

Diagnosis of Foreign Bodies Ingestion, Inhalation, and Penetration - Case Series

Ahmad Mokhtar Abodahab ^{1*}, Mohamed Omar Elalfy ², Hamdan Abdelhameed Aly¹

¹Radiology Department, Faculty of Medicine, Sohag University, Sohag,

² Surgery Department, Faculty of Medicine, Al-Azhar University, Cairo, Egypt

*Corresponding author: Ahmad Mokhtar Abodahab, Mobile: +201004349407, E-mail: Ahmed_Abodahab@med.sohag.edu.eg

ABSTRACT

Background: Foreign bodies of different routes of entry (ingestion, inhalation and penetration) are a common complaint in different age groups, especially children and mentally affected patients. Diagnosis depends on history, clinical examination and imaging. Imaging of different modalities are the main tools of diagnosis according to the route of entry and nature of the foreign body. The fate of the cases is related to many factors such as route of entry, site of lodgment, nature of the foreign body (chemical or physical) and whether it is expelled or retained.

Patients and Methods: Retrospective assessment of 10 patients with different types of foreign bodies with unusual findings or course were investigated in the study.

Results: Different findings and fates of the cases were explained and discussed. Imaging modalities were the main tool of diagnosis. Choosing the proper imaging modality was mandatory for proper management. Follow-up of any non-visualized ingested radiopaque foreign body was done from mouth to anus to avoid unexpected upward movement of it.

Conclusion: Imaging modalities are the main key to the diagnosis of different types of foreign bodies. Choice of the suitable modality is related to the site and nature of them. The findings and fate of them are also related to site, size, and nature.

Keywords: Foreign bodies ingestion, Foreign bodies inhalation, Foreign bodies penetration, Imaging modalities.

INTRODUCTION

Foreign bodies can enter the human body in different ways, causing different forms of harm, up to death. Foreign bodies may be ingested, inhaled, penetrate the human body, or be inserted in different body orifices. Radiologically different imaging modalities are important for the diagnosis of foreign bodies according to their nature, site, and pathological effect. For X-ray and CT, foreign bodies are mainly classified as radio-opaque and lucent. Even if the foreign body is radiolucent and not visualized in a radiological scan, it is still important to detect it. Foreign body ingestion is more common among children and mentally affected patients ⁽¹⁻⁶⁾.

PATIENTS AND METHODS

This retrospective observational study is targeting different types of foreign bodies; different cases are involved of both sexes and any age group. The study is presenting a case series of 10 cases in Sohag University Hospital, Egypt, and Muli Regional Hospital, Maldives.

Ethical considerations:

Ethical Approval has been given by Ethical Committee of Faculty of Medicine, Sohag University. As the study design was retrospective, it did not require patients informed written consent. The Helsinki Declaration was followed at all stages of the study.

RESULTS

10 cases were involved in the study (7 males and 3 females) (Fig. 1) of ages from 1 year to 92 years old (Fig. 2). The clinical complaints of the cases were foreign body ingestion, inhalation, and penetration scanned with

different modalities (X-ray, Ultrasound, and Computed Tomography). Only one case died, while the other 9 cases were managed and improved. The clinical and/or radiological findings of each case are discussed in the section of case presentation.

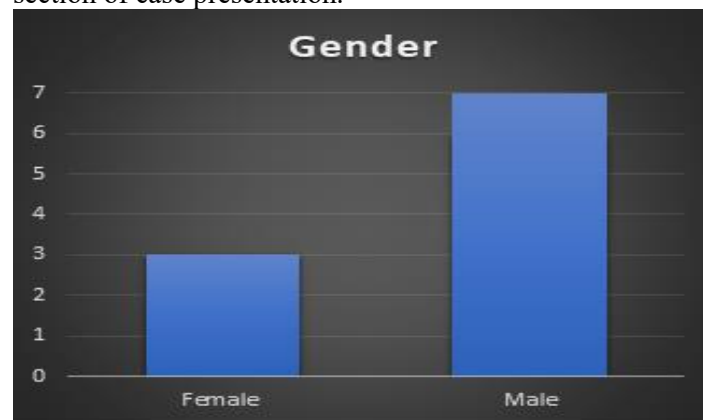


Figure (1): Gender distribution of the study cases.

