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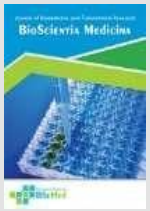

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Beyond 'Blunt': A Pathophysiology-Guided Framework for Managing High-Risk Pediatric Foreign Body Ingestion

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A B S T R A C T

Background: Foreign body ingestion is a significant cause of pediatric morbidity. The traditional "blunt" classification is insufficient for risk stratification, as objects like magnets and impacted items pose distinct threats based on their intrinsic properties. This study analyzes how a pathophysiology-based approach, distinguishing active (magnetic) from passive (mechanical) injury mechanisms, guides clinical decision-making. **Methods:** We conducted a retrospective, descriptive case series at a tertiary pediatric surgical center, reviewing cases from January 2022 to December 2024. Five illustrative cases of high-risk blunt foreign body ingestion were selected to demonstrate the spectrum of management based on the object's potential for harm. **Results:** The series included five children (aged 3-7 years). A 7-year-old with a single gastric magnet retained for five days developed mucosal injury and required urgent endoscopic removal. A 5-year-old with a recently ingested solitary gastric magnet and a 3-year-old with an impacted pyloric pendant also underwent urgent endoscopic removal. A 6-year-old with a gastric coin had elective endoscopy due to socioeconomic factors. In contrast, a 5-year-old with a coin that passed the pylorus was managed conservatively with spontaneous passage. All patients had successful outcomes. **Conclusion:** The management of pediatric foreign body ingestion should be dictated by the object's pathophysiological potential for injury, not its shape. Understanding the difference between active magnet-induced pressure necrosis and passive mechanical impaction is paramount for applying guidelines effectively and preventing severe complications. This framework supports a necessary shift from shape-based to mechanism-based risk assessment.

1. Introduction

Foreign body ingestion (FBI) represents one of the most common and challenging pediatric emergencies encountered in clinical practice globally.[1] The incidence of these events peaks in children between the ages of six months and three years, a developmental period characterized by intense oral exploration as a primary means of interacting with the environment.[2] Data from poison control centers and hospital emergency registries consistently demonstrate that the vast majority of these events are accidental, often occurring within the home under varying degrees of supervision. In 2022 alone, the National Poison Data System in the United States received over 50,000 reports of FBI in children under the age of five.[3] While direct mortality from FBI

remains low, the potential for significant morbidity—including esophageal perforation, mediastinitis, peritonitis, fistula formation, and catastrophic hemorrhage—necessitates a high index of suspicion and a structured, evidence-based approach to management.[4]

Historically, and across diverse geographical regions, coins have been the most frequently ingested objects, a finding corroborated by large-scale studies in North America, Europe, and Southeast Asia. However, the epidemiological landscape of pediatric FBI is undergoing a perilous evolution. The proliferation of small, powerful consumer electronics, novelty toys, and modern household items has precipitated a concerning rise in the ingestion of high-risk objects, particularly button batteries and high-powered, rare-earth neodymium magnets.[5] While coins remain prevalent, constituting 41.2% to 43.6% of ingestions in recent Southeast Asian series, the increasing incidence of magnet and battery ingestions presents a disproportionately greater clinical threat. This is due to their capacity to inflict rapid and severe tissue damage through active electrochemical or magnetic forces, mechanisms entirely distinct from the passive mechanical pressure exerted by a coin. This epidemiological shift underscores a critical clinical imperative: clinicians must look beyond an object's superficial shape and consider its intrinsic physicochemical properties to accurately assess risk and determine the urgency of intervention.[6]

The traditional classification of ingested foreign bodies into broad categories such as "blunt," "sharp," or "long" provides a useful, albeit dangerously simplistic, initial framework for risk assessment. This terminology, however, can be profoundly misleading. To group a coin and a set of neodymium magnets under the single descriptor "blunt" is to obscure the fundamentally different mechanisms by which they can cause catastrophic harm. A coin's potential for injury is largely passive and time-dependent, whereas the injury from multiple magnets is active, aggressive, and progresses on a much faster timescale.[7] The continued reliance on such an oversimplified classification system risks under-triaging patients with truly high-risk ingestions, potentially leading to devastating delays in care.

