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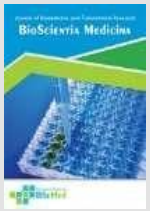

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The Pointed Challenge: Endoscopic Management of an Ingested Sharp Foreign Body and a Synthesis of Modern Techniques

Sindhu Nugroho Mukti[1*], Sigit Adi Prasetyo[2], Bernardus Parish Budiono[2]

[1]General Surgery Resident, Faculty of Medicine, Universitas Diponegoro/Dr. Kariadi General Hospital, Semarang, Indonesia

[2]Digestive Division, Department of Surgery, Faculty of Medicine, Universitas Diponegoro/Dr. Kariadi General Hospital, Semarang, Indonesia

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***Corresponding author:**
Sindhu Nugroho Mukti

E-mail address:
sindhunugroho21@gmail.com

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A B S T R A C T

Background: The ingestion of sharp-pointed foreign bodies constitutes a high-acuity medical emergency, distinguished from other ingested objects by its significant potential for severe complications, including visceral perforation and hemorrhage. While flexible endoscopy has emerged as the cornerstone of management, its successful application hinges on a systematic, protocol-driven approach. This manuscript presents a case of an ingested straight pin and uses it as the framework for a critical synthesis of modern diagnostic and therapeutic strategies. **Case presentation:** A 40-year-old female presented to the emergency department, hemodynamically stable and completely asymptomatic, two hours after accidentally swallowing a straight pin. A benign abdominal examination belied the potential danger. Plain radiography confirmed a single, sharp metallic object in the gastric antrum. An urgent esophagogastroduodenoscopy under general anesthesia was performed. The pin was securely grasped with rat-tooth forceps and extracted without incident. The patient's recovery was uneventful, and she was discharged on the first postoperative day. **Conclusion:** This case provides a high-fidelity validation of current international guidelines, demonstrating that a protocol-driven approach—encompassing rapid triage, definitive imaging, and urgent therapeutic endoscopy—is both safe and maximally effective for upper gastrointestinal sharp foreign bodies. The successful outcome underscores the critical importance of this management algorithm in preventing progression to life-threatening complications. This case-driven synthesis reinforces that adherence to a rigorous, evidence-based protocol is the most effective strategy to navigate this pointed clinical challenge and consistently achieve optimal patient outcomes.

1. Introduction

The ingestion of foreign bodies represents a significant and enduring challenge within the global landscape of emergency medicine, gastroenterology, and surgery.[1] This common clinical problem drives a substantial volume of emergency department visits annually, presenting clinicians with a diverse spectrum of ingested items, from innocuous food boluses to profoundly hazardous objects that can precipitate life-threatening crises. While a reassuring majority—estimated at 80-90%—of these objects will navigate the entirety of the gastrointestinal (GI) tract spontaneously and without clinical sequelae, a clinically significant cohort of 10-20% will fail to progress, mandating intervention. Within this group, flexible endoscopy has rightfully become the therapeutic mainstay, with success rates exceeding 95%. A small but critical fraction of less than 1% will ultimately require surgical intervention, typically prompted by the failure of endoscopic methods or the

onset of severe complications.[2] Within this broad clinical context, a distinct hierarchy of risk exists, and no category commands more immediate concern than that of sharp-pointed foreign bodies. Objects such as pins, needles, fish bones, and glass fragments are not merely passive occupants of the GI tract; they are active threats, armed with the potential to perforate the visceral wall.[3] The statistical risk is not trivial; primary epidemiological studies have established perforation rates ranging from 15% to 35%, a wide variability influenced by factors such as the object's size and shape, its anatomical location, and the crucial interval between ingestion and intervention.[4] The consequences of such a perforation are dire and location-dependent, ranging from mediastinitis following an esophageal tear to fulminant peritonitis from an intestinal breach.[5] This elevates the ingestion of a sharp object from a clinical problem to a time-sensitive medical emergency. This category of hazard is pathomechanically distinct from other dangerous ingestions, such as button batteries, which induce liquefaction necrosis via electrical current generation, or high-powered magnets, which can cause ischemic necrosis by trapping bowel walls.[6] The sharp object's threat is one of direct, mechanical violence to the integrity of the GI tract.[7]

In response to this challenge, the past two decades have witnessed a profound evolution in management philosophy. A historical reliance on watchful waiting or primary surgical intervention has been supplanted by a paradigm of proactive, minimally invasive management centered on advanced flexible endoscopy.[8] International bodies, most notably the European Society of Gastrointestinal Endoscopy (ESGE) and the American Society for Gastrointestinal Endoscopy (ASGE), have codified this modern approach in comprehensive, evidence-based clinical guidelines.[9] These protocols provide a robust framework for risk stratification, guide the selection of diagnostic imaging, and dictate the critical timing of intervention. For a sharp-pointed object identified in the stomach or duodenum, the recommendation is unequivocal: urgent endoscopic retrieval, ideally within 24 hours, is mandatory to prevent its migration into the less accessible and more vulnerable distal bowel. Despite the clarity of these guidelines, their application in real-world clinical practice is a complex undertaking, demanding not only technical proficiency but also a deep, nuanced understanding of the underlying scientific principles. The successful management of a patient is a cascade of correct decisions, each informed by a body of evidence. It is this intricate interplay of diagnosis, risk assessment, and technical execution that forms the core of this manuscript.[10]

The primary aim of this manuscript is to provide a detailed deconstruction of the successful management of an ingested sharp foreign body, using a real-world case as a scaffold for a comprehensive analysis of modern best practices. This manuscript adopts the structure of a case-driven systematic review, moving beyond a simple descriptive report to offer a deeply analytical and educational narrative. The novelty of this work is twofold. First, it reframes the discussion of foreign body management not as a series of abstract guidelines, but as a sequence of critical clinical questions that arise during a patient's journey, from the emergency room to the endoscopy suite. Second, it provides a rigorous and critical synthesis of the current literature, focusing on three key domains: the evolution of diagnostic imaging algorithms, the hierarchy of evidence for the timing of intervention, and the technical innovations in endoscopic retrieval hardware and techniques. By integrating a high-fidelity case with a deep, critical analysis of the evidence, this study aims to validate the modern management algorithm for sharp foreign bodies and serve as an impactful educational resource for clinicians, illuminating the synthesis of scientific knowledge and technical skill required to navigate this pointed challenge.

