CASE REPORT

Conservative management of coin ingestion in a toddler using serial plain radiography in Zambia: An imaging case report

Chikumbutso Khomba [1], Mutale Bwalya [2], Osward Bwanga [3], Simon Chisha [4], David Nyimbili [2]

[1] *Affidea Diagnostic, Dublin, Ireland*
[2] *Kasama General Hospital, Radiology Department, Zambia*
[3] *Midlands University Hospital, Tullamore, Radiology Department, Ireland*
[4] *Kasama General Hospital, Surgical Department, Zambia*

ABSTRACT

Introduction

Coin ingestion is a frequent paediatric emergency that often necessitates imaging for accurate diagnosis and management. In low-income settings such as in Zambia, limited access to advanced imaging and endoscopic services presents significant challenges to delivering safe and effective care. Although context-specific guidelines can be tough to implement, incorporating simple adjuncts such as handheld metal detectors offers a non-ionising, affordable, and efficient alternative to support diagnosis and monitoring. Despite resource constraints, such innovations can enhance triage, reduce radiation exposure, and improve clinical outcomes for children with ingested metal foreign bodies.

Patient Information

We report a case of a 2-year-old boy in Zambia who accidentally ingested a two-Zambian-Kwacha coin. Initial anteroposterior radiography localised the coin at the thoracic inlet (cervical-thoracic levels C6-T1). Serial radiographs documented distal migration within 12 hours and passage over the next three days

Interventions and Outcomes

The asymptomatic child was managed conservatively with plain film radiography, monitoring and dietary modification, avoiding invasive intervention and anaesthetic risk. The coin was expelled naturally by day four, supporting the evidence of conservative management of ingested coins in children.

Conclusion

This case highlights the crucial role of plain film radiography in both diagnosing and monitoring foreign ingestion in children. The management process underscores key challenges typical of resource-limited environments, including the omission of a lateral projection and a lack of digital infrastructure for image storage and review. These limitations highlight the ongoing need for improving imaging protocols and digital system integration to enhance diagnostic reliability and patient safety in similar settings.

Corresponding author:
Chikumbutso Khomba, Affidea, Dublin, Ireland,
E-mail: waakhomba@gmail.com

Keywords: Coin ingestion; Case Reports; Conservative management; Radiography; Toddler

This article is available online at: http://www.mjz.co.zm, http://ajol.info/index.php/mjz, doi: https://doi.org/10.55320/mjz.53.1.870
The Medical Journal of Zambia, ISSN 0047-651X, is published by the Zambia Medical Association

INTRODUCTION

Foreign body (FB) ingestion is a common paediatric emergency, with coins representing the most frequently swallowed objects among young children due to their developmental tendency to explore items by mouthing.[1] Coins account for nearly 70% of paediatric all FB ingestions in children. While most pass harmlessly through the gastrointestinal tract, complications may occur if impaction develops, presenting with symptoms such as choking, dysphagia, vomiting, coughing, or thoracoabdominal pain.[2] A critical diagnostic challenge arises in differentiating coins from button batteries, which can appear similar on radiographs, but the latter carries a potentially fatal injury risk if not promptly recognised and managed, making early distinction vital.[3]

Medical imaging is crucial in assessing suspected coin ingestion, enabling confirmation of the object's presence, location, and size, while assisting in distinguishing coins from button batteries.[1] Plain film radiography remains the primary diagnostic tool due to its accuracy, accessibility, and affordability. However, concerns persist regarding ionising radiation exposure in children, particularly when multiple images are required.[4] The use of handheld metal detectors offers a valuable radiation-free alternative, especially beneficial in resource-limited settings where access to X-ray equipment may be restricted.[5]

This imaging case report details a two-year-old boy who presented to the emergency department after a witnessed swallowing of a two-Zambia-Kwacha coin, illustrating the vital diagnostic role of plain film radiography in confirming coin ingestion and guiding management. It also highlights key systemic challenges paediatric imaging faces within low-resource settings, including shortages of radiologists, limited specialised paediatric radiography training, inadequate digital imaging infrastructure such as Radiology Information System (RIS) and Picture Archiving and Communication System (PACS), and the absence of standardised paediatric imaging guidelines.