A more clinically relevant and pathophysiologically sound approach is to categorize objects based on their potential for active versus passive tissue injury. This refined classification system provides a more accurate and immediate guide to clinical urgency and the appropriate management pathway: (1) Inert Objects (Passive Injury Mechanism): This category includes items like coins, marbles, plastic toy parts, and non-magnetic jewelry. These objects are chemically and physically inert. Their potential for harm arises almost exclusively from mechanical obstruction or, in cases of prolonged stasis, time-dependent pressure necrosis on the surrounding mucosa. The injury process is typically slow, localized, and directly related to the duration of impaction at a site of anatomical narrowing, such as the cricopharyngeus, aortic arch impression, gastroesophageal junction, or pylorus; (2) Active-Magnetic Objects (Active Injury Mechanism): This group is primarily composed of high-powered rare-earth (neodymium) magnets, which are 5 to 10 times more powerful than traditional ferrite magnets. The danger of these objects is not their shape but their immense attractive force.[8] When two or more magnets are ingested (or a single magnet with another metallic object), they can attract each other across separate loops of the bowel wall. This establishes a point of constant, powerful compression that far exceeds capillary perfusion pressure, leading to a rapid and severe form of transmural pressure necrosis. This can result in perforation, fistula formation, volvulus, and peritonitis within hours to days. The injury is active, progressive, and independent of anatomical narrowing; (3) Active-Electrochemical Objects (Active Injury Mechanism): Button batteries are the archetypal example in this category. When lodged in the moist, electrolyte-rich environment of the esophagus, a button battery generates an external electrical circuit. This current drives the hydrolysis of tissue fluids, producing a high concentration of hydroxide ions at the battery's negative pole. The

result is a highly localized, severe alkaline chemical burn (pH >12) that causes liquefaction necrosis—a process that rapidly dissolves tissue. Significant damage can occur within 15 minutes, and full-thickness perforation can occur in as little as two hours, with the catastrophic potential for aortoesophageal fistula formation. This pathophysiological framework reveals that the term "blunt" is wholly insufficient for clinical decision-making. The distinction between a passive mechanical threat and an active magnetic or electrochemical one is fundamental to understanding the urgency and nature of the required intervention.[9]

While approximately 80% to 90% of all ingested foreign bodies will traverse the gastrointestinal (GI) tract spontaneously, 10% to 20% will require endoscopic removal, and less than 1% will necessitate surgery. A particularly perilous feature of high-risk ingestions is the potential for an initial asymptomatic period. A child who has swallowed a button battery or multiple magnets may exhibit no immediate symptoms, which can lead caregivers to delay seeking medical attention under a false sense of security. This "asymptomatic trap" is exceptionally dangerous, as irreversible tissue damage can be progressing silently. For button batteries, liquefaction necrosis begins within minutes; for magnets, inter-loop pressure necrosis can become established within hours. Therefore, a witnessed or strongly suspected ingestion of any object with an active injury mechanism constitutes a medical emergency, regardless of the child's initial clinical appearance. A high index of suspicion, coupled with an understanding of these rapid and distinct pathophysiological processes, is essential for any clinician evaluating a child with a potential FBI.[10]