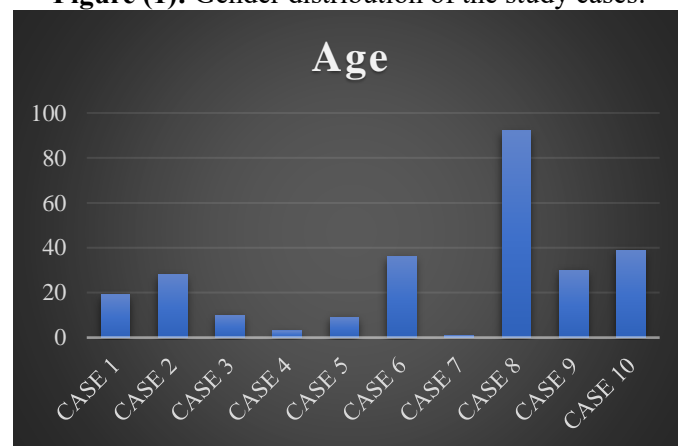


Figure (2): Ages distribution of the study cases.

CASES PRESENTATION

CASE 1

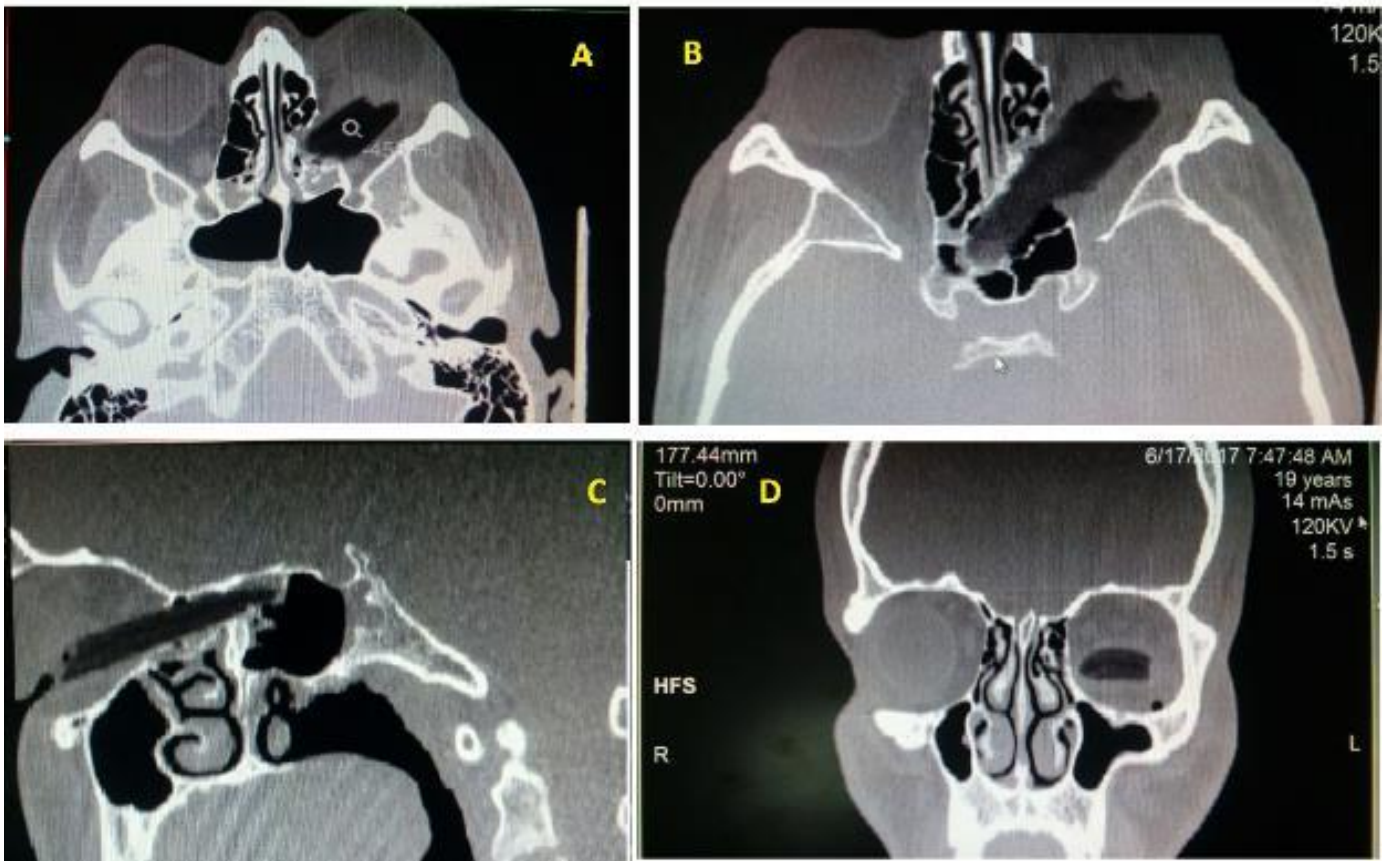


Figure (3): Male patient 19 years old stabbed in Lt orbit by a pointed piece of wood. CT scan was performed; **A** and **B**-axial, **C**- oblique sagittal reformate, and **D**- coronal reformate. Scans are showing hypodense foreign body (-455 Hu) is seen penetrating the left orbital cavity, displacing