veterinary sciences

Case Report

Radiographic Characteristics of Jujube Pit Foreign Bodies in a Dog

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Simple Summary

Jujube pits are dangerous, sharp-pointed foreign bodies that are common in East Asian households but have not been previously reported in the veterinary literature. This report describes a 15-year-old neutered male Maltese dog that ingested six jujube pits, which were successfully identified using a distinctive and characteristic X-ray sign: a spindle-shaped opacity featuring a central longitudinal stripe. This unique radiographic appearance allowed for a strong suspicion of the foreign bodies, enabling timely surgical removal of the pits through gastrotomy, leading to a full recovery. This case highlights a diagnostic marker that can help veterinarians quickly identify these high-risk seeds on plain radiographs, thereby preventing life-threatening gastrointestinal complications such as perforation.

Abstract

Jujube (*Ziziphus jujuba* Mill.) is a widely consumed fruit in East Asia, yet its sharp-ended pits pose a high risk of gastrointestinal perforation in humans. While well-documented in human medicine, jujube pit ingestion in dogs has not previously been reported in the veterinary literature. This report describes a 15-year-old neutered male Maltese dog that presented with anorexia and lethargy five days after accidentally ingesting whole jujubes. Abdominal radiographs identified multiple intraluminal gastric foreign bodies demonstrating a distinctive, orientation-dependent sign: circular (transverse) or spindle-shaped (sagittal) opacities featuring a characteristic central longitudinal stripe. Although abdominal ultrasonography was limited in this specific case due to severe acoustic shadowing from localized gastric gas, the unique radiographic marker provided a reliable diagnostic clue before surgical confirmation. A gastrotomy was performed to successfully retrieve six intact, sharp-pointed pits, and the dog recovered uneventfully. To the authors' knowledge, as the first report to describe the clinical progression and specific radiographic characteristics of jujube pits in a dog, this case highlights the central longitudinal stripe as a diagnostic clue. This marker facilitates the differentiation of jujube pits from other foreign bodies on plain radiographs, allowing for timely surgical intervention to prevent catastrophic complications.

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1. Introduction

Jujube (*Ziziphus jujuba* Mill.) is widely consumed in East Asian countries for its nutritional benefits and its role in traditional herbal medicine [1]. While it is a common dietary staple, the accidental ingestion of jujube fruits along with their pits poses a significant health hazard due to the pit's unique morphology [2–6]. The jujube pit is a fusiform, double-pointed fragment that can reach up to 4.0 cm in length, making it a particularly dangerous sharp-pointed foreign body. In human medicine, jujube pit ingestion is a well-documented cause of severe clinical emergencies; its sharp ends can easily penetrate the mucosa of the esophagus or intestines, leading to life-threatening complications such as gastrointestinal (GI) perforation, abscess formation, and peritonitis [2–6].

In veterinary medicine, while GI foreign bodies are frequently encountered in dogs—often presenting with non-specific signs like anorexia and vomiting [7]—cases specifically involving jujube pits have not been previously reported. Most documented cases of discrete foreign bodies in small animals involve blunt items, such as stones or plastic objects, which lack this sharp morphology [7]. Furthermore, while abdominal radiography is a primary diagnostic tool, it often shows low sensitivity in detecting such foreign bodies in human patients, where more advanced imaging like computed tomography (CT) is typically required for a definitive diagnosis [8].

The purpose of this report is to present the clinical progression and characteristic radiographic findings of multiple jujube pit ingestions in a dog. This case involves a 15-year-old Maltese that presented with anorexia five days after ingesting jujube pits. To the authors' knowledge, this is the first case report in the veterinary literature to document the diagnostic findings of jujube pits in a canine patient, highlighting their risk as sharp foreign bodies and the importance of their identification on plain radiographs.

2. Case Description

A 15-year-old neutered male Maltese dog, weighing 3.7 kg, was referred to the veterinary clinic with a primary complaint of acute-onset anorexia and lethargy. According to the owner's detailed history, the dog had accidentally consumed several whole jujube fruits, including the pits, approximately five days prior to the presentation. Following the ingestion, the dog exhibited a progressive decline in appetite and a noticeable decrease in overall activity levels, which prompted the veterinary visit.