IMAGING CASE PRESENTATION

A two-year-old boy from an average household without any significant medical history or development problems was brought to the emergency department following a witnessed ingestion of a two-Zambia-Kwacha coin approximately 30 minutes prior, while playing at home. The child's mother provided critical information regarding the incident, including the identity of the swallowed object, time of ingestion, and the child's most recent meal. This information is clinically vital when dealing with ingested Fbs.

Clinical examination

The child had no prior history of FB ingestion, allergies, or chronic illnesses, and lived in a stable household with attentive parental supervision. On presentation to the emergency department, the child was alert, playful and haemodynamically stable. His pulse rate was 82 beats/min, respiratory rate was 21 breaths/min, oxygen saturation of 96%, and blood pressure reading was 105/65 mmHg. No signs of respiratory distress, choking, vomiting, or coughing were observed, consistent with an asymptomatic presentation of a non-obstructive FB. Further assessment with X-ray imaging was requested.

Initial imaging

An anteroposterior (AP) radiograph of the neck, chest, and abdomen was performed with paediatric-specific exposure factors (63 kVp, 320 mA, 8 mAs) using a WMD fluoroscopic apparatus, which serves as the facility's primary X-ray equipment for both fluoroscopy and plain radiography work (**Fig. 1**). Strict field of view collimation, and single shot mode was applied to avoid accidental multiple exposures to ensure stringent radiation protection.

Figure 1. A photograph showing a WMD Fluoroscopic X-ray machine serving as a primary X-ray unit

This initial radiograph showed a single, circular uniform radiodensity object "en-face" at the thoracic inlet/vertebral levels C6–T1 (**Fig. 2**), consistent with oesophageal lodging of the swallowed two-Zambian Kwacha coin as opposed to a button battery, which on the AP view, would show as a "double-rim/halo" appearance as illustrated in **Table 1**. Button batteries require urgent endoscopic removal regardless of patient presentation status.[3]

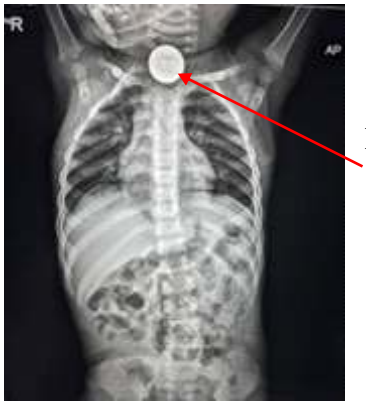


Figure 2. Initial AP radiograph depicting the two-Zambian-Kwacha coin lodged at the thoracic inlet (C6–T1 level)

Although a lateral radiograph was not obtained in our case due to the absence of institutional protocol for FB imaging, the literature recommends that the initial imaging include AP and lateral radiographs for precise localisation and differentiation.[3] This should be adopted for future FB ingestion cases at our facility. The unreported radiographic image was transmitted to the referring clinicians via WhatsApp messaging due to a lack of a RIS/PACS system and a reporting radiologist.

The table below shows the key radiographic features of a coin and a button, and their associated clinical urgency and management.

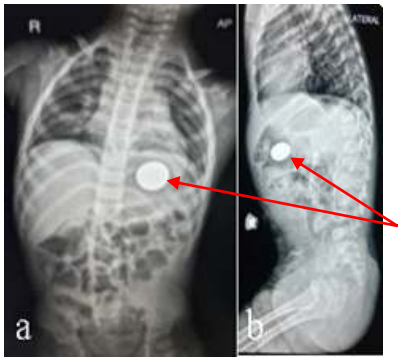
Table 1: Comparison of radiographic Features for coin and button battery and the associated clinical urgency [6,7,8]

