

Perforating foreign body in the ventriculus of a pet pigeon (*Columba livia domestica*)

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CASE DESCRIPTION

A 2-year-old female pigeon was evaluated because of a 5-day history of lower than typical activity level, weight loss, and polyuria.

CLINICAL FINDINGS

Whole-body radiography revealed a linear metallic foreign body in the area of the ventriculus. Fluoroscopy followed by contrast-enhanced CT was performed to further characterize the lesion location, revealing that the foreign body had perforated the ventral aspect of the ventriculus wall and that the ventral extremity of the foreign body was surrounded by a mass, consistent with a granuloma.

TREATMENT AND OUTCOME

A midline celiotomy was performed, and a large granuloma was identified ventral to the ventriculus, adherent to the dorsal aspect of the keel bone. The metallic foreign body (a nail) was removed, and the content of the granuloma was debrided. Amoxicillin-clavulanic acid (150 mg/kg [68.2 mg/lb], PO, q 12 h for 10 days), meloxicam (1 mg/kg [0.45 mg/lb], PO, q 12 h for 5 days), and sucralfate (100 mg/kg [45 mg/lb], PO, q 8 h for 10 days) were prescribed. The pigeon made a successful recovery and was still doing well at a 1-year recheck evaluation.

CLINICAL RELEVANCE

Although traumatic gastritis in pigeons has been reported, use of advanced diagnostic imaging for the pigeon of this report facilitated identification of the precise nature of the lesion and, therefore, surgical planning. The outcome for this pigeon suggested that successful resolution of traumatic gastritis may be possible in other affected birds with surgery. (*J Am Vet Med Assoc* 2018;253:1610–1616)

A 2-year-old female pigeon (*Columba livia domestica*) was evaluated because of a 5-day history of lower than typical activity level, weight loss, and polyuria. No change in appetite was reported. The pigeon had been adopted by its owner approximately 1 year previously and was kept as a pet. It had produced 1 egg before adoption, according to its previous owner, and had since been producing eggs approximately every 2 to 3 months. Since adoption, the pigeon had sustained an injury of unknown origin to the left wing that prevented it from flying. It was kept with other pigeons in a room exclusively dedicated to them, which the owner cleaned daily. Items present in the room included wooden perches as well as water and food bowls.

On initial examination, the pigeon appeared alert and reactive when observed in the carrier. Formed excrement was noted that appeared to contain a greater than typical amount of urine. Body weight was 270 g (0.59 lb), and body condition was scored as 2.5/5 (3.5/5 is considered normal). Palpation of the crop revealed that the organ was almost empty, containing only a small amount of seeds. A moderate decrease was noted in the degree to which the left elbow joint could be extended, and this finding was considered likely related to the previous wing injury. All other results of physical examination were unremarkable.

To facilitate diagnostic imaging, the pigeon was anesthetized with 5% isoflurane^a delivered via face mask and intubated with a 3.0 uncuffed endotracheal tube. A blood sample was collected from a medial metatarsal vein and submitted for a CBC and plasma biochemical analysis. Results indicated mild increases in plasma calcium (4.73 mmol/L; reference interval, 2.0 to 2.6 mmol/L) and cholesterol (6.33 mmol/L; reference interval, ≤ 6 mmol/L) concentrations.

Whole-body lateral and ventrodorsal radiographs were obtained, revealing a 1.4-cm, linear, sharp metallic foreign object at the ventral aspect of the ventriculus (**Figure 1**). Within the ventriculus, numerous round mineral opacities were visible. A small metallic object was also noted close to the cloaca. The coelomic cavity appeared moderately distended with rounded soft tissue opacities ventral to the ventriculus, some of which contained central gas and small mineral opacities. These findings suggested a foreign body and grit in the ventriculus. At the mid-diaphysis of the left ulna, a malaligned transverse fracture bridged by a moderate amount of smooth new bone formation was visible. No other substantial abnormality was detected.

The bird recovered from anesthesia and was hospitalized. Sucralfate^b (100 mg/kg [45 mg/lb], PO, q 12 h) was administered to treat any potential ventriculus

ulcers or mucosal abrasions caused by the metallic foreign body.

