



CASE REPORT

**REVISED** Case Report: Modified endoscopic hook for extracting magnetic esophageal foreign bodies in a rural area [version 3; peer review: 2 approved, 1 not approved]

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**Abstract**

Foreign bodies (FB) in the aerodigestive tract are common, especially in children. The type of foreign body in the esophagus can vary and include magnets. A magnet that lodges in the esophagus should be extracted within 24 hours to prevent complications due to associated chemical reactions. In rural areas, there are several limitations to extracting FBs from the esophagus. We report a case of a magnetic FB that lodged in the esophagus of a three-year-old boy. The extraction was successfully done by esophagoscopy with the modification of a hook that was attached to the endoscope. This innovation may help physician all over the world, especially in rural areas. In the future, this innovation could be produced on an industrial scale.

**Keywords**

Foreign bodies, aerodigestive tract, endoscopic hook, esophagoscopy

**Open Peer Review**

Approval Status

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<b>version 2</b> (revision) 23 Nov 2023		 view	 view
<b>version 1</b> 04 Jan 2023	 view	 view	

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Any reports and responses or comments on the article can be found at the end of the article.

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**Author roles:** **Kadriyan H:** Conceptualization, Data Curation, Writing – Original Draft Preparation, Writing – Review & Editing; **Primayanti I:** Validation, Writing – Review & Editing; **Syamsidar S:** Conceptualization, Resources; **Fakhrussiam LF:** Resources, Visualization; **Rozi MF:** Resources, Visualization; **Hijrinelly H:** Validation, Writing – Review & Editing

**Competing interests:** No competing interests were disclosed.

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**REVISED Amendments from Version 2**

There are some important additional issues inserted on the new file to explain the safety and potential side effect of this innovation. There is also an additional picture to make a better understanding about the properties of this innovation. Therefore, the other physician can reproduced this innovation in the future.

**Any further responses from the reviewers can be found at the end of the article**

**Introduction**

Although a warning regarding choking risk has been included on every toy by the factory,<sup>1</sup> cases of foreign body (FB) in the upper aerodigestive tract remain frequently found in the clinical setting. Several types of FBs can be found in the upper aerodigestive tract, including coins, magnets, batteries, pins, and organic substances such as peanuts, meat, among others.<sup>2-4</sup> The effect of FBs in the aerodigestive tract varies, depending on its location. If the FB is lodged in the esophagus, it will cause dysphagia, while in the bronchus it may cause airway obstruction and lead to mortality.<sup>2,3</sup>

The part of a toy such as a magnet can usually found in children and may cause perforation or fistula on the esophagus. This complication occurs because of the effect of the chemical reaction between the magnet with the esophagus tissue. Therefore, a magnet FB in the esophagus should be extracted within 24 hours of the finding.<sup>3-5</sup>

The extraction of FBs from the esophagus may be challenging, especially in a rural area with limited equipment. An endoscope or esophagoscope, and a forceps or extractor are not complete or do not fit with the type or shape of the FBs. Therefore, in rural areas, the physician should try to do their best to help the patient with those limitations. In this report, the authors would like to share the modification of the hook that is attached to the rigid endoscope. This modification successfully extracted a big and thick heart-shaped magnet in the esophagus.

**Case presentation**

A three-year-old boy was referred from the primary hospital with FBs lodged in the esophagus 1 hour prior to the hospitalization. He accidentally ingested the magnet toys while playing with his sister. After the incident, the boy was crying and his sister told their mother that her brother had ingested the toy part. His sister showed the shape of FB that was ingested to their mother. Therefore, the boy was then brought to the hospital to see whether the FB was lodged somewhere or not. There was no sign of coughing or dyspnea in this patient.