Lt eye globe upward and anteriorly (piece of wood). The tip of it is reaching sphenoid sinus.

CASE 2

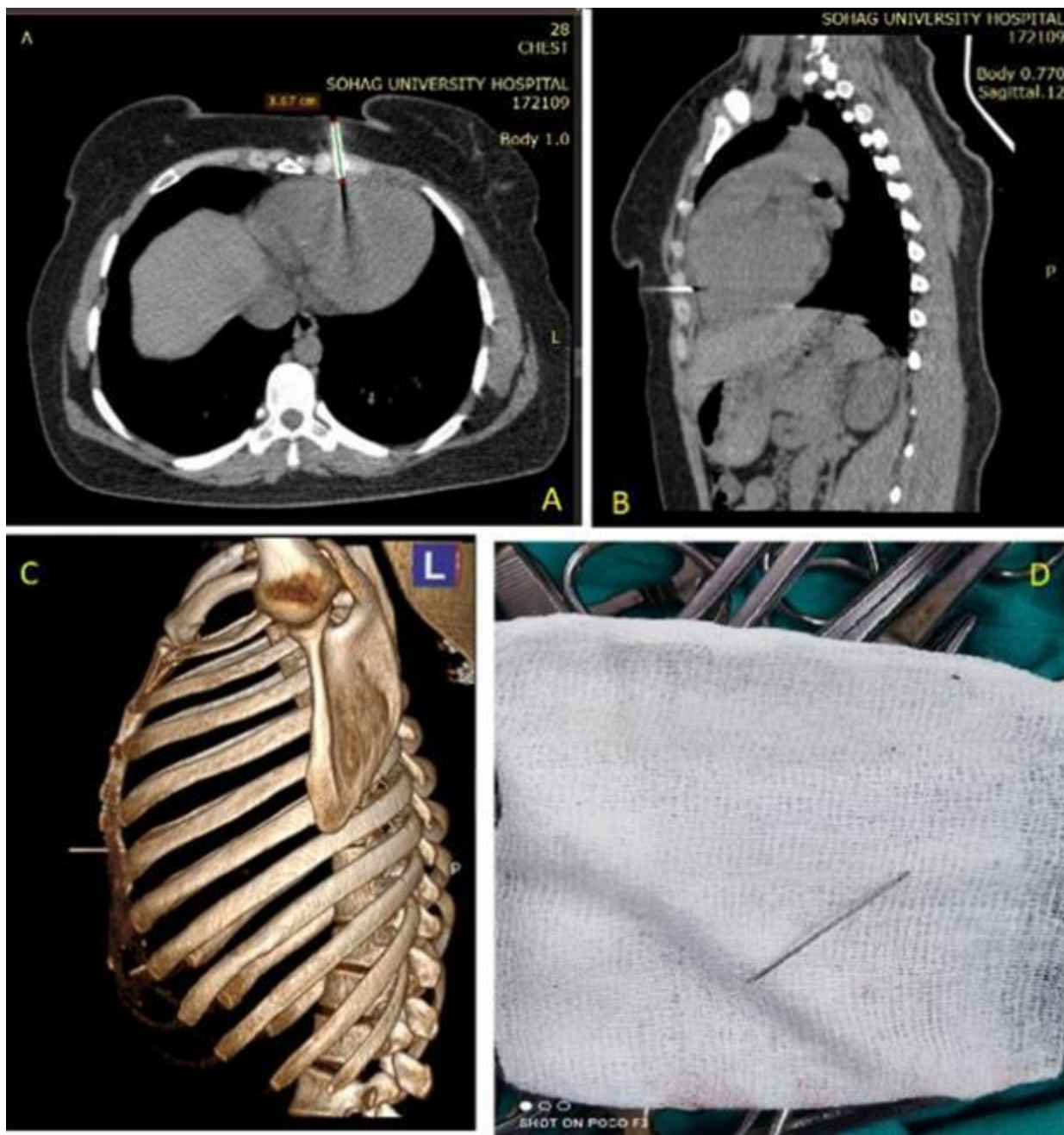


Figure (4): Female patient (nurse) 28 years old, non-enhanced CT chest A- Axial Scan, B- Sagittal reformate, C- 3D reformate, which is showing radiopaque needle (3.6 cm), which is totally penetrating chest wall Lt substernal, D- After surgical extraction the foreign body approved to be a broken syringe needle.