The aim of this study is to present a series of five diverse cases of high-risk blunt foreign body ingestion managed at a tertiary care center in Indonesia. Through detailed clinical vignettes, we illustrate the spectrum of presentation and management, from emergent surgical intervention to conservative watchful waiting. The novelty of this work lies in its explicit focus on bridging the gap between the fundamental pathophysiology of injury and real-world clinical decision-making. We demonstrate how a nuanced understanding of the distinct mechanisms of harm—specifically, magnet-induced transmural pressure necrosis versus mechanical impaction injury from inert objects—directly informs the application of international management guidelines from the North American Society for Pediatric Gastroenterology, Hepatology, and Nutrition (NASPGHAN) and the European Society of Gastrointestinal Endoscopy (ESGE). By contextualizing these principles within a Southeast Asian clinical setting, this case series serves as a practical, educational tool for surgeons, gastroenterologists, and pediatricians, reinforcing that the therapeutic pathway is dictated not by an object's shape but by its intrinsic potential to actively or passively destroy tissue.

2. Methods

This study is a retrospective, descriptive case series conducted at Dr. Kariadi General Hospital, a national referral and tertiary care teaching hospital in Central Java, Indonesia. A retrospective review of the hospital's pediatric surgery and endoscopy databases was performed for the period from January 1st, 2022, to December 31st, 2024. All patients aged 18 years or younger who were managed for the ingestion of high-risk "blunt" foreign bodies were considered for inclusion. Patients were included if they had a confirmed ingestion of either (1) one or more magnets or (2) an inert blunt object, such as a coin or piece of jewelry, that was impacted or required intervention beyond watchful waiting for passage. Cases were selected for this series if they exemplified a distinct point on the management spectrum (emergent surgery, urgent endoscopy, elective endoscopy, or planned conservative management) and clearly illustrated the study's core thesis regarding pathophysiology-guided decision-making. Patients with ingestion of sharp objects, long objects (>6 cm), food bolus impactions, button batteries (which are managed via a separate, highly urgent protocol), or

cases with incomplete medical records were excluded from this series.

Data were systematically extracted from the hospital's electronic and paper medical records. Information collected included patient demographics (age, sex), details of the ingested object, time from ingestion to presentation, clinical signs and symptoms, physical examination findings, laboratory results, findings from radiographic imaging (anteroposterior and lateral views), endoscopic reports, operative notes, and clinical outcomes, including length of hospital stay and post-intervention complications. All data were de-identified to protect patient confidentiality.

This study was conducted in accordance with the ethical principles of the Declaration of Helsinki. Due to the retrospective and de-identified nature of the data analysis, the institutional review board of Dr. Kariadi General Hospital granted a waiver for formal ethical approval and individual patient consent.

3. Results

Case 1: Prolonged retention of a solitary gastric magnet with mucosal injury

A 7-year-old male was brought to the emergency department with a five-day history of vague, intermittent epigastric discomfort and poor appetite. His parents, farmers from a rural area, noted he had been playing with small, spherical magnets from a toy set around the time symptoms began. The significant delay in seeking care was due to the mild and non-specific nature of his symptoms, which were initially thought to be related to a minor illness.

On examination, the child was afebrile and his vital signs were normal (Heart Rate: 88 beats/min, Respiratory Rate: 20 breaths/min, Blood Pressure: 105/70 mmHg). He appeared comfortable and was in no acute distress. The abdominal examination revealed a soft, non-distended abdomen with mild tenderness to deep palpation in the epigastrium. There were no signs of guarding or peritonitis, and bowel sounds were normoactive.

Laboratory investigations, including a complete blood count and C-reactive protein, were all within normal limits. Anteroposterior (AP) and lateral abdominal radiographs were obtained (Figure 1A, 1B), which revealed a single, high-density, 1 cm spherical object located in the gastric silhouette. Its position was unchanged from an initial radiograph taken at a local clinic two days prior, confirming it had failed to pass the pylorus.

Given the prolonged retention of a gastric magnet (greater than 24 hours) and the development of symptoms, however mild, the decision was made for urgent esophagogastroduodenoscopy (EGD). This aligns with guidelines recommending the removal of all gastric magnets, with increased urgency for symptomatic patients or those with prolonged retention.

