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CASE REPORT

Retained Percutaneous Foreign Body in the Wrist Managed Without C-arm Fluoroscopy Guidance: An Imaging Case Report from Zambia

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ABSTRACT

Introduction: Retained percutaneous foreign bodies (FBs) are a common emergency and surgical problem. If not promptly identified and removed, FBs may lead to chronic pain, neurovascular injury, infection and medicolegal implications. Plain radiography remains the first-line imaging modality for detecting retained FBs.

Case presentation: A 24-year-old female presented with a small puncture wound following a needle-stick injury to the right hand/wrist. Radiographs confirmed a radiopaque FB projected over the midcarpal region adjacent to the capitate bone, with no evidence of intra-articular extension. Radiographic mapping guided surgical exploration, although two attempts were required before successful surgical removal. The patient was discharged in stable condition on the same day of FB removal. At the two-week follow-up, the wound had healed almost completely, with no complications observed.

Conclusion: This case highlights the importance of accurate localisation of a retained percutaneous foreign body for successful removal. Localisation should include orthogonal radiographs and skin-surface entry-site markers, with real-time image guidance where available. When C-arm fluoroscopy is unavailable, radiographic mapping can provide a practical preoperative localisation aid; however, because it relies on static images, localisation may be less precise and repeat surgical exploration may still be required.

INTRODUCTION

In accident and emergency settings, retained percutaneous foreign bodies (FBs) occur in around 7-15% of patients with traumatic wounds and lacerations. [1] Most cases are accidental, with glass, metal, and wooden splinters most commonly reported, particularly in the hand and wrist. [2,3] Patients may present with an open wound and a

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history of attempted or incomplete FB removal.[1] Retained percutaneous FBs are frequently missed during the initial examination, with 38- 40% reportedly overlooked, potentially delaying diagnosis and increasing the risk of complications. [1,4] These complications may include chronic pain, neurovascular injury, infection, and medicolegal implications.[1,4] Early recognition, supported by appropriate imaging and prompt management, is essential to minimise morbidity and optimise patient outcomes.

Retained percutaneous FBs require a stepwise imaging approach for accurate detection and safe management. Plain radiography is the first-line investigation due to its availability, low cost, and ability to detect radiopaque materials such as metal and glass, but it is less effective for radiolucent objects like wood and plastic. [1,4] When radiographs are negative or unclear, ultrasonography is preferred because it has high sensitivity for radiolucent retained FBs, no radiation exposure, and the ability to guide removal, although it is operator-dependent and best for superficial objects.[2,5] Computed tomography (CT) is not routinely used for initial assessment due to its relatively high radiation dose and cost. [4] Once identified, retained percutaneous FBs can be removed surgically under C-arm fluoroscopy or ultrasound guidance. [1] However, the evidence base underpinning these imaging pathways is predominantly derived from well-resourced healthcare settings. There is a paucity of literature evaluating their applicability, availability, and diagnostic performance in Zambia and other low-resource contexts, where access to advanced imaging modalities and specialist imaging expertise may be constrained.

In this imaging case report, we describe a 24-year-old woman with a retained percutaneous foreign body in the right hand/wrist following a needle-stick injury. Surgical removal using radiographic mapping required two attempts. C-arm fluoroscopic guidance was unavailable because the equipment was awaiting commissioning and licensure from the Radiation Protection Authority. The case illustrates radiographic mapping as a practical preoperative localisation aid when fluoroscopy is unavailable, while also demonstrating the limitation of static imaging when real-time guidance cannot be provided.

CASE PRESENTATION

Patient information and clinical findings

In April 2026, a 24-year-old woman was referred from a mini hospital to a general hospital after sustaining an accidental needle-stick injury to her right hand while sweeping at home. She presented to the outpatient department (OPD) with pain and a small puncture wound on the palmar aspect of the right wrist, accompanied by localised tenderness on palpation. There was no erythema, swelling, fluctuance, purulent discharge, or obvious deformity. Hand dominance and the exact radial-ulnar relationship of the puncture site to the wrist crease were not documented.