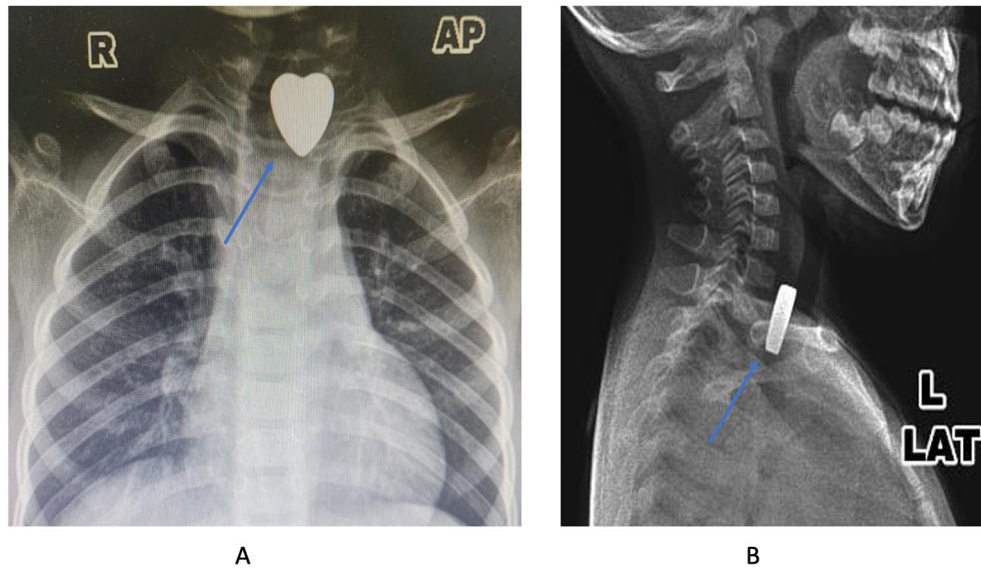
An x-ray examination was done to know the location of the FBs in the upper aerodigestive tract. The result showed the radiopaque metallic object with a heart shape was lodged in the upper esophagus (**Figure 1A** and **B**). After the diagnosis was established, the patient was scheduled for an esophagoscopy to extract the FB under general anesthesia.

During the esophagoscopy, several forceps and baskets were tried to extract the FB, however, the FB was moving down to the middle part. After several attempts, the authors then tried to modify the endoscope by placing the additional hook on the tip of the rigid scope (**Figure 2A**, red arrow). Finally, the FB could be extracted without any complications, however, the color of the FB has changed (**Figure 2A**, yellow arrow) from its original color (**Figure 2A**, green arrow).