The next day, fluoroscopy^c was performed to further characterize the location of the metallic foreign



Figure 1—Ventrodorsal (A) and left lateral (B) whole-body radiographic images of a 2-year-old female pigeon (*Columba livia domestica*) referred because of a decrease in activity level, weight loss, and polyuria. Within the ventriculus, numerous round mineral opacities consistent with grit are visible. Superimposed on (A) or at the ventral aspect of (B) the ventriculus, a linear, mineral-opaque structure with sharp margins can be seen. In panel B, the coelomic cavity appears moderately distended with an increase in soft tissue opacity along the ventral aspect of the coelomic cavity. These findings were consistent with a ventriculus foreign body and a suspected granuloma or abscess ventral to the ventriculus.

body. For this procedure, the pigeon was placed in a cardboard box, and a lateral fluoroscopic examination was performed at 7.5 frames/s, with the pigeon standing. Findings confirmed that the metallic foreign body was associated with the ventral aspect of the ventriculus, and the ventral margin of the foreign body appeared to be within the coelomic cavity. The ventriculus contained multifocal, round mineral opacities consistent with grit, and the walls of the ventriculus were seen contracting dorsad to the linear foreign object. The dorsal aspect of the metallic object was sharp and extended to the level of the mineral opacities in the ventriculus. Given the fluoroscopic findings, the foreign body was deemed to be situated within and to pass through the ventral aspect of the ventriculus wall. The small metallic object that had been noted close to the cloaca was not visible anymore, and it was concluded that this object had been eliminated in the excrement. The gastric cycle frequency was approximately 4 cycles/min, and gastric motility appeared unremarkable.

The next day, the pigeon was sedated for additional imaging by administration of midazolam hydrochloride^d (3 mg/kg [1.36 mg/lb], IM) and butorphanol tartrate^e (1.5 mg/kg [0.68 mg/lb], IM). A CT examination of the coelomic cavity was performed with a 16-slice helical scanner.^f Images were acquired before and 2 to 5 seconds after administration of contrast medium (iopamidol^g at 2 mL/kg [0.9 mL/lb], IV, over 2 seconds) through a catheter placed in the right metatarsal vein.¹ The linear metallic-opaque structure was seen extending from the lumen of the ventriculus, through the ventral aspect of the ventriculus wall, and into the ventral part of the coelomic cavity (**Figure 2**). Surrounding the ventral aspect of the metallic structure was a round, 1.6-cm-diameter, well-circumscribed mass with a thin, contrast-enhanced wall and central, non-contrast-enhanced region.

Multiple round, well-circumscribed, mineral-opaque structures were noted within the dependent portion of the ventriculus that were consistent with grit. Within the coelomic cavity, at the right lateral aspect of the ventriculus and within the caudal aspect of the coelomic cavity, medial to the spleen, 2 round, well-circumscribed nodules were noted. These nodules were predominantly of pure fluid opacity (0 Hounsfield units) and had a thin wall of soft tissue opacity. The CT findings were interpreted as confirming that the metallic foreign body had perforated the ventriculus; a structure compatible with a granuloma or abscess was adjacent to the ventriculus at the level of the perforation.

Celiotomy was planned to remove the foreign body. Because a small part of the metallic object was seen in the