During EGD under general anesthesia, the spherical magnet was found in the gastric antrum. The underlying mucosa was not normal; it showed a well-demarcated area of significant erythema, edema, and a small, superficial erosion at the point of contact, consistent with a pressure-induced injury from the prolonged stasis of the object. The magnet was securely captured using a Roth Net retrieval device and removed without incident. The patient recovered quickly, his epigastric discomfort resolved, and he was discharged home the following day.

Case 2: Conservative management of a distal coin: A case of watchful waiting

A 5-year-old male was brought to the emergency department by his parents approximately five hours after they witnessed him swallow a coin while playing. The child remained completely asymptomatic, with no complaints of abdominal pain, dysphagia, drooling, or respiratory distress. His parents, both professionals, sought immediate medical evaluation. Physical examination was entirely unremarkable. The child was in no distress, with normal vital signs for his age. His abdomen was soft, non-tender, non-distended, and had normoactive bowel sounds. Laboratory investigations were not performed as they were not

clinically indicated. An abdominal radiograph (AP view) was performed, which revealed a single, flat, circular metallic object with well-defined edges, consistent with a coin measuring 2.2 cm in diameter. The object was located in the right lower quadrant, clearly having passed the pylorus and presumed to be within the distal small bowel.

Based on established NASPGHAN guidelines for asymptomatic patients with a blunt object that has passed the pylorus, a conservative management plan was adopted. The family was provided with detailed counseling regarding this approach. They were instructed to encourage a normal, high-fiber diet, to monitor the child for any development of "red flag" symptoms (worsening abdominal pain, vomiting, bloody stools), and to visually inspect all stools for passage of the coin. They were advised to return immediately if any symptoms developed.

A follow-up abdominal radiograph was performed 24 hours after the initial presentation. This serial imaging confirmed the efficacy of the conservative approach, showing that the coin had progressed distally and was now located in the region of the descending colon. The family called to report that the coin was successfully passed in the stool approximately 48 hours after ingestion. The child remained asymptomatic throughout the observation period and required no further intervention.

Case 3: Urgent endoscopic retrieval of a recently ingested solitary gastric magnet

A 5-year-old male presented to the emergency department 12 hours after his parents were informed by a neighbor that he had swallowed a magnet. The child was initially taken to a local clinic, where an abdominal radiograph confirmed a metallic foreign body. He was subsequently transferred to our tertiary facility due to the lack of pediatric endoscopic capabilities at the initial center. The patient was entirely asymptomatic.

On examination at our institution, the child was playful and in no distress. His vital signs were normal, and the abdominal examination was benign. Laboratory investigations were within normal limits. A repeat AP and lateral abdominal radiograph confirmed the presence of a single, triangular-shaped, radiopaque object located within the gastric silhouette.

Despite the child being asymptomatic and having ingested the magnet recently, the decision was made for urgent endoscopic removal (<24 hours from presentation). This decision aligns with current NASPGHAN and ESGE guidelines, which recommend removal of all gastric magnets. The primary rationale is to mitigate the significant risk posed by the potential for a second, unobserved ingestion of another magnet or metallic object, which would create the dangerous scenario of inter-loop attraction. Awaiting spontaneous passage of a magnet is not recommended.

The patient underwent EGD under general anesthesia with endotracheal intubation. The triangular magnet was easily identified in the body of the stomach. In contrast to Case 1, the underlying gastric mucosa was carefully inspected and found to be completely normal, with no evidence of erosion or ulceration. For safe removal, a Roth Net retrieval device was passed through the endoscope's working channel. The magnet was successfully captured within the net, which was then cinched closed. The procedure was uncomplicated. The patient was observed for four hours post-anesthesia and was discharged home the same day without any complications.