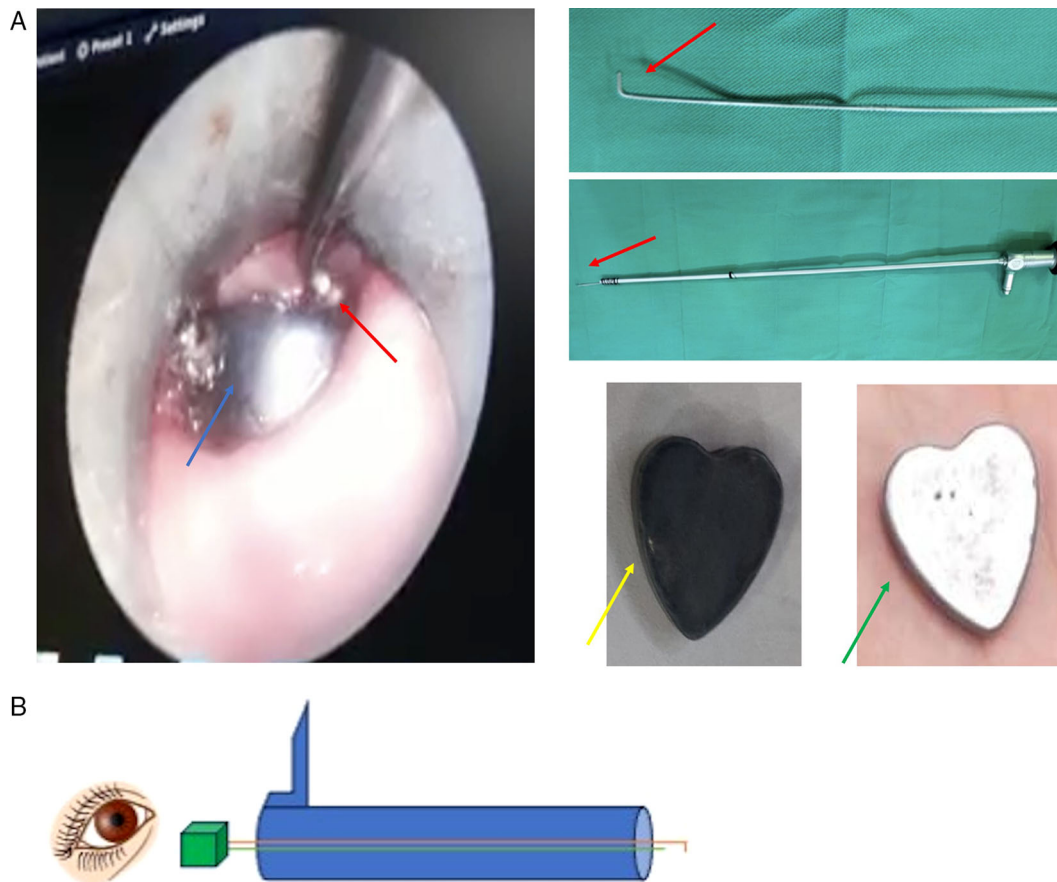
Follow-up after surgery was done after two (2) days, and no complications occurred. The patient was then released from the ward. A week after the surgery, the patient came to the outpatient clinic. No difficulties in swallowing were found, and the patient could eat all kinds of food.

**Discussion**

The constraints in managing certain cases in rural areas may be unexpected; therefore, some physicians may refer the patient to a bigger/higher hospital if they encounter difficulties. In some archipelago countries, the transportation between the islands may become a problem. Some small islands may only have boating infrastructure; on the other hand, larger islands may have a more complete transportation infrastructure. In some cases, the patient or their family may not agree to be referred to another hospital on other islands. Another patient may delay the treatment time for another reason, for instance, costs considerations and low awareness of disease symptoms.<sup>6,7</sup> As such, the diseases may develop into a more dangerous condition. In the gastrointestinal magnetic FB, it could promote a fistula or perforation.<sup>5</sup> Therefore, the physician should apply their best competencies to manage the cases. On the other hand, the patients safety must be a priority. One of the general constraints faced in rural areas is inadequate equipment. The other constraint is manpower.<sup>7</sup> The hospital level in some countries is divided into primary to tertiary. Primary hospitals usually have simple equipment and manpower. On the other hand, tertiary hospitals have complete equipment and manpower.<sup>8</sup> In Indonesia in 2021 there



**Figure 1.** The X-ray images showed the metallic density with the heart shape (blue arrow) (A: anterior-posterior projection; B: lateral projection).



**Figure 2.** A. The FB extraction under endoscope view (blue arrow: the FB; red arrow: the hook; green arrow: original magnet). B. Schematic design of rigid esophagoscope (blue tubular) with modified hook (brown line) that attached to rigid scope (green line).

were only 16 of 34 provinces who have tertiary hospitals, the rest were primary and secondary hospitals. Mostly, the provinces that have tertiary hospitals are located on the big island such as Java island.<sup>9</sup>

Anatomically, there are several narrow points in the esophagus, consecutively upper, middle, and lower as the common site of FB lodging. The most common lodging site is upper part of esophagus.<sup>10</sup> In a rural area such as Africa and Spain, the use of rigid esophagoscope/bronchoscope remain the major procedure for managing FB in aerodigestive tracts.<sup>11,12</sup> This condition is similar to the condition in our region, rigid esophagoscope remains used to extract the FB in the upper digestive tract. Our island is a small island and the distance to the nearest island which has a better health facilities is 4-5 hours by boat.

