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Intentional Ingestion, Insertion and Self-Embedding of Foreign Bodies - What a Radiologist Should Know

Review Article

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Abstract

Background: Intentional foreign body presence in the human body can occur through various mechanisms and have variable clinical presentations. Imaging plays an essential role in early diagnosis, localization, characterization and detection of any complications due to the presence of foreign bodies.

Purpose: To review the radiological findings in cases with foreign body insertion.

Material and Methods: A review of the cases with self-insertion of foreign bodies with radiological findings is illustrated. The role of different imaging modalities and the radiologist is reviewed with appropriate clinical cases.

Results: Multiple cases with appropriate imaging modalities show the importance of radiologists in the early diagnosis and management of foreign bodies. A comparative evaluation of various imaging modalities in appropriate settings is essential, as reviewed in the study.

Conclusion: Radiologists play a crucial role in diagnosing and treating patients with self-insertion of foreign bodies.

Keywords: Foreign body; Self-insertion; Radiologist

Introduction

The intentional presence of foreign bodies (FB) into the human body can occur through various mechanisms such as self ingestion, self-insertion and self-embedding behaviour. Clinical presentation may vary from a slight injury to dreaded complications such as perforation, obstruction, bleeding and abscess formation depending on the location and nature of the foreign body. Imaging plays a vital role in early diagnosis, localization, characterization and detection of any complications due to the presence of foreign bodies [1]. Intentional presence of foreign bodies is not familiar; however, their accurate diagnosis and management are of paramount importance. Radiologist plays an important role in the early diagnosis, management and follows up of these patients. A variety of imaging modalities such as radiographs, ultrasound and CT are employed for accurate management of these patients. When reporting these cases, the foreign body should be described for location, number, size, shape, nature based on attenuation and presence of complications for optimal management. The role of radiologists in diagnosis and management is summarized in Table 1.

The use of various imaging modalities in detecting these foreign bodies with relative advantages and disadvantages is summarized in Table 2.

Ultrasonography is used primarily for evaluating superficially

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embedded or radiolucent foreign bodies. It has the advantage of being portable and lacking any radiation exposure. Both high-frequency and low-frequency transducers are employed for superficial and deep located foreign bodies [2]. Imaging may reveal posterior acoustic shadowing in the case of wooden or stone foreign bodies and ring down artefact in glass or metal foreign bodies [3].

Fluoroscopy may help in real-time visualization of oesophagal or diaphragmatic motility; however, its role is limited.

CT is the investigation of choice for these cases to localize and detect complications [4]. On CT imaging, wooden foreign bodies usually mimic fat or air with negative Hounsfield units (HU). These may show water attenuation due to their porous nature with an ability to absorb water with time. The CT attenuation values for plastic bodies are around 100 to 500 HU, stone foreign bodies more than 1,000HU, glass bodies from 500 to 2,000, and metallic bodies show the highest values, usually more than 3,000 HU. Streak artefacts are common in metallic foreign bodies, while no artefacts are seen in glass or stone foreign body cases [5-8].

A summary of various foreign bodies and key diagnostic features on various modalities is summarized in Table 3.

Table 1: Role of radiologist in diagnosis and management of foreign bodies.

What to report	Site Size shape Number Location Nature (based on radiopacity) Any complications (obstruction,perforation,abscess)
Treatment planning	Image guided retrieval Guidance on endoscopic vs surgical removal
Follow up	Sequential imaging in cases of conservative management For post operative follow up

Table 2: Utility of various imaging modalities in foreign body detection.