CASE 3

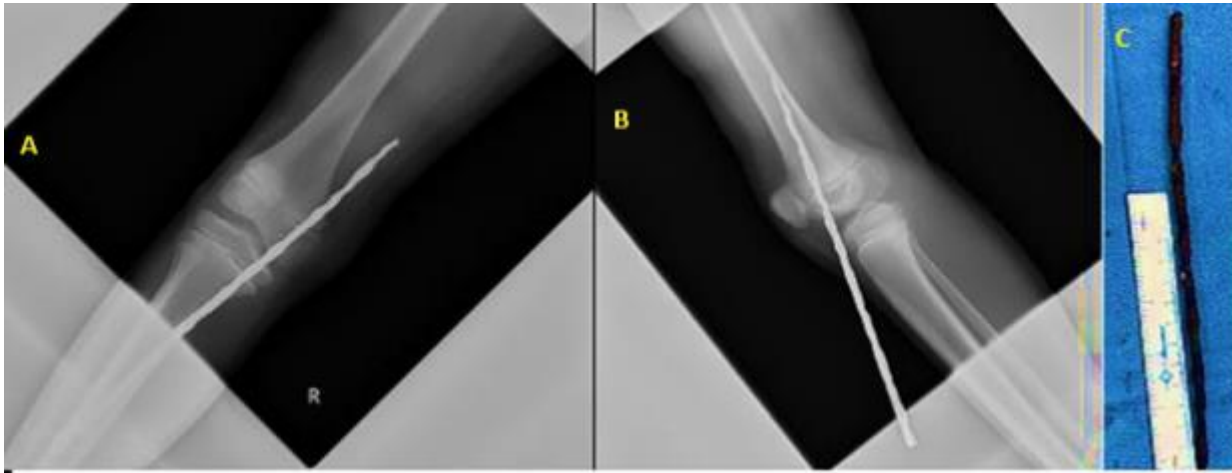


Figure (5): X-ray Rt knee and thigh; A- AP and B-lateral views of young male boy, presented with rusty iron rode penetrated the medial side of his thigh as the boy fallen on it. C-Notice the full length of the rode after surgical extraction is more than 20 cm.

CASE 4

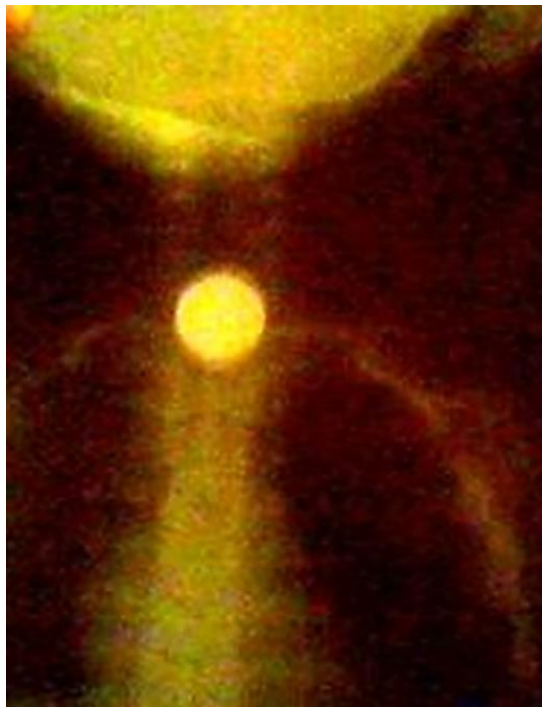


Figure (6): Male boy 3 years old. This follow up X-ray AP view of neck and upper chest is done after disappearance of the swallowed coin in the X-ray abdomen. X-ray denoted upward movement of the coin. This explain why follow up of any ingested foreign body should be from nose to anus in every follow up when not detected in the abdomen as it may move up instead of passing down.

CASE 5



Figure (7): A- Adult male patient presented with Rt knee fishing hook penetrating frontal medial aspect. B- Normal X-ray Rt knee lateral view post extraction.