To provide a clear clinical workflow for this case, the diagnostic and therapeutic methods were performed in the following sequential order:

- Clinical and laboratory evaluation: Initial physical examination, complete blood count, and serum chemistry profile (including canine pancreatic lipase immunoreactivity) to assess systemic status.
- Diagnostic imaging: Plain abdominal and thoracic radiography in orthogonal projections (ventrodorsal and lateral views) followed by abdominal ultrasonography to identify the foreign bodies and evaluate gastric wall integrity.
- Surgical intervention: A exploratory laparotomy and gastrotomy under general anesthesia to safely extract the retained foreign bodies.

Upon initial presentation, the physical examination revealed mildly depressed mentation and mild dehydration (estimated at 5%). The patient's vital signs were recorded as follows: body temperature was normal at 38.1 °C, heart rate was mildly elevated at

180 beats per minute (tachycardia), respiratory rate was 30 breaths per minute, and systolic blood pressure was measured at 150 mmHg. Further physical assessment revealed pinkish and moist mucous membranes with a capillary refill time of less than 1 s. Distinct cranial abdominal pain was clearly elicited upon abdominal palpation, and the body condition score was evaluated as 5 out of 9 (on a standard 9-point scale).

To assess the patient's systemic status and investigate the underlying cause of the GI signs, an initial clinicopathological evaluation was performed. The complete blood count (IDEXX ProCyte Dx, IDEXX Laboratories, Inc., Westbrook, ME, USA) revealed a mild neutrophilia (13.52 $\times$ 10^3 µL; reference range [RR], 2.92–11.64 $\times$ 10^3 µL). The serum chemistry (Hitachi 7020, Hitachi High-Technologies Co., Tokyo, Japan) panel was largely unremarkable, with the significant exception of the canine pancreatic lipase immunoreactivity concentration, which was markedly elevated at 526 µg/L (RR, 0–200 µg/L; Spec cPL®, IDEXX Laboratories, Westbrook, ME, USA).

For further investigation of the GI tract, abdominal and thoracic radiographs were obtained in orthogonal projections from the awake patient using a digital radiography system (REX-525R; LISTEM, Wonju, Republic of Korea) at exposure factors of 60 kVp and 8.0 mAs (320 mA, 0.025 s; Figure 1). The radiographic images clearly revealed the presence of multiple, distinct foreign bodies located within the gastric lumen. These intraluminal objects demonstrated characteristic radiographic features that varied according to their spatial orientation. In the ventro-dorsal projection (Figure 1A,D), objects oriented in a transverse plane appeared as circular soft tissue to partially mineral opacities with a distinct central stripe, whereas those in a sagittal (longitudinal) orientation were observed as spindle-shaped (fusiform) structures of soft tissue to partially mineral opacities with a central stripe. On the lateral radiograph (Figure 1B,C), a cluster of these spindle-shaped foreign bodies was identified within the ventral portion of the stomach (Figure 1B,C were obtained two days later, immediately prior to surgery, as the foreign bodies were not clearly visualized on the initial views). While these objects are physically characterized by rigid and sharp ends, their radiographic appearance in this case appeared as elongated structures with tapered distal aspects, consistently featuring characteristic central longitudinal stripes.

An abdominal ultrasonography (EPIQ 7; Philips Medical Systems, Bothell, WA, USA) was subsequently attempted to evaluate the gastric wall integrity, the foreign bodies, and the surrounding organs including the pancreas. Although a comprehensive evaluation of the gastric lumen and immediately adjacent structures was significantly hindered by a large accumulation of intraluminal gastric gas creating severe acoustic shadowing (Figure 2), a targeted assessment of the pancreas was achieved. The ultrasonographic examination revealed that the pancreas maintained a normal size with smooth margins; however, the pancreatic parenchyma exhibited a heterogeneous and mildly hyperechoic appearance relative to the surrounding peritoneum. These findings, combined with the marked elevation in canine pancreatic lipase immunoreactivity, suggested a localized or subacute pancreatic reaction concurrent with the gastric foreign bodies.