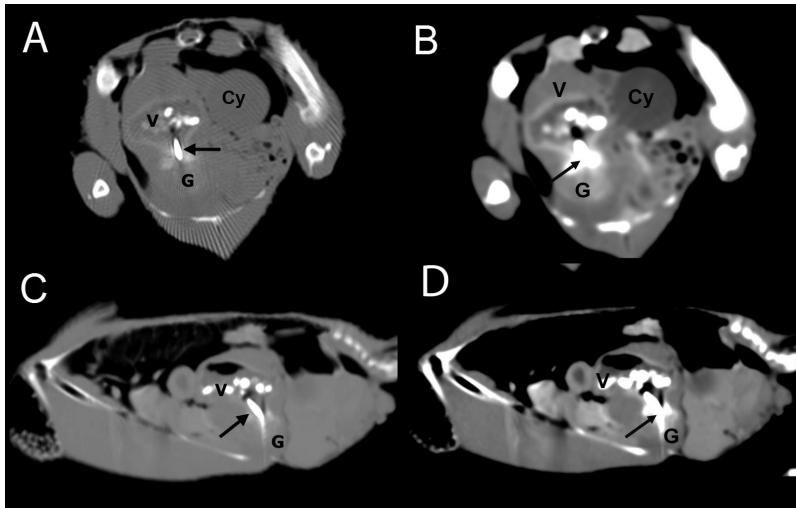


Figure 2—Transverse (A and B) and sagittal (C and D) contrast-enhanced CT images of the pigeon in Figure 1 at the level of the ventriculus (V), obtained with a bone algorithm (A and C) or soft tissue algorithm (B and D). The metallic foreign body (arrows) is visible, extending through the ventral aspect of the ventriculus wall and into the coelomic cavity. Surrounding the ventral aspect of the foreign body is a well-circumscribed mass (G) with a thin contrast-enhanced wall containing a central non-contrast-enhanced region, consistent with a granuloma or abscess. Within the ventriculus, multifocal mineral opacities consistent with grit can be seen. At the right lateral aspect of the ventriculus, 2 round and well-circumscribed nodules were noted that were predominantly of a pure fluid opacity (0 HU) and had a thin wall of soft tissue opacity, compatible with a cystic structure (Cy), such as an ovarian follicle or cyst.

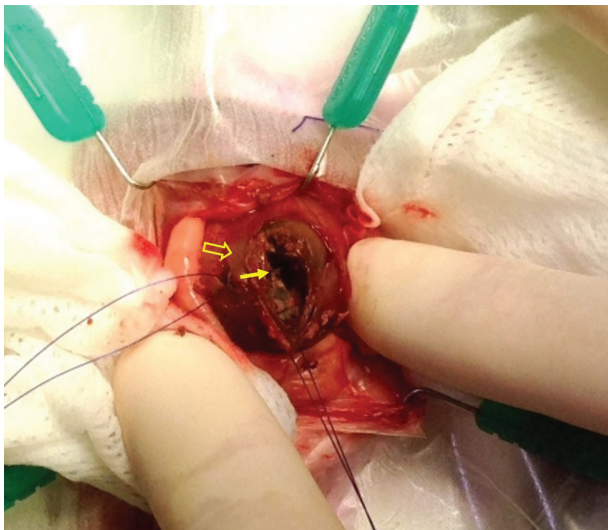


Figure 3—Photograph obtained during coeliotomy performed in the pigeon in Figure 1 through a midline incision. A self-retaining retractor was used to increase the size of the surgical field. Stay sutures were placed on the ventriculus. Both the granuloma (solid arrow) and healthy ventriculus tissue (hollow arrow) are visible.

lumen of the ventriculus, blood zinc and lead testing was recommended to the owner to rule out heavy metal toxicosis. However, because the pigeon had no clinical sign compatible with that condition, and to limit costs, the owner declined the test. Prior to surgery, treatment with amoxicillin-clavulanic acid^h

(150 mg/kg [68.2 mg/lb], PO, q 12 h) was initiated.

In preparation for surgery, the pigeon was premedicated with midazolam (2 mg/kg, IM) and butorphanol (2 mg/kg, IM). Anesthetic induction was performed with 5% isoflurane administered via face mask, and intubation was performed with a 3-mm uncuffed endotracheal tube. A Doppler ultrasonic flow detector, ECG machine, microstream capnograph, pulse oximeter, and esophageal temperature probe were used for patient monitoring during anesthesia. A pressure-controlled ventilator was used to provide intermittent positive pressure ventilation. The pigeon was positioned in dorsal recumbency on a heating mat. A 26-gauge IV catheter was placed in the right ulnar vein, and a constant rate infusion of isotonic fluidⁱ (10 mL/kg/h [4.5 mL/lb/h], IV) and butorphanol (1 mg/kg/h [0.45 mg/lb/h], IV, for pain management and to decrease the amount of isoflurane required) were administered.

A midline celiotomy was performed to allow easiest access to the foreign body and associated granuloma, as judged on assessment of the CT images. The feathers at the planned surgical site were plucked, and the skin was aseptically prepared. A skin incision was performed with a monopolar needle electrode connected to a radiosurgical unit^j from the dorsal aspect of the keel to approximately 1 cm above the cloaca. The celiotomy was extended laterally under the ribs in a T shape. The abdominal muscles were incised in the same pattern with Harrison bent-tip bipolar radiosurgical forceps, allowing inspection of the ventral aspect of the hepatoperitoneal cavities dorsal to the keel. Because the ventriculus is situated within the intestinoperitoneal cavity, the intestinoperitoneal cavity was not penetrated.