2. Case Presentation

A 40-year-old female presented to the emergency department of Dr. Kariadi General Hospital with the singular complaint of having accidentally swallowed a

straight pin. The ingestion event occurred approximately two hours prior to her arrival, during the seemingly benign act of adjusting her headscarf. She reported no subsequent symptoms, specifically denying any pain, dysphagia, odynophagia, or respiratory distress. This asymptomatic presentation, a dangerously reassuring feature in the context of sharp object ingestion, was mirrored by an entirely unremarkable physical examination, which revealed no signs of visceral trauma or peritonitis. This clinical picture highlighted the critical role of diagnostic imaging to confirm the object's presence and precisely determine its location. Figure 1 provides a comprehensive, multi-faceted schematic of the patient's baseline status upon arrival at the emergency department. It serves as a foundational data summary, capturing the essential demographic, historical, and physiological parameters that framed the initial clinical assessment. The schematic is intentionally designed to highlight the critical disjunction between the patient's benign clinical appearance and the high-risk nature of the ingested object. The demographic data—a 40-year-old female—and the history of an accidental ingestion while adjusting a headscarf immediately place the event within a well-defined epidemiological context of accidental foreign body ingestion in adults. Of paramount importance are the clinical findings, which are meticulously detailed to underscore the concept of "deceptive asymptomaticity." The complete absence of symptoms such as pain or dysphagia, combined with a non-tender abdomen and entirely stable vital signs, paints a picture of clinical wellness. This figure visually and textually emphasizes that for sharp foreign body ingestions, a clinician cannot rely on the physical examination alone to gauge the severity of the situation. The normal vital signs, presented in a clear, dashboard-style format, reinforce the patient's hemodynamic stability but also serve as a cautionary note against clinical complacency. This schematic is therefore more than a simple data table; it is a narrative tool designed to communicate the central diagnostic challenge of this case. It illustrates that the initial phase of management was governed not by the patient's reassuring symptoms, but by a high index of suspicion rooted in the mechanism of injury—the known ingestion of a sharp-pointed object. It sets the stage for the subsequent diagnostic and therapeutic steps, which were initiated based on established protocols rather than overt clinical distress.

The immediate diagnostic objective was to definitively confirm the ingestion and localize the foreign body. Given the high probability of a radio-opaque object, the imaging strategy was straightforward. A two-view plain abdominal radiograph proved sufficient and definitive, clearly visualizing the pin within the gastric shadow. The absence of any secondary radiological signs of complication, such as pneumoperitoneum or intestinal obstruction, corroborated the benign clinical examination and normal laboratory findings. This confirmed that no acute complications had yet occurred, thereby indicating the appropriateness of a planned, urgent endoscopic intervention. Figure 2 provides a clear and systematic visualization of the diagnostic workflow, detailing the process from initial suspicion to definitive pre-procedural diagnosis. It is structured to illustrate a logical, evidence-based progression of inquiry, culminating in the critical information needed to formulate a management plan. The figure is bifurcated to represent the two core components of the diagnostic assessment: radiological imaging and laboratory analysis. The primary focus is on the radiological findings, as this modality provided the definitive diagnosis. The schematic includes a representative plain radiograph (AP and Lateral views), which serves as the central piece of evidence. The key findings are enumerated to emphasize a systematic approach to radiographic interpretation. Finding 1, the confirmed presence of the metallic pin, answers the primary question of whether an ingestion occurred. Finding 2, the localization of the object to the gastric shadow, is crucial for procedural planning, confirming that the object is within reach of a standard upper endoscope. Findings 3 and 4, the absence of pneumoperitoneum or bowel obstruction,

are equally critical as they effectively rule out the immediate, life-threatening complications of perforation or obstruction, thereby informing the timing of the intervention as "urgent" rather than "emergent." The laboratory analysis component is presented as a complementary but essential part of the workup. The standard tests—a Complete Blood Count (CBC) and Basic Metabolic Panel (BMP)—are shown to provide a baseline assessment of the patient's physiological status. The normal results corroborate the benign clinical picture, confirming the absence of an occult inflammatory response or metabolic derangement. Finally, the schematic converges on the "Final Pre-procedural Diagnosis." This section synthesizes all the preceding information into a single, concise clinical statement: "Intragastric sharp-pointed foreign body without evidence of acute complications." This definitive diagnosis serves as the direct predicate for the subsequent therapeutic intervention, and the figure as a whole represents a model of efficient and effective emergency diagnostic practice.