The combination of ingestion history and characteristic radiographic findings strongly supported a presumptive diagnosis of gastric jujube pit foreign bodies. Given the sharp, pointed morphology of the jujube pits and the persistent clinical signs, surgical intervention was elected to prevent potential mucosal injury or full-thickness GI perforation, and a gastrotomy was performed two days after the initial presentation. This open surgical approach was preferred over endoscopic retrieval; extracting multiple rigid, sharp-pointed objects endoscopically introduces an unacceptably high risk of secondary esophageal laceration, perforation, or stricture during passage through the lower esophageal sphincter.

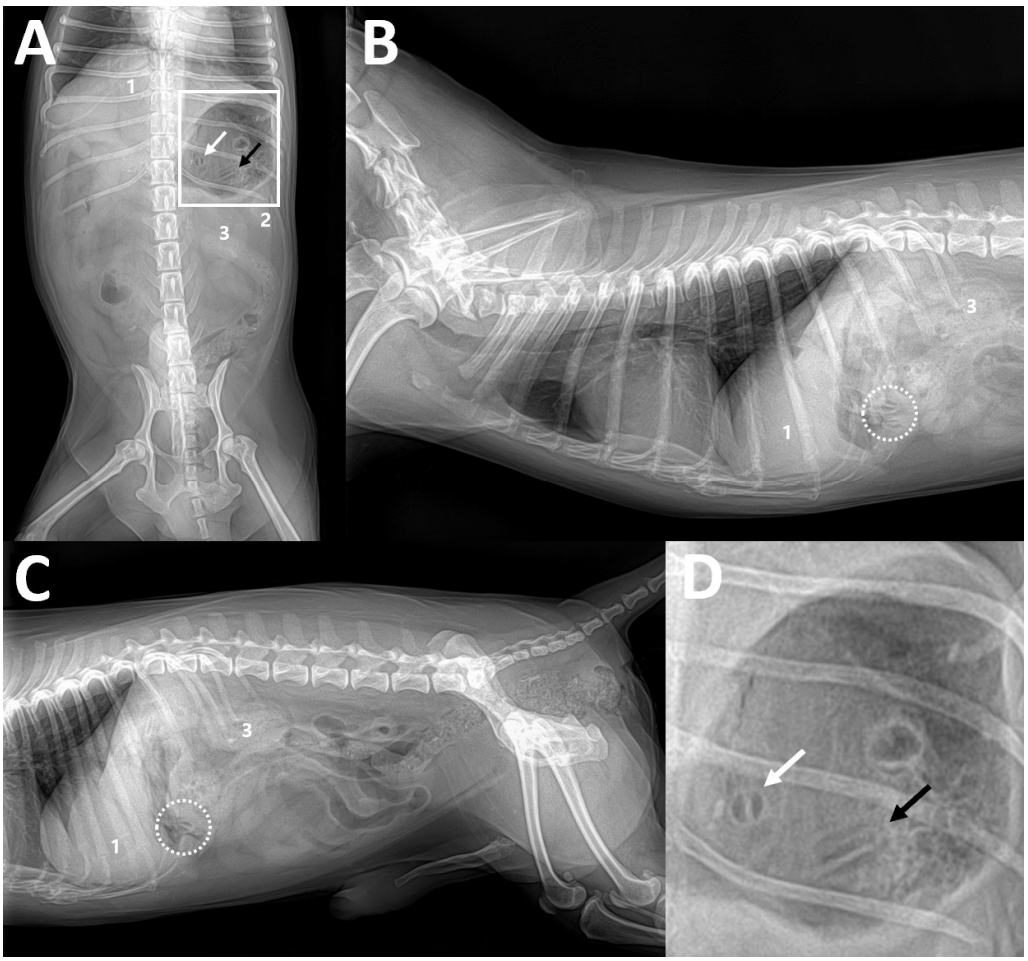


Figure 1. Radiographic findings of ingested jujube pits in a dog. (**A**) Abdominal ventro-dorsal radiograph. The radiographic appearance of the jujube pits varies depending on their orientation: the transverse projection is observed as a circular soft tissue to partially mineral opacity with a central stripe (white arrow), whereas the sagittal (longitudinal) projection is observed as a spindle-shaped soft tissue to partially mineral opacity with a central stripe (black arrow). (**B**) Thoracic left lateral radiograph. Multiple spindle-shaped foreign bodies (white dashed circle), characteristically featuring central stripes, are widely observed within the gastric lumen. (**C**) Abdominal right lateral radiograph. A spindle-shaped foreign body (white dashed circle), characteristically featuring central stripes, is observed within the gastric lumen. (**D**) Magnified view of the area indicated by the white rectangle in (**A**). (**A**,**D**) are radiographs taken at the initial presentation, whereas (**B**,**C**) are radiographs taken immediately before surgery, two days later. 1—liver, 2—spleen, and 3—kidney.