The modification of this hook was inspired by the cerumen hook that is routinely used by the otolaryngologist to remove the hard wax or FB in the ear canal.<sup>13</sup> Therefore, the principle is alike to a cerumen hook. To make it visible, the hook was attached to the rigid scope. Therefore, the FB extraction could be done safely with direct vision. The other concern is the hook should be in a safe mode for the esophagus, with non-sharp tip for example. The schematic design of this equipment (Figure 2B) could be used to understand it's properties.

The extraction itself started with the insertion of a rigid esophagoscope into the esophagus until it was close to the FB location. Then, the hook attached to the scope was inserted through the lumen of the esophagoscope. The hook insertion should be done smoothly in a similar direction to the FB position and esophagus wall (Figure 2A) to prevent a wound that may provoke a perforation. After passing the edge of the FB, the hook direction was then rotated to the body of FB and extracted slowly. If it does not work on the first attempt, the procedure could be repeated until the FB is successfully removed. However, if it is remain fail, the patient should be refer to a better referral health center.

The application of a hook is suitable for a quadrangle- or triangle-shape FB with a certain thickness (thicker than a coin). According to a previous publication, a hook for extracting FB in the esophagus is not available.<sup>4</sup> Therefore, this modification is the first innovation of the kind published in a journal. Hopefully, this innovation could help physicians globally, especially in rural areas. This innovation may also be used as an inspiration to modify incomplete equipment in a rural area. However, advanced research should be done to prove it's safety and efficacy profile. Therefore, in the future, this modification could be produced on an industrial scale.

## Conclusions

The modified endoscopic hook is an innovation that is suitable and safe for extracting quadrangle or triangle FB shapes in the esophagus with a certain thickness.

## Consent of the patient's parents

The written consent for using the images and publishing this case report has been given by the parent of the patient.

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# Open Peer Review

Current Peer Review Status:   

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## Version 3

Reviewer Report 16 August 2024

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**Ali Bilal Ulas** 

Ataturk University, Erzurum, Turkey

It is erroneous to assume that the fact the procedure is performed under optical observation makes it safe. There is a risk of sudden shifts in the hook and serious injuries during manipulation of the object. As this field is not within the authors' own field of expertise, they are unable to grasp the seriousness of the work. Such risky interventions cannot be considered as innovations in the field of oesophageal surgery.

**Competing Interests:** No competing interests were disclosed.

**Reviewer Expertise:** Thoracic Surgery

**I confirm that I have read this submission and believe that I have an appropriate level of expertise to state that I do not consider it to be of an acceptable scientific standard, for reasons outlined above.**

Reviewer Report 16 August 2024

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**Mingyan Cai**

Endoscopy Center, Zhongshan Hospital, Fudan University, Shanghai, Shanghai, China

No further comments

**Competing Interests:** No competing interests were disclosed.

**Reviewer Expertise:** Endoscopy

**I confirm that I have read this submission and believe that I have an appropriate level of expertise to confirm that it is of an acceptable scientific standard.**

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Version 2

Reviewer Report 18 July 2024

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**Ali Bilal Ulas** 

Ataturk University, Erzurum, Turkey

The article presents a case report of a child with a magnetic foreign body lodged in the esophagus, highlighting the difficulties faced in rural areas, such as limited equipment and manpower, and the need for innovative solutions.

While the statement 'the lower esophagus is the most common site of foreign body lodging' is incorrect, it is important to evaluate the method proposed in the article beyond its content. The technique, which is considered an innovation, makes a statement that is contrary to established medical practice.