The granuloma had caused the ventriculus to adhere to the keel, so blunt dissection was performed to detach the ventriculus from the ventral aspect of the keel bone and bring it closer to the surgical opening. A self-retaining retractor^k was used to increase the size of the surgical field. Two stay sutures of 5-0 polydioxanone were placed on the ventriculus thick muscles to bring the ventriculus into view through the celiotomy incision (**Figure 3**). Moistened gauze was placed around the ventriculus to prevent spillage of its content into the peritoneal cavities. The granuloma was visible ventral to the ventriculus. It was difficult to distinguish the capsule of the granuloma from the healthy serosa of the ventriculus. Therefore, to conserve tissues for sealing the surgical opening, most of the capsule was left untouched. The granu-

loma content was debrided, and the necrotic tissues were removed as thoroughly as possible by use of a curette. A swab specimen was collected from the granuloma and submitted for aerobic bacterial culture and antimicrobial susceptibility testing.

The extremity of the foreign body was visible within the abscess, and the object was removed with a small hemostat. It was well embedded in the ventriculus wall, and considerable traction was necessary to extirpate it from the wound. After all necrotic tissues had been debrided, the inside of the capsule was gently flushed with warm sterile saline (0.9% NaCl) solution and continuous suction, and the capsule was closed with 5-0 polydioxanone in a simple interrupted pattern and oversewn with a single cruciate tension-relieving suture. Gloves and surgical instruments were changed, the abdominal muscle was closed with 5-0 polydioxanone in a simple continuous pattern, and the skin was sutured with the same suture material in an interrupted pattern.

The pigeon remained in stable condition throughout the whole procedure, and it recovered from anesthesia without complication. One dose of flumazenil^l (0.05 mg/kg [0.02 mg/lb]) was administered IM. The pigeon remained hospitalized in a temperature-controlled (28°C) incubator during recovery, and IV fluid administration (5 mL/kg/h [2.27 mL/lb/h]) as well as a constant rate infusion of butorphanol (1 mg/kg/h) were continued until the next day. In the evening on the day of surgery, the pigeon was force-fed a 30-mL/kg (13.6-mL/lb) dose of a hand-feeding baby parrot formula,^m treatment with meloxicamⁿ (1 mg/kg, PO, q 12 h) was initiated, and treatment with amoxicillin-clavulanic acid (150 mg/kg, PO, q 12 h) and sucralfate (100 mg/kg, PO, q 8 h) was continued.

The next day, the pigeon was transferred to a regular cage, and the catheter was removed. The pigeon was hospitalized for another 2 days, during which it was observed to eat normally, its body weight increased slightly, and no polyuria was noted. The owner was shown the foreign body, which looked like a nail, but could not determine where the pigeon could have ingested it.

The pigeon was sent home with the previously mentioned doses of amoxicillin-clavulanic acid, meloxicam, and sucralfate to be administered for 10 days, 5 days, and 10 days, respectively. The owner was also instructed to feed the pigeon its regular food, and a recommendation was made to screen the pigeon's environment again for potentially hazardous objects and clean it on a regular basis.

One week later, the pigeon was brought back for a recheck evaluation. The owner reported that it had been doing well at home. Body weight at this point was 265 g (0.58 lb), and body condition was similar to that at initial evaluation. The surgical wound appeared clean and almost healed over. All other physical examination findings were unremarkable. Results of aerobic bacterial culture for the swab specimen obtained during surgery indicated no growth.

At a recheck examination 3 months later, the pigeon remained apparently healthy, and its appetite and excrement were unremarkable. The pigeon had been producing eggs on a regular basis. Results of a CBC and plasma biochemical analysis performed at this time were unremarkable. The pigeon was reevaluated 1 year after surgery, at which point it remained apparently healthy. It died suddenly at home 1 year and 9 months after surgery, after which a postmortem examination was performed.

Gross findings on postmortem examination included mild accumulation of white material over the serosal surface of the right lobe of the liver and the right lateral surface of the apex of the heart, but no other visible lesions. Neither the surgical site nor the granuloma debrided during the surgery could be identified, and the ventriculus had an unremarkable appearance. Histologic examination revealed multifocal granulomatous and necrotizing lesions within tissues from the liver, ventriculus, spleen, and coelomic cavity. Mild myositis of the ventriculus with edema was noted. Necrotizing vasculitis was also identified in tissues from the spleen, liver, and level of the carotid artery.