Examination demonstrated a well-perfused hand, with a capillary refill time of <2 seconds and symmetrical palpable radial and ulnar pulses. Active and passive ranges of motion of the wrist and fingers were fully preserved. Flexor tendon function was intact, with full active flexion of the wrist and all digits. Motor examination demonstrated normal median, ulnar, and radial nerve function, while sensory examination revealed intact light-touch sensation throughout all three nerve distributions, with no paraesthesia or sensory deficit. No clinical evidence of vascular or tendon injury was identified.

The patient was alert and afebrile, with no visible swelling at the injury site. The right hand/wrist remained tender on palpation but was structurally intact, and she denied any numbness. Vital signs were within normal limits: temperature, 36.6°C; blood pressure, 120/78 mmHg; pulse, 96 beats/min; and respiratory rate, 20 breaths/min. Based on the clinical findings, the attending clinician requested plain radiography of the right hand to localise a suspected retained foreign body.

Diagnostic assessment

The patient, accompanied by the attending clinician, presented to the radiology department for an X-ray of the right hand, with a clinical indication of a suspected foreign body. The procedure was explained, and frontal and lateral radiographs of the hand/wrist were obtained. The X-ray beam was collimated to include the wrist and the surrounding area of the entry site to avoid missing a potential foreign body, given the possibility of migration. Imaging was performed using a DRF-3 digital radiography (DR) system. Both radiographs were acquired using exposure settings of 54 kilovoltage peak (kVp) and 2 milliampere-seconds (mAs).

Due to the limited availability of a Radiology Information System (RIS) and Picture Archiving and Communication System (PACS) for image requesting and viewing, the images were reviewed and interpreted at the X-ray workstation by the referring clinician. In this setting, where no radiologist is available, imaging examinations are routinely interpreted by the referring clinicians. The images (Figure 1) demonstrated a linear radiopaque FB, consistent with a metallic needle, projected over the midcarpal region adjacent to the capitate bone, with no evidence of intra-articular extension (arrows). The main diagnostic consideration was whether the radiopaque finding represented a retained metallic needle fragment or an external artefact. This was confirmed as a retained metallic needle fragment by repeat radiographs and localisation mapping. In this case, plain radiography was sufficient to detect and localise the retained percutaneous FB because the metallic object is highly radiopaque and readily visualised on standard X-ray images, enabling accurate identification of its size, shape, and anatomical position without the need for additional cross-sectional imaging such as CT or ultrasonography.

Patient management

The patient's tetanus immunisation status was unknown. Tetanus toxoid (0.5 mL, intramuscularly) was administered within one hour of the patient's presentation to the general hospital because she had sustained a needle-stick injury while sweeping at home, placing her at risk of tetanus from a contaminated puncture wound. Furthermore, management involved surgical removal of the FB from the wrist, which required two surgical explorations before successful retrieval.

First surgical removal attempt: Because no radiopaque marker had been placed at the FB entry site on the initial radiographs (Figure 1), the patient underwent repeat radiographs with radiographic mapping. This was performed by tapping the forceps against the patient's skin around the entry site to create a radiopaque reference marker, enabling accurate localisation of the FB before surgical exploration (Figure 2). The reference marker allowed the clinician to accurately localise the FB before making the incision.

Figure 1: Frontal and lateral radiographs of the right hand/wrist showing a linear radiopaque metallic foreign body projected over the midcarpal region adjacent to the capitate (arrows), with no radiographic evidence of intra-articular extension.

Figure 2: Frontal radiographs of the right hand/wrist during initial skin-surface radiographic mapping using forceps as radiopaque reference markers to relate the retained foreign body to the skin entry site before surgical exploration.

An initial attempt to surgically remove the foreign body was performed by a junior resident medical officer under local anaesthesia via ring block in the outpatient department (OPD) surgical room. A 2% lignocaine solution mixed with epinephrine was used; however, the administered volume, epinephrine concentration, and total lignocaine dose for this first attempt were not documented. The procedure was unsuccessful because localisation was insufficiently precise to identify the foreign body during surgical exploration. Intraoperatively, the surrounding tissue appeared darkened, likely reflecting local tissue reaction or minor bleeding. Following the unsuccessful attempt, the patient was admitted to the female surgical ward.