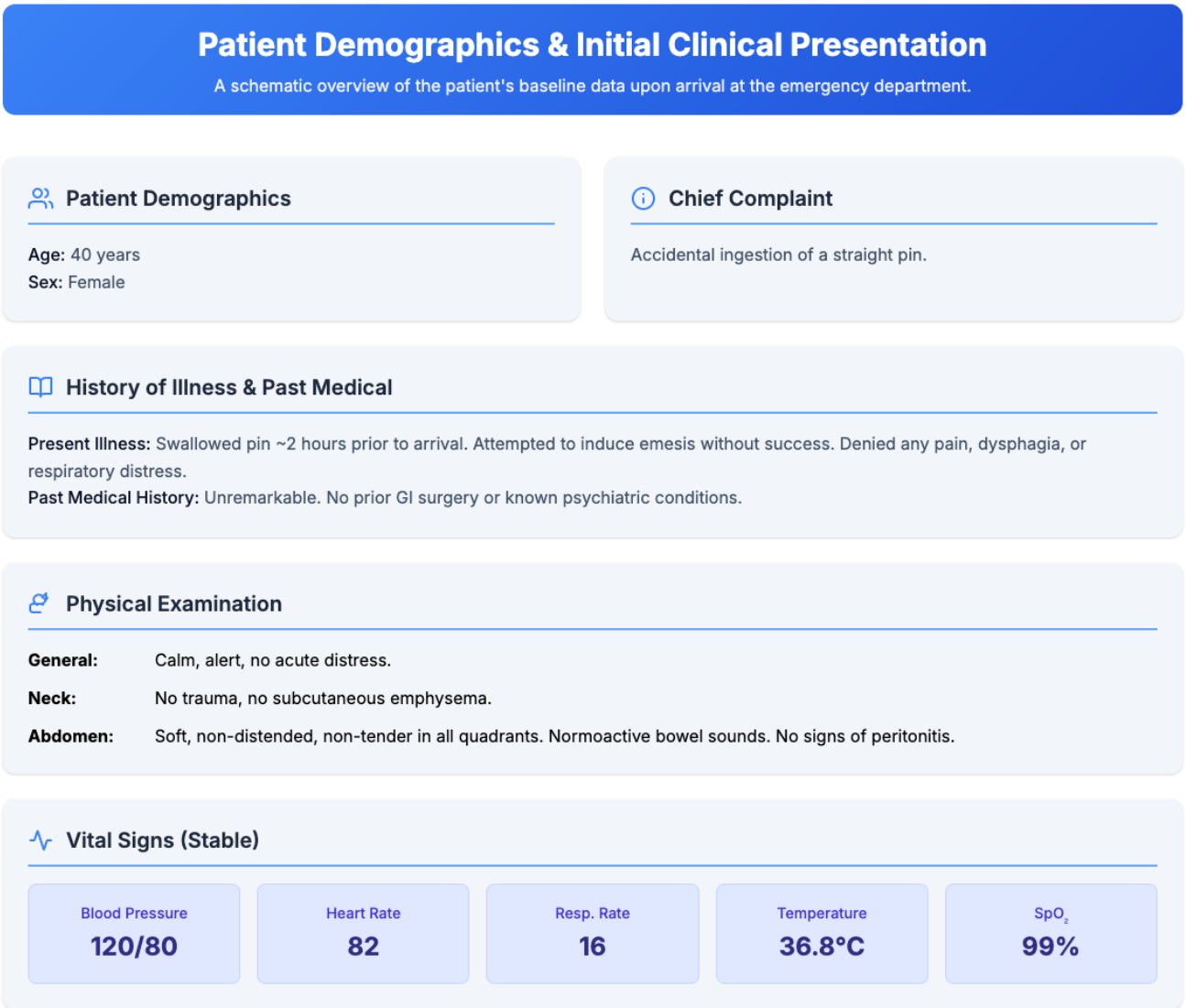

Figure 1. Patient demographics & initial clinical presentation.

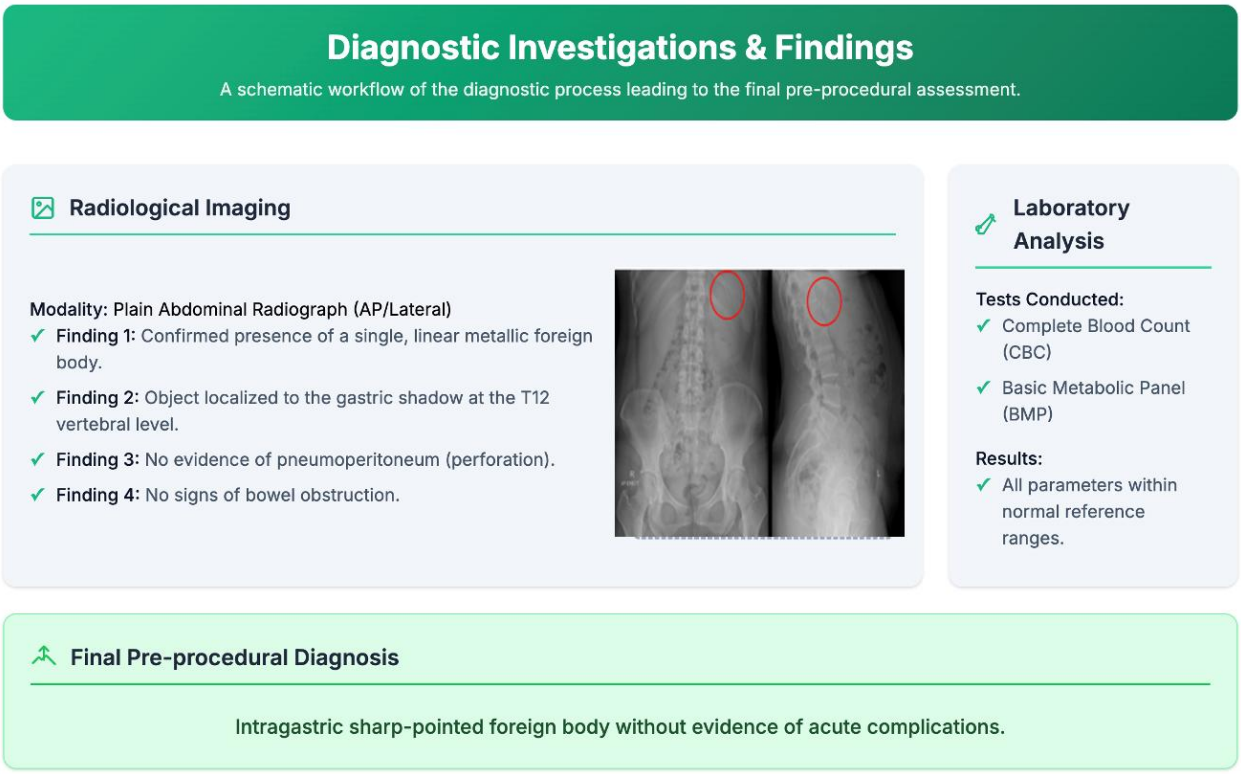

Figure 2. Diagnostic investigations & findings.

In strict adherence to established international guidelines for sharp foreign body ingestion, the patient was taken for an urgent therapeutic esophagogastroduodenoscopy (EGD). The procedural plan was meticulously formulated to maximize safety and efficacy. Figure 3 provides a detailed, granular schematic of the definitive therapeutic intervention: the esophagogastroduodenoscopy (EGD) with foreign body retrieval. It is designed as a workflow diagram, chronologically and thematically breaking down the procedure into its core components to provide a comprehensive overview of the modern endoscopic management of a sharp foreign body. The first section, "Pre-procedural Setup," establishes the critical preparatory steps that ensure patient safety and procedural success. It highlights the urgency of the timing (< 4 hours), the choice of general anesthesia with intubation for definitive airway protection, and the standard left lateral decubitus patient positioning. This section underscores the importance of meticulous planning before the endoscope is even inserted. The second section, "Endoscopic Findings," presents the direct visual evidence obtained during the procedure. It includes a representative endoscopic image showing the pin in situ within the gastric antrum. The findings are systematically documented, confirming the absence of any collateral trauma to the esophagus and precisely describing the location, orientation, and status of the pin. The key finding that the pin was "free-lying with its sharp tip away from the wall" is highlighted, as this anatomical detail was a crucial factor in the subsequent retrieval strategy and the avoidance of complications. The third section, "Retrieval Technique," focuses on the technical execution of the removal. It specifies the chosen instrument—the rat-tooth grasping forceps—and details the critical steps of the method: securely grasping the body of the pin and withdrawing the entire assembly as a single unit with the sharp tip trailing. This section illustrates the application of

established best practices for minimizing the risk of iatrogenic mucosal injury during extraction. Finally, the fourth section, "Post-procedural Assessment & Outcome," provides the immediate results of the intervention. The confirmation of no bleeding or trauma upon post-retrieval inspection, the remarkably short procedure duration, and the ultimate outcome of a successful and uncomplicated removal collectively serve as a powerful testament to the efficacy and safety of modern therapeutic endoscopy when applied in a timely and skillful manner.