Bacterial culture of liver specimens yielded a *Salmonella* strain susceptible to amoxicillin-clavulanic acid, ampicillin, ceftazidime, doxycycline, florfenicol, and trimethoprim-sulfamethoxazole and resistant to enrofloxacin, amikacin, cefoxitin, and cephalothin. The histologic presence of the inflammatory infiltrate targeting the centrilobular hepatic veins, large veins in the spleen, and carotid arteries supported hematogenous spread of the pathogen. Bacterial septicemia due to *Salmonella* infection was therefore the suspected cause of death. No lesion associated with the surgery performed on the ventriculus could be identified.

Discussion

The pet pigeon of the present report had a perforating foreign body in the ventriculus. The responsible metallic object and its location were identified via whole-body radiography, fluoroscopy, and CT. The CT scan also allowed detection of a mass ventral to the ventriculus, which was confirmed as a granuloma during exploratory celiotomy. The ventral celiotomy to debride the granuloma and remove the foreign body was successful, and the pigeon remained healthy for almost 2 years after the procedure.

Multiple cases of gastric foreign bodies in birds have been reported. Described nonmetallic foreign bodies include a plastic tube extending from the distal portion of the esophagus to the ventriculus in a juvenile Alexandrine parakeet (*Psittacula eupatria*),² a string of beads extending from the crop to the intestines in an Amazon parrot (*Amazona* sp),³ feathers in juvenile and nesting female penguins,^{4,5} plastic materials in seashore birds,⁶ and pieces of a wooden perch in a juvenile umbrella cockatoo (*Cacatua alba*).⁷ Ingestion of metallic objects such as nails, wire, hair-

pins, and needles is common in galliformes such as pigeons.⁸ In a retrospective study,⁹ 73 cases of metallic gastric foreign bodies were identified in pigeons over a 7-year period. Objects identified as embedded in the ventriculus included nails, pieces of wire, needles, a wire clamp, a safety pin, and other pieces of sharp metal, and cases of metallic gastric foreign bodies appeared more common in the spring than during other seasons. Metallic gastric foreign bodies have also been identified in other avian species.¹⁰⁻¹⁵

Metallic objects can cause traumatic gastritis and perforation of the proventriculus or, more commonly, the ventriculus. Indeed, during gastric cycles, muscles of the ventriculus contract powerfully, which can force metallic objects through the ventriculus walls.⁸ This situation was common in the aforementioned study⁹ involving 73 pigeons. Perforation can cause secondary peritonitis that is usually focal in nature, with the formation of an abscess of various sizes on the serosal surface of the perforated organ, but can also be generalized.^{8,9} Hepatic arteries and veins may occasionally be perforated, causing fatal hemorrhage.⁸ In some situations, the foreign bodies may even perforate the body wall and become exteriorized.⁹

Clinical signs associated with traumatic perforating gastritis in birds are secondary to a decrease in ventriculus contractions and include anorexia, weight loss from malabsorption, hunching up, gastric stasis, regurgitation, and sometimes a palpable abscess.^{8,9,13} In racing pigeons, the presence of undigested seeds in the excrement is believed to be pathognomonic for traumatic gastritis.⁹ The prognosis for pigeons with traumatic perforating gastritis is reportedly poor, and most affected birds progressively lose weight and die.⁹

The pigeon of the present report was brought for evaluation because of a lower than typical activity level, weight loss, and polyuria. Those clinical signs were nonspecific and did not directly suggest traumatic gastritis. Indeed, although traumatic gastritis commonly results in anorexia and weight loss, it has not been associated with polyuria. No undigested seeds were detected in the pigeon's excrement, contrary to the belief that such seeds are pathognomonic for traumatic gastritis. Similarly, although trauma by a foreign body can result in decreased gastric motility, the pigeon had a gastric cycle frequency of 4 cycles/min, which would be normal according to the measurements performed in turkeys (of 3.3 cycles/min) and Amazon parrots (3 to 6.6 cycles/min).^{16,17} A limitation to the finding regarding gastric cycle frequency was that gastric cycles have not been studied specifically in pigeons. The motility pattern also appeared unremarkable.

Although melena has not been reported for birds with traumatic gastritis, it is plausible that it could occur in birds with foreign body perforation of the gastric wall. Macroscopically, the excrement of the pigeon of the present report had no signs of melena; however, definitive diagnosis would have required a fecal occult blood test. Although no such test was per-

formed, a gastroprotectant (sucralfate) was administered as soon as the foreign body had been identified.

