Case Report & Case Series

Combined use of OsiriX™ imaging software and ultrasound to guide surgery in a patient with a needle in the head

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ABSTRACT

It is essential to use minimally invasive techniques in the surgical removal of the foreign object in asymptomatic patients. A 39-year old woman with an approximately 3 cm-long thin metallic object adjacent to the left frontal bone is reported. The patient’s CT scans were evaluated using OsiriX™ software and by an ultrasound. The object was removed minimally invasively using a local anesthetic, with reduced operative time, less bleeding, quicker wound healing and better cosmetic results.

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1. Introduction

Penetrating head injuries may be diagnosed immediately or with late symptoms, years after the traumatic event. Late presenting symptoms may include epilepsy, abscess, cognitive decline, frontal lobe syndrome, and possible trauma-induced glioblastoma multiforme [1,2]. However, there is no absolute indication for removing intracranial sewing needles detected in the later decades of life [3,4]. Epilepsy, infection or abscess, cerebrospinal fluid leaks are among the main surgical indications [1,5,6]. Chronic headache can also be a reason for removal of the needle [3]. In asymptomatic patients, the needle can be left in situ or removed to prevent the possibility of the late symptoms mentioned above or the migration of the needle associated with subsequent neurological injury [7]. If the decision is made to operate on a patient with a sewing needle in the head, it is essential to use minimally invasive techniques. This is especially crucial to justify surgical removal in asymptomatic patients.

1.1. Case presentation

A 39-year old woman was seen in the outpatient clinic for severe neck and shoulder pain. A cervical magnetic resonance imaging (MRI) was advised. However, as soon as the MRI study started, the radiology technician noticed intense artifacts, which made him suspect that the patient might have a metallic object in her head. The MRI was stopped. A cranial computed tomography (CT) was performed and revealed an approximately 3 cm-long metallic object in the shape of a sewing needle embedded in the external table of the left frontal bone (Fig. 1a, b, c). The patient was suffering severe neck pain and insisted that this foreign object should be removed and her cervical MRI study completed so that a diagnosis could be made. She was therefore admitted to our hospital for its removal. The patient could not at first account for how this metallic object might have entered her head, but later she recalled that when she had given birth to her first child, at the age of twenty, she had stabbed a sewing needle into her pillow and slept on it. This was because of a local superstition that a mother and her newborn baby would in this way be protected from evil and harm during the accouchement period.

The patient’s CT scans were evaluated in three dimensions using OsiriX™ software (OsiriX™ imaging software, Pixmeo, Geneva, Switzerland). The metallic object was found to be located in the left frontal region, adjacent to the external table of the bone, anterior to the coronal suture, extending approximately from the hair line posteriorly parallel to the sagittal plane, 1 cm on the left side of the midline (Fig. 1d, e). The location of the metallic object was also evaluated by ultrasound (Hitachi HI VISION Preirus, Hitachi Medical Corporation Tokyo, Japan), which confirmed the same location found by using the OsiriX™ DICOM viewer (Fig. 1f).

Under local anesthesia, the patient was operated on in the supine position. A linear skin incision of approximately 3 to 4 cm was made, starting at the frontal hairline and extending posteriorly parallel to the sagittal suture, 1 cm on the left side of the midline. The foreign object was immediately visible under the peristium (Fig. 1g). The object was removed easily, although some bone drilling was necessary since it was partly buried in the external table of the frontal bone (Fig. 1h, i).

Abbreviations: CT, computed tomography; MRI, magnetic resonance imaging.
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2. Discussion

In our case, the patient was suffering complaints in the neck and a cervical MRI study was indicated. The needle in her head did not permit an MRI study to be done, thus necessitating its removal. Since MRI studies are now a common diagnostic tool in all medical specialties, providing patients with the freedom to have these performed for any reason can be another indication of surgery in such cranially asymptomatic patients. The anatomical location of the needle is, of course, another issue to take into account in the decision to perform surgery.

To use minimally invasive techniques is especially crucial to justify surgical removal in asymptomatic patients. Conventional stereotaxy or neuronavigational systems using infra-red optical tracking can be helpful. On the other hand, neuronavigational systems using electromagnetic technology are impractical in a patient with a metallic object in the head. When appropriate neuronavigation is not possible, other devices and techniques are necessary. Intraoperative fluorescence in angiography technologies to guide the removal of the foreign metal body in the vicinity of major vascular structures can be used [8]. In this case, we found the combined use of the OsiriX™ imaging software program and ultrasound helpful in the minimally invasive and cosmetically better removal. The OsiriX™ imaging software program, an image processing software dedicated to DICOM images, was developed as a stand-alone application for the MacOS X operating system and has been specifically designed for navigation and visualization of multimodality and multidimensional images [9]. Length measurements on 3D CT using the OsiriX™ program can be used as alternatives to real measurements to within accuracy of 0.3-mm and very high reliability [10,11].

The use of ultrasound to locate superficial objects in the soft tissues under the skin has been reported [12]. However, it cannot reveal a sewing needle under the bone in an adult. In pediatric patients, ultrasound-guided needle localization to aid removal may be possible [13]. In this case, the object was only slightly embedded in the external table of the frontal bone and was visible on ultrasound.

3. Conclusions

Combined use of the OsiriX™ imaging software program and an ultrasound to locate the metallic foreign body in this case resulted in a minimally invasive procedure using a local anesthetic, with reduced operative time, less bleeding, quicker wound healing and better cosmetic results.

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Authors’ contributions

1. Guarantor of integrity of the entire study NB.
2. Study concepts and design NB.
3. Literature research NB.
4. Clinical studies NB, ED, ID, and EB.
5. Manuscript preparation: NB prepared the draft and ED, ID, and EB reviewed and contributed to the final manuscript.

Competing interests
The authors declare that they have no competing interests.

Consent for publication
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