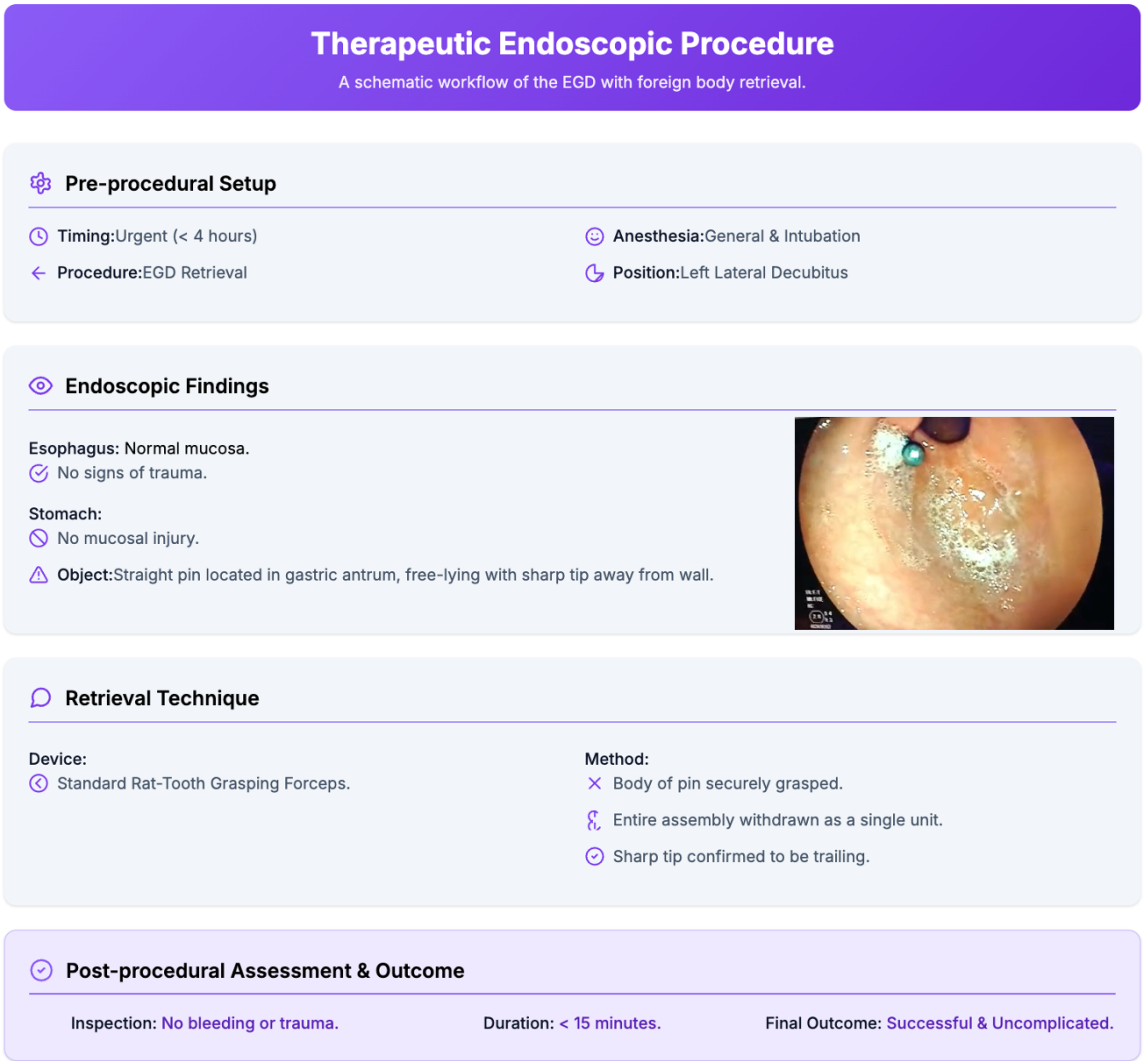

Figure 3. Therapeutic endoscopic procedure.

The patient's post-procedural course was entirely uneventful, serving as a powerful demonstration of the safety and definitive nature of the endoscopic intervention. Her rapid and complication-free recovery facilitated a short hospital stay. Figure 4 provides a clear, longitudinal summary of the patient's postoperative course, presented as a schematic timeline. It is designed to illustrate the rapid and uncomplicated nature of the patient's recovery, which serves as a direct testament to the success of the minimally invasive endoscopic intervention. The timeline format is used to effectively convey the

patient's progress from the immediate post-procedure period to their final follow-up, highlighting key clinical milestones along the way. The timeline begins with the "Immediate Post-Procedure" phase, detailing the routine but essential monitoring in the post-anesthesia care unit (PACU) and confirming the patient's stable recovery from anesthesia. This sets the initial positive trajectory for the postoperative course. The subsequent stages, "Postoperative Day 0" and "Postoperative Day 1," document the patient's swift progression. The ability to tolerate a diet on the day of the procedure and advance to a regular diet the following day, all while remaining completely asymptomatic, underscores the minimal physiological insult of the endoscopic retrieval. The patient's discharge on the first postoperative day is a key outcome metric, demonstrating the efficiency and cost-effectiveness of this management approach. The "1-Week Follow-up" serves as the final clinical data point, confirming the absence of any delayed complications and the patient's full return to normal health and activities. This longitudinal perspective is crucial for demonstrating the durability of the successful outcome. The schematic culminates in the "Final Outcome" summary, which encapsulates the entire postoperative experience in a single, definitive statement: "Complete recovery with no short-term or long-term complications." This figure, in its entirety, provides a powerful visual narrative of the ideal clinical trajectory for a patient undergoing endoscopic removal of a sharp foreign body.