Clinicopathologic findings for the pigeon were mostly unremarkable, which was not surprising given that results of CBC and plasma biochemical analysis are usually described as unremarkable for birds with a gastric foreign body, provided no obstruction exists.^{7,12,13} Although no anemia or leukocytosis was identified, such abnormalities are possible in birds with traumatic gastritis.¹³

In the pigeon of the present report, the foreign body was diagnosed on examination of whole-body radiographs. Radiographs are reportedly sufficient for diagnosing a metallic gastric foreign body or mineral foreign body in birds, and they may sometimes allow for identification of other types of foreign bodies, such as plastic or very dense fiber material.^{2,11,13-15,18} Radiography may also reveal a distended proventriculus, intestinal loops, and sometimes cloaca, and the ventriculus may appear to be pushed caudoventrally.^{2,7,15} However, we found it challenging to identify the exact location of the foreign object in the pigeon. On fluoroscopic examination, it was clearer that a portion of the foreign body was contained within the ventral portion of the ventriculus wall. The CT scan allowed us to determine the exact location within the ventriculus wall and allowed clear identification and complete evaluation of the granuloma. The CT scan therefore helped us not only identify the problems associated with the metallic foreign body but also determine the preferred surgical approach for foreign body retrieval.

Options for removal of gastrointestinal foreign bodies in birds include medical and surgical approaches. When possible, a medical approach should be attempted first because it is less invasive and associated with less complications, but in some situations (eg, perforating foreign body), medical intervention is not an option and surgery is advised. Medical approaches include removal of the metallic foreign bodies with the help of a powerful magnet attached to a probe of an appropriate size given the size of the affected bird.⁸ However, some metallic foreign bodies will not adhere properly to the magnet, and if they are too large or embedded in the wall of the proventriculus or ventriculus, this technique will not be successful. Medical approaches also include endoscopy.^{13,18} For the pigeon of the present report, the foreign body had perforated the ventriculus wall, thereby precluding use of either of these approaches. Moreover, although the foreign body may have been identified via gastric endoscopy, its retrieval with biopsy forceps would have been challenging given that the object was embedded in the ventriculus wall. Surgery was therefore indicated not only for foreign body removal but also for gaining access to the granuloma identified via CT to debride as much necrotic tissue as possible.

Proventriculotomy is typically recommended over ventriculotomy in birds because of the high risk of postoperative wound dehiscence given the highly muscular walls of the ventriculus, even at the level of

the thin muscle, and because it is usually not possible to close the incision with an inverting pattern. An inability to use an inverting pattern may also result in leakage of ventriculus content into the coelomic cavity. Finally, the ventriculus is more highly vascularized than the proventriculus, so the risk of perioperative hemorrhage is higher.¹⁹ Two techniques have been attempted in Japanese quail to improve postoperative healing and complication rates: application of a collagen patch over the surgical site and application of a coelomic fat patch.^{20,21} However, neither technique resulted in an improved healing process, and on the contrary, both patches were associated with an increase in serosal inflammation, which may have contributed to perforation of the surgical site in quail that received the collagen patch.

In the pigeon of the present report, the foreign body had already perforated the ventriculus, so the decision was made to remove it through the ventriculus. The incision was performed over the granuloma, making it perhaps not completely accurate to use the term ventriculotomy to describe the surgery. Nevertheless, as previously mentioned, it was challenging to distinguish the capsule of the granuloma from the healthy serosa of the ventriculus, so the surgery was treated as a ventriculotomy (eg, a tension-relieving suture was added on top of the simple interrupted pattern to close the incision at the end of the procedure). Although not indicated to remove the foreign body in this particular circumstance, endoscopy could have been used before and after surgery to evaluate the mucosa of the proventriculus and koilin layer of the ventriculus. However, the perforation in the ventriculus created by the metallic object was not extended during surgery, so even the smallest endoscope would not have fitted through this opening.