Case 4: Pyloric impaction of an irregularly shaped pendant

A 3-year-old female was brought for evaluation 12 hours after her mother witnessed her swallow a heart-shaped metal pendant from a necklace. The child was asymptomatic but was transferred from a peripheral hospital that lacked endoscopic services. The physical examination at our institution was unremarkable, with normal vital signs and a benign abdominal exam. Laboratory results were within normal limits. An initial radiograph taken at the outside hospital and a

repeat radiograph performed upon arrival six hours later both demonstrated a heart-shaped metallic object located in the epigastrium at the level of the L1 vertebra. Critically, there was no evidence of distal progression of the object between the two films. This static position strongly suggested that the object was impacted.

The management decision was guided by two key factors: the object's characteristics and its failure to progress. The pendant was irregularly shaped and measured greater than 2.5 cm at its widest point, both of which increase the risk of impaction at narrow points of the GI tract. The lack of movement past the gastroduodenal junction indicated impaction at the pylorus. According to ASGE guidelines, large objects (>2.5 cm) or those that fail to pass the pylorus after a period of observation warrant endoscopic removal.

EGD was performed under general anesthesia. The endoscope was advanced into the stomach, where the pendant was found to be firmly lodged within the pyloric channel. The surrounding pyloric mucosa was visibly erythematous and edematous, consistent with the early stages of pressure-induced injury from the impacted object. Using a pair of rat-tooth grasping forceps, the pendant was carefully manipulated and dislodged from the pylorus. To ensure safe extraction and prevent injury to the gastroesophageal junction and esophagus, a soft latex hood was fitted onto the tip of the endoscope. The pendant was grasped and pulled up against the hood, which effectively shielded the mucosa during withdrawal. The procedure was successful and without immediate complications. The patient was observed in the hospital for 24 hours, tolerated a liquid diet, and was discharged home in good condition.

Case 5: Asymptomatic gastric coin: the decision for elective endoscopic removal

A 6-year-old male was brought to the hospital by his parents with a suspected coin ingestion that had occurred approximately 15 hours prior. The event was unwitnessed, but a coin was missing from a table where the child was playing. The child was completely asymptomatic. Physical examination was normal in all respects, and laboratory values were unremarkable. An abdominal radiograph confirmed the presence of a single, 2.3 cm circular radiopaque object consistent with a coin, located in the fundus of the stomach.

The management of an asymptomatic gastric coin presents a clinical equipoise. International guidelines suggest that such objects can be observed for a period of up to four weeks, as the majority will pass spontaneously. Alternatively, elective endoscopic removal is also an acceptable option. The decision-making process in this case was heavily influenced by the family's socioeconomic context. The parents were of a lower socioeconomic status, living in a remote area several hours from the hospital, with occupations that made frequent follow-up visits and obtaining serial imaging logistically and financially challenging.

After a thorough discussion with the parents outlining both options—watchful waiting with the need for stool surveillance and potential repeat X-rays versus a definitive, one-time endoscopic procedure—a shared decision was made to proceed with elective EGD. This approach was chosen to provide certainty of treatment, eliminate the burden of prolonged follow-up, and mitigate the small but real risk of future complications from a retained gastric foreign body.

The EGD was performed the next day under general anesthesia. The coin was found in the gastric fundus with no associated mucosal injury. It was easily grasped with an endoscopic snare and removed without incident. The patient recovered well from the procedure and was discharged home on the same day. This case highlights how non-clinical, real-world factors can and should influence the application of clinical guidelines to provide the most appropriate and safest care for an individual patient.

Table 1. Summary of patient demographics, clinical presentation, interventions, and outcomes.

A comparative overview of five pediatric cases of high-risk foreign body ingestion.