CASE 6



Figure (8): US scan of male patient 36 years old, Rt hand dorsum of 1st web space, small focal area of edematous tissue contains small echogenic needle shaped structure measures 3 X 0.7 mm, seen at depth of 5 mm (arrow).

CASE 7



Figure (9): Female patient 1 years old, presented with history of swallowing of F.B. X-ray AP view chest and abdomen is showing radiopaque clips pin at Rt upper quadrant (in the stomach). The case was referred to another hospital for upper gastric endoscopy extraction.

CASE 8

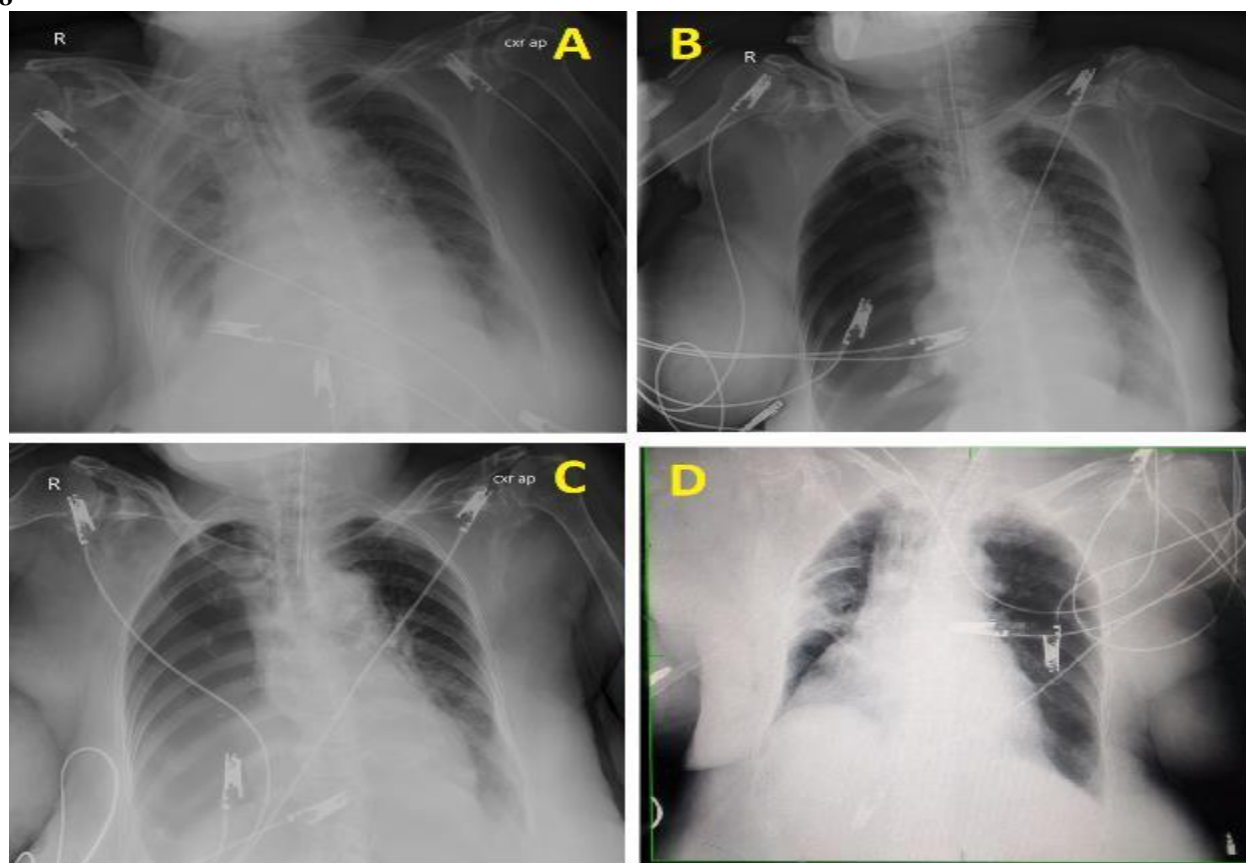


Figure (10): Chest X-ray views of female patient 92 years old presented with sudden dyspnea after choking **after** ingestion of antibiotic tablet. A- CXR when presented showing reduced Rt side volume with ipsilateral mediastinal displacement, B- Post ventilation Rt pneumothorax, C- Follow up with the same finding, D- After insertion of an intercostal

tube pneumothorax resolved and focal middle segmental collapse was noticed. But the general conditions of the patient were deteriorated few days later and died.