X- ray	Ultrasound	Fluoroscopy	CT
AP and Lateral views required Erect view in cases of rectal foreign bodies. Usually first investigation to be performed	High frequency probe (7-15 Mhz) for superficially located and low frequency probe(2-3 Mhz) for deep located.	Useful in cases of demonstration of organ function. e.g.oesophageal motility in FB impaction Diaphragmatic movement	Investigation of choice
Advantages Readily available Low cost Gives information about size, shape, number, location. May give information about complications such as perforation	**Advantages** Easily available Portability No radiation Especially useful for non radio opaque FB.	**Advantages** Real time dynamic information	**Advantages** Multiplanar capability Fast acquisition Excellent detection and characterization of FB Detection of complications Optimum management planning
Disadvantages Radiation exposure (more if used for follow up with conservative management) Radiolocent FB such as wood, fish bone can be missed. No cross sectional information for adequate treatment planning May miss few complications sych as abscess,fistula ,sealed perforation	**Disadvantages** Limited role in superficial / subcutaneous FB Operator dependent Deep extent and associated complications may be missed	**Disadvantages** Limited use Radiation	**Disadvantages** Radiation exposure Contrast related risks if contrast enhanced CT done Streak artefacts in metallic foreign bodies

Intentional foreign body ingestion

Intentional foreign body ingestion is commonly seen in adults suffering from substance abuse or depressive disorders. In some cases, it is sometimes done for illicit drug trafficking using balloons or plastic [9,10]. In most cases, the foreign body can pass down the intestinal tract without any significant complication and hence no intervention is required. Few may require endoscopic or surgical intervention [11].

Clinical presentation depends on the location and nature of the foreign body, organ involved and presence of associated complications. The most common location for ingested foreign body impaction is in the upper third of the oesophagus. Other locations are at the level of the aortic arch, left main bronchus, or gastroesophageal

Table 3: A summary of various foreign bodies and key diagnostic features on various modalities.

Wood	Radiolucent	Hyperechoic Posterior acoustic shadowing	Mimic Fat or air Negative attenuation due to porosity and fat absorption Soft tissue attenuation later due to water absorption No streak artefact
Plastic	Radiolucent	Hypoechoic Posterior acoustic shadowing	100- 500 HU Varies with composition No streak artefact
Glass	Radioopaque	Hyperechoic Ring down artefact	500-2000 Varies with composition No streak artefact
Bone	Radioopaque (fish bone radiolucent)	Hyperechoic Posterior acoustic shadowing	Variable attenuation depending on bone compoition
stone	Radioopaque	Hyperechoic Posterior acoustic shadowing	1000-3000 HU No streak artefact
Metallic	Radioopaque (except aluminium)	Hyperechoic Ring down artefact	More than 3000 Hu except aluminium (around 700 HU) streak artefact
Tricho/ phytobezoars	Radiolucent with air foci	Hyperechoic arch like with marked posterior acoustic shadowing	Round to oval mass with mottled air foci
Illicit drug trafficking	Isodense/ hyperdense relative to faeces	Hyperechoic with shadowing	Isodense/hyperdense

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junction, pylorus, C-loop of the duodenum, the duodena-jejunal junction (Figure 1), ileocecal valve and rectosigmoid [12].

An AP and lateral radiograph scan detect radio-opaque foreign bodies and demonstrate the number, location, size, shape of the foreign bodies ingested or any complication such as perforation or obstruction [13].

CT is the imaging of choice in these cases for accurate delineation of the foreign body and associated complications like perforation, fistula or abscess. Endoscopic or surgical interventions can be planned after imaging or a conservative approach with sequential imaging until the passage of the foreign body can be done [14-15].

Intentional insertion of foreign bodies into body orifices (Polyembolokoilamania)

The self-insertion of variable objects characterizes Polyembolokoilamania into body orifices such as the rectum, vagina, urethra. Multiple factors have been implicated for such tendencies, including autoerotic stimulation, psychiatric disorders and substance abuse. Diagnosis is usually delayed due to self embarrassment or neglect and can lead to potential complications such as bowel injury or perforation. A multidisciplinary approach with radiologists, surgeons and psychiatrists is required for optimum diagnosis, management and prevention of relapse. Patient presentation depends on insertion site and foreign nature and may include pain, dysuria, and hemorrhage [15,16].

