

Sewing needle foreign body ingestion in dogs and cats: 65 cases (2000–2012)

Chap L. Pratt, DVM; Erica L. Reineke, VMD; Kenneth J. Drobatz, DVM, MSCE

Objective—To characterize clinical signs, diagnostic test results, foreign body location, treatment, and outcome for dogs and cats with sewing needle foreign bodies.

Design—Retrospective case series.

Animals—65 dogs and cats with sewing needle foreign bodies.

Procedures—Medical records of 27 dogs and 38 cats examined because of sewing needle foreign bodies from January 2000 to February 2012 were reviewed for signalment, medical history, physical examination findings, diagnostic test results, interval from witnessed exposure and radiographic imaging to definitive treatment, definitive treatment, sewing needle location, complications, and outcome.

Results—7 (10.8%) animals had sewing needles in extragastrintestinal locations that were not causing clinical signs. The remaining 58 (89.2%) animals had known sewing needle exposure or acute clinical signs associated with ingestion. The esophageal and gastric regions were the most common location for a sewing needle (10/21 [47.6%] dogs; 19/37 [51.4%] cats), followed by the oropharynx (7/21 [33.3%] dogs; 11/37 [29.7%] cats) and small and large intestines (4/21 [19.0%] dogs; 7/37 [18.9%] cats). Gastrointestinal perforation was detected in 10 of 58 (17.2%) animals (5/21 [23.8%] dogs; 5/37 [13.5%] cats). Sewing needles in the esophagus and stomach were successfully removed endoscopically in 8 of 9 dogs and 18 of 19 cats. Survival rate was 98.1% (51/52) for animals receiving definitive treatment.

Conclusions and Clinical Relevance—Endoscopic removal of ingested sewing needles was highly successful and should be recommended to prevent gastrointestinal tract perforation and associated morbidity. Prognosis for dogs and cats receiving definitive treatment for sewing needle foreign body ingestion was excellent. (*J Am Vet Med Assoc* 2014;245:302–308)

Foreign body ingestion is a common reason for emergency visits in small animal practice. Depending on the nature of the foreign body and risk of gastrointestinal tract obstruction or perforation, various treatments may be recommended. Treatment options may include intensive monitoring, induction of emesis, and endoscopic or surgical removal. Treatment recommendations often are dependent on clinician experience and rarely supported by evidence in the peer-reviewed literature.

Retrospective studies of humans have found that 65% of ingested sharp-pointed objects pass without incidence,¹ with perforation occurring in 15% to 35% of cases.² On the basis of this information, the American Society for Gastrointestinal Endoscopy Practice Guidelines recommend endoscopic removal of all amendable ingested sharp objects in people.³ If retrieval is not possible by minimally invasive routes (eg, foreign body has passed into the jejunum) and the patient has no clinical signs associated with the foreign body, monitoring via examination of serial radiographs is recommended until passage of the foreign body.³ Surgical intervention is recommended in patients who develop clinical signs

or patients in which the foreign body fails to advance after 3 days.³

The authors are not aware of similar veterinary consensus statements for nonobstructive foreign bodies, such as sewing needles. Case reports^{4–7} of sewing needle migration and a few retrospective studies^{8–10} that include descriptions of sewing needle foreign bodies have been published in the veterinary literature. To the authors' knowledge, these reports do not include descriptions of the ability for sewing needles to pass through the gastrointestinal tract, incidence of perforation, or diagnostic and interventional options that will aid in clinical decision making. It is common to recommend endoscopic or surgical retrieval of a sewing needle foreign body from an animal, despite the lack of evidence in the veterinary literature to support such a recommendation. The purpose of the study reported here was to characterize the clinical signs, diagnostic evaluation, location of a sewing needle, frequency of perforation, definitive treatment, and outcome in dogs and cats with sewing needle foreign body ingestion.

Materials and Methods

Case selection—The medical record database at the Matthew J. Ryan Veterinary Hospital of the University of Pennsylvania for the period between January 2000 and February 2012 was searched by use of the terms sewing needle and needle to identify cases. Cases

From the Department of Clinical Studies-Philadelphia, School of Veterinary Medicine, University of Pennsylvania, Philadelphia, PA 19104. Presented in abstract form at the International Veterinary Emergency and Critical Care Conference, San Antonio, Tex, September 2012. Address correspondence to Dr. Pratt (chappratt06@gmail.com).

were included if physical examination or radiography confirmed the presence of a sewing needle foreign body. Cases were excluded if a sewing needle foreign body could not be confirmed or the medical record was incomplete.