Figure 4. Post-procedure management & final outcomes.

3. Discussion

The central, and most dangerously misleading, feature of this case was the patient's complete lack of symptoms upon presentation. This phenomenon of "deceptive asymptomaticity" is a well-recognized but frequently underestimated challenge in foreign body management.[11] The patient's benign physical examination could have tempted a less vigilant clinician towards a path of expectant management, a decision that would have been a grave error. The ability of a sharp object, such as a straight pin, to reside within the stomach without causing immediate symptoms is grounded in the unique anatomy and physiology of the organ.[12] The stomach is a large, capacious, thick-walled muscular sac designed to accommodate and process substantial volumes. When a small, lightweight object like a pin enters this space, it often comes to rest in the most dependent portion, typically the antrum, without its sharp tip engaging the mucosa.[13] The gastric wall, with its robust muscularis propria and protective mucous layer, is far more resistant to incidental perforation than the thin-walled esophagus or small intestine. Furthermore, the absence of a fixed, narrow lumen means the object is not immediately subjected to the powerful, localized peristaltic forces that would cause impaction and subsequent injury in other parts of the GI tract.[14] However, this state is transient and unstable. The stomach's own rhythmic contractions, designed for mixing and emptying, can at any moment reorient the pin, driving its sharp tip into the gastric wall or propelling it through the pylorus into the far more vulnerable duodenum. A micro-perforation in the gastric wall might not produce immediate systemic signs; the highly acidic environment (pH 1.5-3.5) is relatively sterile, and the body's rapid inflammatory response, spearheaded by the omentum (the "policeman of the abdomen"), can quickly create a fibrinous seal, resulting in a contained perforation that may not manifest with the classic signs of peritonitis.[15] This intricate interplay of anatomy and physiology explains the treacherous asymptomatic period.

Figure 5 presents a conceptual flowchart that illustrates the critical pathophysiological cascade initiated by the ingestion of a sharp-pointed foreign body. It is designed not merely to depict a sequence of events, but to serve as a visual argument for the core thesis of this manuscript: that the clinical course of such an event is a dynamic process that can be favorably altered by timely and appropriate intervention. The schematic deconstructs the patient's potential journey into distinct phases, highlighting the pivotal moments where clinical outcomes are determined. It visually contrasts the natural history of an unmanaged sharp object with the therapeutic pathway initiated by the clinical team, thereby providing a powerful rationale for the modern, protocol-driven approach to management. The flowchart begins with the "Ingestion Event," the inciting incident that sets the entire clinical scenario in motion. This first step, the accidental swallowing of a straight pin, is the portal of entry into a state of heightened clinical risk. From this point, the object enters the gastrointestinal tract, and its journey is governed by a complex interplay of anatomical constraints and physiological forces. The second stage, the "Asymptomatic Gastric Phase," is arguably the most critical and potentially treacherous period from a clinical decision-making standpoint. As visually represented by the schematic of the stomach, the object resides within a relatively safe harbor. The stomach's large volume, thick muscular walls, and protective mucous layer provide a temporary buffer against the object's sharp tip. This anatomical and physiological reality explains the "deceptive asymptomaticity" observed in our patient. During this phase, the object is subject to the gentle mixing motions of the stomach but has not yet been propelled with sufficient force or specific orientation to cause injury.[16] This stage represents a crucial, but finite, window of opportunity. The schematic emphasizes that this is a phase of temporary safety, not of inherent benignity.