The modified endoscopic hook technique is not an innovation, and it is neither suitable nor safe. *Primum non nocere* (First, do no harm)! Patient safety must remain the highest priority. I appreciate the challenges the authors faced and their good intentions in attempting to avoid perforation with a magnet. However, using a hook in the esophagus will undoubtedly cause more serious complications, such as damage to the trachea, aorta, and other organs, or mediastinitis, which will inevitably lead to significant outcomes. It is imperative that any unnecessary interventions that could lead to malpractice and compromise patient safety are avoided.

The authors suggest repeating the procedure if it does not work on the first attempt. As thoracic surgeons, we strongly advise against repeated attempts due to the risk of iatrogenic esophageal perforations, which can cause serious complications. The article does not sufficiently discuss potential risks or complications associated with the modified tool. It is imperative to question why a hook for extracting foreign bodies in the esophagus is not available. Serious mortality and significant mortal consequences are associated with such interventions.

Furthermore, the authors confirm that if the case had been in an urban area, a flexible endoscope would have been used. However, the authors were mistakenly concerned about urgent



intervention for the esophageal SINGLE magnet. Even in centers with rigid and flexible endoscopes, multiprong forceps, hinged types of forceps, basket retrieval forceps, net retrieval devices, snares, high patient volume, and experienced hands, there is a possibility of complications. It would be more appropriate to perform such interventions in centers with multidisciplinary teams that can manage any complications that may arise.

In conclusion, although the authors' intentions are understood and appreciated, the proposed method is not safe or advisable.

**Is the background of the case's history and progression described in sufficient detail?**

Partly

**Are enough details provided of any physical examination and diagnostic tests, treatment given and outcomes?**

Partly

**Is sufficient discussion included of the importance of the findings and their relevance to future understanding of disease processes, diagnosis or treatment?**

No

**Is the case presented with sufficient detail to be useful for other practitioners?**

No

**Competing Interests:** No competing interests were disclosed.

**Reviewer Expertise:** Thoracic Surgery

**I confirm that I have read this submission and believe that I have an appropriate level of expertise to state that I do not consider it to be of an acceptable scientific standard, for reasons outlined above.**

Author Response 21 Jul 2024

**hamsu kadriyan**

Dear Reviewer,

Thank you on reviewing my article.

1. The statement regarding the commonest site of FB lodging was change to "as the common site of FB lodging. The most common lodging site is upper part of esophagus" to prevent the misunderstandings.
2. To better understand the safety nature of this innovation, the authors have added the schematic picture of the innovation (Figure 2B). Therefore, it can be used more safely.
3. The potential impact of using hooks has been mention in paragraph 4 on the discussion heading.
4. If FB extraction fails with this method, the authors rely on the patient to be referred to a better hospital. (Paragraph 3 and 4 on the discussion heading)

5. The authors also believe that with this case report, we cannot definitively determine the safety and efficacy of this innovation. Therefore, the authors propose that better studies with a better methods may be conducted in the future to prove its safety and efficacy properties (last paragraph of the discussion title).

**Competing Interests:** I have confirm that I don't have any competing interest

Reviewer Report 15 December 2023

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**Dian Adi Syahputra** 

Department of Surgery, Syiah Kuala University, Banda Aceh, Indonesia

Thank you for the revision.

Suggestions to the author are mainly regarding the discussion of oesophageal anatomy and the most common site of foreign body impaction.

Reference 10 states that the most common site is the upper esophagus at around 50%, contrary to the author's statement in the discussion section that it is the lower esophagus.

The reference below supports the statement that the upper esophagus is the most common site. Please be very careful in writing statements in declared articles. Thank you.

Shruti Jayachandra, Guy D. Eslick,

A systematic review of paediatric foreign body ingestion: Presentation, complications, and management,

International Journal of Pediatric Otorhinolaryngology,

Volume 77, Issue 3,

2013,

Pages 311-317,

ISSN 0165-5876,

<https://doi.org/10.1016/j.ijporl.2012.11.025>.

