

Proximal migration of retained pencil lead along a flexor tendon in the hand

A case report

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Abstract

Rationale: The hand is the most common site for foreign body injuries. Pencil lead penetration mainly occurs in school-age children. We report a case of proximal migration of a retained pencil lead in the hand, emphasizing the importance of adequate imaging and prompt removal of the foreign body.

Patient concerns: We report the case of an 8-year-old boy who visited our outpatient clinic for a retained foreign body in the right palm. Removal was planned under general anesthesia. Black staining from the pencil lead was observed around the tendon sheath in the operative field, but the foreign body itself was not apparent.

Diagnosis: Intraoperative radiography located the foreign body at the wrist, 5 cm away from the original site. Proximal migration of the retained foreign body was suspected.

Intervention: Incision was extended toward the wrist and the foreign body was discovered in the flexor sheath at the wrist.

Conclusion: Foreign bodies may migrate to adjacent tissues, but rarely wander far. Computed tomography is the most useful tool in diagnosing a pencil lead foreign body.

Lessons: Adequate imaging and prompt removal of the foreign body is important. When a retained foreign body is removed after a delay, the physician must always consider the possibility of foreign body migration.

Abbreviations: CT = computed tomography, MRI = magnetic resonance imaging.

Keywords: foreign body, hand, tendon

1. Introduction

The hand is the most common site of foreign body injuries.^[1] Among the numerous materials that can invade the hand, pencil lead penetration mainly occurs in school-age children.^[3,4] As the history is often imprecise, adequate imaging is far more important.

Most patients with a foreign body present with pain, but sometimes have no clinical manifestations. Diagnosis on these occasions can be challenging and may lead to misdiagnosis and a retained foreign body.^[2]

Retained foreign bodies can be inert or cause immediate or delayed complications. Infection is the most common complica-

tion, and foreign body migration is possible.^[2,5] Foreign body migration has been reported from the abdominal cavity to the intracranial space and major blood vessels.^[6,7,8,9,10]

This paper reports a case of proximal migration of retained pencil lead in the hand, emphasizing the importance of adequate imaging and prompt removal of the foreign body.

2. Methods

We obtained the patient's medical records and reviewed the related literature. Informed consent to participate in the study was obtained from the patient. This study was approved by the Chonnam National University Hospital Institutional Review Board.

3. Case report

An 8-year-old boy visited our outpatient clinic for a retained foreign body in the right palm. There was no pain or other symptom, but the foreign body was incidentally found in a radiograph taken at a local clinic. On the day of the injury, the boy told the physician there was a pencil lead left in his palm, but there was no visible foreign body on the radiograph at that time. The physician explored the wound, found no foreign object, and performed primary closure of the right palm.

As physical examination found no specific symptoms or signs, we proceeded with imaging. Radiography found a 7-mm-long foreign object in the palmar aspect of the 4th metacarpal (Fig. 1). However, no detectable foreign body was observed on ultrasonography. Finally, hand computed tomography (CT)

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Figure 1. Hand oblique view showing a foreign body at the level of the 4th metacarpal (red-dashed circle).

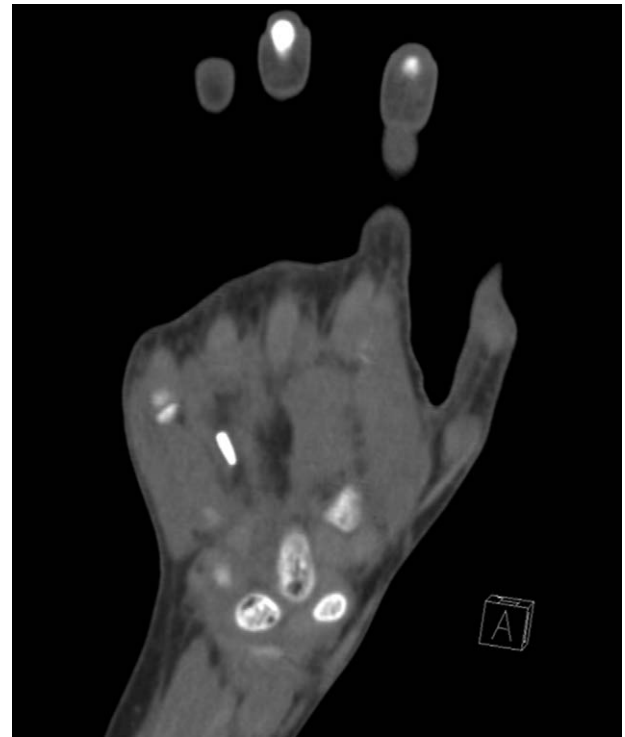


Figure 2. Hand CT showing a radiopaque foreign body in the soft tissue of the palmar aspect at the 4th metacarpal (red circle).

identified a 7-mm radiopaque foreign body under the flexor digitorum tendon at the 4th metacarpal shaft (Fig. 2).