	Coin	Button Battery
AP View Radiographic Features	Homogeneous radiodensity; flat disc, En-face orientation	Double-ring "halo" sign; central lucency
Lateral View Radiographic Features	Thin flat radiopaque disc (end-on view), tangential orientation	Step-off or bilaminar edge due to battery terminals
Clinical Urgency	Usually low; observation if asymptomatic	Emergency; requires urgent endoscopic removal within 2 hours
Risk of Injury	Generally low	High risk of tissue necrosis, perforation
Management	Conservative if the coin migrates distally in the oesophagus within 12 hours & the patient is asymptomatic. Removal within 24 hrs for still lodged in the oesophagus	Urgent endoscopic removal within 2 hours regardless of clinical status
Initial Imaging Protocol	AP + lateral recommended	AP + lateral mandatory

Based on the mother's account, the coin's uniform circular radiographic pattern, the child's stable condition and limited endoscopic and surgical resources, a conservative management approach was adopted. The approach comprised dietary adjustments, stool monitoring, and scheduled clinical and radiographic reviews.

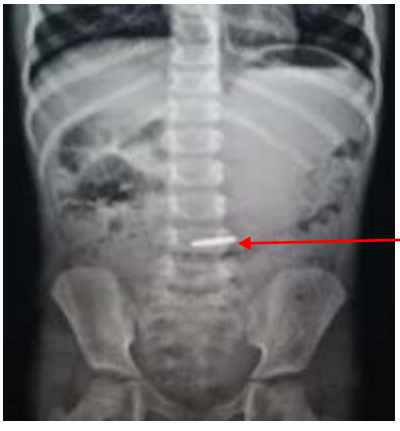
Follow-up imaging

Clinical assessments and serial radiographs at 12 hours and on days 3 post-ingestion confirmed distal migration of the coin into the stomach and lower abdomen, respectively, while the child remained asymptomatic (**Figures 3 and 4**). Conservative management was continued in accordance with best practice, as the coin migrated into the stomach within 12 hrs mark, and the mother was advised to return if complications arose.



The two-Zambian Kwacha coin at the level of the stomach

Figure 3a & b. AP and lateral radiographs at 12 hours showed distal migration of the coin into the stomach region



The two-Zambian-Kwacha coin in the axial tangential plane at the mid-abdomen, level L3-L5

Figure 4. AP Abdomen radiograph taken on day 3 demonstrates coin position at mid-abdomen

On day 4, the coin was confirmed to have been expelled spontaneously and identified via stool inspection reported by the mother (**Fig. 5**).

Figure 5. Photograph of the two-Zambian-Kwacha coin retrieved by the caregiver.

Figure 6 below is graphic representation of the imaging timeline, location of the coin and the clinical decisions that followed.

Time post-ingestion	0 hours	12 Hours	Day 3	Day 4
Views Performed	AP only	AP & lateral	AP only	None/Clinical confirmation
Coin Location/Orientation	Thoracic inlet (C6-T1)/En face orientation	Stomach/En face on AP view and oblique on lateral view	Mid-abdomen/Tangential metallic shadow in the axial plane on AP view	Passed out
Clinical Status	Asymptomatic	Asymptomatic	Asymptomatic	Asymptomatic
Notes	Lateral omitted due to protocol limits	Continued conservative management	Ongoing monitoring	Discharge, spontaneous passage confirmed

Figure 6: Timeline table showing radiographic times, coin location

DISCUSSION

While broad recommendations from international guidelines inform paediatric coin ingestion management, local resource limitations necessitate tailored monitoring strategies, as demonstrated in our case. Clinicians rely on the radiographic appearance of an FB to assess the urgency and plan

management intervention.[8] This case report highlights the role of routine plain film radiography for diagnosing and monitoring conservatively managed paediatric coin ingestion. Serial supine radiographs were taken over three days, with a lateral abdominal view on day two. The initial single AP projection covering the neck, chest, and abdomen was adapted for paediatric patients to balance limited cooperation and anxiety with comprehensive gastrointestinal visualisation while minimising radiation exposure.[9]

International guidelines recommend initial management of suspected or witnessed coin ingestion in children with a series of AP and lateral radiographs to confirm the FB's location.[3] This imaging helps distinguish coins from button batteries, which have subtle radiographic differences but require distinct management approaches and urgency, as illustrated in Table 1**.** Conservative management involving clinical and stool monitoring, plus follow-up imaging every 1 to 2 weeks to confirm passage, is appropriate for otherwise healthy and asymptomatic children who ingest small, inert objects such as coins. However, if the coin remains lodged in the oesophagus and does not migrate to the stomach within 24 hours, endoscopic removal is necessary to avoid complications.[6]