Given the patient's advanced age and high anesthetic risk, the two-day interval between the initial presentation and surgery was primarily utilized for intensive pre-operative medical stabilization. Furthermore, this window aligned with immediate surgical scheduling constraints at the institution. To manage the suspected pancreatitis and optimize the patient's systemic status prior to anesthesia, pre-operative medical stabilization was initiated. Fluid therapy was maintained at 14 mL/h using 0.45% sodium chloride (JW Pharmaceutical, Seoul, Republic of Korea) supplemented with 2.5% dextrose, prepared using 50% dextrose (Dai Han Pharm, Seoul, Republic of Korea). Pre-operative medications included ampicillin–sulbactam (22 mg/kg, IV, q8h; Dongkwang Pharm, Seoul, Republic of Korea), metronidazole (7.5 mg/kg, IV, q12h; Dai Han Pharm), omeprazole (1 mg/kg, IV, q12h; AstraZeneca, Cambridge, UK), and maropitant (1 mg/kg, SC, q24h; Zoetis, Parsippany, NJ, USA). Analgesia was managed via continuous rate infusion (CRI) of lidocaine (loading dose: 0.5 mg/kg, maintenance: 1 mg/kg/h; Dai Han Pharm) and

ketamine (loading dose: 1.5 mg/kg, maintenance: 0.2 mg/kg/h; Yuhan Corporation, Seoul, Republic of Korea).

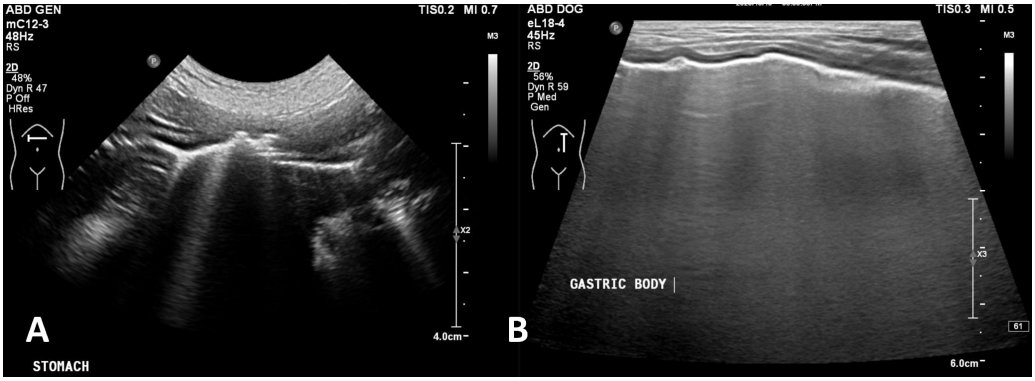


Figure 2. Ultrasonographic findings of the stomach in the dog. (**A**,**B**) Abdominal ultrasonography of the gastric region. Comprehensive evaluation of the gastric lumen and wall structure is completely precluded by a massive accumulation of intraluminal gas. Note the intense, linear hyperechoic interface at the superficial mucosal–gas boundary, accompanied by severe acoustic dirty shadowing and reverberation artifacts that obscure all deeper gastric structures and foreign bodies.

The patient was placed under general anesthesia, and a standard ventral midline coeliotomy was performed. The stomach was carefully exteriorized and isolated with moistened laparotomy sponges to prevent abdominal contamination. A gastrotomy was then performed, and the gastric lumen was explored. A total of six intact jujube pits, all retaining their sharp and rigid characteristics, were successfully identified and manually extracted (Figure 3).



Figure 3. Gross appearance of the retrieved foreign bodies. A total of six intact jujube pits were surgically extracted from the gastric lumen via gastrotomy. Note the characteristic fusiform (spindle-shaped) morphology and the rigid, pointed ends of each pit, which remained intact despite being present in the stomach for seven days.