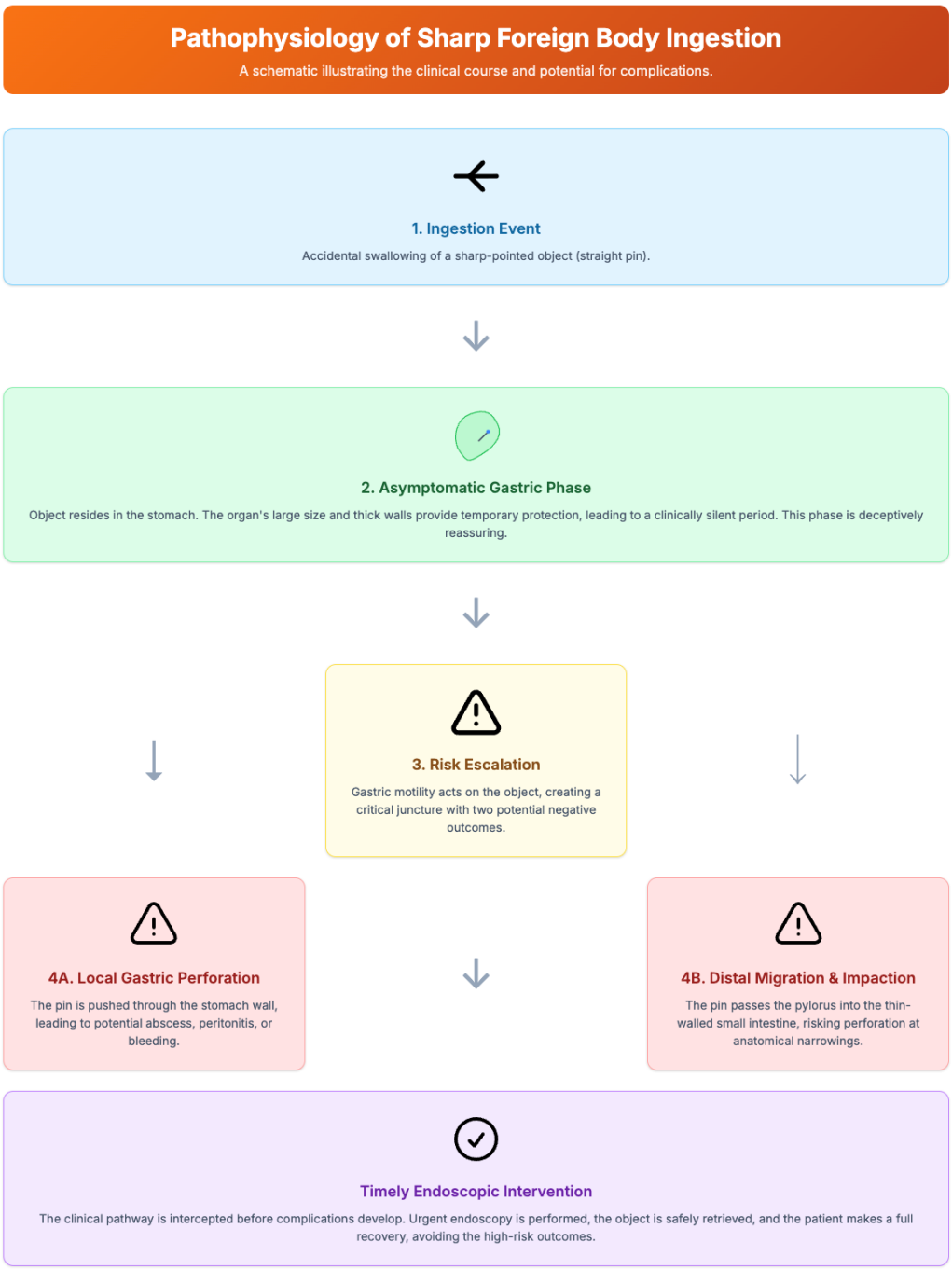

Figure 5. Pathophysiology of sharp foreign body ingestion.

The absence of symptoms is not an indicator of low risk but rather a feature of the object's current location and the body's temporary anatomical defenses. The flowchart then proceeds to the critical juncture labeled "Risk Escalation." This represents the moment the temporary stability of the gastric phase is disrupted. The relentless forces of gastric motility and peristalsis, designed to propel chyme towards the pylorus, begin to act upon the foreign body. This is the pivotal moment where the object's potential energy of risk is converted into the kinetic energy of injury. The schematic illustrates this as a branching point, a

critical node in the clinical algorithm where the natural history of the event diverges into two distinct, high-risk pathways if left unmanaged. This branching is the core of the pathophysiological threat and the central justification for urgent intervention.[17] The first potential adverse pathway is "Local Gastric Perforation" (4A). In this scenario, the gastric contractions reorient the pin and generate sufficient force to drive its sharp tip directly through the stomach wall. The consequences of such a perforation are severe and depend on its location and whether it is contained or free. A free perforation into the peritoneal cavity would result in chemical peritonitis from the spillage of highly acidic gastric contents, leading to a rapid onset of severe abdominal pain, systemic inflammation, and potential sepsis. A perforation into the lesser sac might result in a more contained process, leading to the formation of a localized abscess. Furthermore, perforation of the posterior gastric wall could lead to erosion into vital structures like the pancreas or the splenic artery, resulting in pancreatitis or catastrophic hemorrhage. This pathway represents a failure of the stomach's anatomical defenses and the realization of the object's immediate mechanical threat. The second, and often more common, adverse pathway is "Distal Migration & Impaction" (4B). In this scenario, the object is successfully propelled through the pyloric sphincter into the small intestine. While this may seem like progress, it represents a significant escalation of risk. The small intestine, unlike the stomach, is a narrow, tortuous, and thin-walled organ. The object is now subjected to the powerful, coordinated peristaltic waves of the small bowel, which can easily cause it to become impacted at points of anatomical narrowing, such as the duodenal sweep or the ileocecal valve. Once impacted, the same peristaltic forces that caused the migration now act to drive the sharp tip through the delicate bowel wall, leading to perforation. Perforation in the small bowel results in the spillage of feculent, bacteria-rich contents into the peritoneum, leading to bacterial peritonitis, a life-threatening surgical emergency. This pathway highlights that the successful passage from the stomach is not a sign of resolution but rather a transfer of the risk to a less accessible and more vulnerable part of the anatomy. The final and most crucial element of the schematic is the "Timely Endoscopic Intervention." This represents the therapeutic action that intercepts and fundamentally alters the natural history of the event.[18] As illustrated, this intervention is strategically deployed during the asymptomatic gastric phase, before the critical juncture of risk escalation is reached. By performing an urgent endoscopy, the clinical team actively removes the threat while it is still located in the safest possible anatomical location. This act of proactive retrieval prevents both of the high-risk complication pathways from ever materializing. The flowchart culminates in this therapeutic resolution, visually demonstrating how the application of a modern, evidence-based protocol transforms a trajectory headed towards severe morbidity into one of a complete and uncomplicated recovery. This figure, therefore, serves as a powerful visual summary of the entire clinical and pathophysiological argument: in the management of sharp foreign bodies, timing is everything, and proactive, early intervention is the key to preventing a manageable clinical problem from evolving into a surgical catastrophe. This detailed schematic serves as a visual anchor for the central argument of this manuscript, which posits that a successful outcome in cases of sharp foreign body ingestion is not a matter of chance but the direct result of a management strategy that is both proactive and deeply informed by the underlying pathophysiological principles. The flowchart is not merely a sequence of events but a decision tree, illustrating the critical divergence between the natural history of an unmanaged sharp object and the altered, favorable course created by decisive clinical action. The initial "Ingestion Event" is the stochastic insult that initiates the entire clinical cascade.[19] Once the object has passed the cricopharyngeus, its fate is determined by the dynamic environment of the GI tract. The entry into the "Asymptomatic Gastric Phase" represents the first critical stage. This period of clinical silence is a