In our case, the decision for serial imaging within a few days reflects local monitoring practices and the need to reassure parents, especially where immediate endoscopic intervention is not readily available. This justifies a cautious monitoring approach in resource-limited environments, balancing patient safety with radiation exposure risks. Conservative management should always be paired with clear instructions for caregivers to seek immediate medical attention if symptoms develop. This approach aligns with expert consensus, advocating personalised follow-up based on clinical status, resource availability, and potential risks.[3,6]

Radiation safety principles, particularly the as low as reasonably achievable (ALARA) principle, were strictly applied using paediatric-specific protocols.[4] These included precise collimation to the area of interest, guideline-recommended shielding, preference for single-shot images, avoidance of repeat exposures, and careful consideration of the child's increased radiosensitivity.[4,10] Although handheld metal detectors have demonstrated high diagnostic accuracy in detecting metallic FBs to support diagnosis and reduce radiation exposure, such adjunctive tools were not available in our setting.[11]

In the absence of RIS and PACS, radiographs were captured using a smartphone and sent via WhatsApp to referring doctors, a common practice in low-resource settings.[12] While this enables rapid communication, image quality is compromised by compression and confidentiality concerns arise.[12] PACS and RIS systems, when implemented, enhance diagnostic accuracy and efficiency by maintaining DICOM-compliant images, supporting audit trails, enabling remote reporting, and integrating seamlessly with hospital workflows.[13,14] These systems also ensure robust data security and compliance with legal frameworks such as the Zambian Data Protection Act.[15] Facilities lacking such infrastructure should utilise encrypted, hospital-approved communication platforms governed by clear data-protection policies to safeguard patient information ethically and legally. Although costs remain a barrier, transitioning toward secure digital systems would markedly improve workflow, accountability, and radiological reporting standards.

This case demonstrates conservative management of an asymptomatic two-year-old with coin ingestion, guided by radiographic evidence and established paediatric protocols. The outcome highlights the essential role of multidisciplinary collaboration among radiographers, clinicians, and caregivers. Active parental involvement, fostered by clear communication and reassurance, was pivotal in ensuring adherence to follow-up and treatment success, emphasising the value of teamwork and family-centred care in paediatric FB management.

RECOMMENDATIONS

To enhance paediatric radiography practices and improve the diagnosis and management of ingested coins at both institutional and national levels, the following recommendations are proposed.

1. Develop national guidelines to standardise imaging protocols, address practice gaps, and promote best practices across healthcare institutions.
2. Integrate handheld metal detectors into clinical practice for rapid, non-ionising detection of ingested metallic foreign bodies, improving triage efficiency.
3. Implement RIS and PACS systems to enhance workflow efficiency, diagnostic accuracy, and patient data protection, ensuring compliance with relevant data laws.
4. Conduct a comprehensive assessment of paediatric radiography training needs.

CONCLUSION

This imaging care report demonstrated how serial plain radiography enabled the safe and conservative management of coin ingestion in a toddler within a resource-constrained setting. Despite systemic challenges, contextualised clinical decisions, close observation and engagement with caregivers facilitated a favourable outcome. Investment in imaging protocols and digital systems is crucial to enhance paediatric emergency care.

PATIENT PERSPECTIVE

The child's mother expressed deep appreciation and satisfaction with the clarity of communication and care throughout the hospital stay and follow-up.

INFORMED CONSENT

Written informed consent to publish this anonymised case and images was obtained from the patient's guardian. All imaging was de-identified to protect patient privacy. **A copy of the signed consent** can be made available by the corresponding author upon request.

DECLARATIONS

The authors declare no conflicts of interest regarding this manuscript.