Elective surgery under general anesthesia was planned. The skin was incised through the previous scar, and the tendon sheath appeared stained with black-pigmented material. Exploration was continued over the tendon sheath, flexor digitorum tendon, and the periosteum, with no sign of a foreign body, other than the black staining.

An intraoperative radiograph identified the foreign body in the wrist, approximately 5 cm from the original site at the 4th metacarpal (Fig. 3). Incision was extended toward the wrist, the transverse carpal ligament was excised, and the foreign body was discovered in the flexor sheaths between the tendons. The 7-mm-long, sharply pointed pencil lead corresponded with the previous imaging result (Fig. 4).

The postoperative radiograph showed no sign of a foreign body.

4. Discussion

The hand is the most common site for foreign body injuries.^[1] Glass, wood, and metal are the most common materials.^[2] Pencil lead injuries often occur in school-age children, frequently in the head and neck region.^[3,4]

Patients with a suspected retained foreign body in the hand present with pain, localized swelling, or sometimes no symptoms at all. In the absence of symptoms, clinical signs, and adequate imaging studies, insufficient clinical history and failure to perform precise exploration can lead to a missed diagnosis and a retained foreign body.^[2] One study reported that 4.7% of 950 tendons retrieved at autopsy had silent foreign bodies.^[1] Another study reported that 38% of retained foreign bodies in the



Figure 3. Intraoperative PA view showing a migrated foreign body between the hamate and lunate (red-dashed circle).



Figure 4. The pencil lead removed from the hand.

hand were missed by the first treating physician.^[2] The patient in this case also presented with no symptoms, and there was no sign of inflammation during the exploration.

Retained foreign bodies can be inert, or can result in both acute and chronic complications, including infection, nerve apraxia or injury, nail deformity, fracture, inclusion cyst, tendonitis, tenosynovitis, adhesion, and migration of the foreign body.^[2,5] Foreign bodies may move to adjacent tissues, but rarely wander far. Migrations into major blood vessels, and abdominal, thoracic, and cranial cavities, have been reported.^[6–10] Several reports describe foreign body migration, usually in the upper extremities but also in the lower extremities.^[5,11–14] Among these cases, those reported by Firth et al and Bu et al are similar to the present case by showing that the direction of migration is associated with the shape of the foreign body.^[12,13] All were characterized by a sharp, pointed end (toothpick and sago palm leaf thorn), which facilitated directional movement. Identifying the shape of the foreign body may predict the orientation and probability of movement. Further, a surgeon must consider surgical removal if the object is near a tendon or vessel, considering the possibility of an unexpected journey, even if the retained foreign body is inert.

Pencil leads are composed of graphite, kaolinite, wax, or other animal fat.^[15] A chemical or biologic reaction induced by the pencil lead itself may be trivial. A pencil lead in the eyeball can be inactive and cause no inflammation for a long time, even for over a decade.^[16,17] However, as far as we know, potential toxicity of the pencil lead has not been fully investigated. In this case, there was no intraoperative sign of inflammation or foreign body reaction.

Unlike metal or glass, a pencil lead is visualized by only 50% of radiographic studies.^[2] The pencil lead was invisible in this patient's initial radiograph, but appeared in later studies taken at our hospital. This may reflect different radiation doses in taking X-rays. In a study on foreign bodies in the maxillofacial

region, CT was best for the identification of graphite.^[3] We also performed CT, and clearly recognized the foreign body, as well as its shape, size, and 3-dimensional position relative to adjacent structures. Ultrasonography is an inexpensive, radiation-free tool, and is highly sensitive for identification of superficial foreign bodies.^[18] However, the pencil lead in this case was located deep beneath the flexor tendon, and could not be detected with ultrasonography. Magnetic resonance imaging (MRI) is an option, but is expensive. Moreover, graphite in the pencil lead has diamagnetic properties; lacking intrinsic magnetism, it will weaken a local magnetic field, and eventually leave a susceptibility artifact on the image. Two cases of blooming artifact on MRI due to pencil lead have been reported.^[19,20]

Adequate clinical history and appropriate imaging will aid in diagnosis of a foreign body and guide the treatment plan. As history-taking in children is problematic, objective results are vital. In diagnosing pencil lead penetration, CT is the most useful tool. The choice of surgical intervention and treatment requires consideration of the foreign body configuration, relationship with adjacent structures, and possibility of complications including local or distant migration.

Author contributions

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