CASE 9



Figure (11): Adult patient X-ray skull AP and lateral views showing multiple small rounded radiopaque foreign bodies scattered at the soft tissue of the right side of the skull (Shoot gun injury). CT scan is mandatory to explain intracranial penetrations and associated injuries.

CASE 10



Figure (12): A-39 years old fisher man, presented with a fishing hook penetrating his Lt upper eyelid. B-FB was superficial and surgically extracted with no deeper injury occurred (Intact eye globe), so no radiological scan was requested. C- The Hook after extraction. Follow up soft tissue US scan may be required if later wound complications are suspected.



Figure (13): X-ray skull AP view, adult female patient with Rt nose piercing, which can be misdiagnosed as nasal FB.

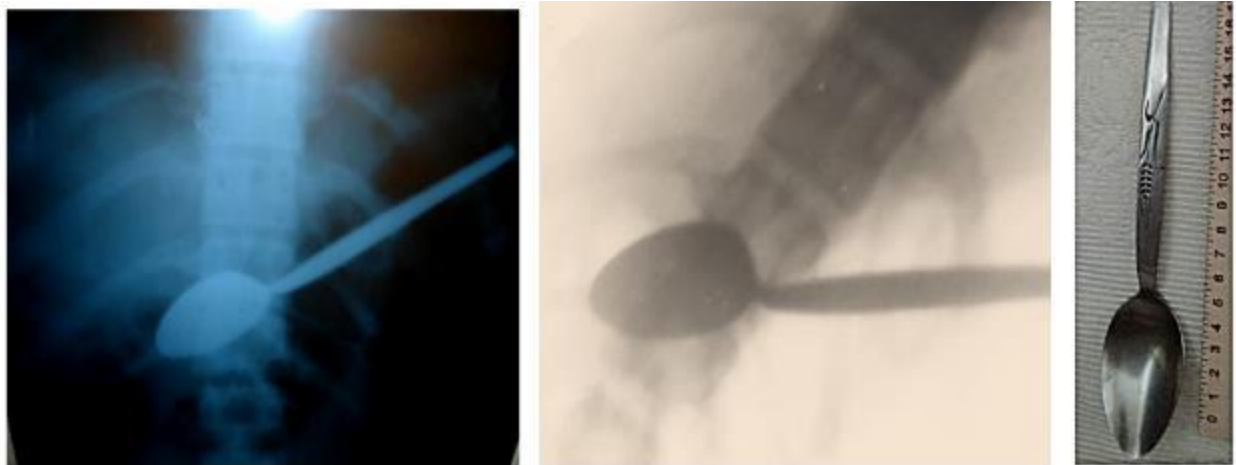


Figure (14): X-Ray Abdomen and fluoroscopic scan of a young adult female patient presented with spoon swallowing; The case is published by the corresponding author as a case report⁽¹⁾.