REFERENCES

1. Diaconescu S, Gimiga N, Sarbu I, Stefanescu G, Olaru C, Ioniuc I, et al. Foreign bodies ingestion in children: experience of 61 cases in a paediatric gastroenterology unit from Romania. *Gastroenterol Res Pract*. 2016;1982567. https://doi.org/10.1155/2016/1982567
2. Jayachandra S, Eslick GD. A systematic review of paediatric foreign body ingestion: presentation, complications, and management. *Int J Pediatr Otorhinolaryngol*. 2013;77(3):311-317. https://doi.org/10.1016/j.ijporl.2012.11.025
3. Mubarak A, Benninga MA, Broekaert I, Dolinsek J, Homan M, Mas E, et al. Diagnosis, Management, and Prevention of Button Battery Ingestion in Childhood: A European Society for Paediatric Gastroenterology Hepatology and Nutrition Position Paper. *Journal of Paediatric Gastroenterology and Nutrition*. 2021;73(1):129–36. https://doi.org/10.1097/MPG.0000000000003048
4. Martin A, Harbison S, Beach K, Cole P. An introduction to radiation protection. 7th ed. London: CRC Press; 2019.
5. Vigil J, Hamzah HB, Ganapathy S. Handheld Metal Detector Screening for Metallic Foreign Body Ingestion in Children. *J Vis Exp*. 2018(139). Doi: 10.3791/58468
6. Kramer RE, Lerner DG, Lin T, Manfredi M, Shah M, Stephen T, et al. Management of Ingested Foreign Bodies in Children: A Clinical Report of the NASPGHAN Endoscopy Committee. J *Pediat. Gastroenterol Nutr*. 2015;60(4) 562-574. DOI: 10.1097/MPG.0000000000000729
7. Tringali A, Thomson M, Dumonceau J, Tavares J, Tabbers M, Furlano R, et al. Paediatric

Gastrointestinal Endoscopy: European Society of Gastrointestinal Endoscopy (ESGE) and European Society for Paediatric Gastroenterology, Hepatology and Nutrition (ESPGHAN) Guideline Executive Summary. *Endoscopy*. 2017;49(1):83–91. DOI: 10.1055/s-0042-111002.

8. Whelan R, Shaffer A, Dohar JE. Button battery versus stacked coin ingestion: A conundrum for radiographic diagnosis. *Int J Pediatr Otorhinolaryngol*. 2019;126:109627. https://doi.org/10.1016/j.ijporl.2019.109627
9. Harvey-Lloyd JM. Paediatric radiography: the problem of the uncooperative child. *Radiography*. 2013;19(2):285-289. https://doi.org/10.1016/j.radi.2013.07.010
10. Lin C, Chan P, Huang K, Lu C, Chen Y, Chen Y. Guidelines for Reducing Image Retakes of General Digital Radiography. *Adv Mech Engi*. 2016;8(4):1–6. doi:10.1177/1687814016644127.
11. Nation J, Jiang W. The utility of a handheld metal detector in the detection and localisation of paediatric metallic foreign body ingestion. *Int J Pediatr Otorhinolaryngol*. 2017;92:1-6. https://doi.org/10.1016/j.ijporl.2016.10.035
12. Kotalwar SG, Prakash AK, Chatterjee P, Datta B, Goyal P, Tripathy JP, et al. Comparison of diagnostic accuracy of digital chest X-ray images between PACS and WhatsApp Messenger in a resource-poor setting. *Indian J Tuberc*. 2021;68(2):186-194. https://doi.org/10.1016/j.ijtb.2020.07.029
13. Hanna M, Brabin J, Spuur K, Keshwan R, Chau M. 2025. A Narrative Review of the Benefits of RIS/PACS and Its Integration into the Radiology Departments of Low and Middle-Income Countries. *Radiography*. 2025;31(6):103185. https://doi.org/10.1016/j.radi.2025.103185
14. Kapapa N, Bwanga O, Sichone JM, Kafwimbi S, Ohene-Botwe B. Using a digital transformation framework to explore the experiences of radiographers in the use of digital radiography in a low-resource setting. *Radiography*. 2025;31(1):75-82. doi: 10.1016/j.radi.2024.10.024
15. Republic of Zambia. Data Protection Act No. 3 of 2021 of the Republic of Zambia. Lusaka: Government printers; 2021.