(<https://www.sciencedirect.com/science/article/pii/S0165587612006519>)

**Is the background of the case's history and progression described in sufficient detail?**

No

**Are enough details provided of any physical examination and diagnostic tests, treatment given and outcomes?**

No

**Is sufficient discussion included of the importance of the findings and their relevance to future understanding of disease processes, diagnosis or treatment?**

No

**Is the case presented with sufficient detail to be useful for other practitioners?**

No

**Competing Interests:** No competing interests were disclosed.

**Reviewer Expertise:** Pediatric Surgeon

**I confirm that I have read this submission and believe that I have an appropriate level of expertise to confirm that it is of an acceptable scientific standard.**

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**Version 1**

Reviewer Report 15 November 2023

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**Dian Adi Syahputra** 

Department of Surgery, Syiah Kuala University, Banda Aceh, Indonesia

A beneficial case report on managing FB in areas with limited resources.

There are some comments to improve this case report to make it better for readers.

1. The author should not use the term "otolaryngologists" in this case report, especially in the abstract and the last paragraph of the discussion. It is better to use global terms such as doctors or physicians.
2. In the discussion section, the author should discuss the anatomy of the esophagus, which results in the retention of the FB in the esophagus to the stomach.
3. The author should refrain from doing self-citation in this report because there are 2 self-citations in the references. Many case reports discuss FB in children, especially in the esophagus.

**Is the background of the case's history and progression described in sufficient detail?**

Yes

**Are enough details provided of any physical examination and diagnostic tests, treatment**

**given and outcomes?**

Yes

**Is sufficient discussion included of the importance of the findings and their relevance to future understanding of disease processes, diagnosis or treatment?**

Partly

**Is the case presented with sufficient detail to be useful for other practitioners?**

Yes

**Competing Interests:** No competing interests were disclosed.**Reviewer Expertise:** Pediatric Surgeon**I confirm that I have read this submission and believe that I have an appropriate level of expertise to confirm that it is of an acceptable scientific standard, however I have significant reservations, as outlined above.**

Author Response 19 Nov 2023

**hamsu kadriyan**

Dear reviewer,

Thank you for your comment on my article. Regarding your suggestion, I have revised the article as follows:

1. I have changed the word "otolaryngologist" to "physician".
2. I have added the anatomy of the esophagus in the discussion section.
3. To prevent self-citation I deleted one of the references, but the other one is significant to support the explanation of health services problem in a rural area. I also added some other references to support the importance of this manuscript.

**Competing Interests:** I have no conflict of interest

Reviewer Report 15 November 2023

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**Mingyan Cai**

Endoscopy Center, Zhongshan Hospital, Fudan University, Shanghai, Shanghai, China

The authors described a modified endoscopic hook for extracting magnetic esophageal foreign body. It has some novelty, but such big magnetic foreign body will not always successfully hooked

by the small hook. The reproduction of the result is limited in other cases, since the hook itself sometimes won't have enough power to extract the foreign body from the narrowing space of the esophageal entrance.

GI endoscopy with accessory channels through which can apply a series of accessories has more advantages than this rigid scope.

**Is the background of the case's history and progression described in sufficient detail?**

Yes

**Are enough details provided of any physical examination and diagnostic tests, treatment given and outcomes?**

Partly

**Is sufficient discussion included of the importance of the findings and their relevance to future understanding of disease processes, diagnosis or treatment?**

Yes

**Is the case presented with sufficient detail to be useful for other practitioners?**

Partly

**Competing Interests:** No competing interests were disclosed.

**Reviewer Expertise:** Endoscopy

**I confirm that I have read this submission and believe that I have an appropriate level of expertise to state that I do not consider it to be of an acceptable scientific standard, for reasons outlined above.**

Author Response 19 Nov 2023

**hamsu kadriyan**

Dear Reviewer

Thank you for your comment on my manuscript.

The setting of this case was in a rural area. If the case was found in an urban area, I agree to the use of a flexible endoscope. To support the importance of this innovation in rural areas, I have inserted some references in the discussion section

**Competing Interests:** I have no conflict of interest

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