direct consequence of the stomach's remarkable anatomical and physiological adaptations for its role as a reservoir and digestive chamber. Its significant volume allows a small object to exist within its lumen without causing obstruction, while its thick wall, comprising three distinct smooth muscle layers (outer longitudinal, middle circular, and inner oblique), provides a formidable mechanical barrier. At a microscopic level, the gastric mucosa is protected by a thick, adherent layer of mucus rich in bicarbonate, which neutralizes acid at the cell surface and provides a physical lubricant, further reducing the likelihood of the pin's tip engaging with and penetrating the epithelium. This phase, however, is inherently unstable. The stomach's powerful peristaltic contractions, with rates of approximately three per minute, are designed to mix and propel contents. While these forces are initially non-threatening, they guarantee that the object's passive state is temporary. This asymptomatic phase is, therefore, the crucial window for intervention—a period where the potential for harm is high, but the actual harm is, for the moment, zero. The transition to "Risk Escalation" is the pivotal event in this pathophysiological narrative. This is the point at which the latent potential energy of the sharp object is converted into the kinetic energy of tissue injury. The schematic correctly identifies this as a critical node from which two distinct, and equally dangerous, complication pathways diverge. This transition is not random; it is a predictable consequence of gastrointestinal physiology. As gastric emptying proceeds, the pin is inevitably propelled towards the pylorus. Its interaction with this muscular sphincter and the powerful antral contractions can lead to one of two outcomes. The first pathway, "Local Gastric Perforation (4A)," occurs when the biomechanical forces cause the pin to reorient and directly penetrate the gastric wall. The likelihood of this event is a function of the object's geometry and the vector of the force applied by the muscular contractions. If the pin becomes fixed, the constant pressure at its tip can also lead to pressure necrosis, a more insidious form of perforation where localized ischemia leads to tissue breakdown. The sequelae of gastric perforation are severe. A free perforation into the greater sac of the peritoneum leads to an immediate chemical peritonitis, as the sterile but highly acidic gastric fluid (pH 1.5-3.5) causes profound tissue inflammation. This typically presents with the dramatic onset of severe, diffuse abdominal pain, guarding, and rigidity. If the perforation is contained, often by the rapid mobilization of the omentum—the "policeman of the abdomen"—a localized abscess may form. The location of the perforation dictates the specific risk; for example, a posterior perforation can lead to erosion into the pancreas, causing pancreatitis, or into the splenic artery, a branch of the celiac trunk, which can result in life-threatening hemorrhage. The second pathway, "Distal Migration & Impaction (4B)," represents a different, but no less dangerous, escalation of risk. Here, the pin successfully navigates the pylorus and enters the small intestine. While this might be perceived as progress, it is in fact a transfer of the threat to a far more vulnerable and less accessible anatomical region. The small intestine is a narrow, thin-walled tube, and the object is now subjected to the powerful, coordinated peristaltic contractions known as the migrating motor complex. The risk of perforation in the small bowel is significantly higher than in the stomach. The object is likely to become impacted at one of several points of anatomical narrowing or acute angulation: the C-shaped sweep of the duodenum, the ligament of Treitz, or the ileocecal valve. Once impacted, every subsequent peristaltic wave acts to drive the sharp tip through the delicate bowel wall. A small bowel perforation has profoundly different consequences than a gastric one. The luminal contents are no longer sterile; they are rich in a polymicrobial flora. Spillage of this material into the peritoneum results in bacterial peritonitis, a fulminant and life-threatening condition that can rapidly progress to sepsis, multi-organ failure, and death if not treated with immediate surgical intervention. The schematic visually depicts this intervention as the definitive pathway that averts the

bifurcation into the high-risk complication arms. By acting during the asymptomatic gastric phase, the clinical team leverages the temporary anatomical safety of the stomach to perform a controlled, minimally invasive retrieval. This proactive strategy is the cornerstone of modern management. It is a decision based on a deep understanding that the absence of symptoms is not reassuring and that the risk of complication increases non-linearly with time and with distal migration of the object. The successful endoscopic removal of the pin is therefore not just the resolution of a single clinical problem; it is the active prevention of a spectrum of potentially lethal surgical emergencies.

Given this potential for a clinically silent but high-risk situation, the role of objective imaging becomes not just important, but absolutely imperative. Our case, in which the pin was radio-opaque, highlights the enduring utility of plain radiography as a first-line diagnostic tool. It is rapid, widely available, and cost-effective. A two-view study (AP and lateral) is essential to confirm the object's nature, rule out the presence of multiple objects, and, crucially, to localize it in three-dimensional space, confirming its intragastric position. However, the true test of clinical acumen arises in the counterfactual scenario: what if the ingested object had been a radiolucent fish bone or a plastic fragment? In such a case, a negative plain radiograph would be meaningless. This is where a disciplined, protocol-driven approach to imaging is paramount. The current standard of care for a symptomatic patient with a suspected radiolucent foreign body, or an asymptomatic patient with a credible history, is a low-dose, non-contrast computed tomography (CT) scan. CT offers vastly superior sensitivity for detecting objects of low density and, more importantly, can identify the subtle secondary signs of an occult perforation, such as localized mesenteric fat stranding, small pockets of extraluminal air, or early fluid collections. The decision to proceed from a negative plain film to a CT scan in the appropriate clinical context is a critical step in unmasking the hidden risk and preventing a catastrophic delay in diagnosis.

Upon radiographic confirmation of an intragastric straight pin, the clinical team was immediately confronted with its next critical question: What does the science tell us about how much time we really have? The decision to proceed with an endoscopic retrieval within approximately four hours of the patient's arrival was not arbitrary. It was a direct application of the "urgent endoscopy" protocol recommended by international guidelines, which advocate for intervention within 24 hours for high-risk objects in the stomach. A critical analysis of this recommendation reveals that the 24-hour window is a carefully considered timeframe based on an understanding of gastrointestinal kinetics, biomechanics, and a wealth of clinical data from large case series. The primary rationale for this urgency is to preempt the object's passage through the pyloric sphincter into the small intestine. The kinetics of gastric emptying for solid, indigestible objects are highly variable, influenced by factors such as the patient's fasting state, the presence of other gastric contents, and the object's size and shape.[20] However, the constant, powerful peristaltic waves of the stomach will inevitably propel the object towards the pylorus. Once in the duodenum, the risk profile of the sharp object escalates dramatically. The duodenum's C-shaped loop and the acute angle at the ligament of Treitz are anatomical points of high risk for impaction and perforation. Furthermore, the wall of the small intestine is significantly thinner and less protected than the stomach wall, making it far more susceptible to perforation by the same peristaltic forces that now act to drive the object's tip through the tissue. Endoscopic retrieval from the duodenum is technically more challenging, and from the jejunum and ileum, it is often impossible with standard endoscopes.

The evidence underpinning the 24-hour guideline is largely derived from extensive retrospective cohort studies and large case series, as a randomized controlled trial comparing different intervention times would be unethical. These studies consistently demonstrate that the incidence of complications rises

significantly once a sharp object passes the pylorus. The 24-hour timeframe, therefore, represents a pragmatic balance. It provides a sufficient window to allow for safe patient transfer, appropriate fasting to reduce aspiration risk, and the mobilization of a skilled endoscopy team and equipment, while still intervening within the period of highest safety and efficacy. However, it is crucial to recognize that this is an outer limit, not a target. In certain high-risk situations, this window should be narrowed. For example, a patient who has ingested a particularly long (>6 cm) and sharp object, or multiple sharp objects, or a patient with known altered anatomy from previous gastric surgery (such as a Roux-en-Y gastric bypass), presents an even higher risk of complication, and intervention should be pursued as expeditiously as possible, much closer to the 2-6 hour "emergent" timeframe. The ticking clock of an intragastric sharp object is very real, and the decision to act with deliberate urgency is one of the most critical determinants of a successful outcome.