Following the successful removal of the foreign bodies, the gastrotomy incision and the abdominal wall were routinely closed. Post-operative analgesia was maintained using a remifentanil CRI (3 µg/kg/h; BCworld Pharm, Yeoju, Republic of Korea). Post-operative medical management included cefazolin (22 mg/kg, IV, q8h; Chong Kun Dang Pharmaceutical, Seoul, Republic of Korea), omeprazole (1 mg/kg, IV, q12h; AstraZeneca), metronidazole

(7.5 mg/kg, IV, q12h; Dai Han Pharm), maropitant (1 mg/kg, SC, q24h; Zoetis), and oral almagate suspension (2 mL/dog, PO, q8h; Yuhan Corporation).

Although the dog exhibited no interest in food on post-operative day 1, voluntary appetite significantly improved from post-operative day 2. The patient was discharged once clinically stable. At the follow-up evaluation performed 14 days post-surgery, the patient demonstrated complete resolution of all presenting clinical signs, and follow-up clinicopathological evaluations confirmed that all hematological and serum chemistry parameters had fully returned to their respective RRs.

3. Discussion

To the authors' knowledge, this is the first veterinary case report to comprehensively document the clinical presentation, management, and distinctive radiographic features of jujube pit ingestion in a dog. In this report, a 15-year-old Maltese dog presented with anorexia and lethargy after ingesting multiple whole jujubes, accompanied by elevated pancreatic lipase activity, raising concern for concurrent or secondary pancreatic inflammation. Despite the prolonged retention of six rigid, sharp-pointed pits within the gastric lumen for several days, the dog was successfully treated via gastrotomy before full-thickness mucosal perforation could occur. The primary significance of this case lies in the identification of a distinctive and characteristic radiographic sign—a fusiform opacity featuring a characteristic central longitudinal stripe—which proved crucial for establishing a presumptive diagnosis prior to surgery. Furthermore, this case serves to alert veterinary practitioners to the profound risks associated with these uniquely shaped, double-pointed seeds, which act as dangerous sharp foreign bodies capable of causing fatal GI complications.

Ingestion of foreign bodies is a frequently encountered and potentially critical clinical scenario in small animal veterinary practice [7]. While the majority of ingested foreign objects pass through the GI tract uneventfully, sharp-pointed foreign bodies represent a severe subcategory that poses a substantial clinical challenge [4,8–10]. Unlike blunt or smooth objects, sharp foreign bodies—such as fish bones, poultry bones, sewing needles, and wooden skewers—carry a disproportionately high risk of causing severe, life-threatening complications. The primary danger lies in their physical propensity to penetrate, embed within, or lacerate the GI mucosa, particularly at anatomical narrowings or sharp angulations. This mechanical trauma can rapidly progress to local tissue necrosis, obstruction, or full-thickness transmural perforation [10]. Such perforations allow for the leakage of intraluminal contents into the peritoneal cavity, inevitably culminating in severe secondary peritonitis, intra-abdominal abscess formation, and potentially fatal systemic sepsis, drastically increasing patient morbidity and mortality [10].

Furthermore, although the foreign bodies were safely confined within the gastric lumen without causing secondary ileus in this patient, jujube pits pose an inherent threat of mechanical intestinal obstruction. This risk is particularly pronounced at the ileocecal valve, where the intestinal luminal diameter decreases significantly, making it a primary site for impaction, localized pressure necrosis, and subsequent transmural perforation. Therefore, prompt radiographic identification of these unique foreign bodies while still within the stomach is of paramount clinical importance to prevent life-threatening downstream obstructive complications.

In this context, the jujube, commonly known as the Chinese date, warrants special clinical attention as an underreported yet highly hazardous foreign body in veterinary medicine. The jujube is an extensively cultivated and highly popular fruit widely consumed across East Asian countries, including Republic of Korea, China, and Taiwan, where it serves as a staple in both culinary traditions and traditional herbal medicine [1]. While the flesh of the fruit is nutritious, the pit (stone) of the jujube possesses a unique, hard,

fusiform (spindle-like) morphology characterized by exceedingly sharp, pointed ends on both sides [2]. Generally, jujube pits are known to measure approximately 20 to 30 mm in length and 7 to 10 mm in width, although they can reach a maximum length of up to 40 mm [2]. Due to these rigid and double-pointed physical characteristics, an accidentally ingested jujube pit acts essentially as a double-pointed sharp foreign body with high potential for mucosal penetration.