CHARACTERISTIC	CASE 1	CASE 2	CASE 3	CASE 4	CASE 5
Age (years) / Sex	7 / Male	5 / Male	5 / Male	3 / Female	6 / Male
Ingested Object	Single spherical magnet	Single coin	Single triangular magnet	Heart-shaped pendant	Single coin
Onset to Presentation	5 days	5 hours	12 hours	12 hours	15 hours
Key Symptoms	Mild epigastric discomfort	Asymptomatic	Asymptomatic	Asymptomatic	Asymptomatic
Salient Physical Findings	Mild epigastric tenderness	Unremarkable	Unremarkable	Unremarkable	Unremarkable
Key Radiographic Findings	Single magnet in stomach, no progression	Single coin in small bowel	Single magnet in stomach	Impacted pendant at pylorus (no progression)	Single coin in stomach
Management Strategy	Urgent EGD	Conservative (watchful waiting)	Urgent EGD	Urgent EGD	Elective EGD
Endoscopic/Surgical Findings	Magnet in antrum with mucosal erosion	N/A	Magnet in gastric body, normal mucosa	Pendant impacted in pylorus with mucosal edema	Coin in gastric fundus, normal mucosa
Final Outcome	Discharged without complication	Discharged without complication	Discharged without complication	Discharged without complication	Discharged without complication

4. Discussion

The management decisions detailed in the preceding cases were not arbitrary but were directly guided by a sophisticated understanding of the distinct pathophysiological threats posed by each ingested object. A deep appreciation for these mechanisms is essential for any clinician, as it transforms the application of guidelines from rote memorization into reasoned clinical judgment.[11] The fundamental difference lies in whether the object inflicts harm passively through mechanical forces over time or actively through intrinsic properties like magnetism. The presented cases serve as compelling real-world evidence for the necessity of this pathophysiology-first paradigm (Figure 1).

The ingestion of magnets, illustrated in Cases 1 and 3, introduces a risk profile entirely different from inert objects.[12] While the endoscopic management of single magnets in these cases was straightforward, it is the potential for catastrophic injury that drives the aggressive management guidelines. The urgency for removing even a single gastric magnet is rooted in preventing the devastating scenario that occurs when multiple magnets are ingested.[13] Modern consumer products often contain small rare-earth magnets, typically composed of a neodymium-iron-boron (NdFeB) alloy. These magnets are orders of magnitude more powerful than traditional ferrite magnets.[14] Their small size belies an immense attractive force that can act over significant distances, even through biological tissue. Had the child in Case 1 or Case 3 ingested a second magnet, the pathological process would have been entirely different, escalating from a manageable endoscopic problem to a surgical emergency. When two or more magnets are ingested, peristalsis can separate them into different segments of the GI tract. Their powerful magnetic fields then draw these separate bowel loops together with formidable force, trapping the intervening mesenteric and bowel walls between them. This creates a focal point of intense,

unremitting pressure that far exceeds the capillary perfusion pressure of the delicate intestinal vasculature (approximately 20-30 mmHg). The consequence is an immediate and total cessation of blood flow to the entrapped tissue, leading to profound ischemia.[15] This is the central mechanism of multiple-magnet injury: magnet-induced transmural pressure necrosis. Unlike an impacted coin, the magnetic force is an active, inward-pulling force that strangulates tissue.

Figure 1. The pathophysiology-guided framework for managing high-risk foreign body ingestion.

The initial ischemic insult from multiple magnets triggers a rapid and devastating pathological cascade. The sustained lack of blood flow leads to cell death (necrosis) that progresses through the entire thickness of the bowel wall, from mucosa to serosa. Significant mucosal ulceration can be present in less than eight hours. As the necrotic tissue loses integrity, it can lead to perforation into the peritoneal cavity or erode a channel between the adherent bowel loops, forming an entero-enteric fistula. The fixed point of magnetic adhesion can act as a pivot point for a volvulus, leading to acute bowel obstruction and massive intestinal infarction.[16] This potential for severe injury is precisely why international guidelines advocate for the urgent removal of all known gastric magnets, as was performed in our cases.