Second surgical removal attempt: Following the unsuccessful initial exploration, repeat surgical removal was undertaken after repeat radiographs with improved radiographic mapping. Surgical clips, rather than forceps, were used as radiopaque reference markers to accurately localise the FB before surgical removal (Figure 3).

Figure 3: Frontal and lateral radiographs of the right hand/wrist during repeat skin-surface radiographic mapping using surgical clips as radiopaque reference markers before the second surgical exploration.

The same junior resident medical officer who performed the initial attempt repeated the procedure in the outpatient treatment room, with assistance from a general surgeon. Local anaesthesia was achieved by infiltrating 10 mL of 1% lignocaine (10 mg/mL) around the operative site under aseptic conditions, resulting in a total lignocaine dose of 100 mg. No epinephrine was used. Adequate anaesthesia was confirmed before surgical exploration. A tourniquet was applied to the forearm proximal to the site of the FB. This approach enabled precise localisation and successful removal of the needle, which measured 1.5 cm in length (Figure 4).

Figure 4: Clinical photograph of the operative site after successful retrieval, showing the removed intact metallic needle (arrow), approximately 1.5 cm in length.

Post-removal imaging was not performed to confirm complete extraction, as the needle was removed intact without evidence of fragmentation. The wound was closed using 2-0 Vicryl sutures with a cutting needle and subsequently dressed.

Follow-up and outcome

No post-procedural complications were noted, and the patient was discharged in stable condition on the same day. She was prescribed paracetamol 1 g orally three times daily for 2 days, ibuprofen 400 mg orally three times daily for 5 days, and amoxicillin 500 mg orally three times daily for 5 days. The amoxicillin course was prescribed prophylactically following the contaminated household puncture wound rather than for established infection; there were no clinical

signs of infection at discharge. Instructions included daily wound cleaning at least three times per day, home-based limb physiotherapy, and follow-up review at the referring mini hospital after 1 week and at the general hospital after 2 weeks. At follow-up, the wound had almost completely healed and the patient reported no residual symptoms. Clinical evaluation showed no evidence of infection, with intact sensation, preserved range of motion, and good functional recovery of the hand.

Timeline of events

Table 1 outlines the chronological sequence of the patient's presentation, diagnostic workup, management, and follow-up from initial referral to recovery. It provides a concise overview of key clinical events, including imaging, surgical intervention, and post-discharge outcomes.

DISCUSSION

Plain radiography was sufficient to diagnose the retained percutaneous metallic foreign body because the needle was radiopaque and clearly visualised on orthogonal images (Figure 1). Digital radiography also allowed immediate image review and post-processing, which supported localisation in this resource-limited setting.[3,6,7]

Frontal and lateral radiographs were obtained in this case (Figure 1), consistent with recommendations to use two orthogonal projections when evaluating suspected retained foreign bodies.[3,4] A radiopaque marker should also be placed adjacent to the skin entry site during initial imaging, with a sufficiently wide field of view to account for possible migration along tissue planes.[3] In this case, no entry-site marker was used on the initial images, necessitating repeat radiographic mapping before surgical exploration. The experience reinforces the practical value of standardised local imaging protocols that include orthogonal views and skin-surface reference markers from the outset.

Ultrasonography and CT can complement plain radiography when the foreign body is radiolucent, superficial, associated with soft-tissue complications, or when deeper osseous or neurovascular involvement is suspected.[1,2,4,5] Ultrasonography was not performed in this case because the metallic needle was clearly radiopaque

Table 1: Patient's presentation, diagnosis and management timeline of events

Timeline	Activities
Day 1: Presentation	• The patient presented to the mini hospital and was then referred to a general hospital
Day 2: Admission to the general hospital	• The patient presented to the general hospital • X-rays were performed, revealing an FB • Tetanus toxoid (0.5 mL, intramuscularly) was administered to the patient • Initial radiographic mapping was performed using forceps • First surgical removal attempt was made but was unsuccessful • The patient was subsequently admitted to the female surgical ward for further management
Day 3: Removal of the FB and discharge from general hospital	• Second radiographic mapping was performed using surgical clips • The second surgical removal attempt was successful • The patient was discharged in stable condition
1 Week after discharge	• Outpatient follow-up at the referring mini hospital near the patient's home • Patient reported no complaints
2 Weeks after discharge	• Outpatient review at the general hospital • Patient reported no complaints; the wound was almost completely healed

and local expertise for foreign-body sonography was limited. CT was not considered necessary because there was no clinical or radiographic suspicion of deep osseous, intra-articular, or complex neurovascular injury, and CT was unavailable in the province.