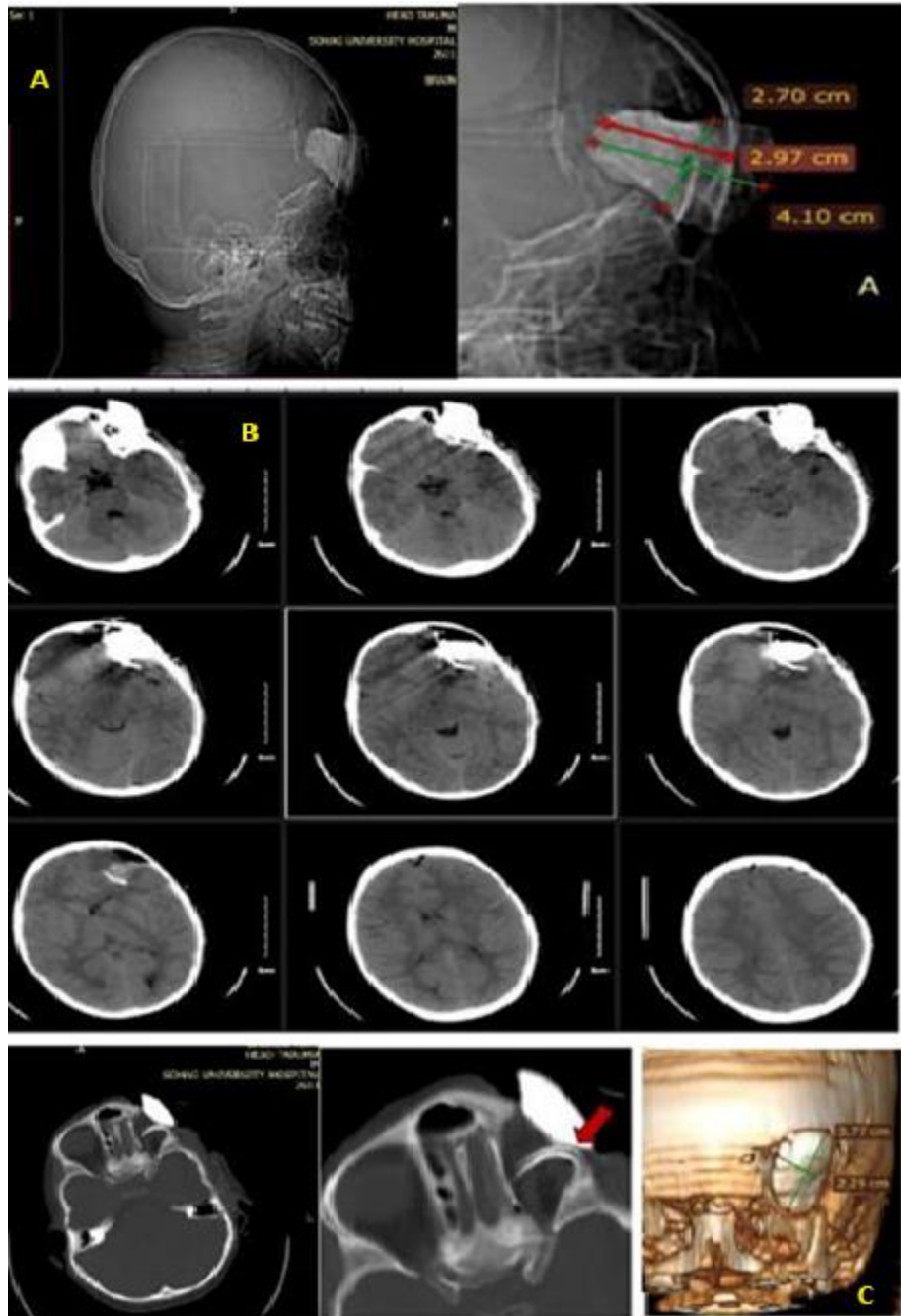


Figure (15): CT scan images (A-Scout, B-axial scans and C-3D reformatted image) a case of male patient 9 years old, fell from height and presented with a stone penetrated the skull – The case is published by the **corresponding author and Abdelbary** as a case report ⁽²⁾.

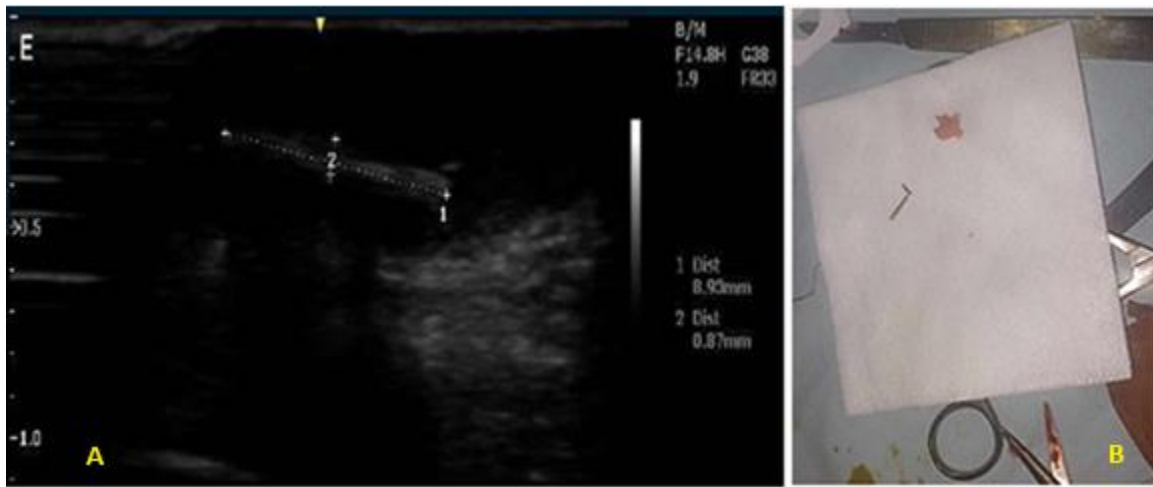


Figure (16): Male boy 9 years old presented with Rt index finger focal swelling with history of foreign body pin few weeks ago. A- Soft tissue US revealed retained woody foreign body, B- After extraction. The case was published by the corresponding author as a case study ⁽²³⁾.