In stark contrast to the active nature of magnet injury, the harm caused by impacted inert objects like the coin in Case 2 and the pendant in Case 4 is a passive, time-dependent process driven by mechanical forces and local anatomy. Case 1, with its prolonged magnet retention, also demonstrated a form of this passive injury (mucosal erosion) superimposed on the object's active potential. For inert objects, the risk of impaction is a function of the interplay between the object's characteristics and the patient's anatomy. Objects with a diameter greater than 2.5 cm or with irregular shapes, like the pendant in Case 4, are more likely to become lodged at sites of natural narrowing. The smooth, round coin in Case 2 successfully navigated the entire GI tract, while the larger, irregularly shaped pendant in Case 4 failed to pass the pylorus. When an inert object becomes lodged, it exerts direct mechanical pressure on the surrounding mucosa. If sustained, this can compromise local blood flow, leading to ischemia, inflammation, and eventually ulceration. This process is significantly slower than that seen with multiple magnets. The mucosal erythema and edema in Case 4 and the erosion in Case 1 are examples of the early stages of this process.

To further highlight the importance of understanding pathophysiology, it is instructive to compare the slow mechanical injury of an impacted coin with the rapid electrochemical injury of an impacted button battery. While both are "blunt," their mechanisms of harm are worlds apart. An impacted button battery establishes a local electrical circuit, generating hydroxide ions that cause a severe alkaline burn and liquefaction necrosis. This process is incredibly swift, with the potential for full-thickness esophageal perforation in as little as two hours.[17] This comparison powerfully reinforces the central thesis: clinicians must look beyond an object's physical shape to its intrinsic properties to truly assess the risk and urgency.

Radiographic imaging in FBI is not merely a tool for localization; it is a critical instrument for pathophysiological risk assessment.[18] For suspected magnet ingestion, obtaining both AP and lateral views is non-negotiable to distinguish single from multiple magnets. The characteristic "double-ring" or "halo" sign of a button battery on an AP radiograph is a radiological emergency alert. Serial radiographs are invaluable for inert objects. An object that fails to progress, as in Case 4, is by definition impacted and requires intervention.[19]

International clinical practice guidelines are the clinical embodiment of these pathophysiological principles. The NASPGHAN algorithm for magnet ingestion is built entirely around the pathophysiology of inter-loop attraction. The recommendation for urgent removal of all gastric magnets, even single ones as in Cases 1 and 3, is a pragmatic safeguard against this potential catastrophe. The guidelines' allowance for observation reflects the understanding that the mechanism of injury—mechanical pressure—is much slower. The decision to intervene on the impacted pendant in Case 4 was based on its failure to progress, a key action point in these guidelines.

The execution of endoscopic removal in children requires a consideration of the object's properties. The choice of device is critical for a safe procedure. As demonstrated, a Roth Net is ideal for containing magnets (Cases 1 and 3), while a protective hood is invaluable for shielding the esophagus from the sharp

edges of an object like the pendant in Case 4. The decision to use general anesthesia with endotracheal intubation for all pediatric endoscopic removals is a standard of care that protects the child's airway.[20]

5. Conclusion

This case series demonstrates that a simplistic classification of ingested foreign bodies based on physical shape is insufficient and potentially hazardous. The true risk profile is defined by an object's intrinsic physical and chemical properties and its resultant potential to cause harm through distinct pathophysiological mechanisms. The management of high-powered magnets and impacted inert objects follows starkly different clinical pathways, rooted in a fundamental understanding of their unique mechanisms of injury: the active, rapid, transmural pressure necrosis induced by inter-loop magnetic attraction versus the passive, slower, localized pressure necrosis from mechanical impaction. Effective and safe management, therefore, hinges on a high index of suspicion, prompt and meticulous radiographic evaluation, and the strict adherence to evidence-based international guidelines that are themselves translations of our pathophysiological understanding. By integrating this deep knowledge into everyday practice, clinicians can navigate these challenging cases with precision, ensuring timely and appropriate interventions. Future efforts should focus on increased public health education regarding the dangers of high-powered magnets and the development of region-specific adaptations of guidelines to account for local socioeconomic and healthcare access realities.

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