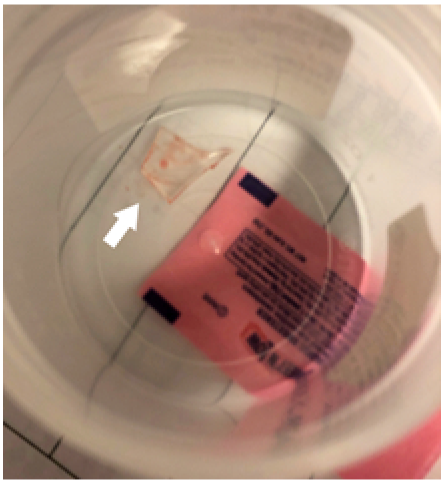
Ultrasound image of the foreign body (white arrows)



The patient was then sterilely prepped and draped. The arm was exsanguinated and a brachial tourniquet was inflated. A small incision was made directly over the FB as seen on US. After minimal dissection, the glass shard was identified and easily removed with limited surgical trauma to the surrounding tissues (Figure 4). Further inspection revealed no evidence of other injury requiring treatment. The wound was irrigated and closed.

Figure 4

Foreign Body (white arrow)



DISCUSSION

Localization and removal of deep retained foreign bodies can be a challenge for the clinician, even if they are radiopaque and visible on conventional radiographs. While metallic and glass FB are readily seen with x-ray imaging, they may move between the time of imaging and surgery. Other materials such as wood, plastic or plant materials can be radiolucent and not visible by these means. CT and MRI can demonstrate location of deep foreign bodies, but they are not as useful for intra-operative localization due to the inability to provide real time feedback during the procedure (1,2,3). US has many advantages over these other modalities including cost, portability, availability, speed, and use under sterile and real-time or "live" conditions.

In cadavers, US has been shown to effectively locate wooden foreign bodies as small as 2.5 mm in length (4) A study demonstrating the use of point of care US in the emergency department for detection of FB, showed the technique as very useful for detecting the location of FB not seen on standard X-ray (5). While this technique in the ED has been shown to be useful, there is no prior description of its use in the operating room. Having knowledge of the location, depth and orientation of a foreign body, and its proximity to critical structures, can be essential to safe and efficient removal. In our patient, US examination revealed more information than just where to make the incision. Imaging also revealed the orientation and depth of the mass and that it was relatively distant from critical neural and vascular structures. Although not used during the operation in our patient, US can be used in real time for difficult to remove FB or for those which are located adjacent to critical structures.

CONCLUSION

Point-of-care US is a useful tool for identifying the location of a FB whether or not it can be seen on X-ray. In addition to localizing the mass, its orientation and relationship to adjacent structures can also be determined. With US readily available in most operating rooms, its use in evaluating these lesions can aid in surgical localization and excision.

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