Ventriculotomy is commonly believed to be associated with a poor prognosis and is generally not recommended.¹⁹ In a retrospective study,⁹ ventriculotomy was performed in several pigeons with traumatic gastritis and was generally associated with a poor outcome.⁹ The first technique attempted in that study consisted of opening the ventriculus, removing the foreign body and all necrotic material, and closing the ventriculus in 1 layer. After this procedure, the pigeons developed a fistula at the level of the ventriculus and died of secondary peritonitis. A second, similar technique was attempted in other pigeons, but the ventriculus was sutured to the abdominal wall, thereby creating a fistula that could be medically treated from the outside. Still, this second technique resulted in no better outcome. The last technique used in that study⁹ involved only partial removal of the necrotic tissue and creation of adherences with the abdominal wall. Three of 4 so-treated birds recovered well with this technique but were then lost to follow-up, so the ultimate outcome remained unknown. Ventriculotomy has also been described in several case reports^{2,10,11,13-15,22} involving various avian species, with a good outcome achieved in 5 birds and poor outcome (death) for 2 birds.

Long-term follow-up information was available for the pigeon of the present report, indicating that it recovered well. Moreover, on postmortem examination performed almost 2 years later, no abnormality was identified at the level of the ventriculus, and the granuloma was no longer visible. *Salmonella* organisms were identified in the liver as well as lesions compatible with bacterial septicemia. No pathological element could be found to link the perforating foreign body with the salmonellosis believed responsible for the pigeon's death, and the timing of the death made the perforating object an unlikely cause. The surgery was therefore considered a success.

The retrieved foreign body (a nail) was metallic, but because it was not further analyzed, its composition remained unknown. The nail could have contained heavy metals such as zinc; however, the pigeon had no clinical signs compatible with heavy metal toxicosis. Had the nail contained toxic metals, the lack of such signs could have been attributable to the embedding of the nail mostly within the ventriculus wall, with only a small portion identified within the lumen of the ventriculus, where it could be digested and absorbed. Nevertheless, blood zinc and lead testing was recommended but declined by the owner. Chelation treatment was not deemed necessary given the lack of clinical signs. The origin of the nail was not identified by the owner. The pigeon could have encountered it in the room where it was confined, although this was deemed unlikely given that the room was cleaned daily and contained only wooden perches. Another possibility was that the pigeon had ingested the nail prior to adoption and that the traumatic gastritis therefore represented a chronic condition.

Most birds with gastritis also have enteritis, and the most commonly implicated pathogens are gram-negative bacteria, such as *Escherichia coli*, *Klebsiella* spp, *Salmonella* spp, and *Enterobacter* spp.²³ It was therefore likely that the pigeon had secondary enteritis, which could explain the polyuria; indeed, enteritis may cause abnormal intestinal motility, interfering with colonic reabsorption of water from the cloaca and causing water content to increase within the excrement. No signs of polyuria were noted in the pigeon of the present report following surgery and antimicrobial treatment. Fecal Gram staining could have been performed to identify any abnormal proportion of gram-negative bacteria, or bacterial culture and antimicrobial susceptibility testing of fecal matter could have been pursued to determine whether the pigeon had enteritis and, if so, the appropriate antimicrobial to administer. Aerobic bacterial culture of granuloma content was performed but yielded no growth.

To the authors' knowledge, the present report represented the first of perforating foreign body in the ventriculus of a domestic pigeon in the English-language veterinary medical literature. The usefulness of advanced diagnostic imaging for identifying the precise nature of the lesion and for surgical planning was demonstrated, and findings suggested that

successful resolution of this condition in other birds may be possible with surgery.

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Footnotes

- a. Isoflurane, Fresenius Kabi, Richmond Hill, ON, Canada.
- b. Sucralfate, Novopharm, Toronto, ON, Canada.
- c. Philips BV Endura C-Arm fluoroscopy unit, Philips Medical Systems, Bothell, Wash.
- d. Midazolam, Sandoz, Boucherville, QC, Canada.
- e. Torbugesic, Wyeth, Markham, ON, Canada.
- f. GE Bright Speed, General Electric Healthcare, Milwaukee, Wis.
- g. Isovue-370, Bracco Diagnostics, Princeton, NJ.
- h. Clavamox, Zoetis, Kirkland, QC, Canada.
- i. Plasmalyte-A, Baxter, Mississauga, ON, Canada.
- j. Ellman International Inc, Hicksville, NY.
- k. Lone Star, Coopersurgical, Trumbull, Conn.
- l. Anexate, Hoffman La-Roche, Mississauga, ON, Canada
- m. Tropicant hand feeding formula, Hagen, Baie d'Urfé, QC, Canada.
- n. Metacam, Boehringer Ingelheim, Burlington, ON, Canada.

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