While specific reports detailing jujube pit ingestion in companion animals remain notably scarce, the human medical literature extensively documents the severe morbidities associated with accidental ingestion of these pits. In humans, impacted jujube pits have been frequently reported to cause esophageal impactions, deep mucosal lacerations, severe perforations of the terminal ileum or sigmoid colon, and even perianorectal abscesses and fistulas [2–6]. The sharp ends easily wedge into the mucosal folds, preventing natural transit and triggering intense inflammatory responses. Given the indiscriminate eating habits of dogs, it is probable that dogs residing in East Asian households are frequently exposed to dropped whole jujubes or discarded pits. Therefore, the jujube pit carries a profoundly high risk of inducing severe GI trauma in companion animals, necessitating a high index of suspicion among veterinary practitioners in these regions.

There are several limitations to this study that warrant consideration. First, the diagnostic utility of positive contrast radiography (e.g., barium sulfate) was not evaluated in this patient. It is worth noting that if the jujube pits had transited from the stomach into the small intestines, identifying them on plain radiographs could have been significantly more challenging due to superimposition or fluid/gas interference. In such a scenario, the administration of a contrast medium would have been advantageous, as it can clearly outline the margins of non-radiopaque foreign bodies and definitively confirm the presence, degree, and exact location of a mechanical intestinal obstruction. Second, a primary limitation of this report is that it describes a single case, and therefore the diagnostic sensitivity and specificity of the central longitudinal stripe cannot be statistically determined. The radiographic visibility and precise appearance of jujube pits may vary substantially depending on various clinical factors, including pit size, spatial orientation, degree of mineralization, patient size, gastric contents, surrounding gas or ingesta, and radiographic technique.

The present case holds clinical relevance as it is, to the authors' knowledge, the first veterinary report to document the characteristic radiographic findings of multiple ingested jujube pits in a dog. In human medicine, identifying jujube pits on plain radiographs is notoriously difficult due to their variable radiolucency, often necessitating CT for a definitive diagnosis [2]. However, in this canine case, plain orthogonal abdominal radiography provided crucial and suggestive diagnostic indicators. The jujube pits demonstrated a characteristic spatial orientation-dependent radiographic pattern: a circular opacity with a central stripe on the transverse projection, and a fusiform opacity with a central longitudinal stripe on the sagittal projection. This central longitudinal stripe may represent a characteristic radiographic clue that can help raise suspicion for jujube pit ingestion, particularly when supported by an appropriate dietary history. Furthermore, relying on abdominal ultrasonography can be misleading in such cases, as demonstrated in our case, where extensive intraluminal gas created severe acoustic shadowing that completely obscured the foreign bodies.

4. Conclusions

In conclusion, this case report in veterinary medicine characterizes the radiographic appearance of ingested jujube pit foreign bodies in a dog. The main result of this study highlights a unique, orientation-dependent radiographic marker: a distinct central longitudinal stripe visible within both circular (transverse) and spindle-shaped (sagittal) opacities.

Recognizing this characteristic feature enables rapid, non-invasive diagnosis of jujube pits, preventing critical delays and allowing for timely surgical intervention to mitigate the high risk of gastrointestinal perforation caused by their sharp vertices. However, as this radiographic sign is suggestive rather than formally validated, definitive surgical or endoscopic confirmation may still be required depending on the specific clinical scenario.

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Institutional Review Board Statement: Ethical review and approval were not necessary for this case report, as it did not involve research using laboratory animals. The dog was treated in accordance with the Animal Protection Act of the Republic of Korea.

Informed Consent Statement: Written informed consent was obtained from the animal's owner for participation in the clinical evaluation and publication of this case.

Data Availability Statement: The original contributions presented in this study are included in the article. Further inquiries can be directed to the corresponding author(s).

Conflicts of Interest: The authors declare no conflicts of interest.

Abbreviations

The following abbreviations are used in this manuscript:

GI	Gastrointestinal
CT	Computed tomography
RR	Reference range
CRI	Continuous rate infusion

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