DISCUSSION

Different radiological modalities are mandatory for the diagnosis of many types of foreign bodies invading the human body or their sequelae. X-ray and CT are the most common modalities used for the detection of foreign bodies, classifying them as radiolucent (as wood (Fig. 3), plastic, and glass) and radiopaque (as metals (Figs. 4, 5, 6, 9, 11, 13, and 16) and stones (Fig. 15)). X-ray is the basic modality for the detection of radiopaque foreign bodies: site, size, nature, and course. Foreign body insertion in body orifices does not usually require radiological investigation, e.g., insertion of foreign bodies in the nose or ear, while vaginal or anal foreign bodies like body packing, which is used by smugglers, are mainly detected by radiological scan. Unusually used metallic objects (like nose piercings) can be misdiagnosed as foreign bodies. Ingestion and/or inhalation are the most common routes of foreign bodies ^(1,6,7-12).

The ingested FB may be passed spontaneously in the stool or retained in the GIT. It may cause physical effects like intestinal obstruction or GIT perforation (especially sharp objects) or chemical toxicity (like lithium batteries), which has a very serious or even lethal toxic effect, whatever the route it passed to the body through. Ingestion of FBs usually involves small objects that are easily passed through the esophagus (e.g., coins, pins, and small toys) (Figs. 6 and 9), but ingestion of large unexpected objects also occurs (e.g., large spoons) (Fig. 12). Ingested FB is usually passed down with GIT motility and direction of gravity, but vomiting or regurgitation can move it up (case 4), which makes it lodged in a more dangerous place above the larynx, subjecting the patient to sudden suffocation if not detected and extracted, which is easier at this upper location. So, follow-up of any ingested FB not detected in its previous place should be from nose to anus to exclude upward

displacement and avoid falsely assuming spontaneous passage. FB inhalation has a relatively more fatal fate when it is large enough to obstruct the trachea. A smaller FB that passes through the trachea is lodged in the distal branches of it according to its size, causing either collapse or valve mechanism emphysema. Associated complications of inhaled FB may be direct, such as atelectasis (collapse) and emphysema, or indirect, such as pneumonia or iatrogenic complications of required medical procedures, like post-ventilation pneumothorax (Case 10). Detection of inhaled radiolucent FBs (like food and medications) is relatively more difficult, depending on history and pathological sequences, and it usually requires CT scan assessment. FB penetration may be small, mainly involving sites of contact (hand and foot) of different natures (e.g., metallic, plant thorns (Fig. 7, 8), and glass, or large (Cases 1, 2, and 3). Penetrated FB, which is small and superficial and enough part of it is outside the body, is usually extracted without the indication of a radiological scan (e.g., case 10), while if it is large, a radiological scan is indicated not for detection of it but to explore extension of it (case 3). Shooting guns can contain any types and shapes of metallic FBs (balls, sludges, etc.), so they radiologically appear as metallic FBs, usually multiple (Case 9). FB penetration is usually related to occupational or environmental factors, e.g., case 2 is a nurse with the penetration of a broken syringe needle.

In cases 5 and 10, fishermen were presented with fishing hooks penetrating their knee and eyelid. Surgical extraction is usually the main method of treatment for FB penetration, while fibroscopic extraction is used for FB ingestion (in the upper GIT) and inhalation, and surgical exploration is the solution if it is lodged or leads to intestinal obstruction ⁽¹³⁻²⁴⁾.

CONCLUSION

Foreign bodies ingestion, inhalation and penetration to human bodies or different body orifices is a common radiological finding. Choosing of suitable modality is related to route and nature of it. Radiological scan of different modalities are the main keys of diagnosis of FB especially when unusual or with unclear history. Site, extension and pathological sequences or follow up of FBs also is mainly depending on radiological scan. Also planning for suitable management or surgical extraction and repair is mainly depending on it. Follow up X-ray scans of absent previously detected FB (ingested or inhaled) should be from mouth to anus to avoid false assuming of passed out while it is dislocated in another unusual proximal location. CT is superior to X-ray in assessment of FB all aspects. US is a good imaging tool for detection of superficial retained small FB. MRI is the least indicated modality; it is contraindicated for suspected any metallic FB and used mainly in assessment of non-metallic intraocular FB.

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Conflicts of Interest: None.

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