An AP and lateral X-ray should be obtained to demonstrate the shape, size, orientation, location, and type of the foreign body. Before a digital rectal examination, imaging should be conducted as a safety precaution to prevent provider injury from sharp foreign bodies. CT isthe imaging of choice in radiolucent foreign bodies and demonstrates complications such as perforation or abscess formation (Figure 2). Metallic foreign bodies may show many streak artefacts rendering limited visibility for assessment (Figure 3). For genitourinary radiolucent foreign bodies, Ultrasonography has been shown to have high sensitivity for detecting foreign bodies in the bladder [17].

Self-embedding

Self-embedding is a rare underreported medical entity with the deliberate injury of body tissue by inserting a foreign object. Cases have been reported with foreign bodies embedded in limbs, abdomen, chest or cranium (Figure 4) [18, 19].

Usually, these cases have underlying psychiatric diseases such as post-traumatic stress disorders or borderline personality traits. These patients are more likely to commit suicide [20]. Radiologist plays a crucial role in early diagnosis and radiological modality guided or surgical removal of foreign bodies. Plain radiographs are usually sufficient to diagnose the size, number, location, and foreign object type. USG has proved to be a critical tool for diagnosing non radiopaque foreign bodies embedded in the skin and subcutaneous regions using a high-frequency transducer. CT is the investigation of choice for deeply embedded foreign bodies for localization and detects complications such as perforation, abscess or sinus formation (Figure 5) [18-20].

Figure 1: A 40-year male with habitual history of nail ingestion and complaints of abdominal pain. X-ray AP view showing multiple nails at pylorus (black arrow), DJ junction (white arrow) and small bowel loops.

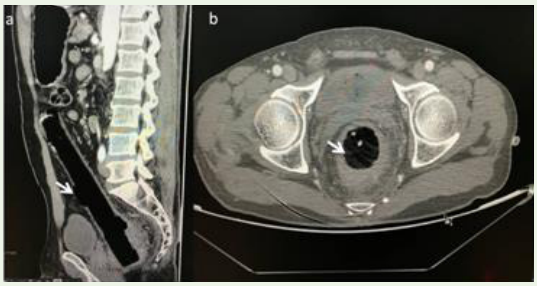

Figure 2: A 26-year male with complaints of pain in perineal region. Saggital (2a) and axial reformatted (2b) CECT abdomen shows the presence of a hypodense wooden foreign body in the rectum. The wooden body was removed and no obvious perforation was seen.

Figure 3: A 28-year male with history of self- insertion of metallic jet spray transrectally. X-ray AP view (3a) shows a metallic foreign body in the pelvis. CT coronal view (3b) and axial view (3c) shows hyper attenuating metallic tap with streak artefact. The Foreign body was removed and a small perforation was noted which was repaired.

Figure 4: A 32-year female with psychiatric illness and history of repeated self insertion of needles. Scanogram (4a) shows multiple needles in bilateral lungs (white arrows), Coronal reformatted lung window (4b) shows associated cavitary and fibrotic changes (black arrow).

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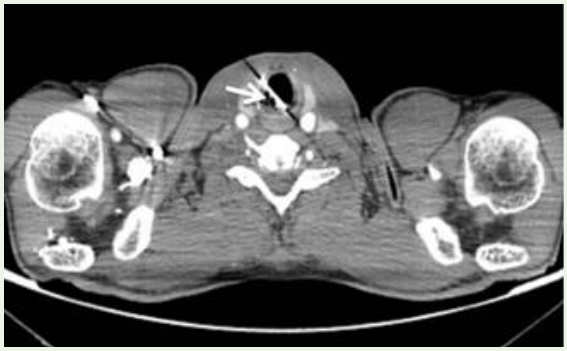

Figure 5: Axial CECT neck shows self inserted needle in the trachea.

Summary

Radiologists play a crucial role in the diagnosis, management and follow up of these patients. The radiologists need to utilize the optimum imaging modality depending on the type and nature of the foreign body and detect early complications. A multidisciplinary team effort is required for adequate management and prevention of relapse by addressing the underlying psychiatric disorder in these patients.

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