Local imaging-system constraints included the absence of a radiologist, RIS, and PACS, so the radiographs were reviewed at the X-ray workstation by the referring clinician. In such settings, smartphone image capture or messaging may be used pragmatically for clinical communication, but image compression can reduce diagnostic quality and electronic sharing raises confidentiality and data-protection concerns.[7,8,9] These system issues are relevant to resource-limited practice but were secondary to the principal challenge in this case: accurate localisation of the retained needle before removal.

The retained foreign body was managed using static radiographic mapping because C-arm fluoroscopy was unavailable. The first surgical exploration was unsuccessful, whereas repeat mapping with surgical clips enabled successful retrieval at the second procedure. This single case therefore illustrates both the potential usefulness and the principal limitation of radiographic mapping: it provides an anatomical reference before incision but does not offer real-time visualisation during exploration. When available, fluoroscopy-assisted removal permits simultaneous visualisation of the surgical instruments and foreign body, which may improve localisation precision and procedural safety.[1,4]

C-arm fluoroscopic guidance is typically performed in the operating theatre in collaboration with the radiology department.[3,10] In this case, the hospital's C-arm fluoroscopy unit could not be used because commissioning and licensure by the Radiation Protection Authority of Zambia were still pending. The case therefore demonstrates a pragmatic resource-adapted approach while underscoring that radiographic mapping should not be presented as equivalent to real-time image guidance.

LIMITATION OF THE CASE REPORT

This case report has several limitations. As a single case, its findings have limited generalisability. There was no radiologist involvement in image interpretation, and no ultrasound or CT correlation was performed. Although the radiographs showed no intra-articular extension, the precise three-dimensional soft-tissue depth of the foreign body was not established by cross-sectional imaging. A post-removal radiograph was not obtained to confirm complete extraction; however, physical inspection showed that the needle was removed intact without evidence of fragmentation. Hand dominance, the exact radial-ulnar relationship of the puncture site to the wrist crease, and the administered volume and total lignocaine dose used during the first removal attempt were not documented. Follow-up was also relatively short. These limitations should be considered when interpreting the findings and conclusions.

CONCLUSION

This case highlights the importance of accurate localisation of retained percutaneous foreign bodies to facilitate safe surgical removal. Initial localisation should include orthogonal radiographs and a radiopaque entry-site or skin-surface marker where appropriate. When available, real-time image guidance such as C-arm fluoroscopy may facilitate localisation and removal. In settings where fluoroscopy is unavailable, radiographic mapping can provide a practical preoperative localisation aid; however, because it relies on static images, localisation may be less precise and repeat exploration may still be required.

PATIENT PERSPECTIVE

The patient reported initial anxiety and discomfort due to persistent pain and uncertainty about the retained FB in the right hand/wrist. She expressed relief after successful localisation and removal following the second surgical procedure. At follow-up, she was satisfied with the outcome and grateful for the resolution of her symptoms without lasting complications.

AUTHORS' CONTRIBUTIONS

Osward Bwanga: Case report conception and drafting of the manuscript.

Charity Nalwesha: Case report conception, imaging and drafting of the manuscript.

Sibeso Kabeleka: Imaging and editing of the manuscript.

Kennedy Chiyanda: Treating the patient, obtaining permission and editing of the manuscript.

Eric Mwale: Treating the patient, obtaining permission and supervision.

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CONFLICT OF INTEREST

The authors have no conflicts of interest to declare.

INFORMED CONSENT

Written informed consent for publication was obtained from the patient. Approval was also granted by the Senior Medical Superintendent for the use of patient information and imaging. In accordance with local hospital policy, ethical approval was not required for the publication of a single case report. All images were fully de-identified to ensure patient confidentiality.

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