The first and most critical decision was to perform the procedure under general anesthesia with endotracheal intubation. This choice was non-negotiable. While many diagnostic endoscopies are performed under conscious sedation, the retrieval of a high-risk foreign body mandates the definitive airway protection and complete patient immobility that only general anesthesia can provide. The physiology of the upper airway during endoscopy involves intense stimulation of the gag reflex. In a sedated patient, this can lead to retching, laryngospasm, or aspiration of gastric contents. More critically, during the final phase of extraction, as the object is withdrawn through the hypopharynx and cricopharyngeus, there is a significant risk of it becoming dislodged. A loose, sharp pin in the airway is a surgical emergency of the highest order. Endotracheal intubation completely mitigates this risk, providing an absolute guarantee of a secure airway throughout the procedure. The selection of the rat-tooth grasping forceps was a deliberate choice based on the object's specific characteristics. The modern endoscopist has a diverse armamentarium of retrieval devices, and the selection is a matter of mechanical suitability. For a linear, firm object like a pin, the toothed jaws of a rat-tooth or alligator forceps provide a secure, high-friction grasp that is essential to prevent the object from slipping during withdrawal. In contrast, for a blunt, round object like a coin, a polypectomy snare, which can be looped over the object and cinched tight, would be superior. For soft or irregularly shaped objects, a retrieval net or basket, which can envelop the object, is the tool of choice. A comparative analysis of these tools is central to procedural planning.

The case notes that a protective overtube was on standby but was not ultimately used. This was a nuanced, intra-procedural clinical judgment. A protective overtube is a flexible plastic sheath that is passed over the endoscope into the esophagus. Once a sharp object is grasped, it can be retracted into the mouth of the overtube, completely shielding the esophageal and pharyngeal mucosa from the sharp tip during withdrawal. The formal indications for its mandatory use include objects that are particularly long, have sharp edges on both ends, or cannot be oriented with the sharp tip trailing. In our case, the clinical judgment not to use it was based on two key factors: the pin was relatively short, and, most importantly, the endoscopist was able to grasp it in such a way that its sharp tip was safely trailing during the entire withdrawal process. This decision, while successful, highlights a critical teaching point: the default position for any sharp body retrieval should be to have an overtube immediately available, and its use should be strongly considered in all but the most straightforward of cases. The procedure was uncomplicated because the pin was free-lying. This scenario would have transformed a simple retrieval into a complex, high-risk procedure demanding advanced techniques. The first step would be a detailed assessment, ideally using Endoscopic Ultrasound (EUS) to determine the depth of penetration and the object's proximity to major serosal blood vessels. The retrieval itself would likely require techniques adapted from the field of Endoscopic

Submucosal Dissection (ESD). Using a specialized endoscopic knife, the endoscopist would make meticulous mucosal incisions around the object to carefully dissect it from the surrounding tissue. This is a high-level skill that carries significant risks of iatrogenic perforation and bleeding. Following such a complex extraction, the resulting mucosal defect would need to be closed endoscopically, using through-the-scope clips or an over-the-scope clipping device. This counterfactual scenario illustrates the remarkable expansion of therapeutic endoscopy and the advanced skill set required to manage the full spectrum of foreign body challenges.

While endoscopy is the undisputed primary modality for management, surgery remains the indispensable final safety net. It is crucial to frame the role of surgery not as a failure of endoscopy, but as an integral and planned component of the overall management algorithm. There are several clear pivot points. The first would have been at the initial presentation. Had the patient presented with signs of peritonitis (guarding, rebound tenderness) or had her imaging revealed evidence of a free perforation (pneumoperitoneum), the endoscopic suite would have been bypassed entirely for an immediate surgical exploration. The second pivot point would be the failure of endoscopic retrieval. Had the pin been too deeply embedded to be safely removed, or had an iatrogenic complication like an uncontrolled bleed occurred during the attempt, the procedure would have been aborted, and the patient would have been taken to the operating room. The final indication for surgery arises if the object passes beyond the reach of the endoscope into the distal small bowel and fails to progress or causes symptoms. In any of these scenarios, the surgical approach itself would be guided by the principles of minimally invasive surgery. The standard of care for the surgical removal of an uncomplicated intragastric foreign body is now a laparoscopic gastrotomy. This procedure involves making several small keyhole incisions in the abdominal wall, insufflating the abdomen with carbon dioxide, and using a camera and long instruments to perform the operation. The stomach would be identified, and the pin localized, often with the assistance of intraoperative endoscopy. A small incision (a gastrotomy) would be made in the stomach wall, the pin would be removed, and the incision would be sutured closed laparoscopically. Data from large meta-analyses consistently show that compared to a traditional open laparotomy, the laparoscopic approach is associated with significantly less postoperative pain, shorter hospital stays, a faster return to normal activities, and superior cosmetic outcomes. An open laparotomy is now reserved for patients with hemodynamic instability or severe, diffuse peritonitis. The modern role of surgery is thus not one of last resort, but of a planned, minimally invasive, and highly effective intervention for the small but critical percentage of cases where endoscopy is not the final answer.

4. Conclusion

The successful management of the patient described in this manuscript is not an anecdote but a real-world validation of a systematic, evidence-based management algorithm for ingested sharp foreign bodies. This case was not solved by a single intervention, but by a seamless cascade of correct, evidence-based decisions. By deconstructing this clinical journey, we have demonstrated how each step in the pathway—from the initial high index of suspicion in an asymptomatic patient, to the disciplined application of imaging, the critical analysis of the timing of intervention, and the specific choice of endoscopic tools—is underpinned by a deep understanding of pathophysiology and guided by high-quality clinical evidence. This case-driven synthesis validates the central tenets of modern foreign body management and reinforces the principle that adherence to such a rigorous protocol is the most effective strategy to navigate the "pointed challenge" of sharp object ingestion. It highlights that the favorable outcome was not a matter of chance, but the direct result of a system of care that is designed to anticipate risk, act with deliberate urgency, and apply advanced

technology with skill and precision. Ultimately, this work stands as a powerful testament to a fundamental principle of modern interventional medicine: when a profound understanding of the scientific basis of disease, the skilled application of advanced technology, and sound clinical judgment converge, even a potentially lethal event can be transformed into a complete and uneventful patient recovery.

5. References

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