Animals were allocated into 2 groups: those with a suspected or witnessed sewing needle ingestion or clinical signs associated with ingestion of a sewing needle and those with a sewing needle identified in an extragastrointestinal location as an incidental finding without associated clinical signs or pathological lesions. Animals with clinical signs associated with a foreign body were grouped on the basis of sewing needle location (oropharyngeal region [oral cavity and pharynx], upper gastrointestinal tract [esophagus and stomach], and lower gastrointestinal tract [small and large intestines]) identified during physical examination or radiography.

Medical records review—Medical records were reviewed for signalment, medical history (witnessed ingestion, clinical signs, and evidence of dietary indiscretion), and physical examination findings. Hematologic analyses at the time of admission included venous blood gas results, PCV, and total solids, electrolytes, glucose, BUN, and blood creatinine concentrations. Diagnostic imaging information included modality (radiography, fluoroscopy, or ultrasonography) and interval from obtaining the last diagnostic image until anesthetic induction. Definitive care and outcome measures collected included interval from witnessed exposure to definitive care, definitive treatment (including procedural success or failure), secondary procedures performed, sewing needle location, presence or absence of perforation, and outcome.

Statistical analysis—Continuous variables were assessed for normality by means of the Shapiro-Wilk test. None of the variables were normally distributed; thus, they were reported as median and range. The Wilcoxon rank sum test was used to compare continuous variables among groups. Categorical variables were reported as proportions and percentages. The Kruskal-Wallis test was used to compare categorical variables when > 2 groups were assessed, which was followed by the Wilcoxon rank sum test for paired comparisons when the Kruskal-Wallis test was significant ($P \leq 0.05$). The Wilcoxon rank sum test was used to compare categorical variables between 2 groups. Values of $P \leq 0.05$ were considered significant for all comparisons. A statistical software program^a was used for all analyses.

Results

Sewing needle foreign bodies were diagnosed in 65 animals (27 dogs and 38 cats), of which 58 (89.2%) had clinical signs associated with sewing needle ingestion and 7 (10.8%) had a sewing needle identified at an extragastrointestinal location as an incidental finding. Of the 58 animals with clinical signs associated with a sewing needle foreign body, there were significantly ($P = 0.017$) more cats (37 [63.8%]) than dogs (21 [36.2%]). The animals with clinical signs associated with the foreign body were grouped by region of the body (oropharyngeal, upper gastrointestinal tract, or

lower gastrointestinal tract) in which the sewing needle was found during physical examination or examination of radiographs (Table 1). In approximately half of the animals (10/21 [47.6%] dogs and 19/37 [51.4%] cats), a sewing needle was identified in the upper gastrointestinal tract, whereas 2 (5.4%) cats and 1 (4.8%) dog had a sewing needle in the esophagus, and the remaining animals (10 [47.6%] dogs and 16 [43.2%] cats) had a sewing needle in the stomach. For 2 animals in which a sewing needle was identified in the stomach during initial examinations, the needle had migrated into the small intestines (jejunum in 1 dog and ileum in 1 cat) at the time of surgical intervention. Approximately one-third of sewing needles (7/21 [33.3%] dogs and 11/37 [29.7%] cats) were found in the oropharyngeal region.

At the time of diagnostic imaging, sewing needle foreign bodies were least commonly identified in the lower gastrointestinal tract (4/21 [19.0%] dogs and 7/37 [18.9%] cats). A sewing needle was detected radiographically in the jejunum of 2 animals (1 dog and 1 cat), the ileum of 1 animal (1 dog), and the rectum of another animal (1 cat). One dog was monitored until passage of the sewing needle, and definitive surgical intervention was declined for the remaining 6 animals (1 dog and 5 cats), which limited information on the exact location within the lower gastrointestinal tract.

Clinical signs for a sewing needle foreign body—Of the 21 dogs with clinical signs, 16 (76.2%) were males (6 sexually intact and 10 neutered) and 5 (23.8%) were females (3 sexually intact and 2 spayed). Most dogs were young, with a median age of 1 year (range, 3 months to 11 years). Breeds represented included 4 (19.0%) mixed-breed dogs, 3 (14.3%) Labrador Retrievers, and 2 (9.5%) Boston Terriers. The remaining 12 (57.1%) dogs were purebreds (1 each of 12 other breeds).

For the 37 cats with clinical signs, 17 (45.9%) were males (1 sexually intact and 16 neutered) and 20 (54.1%) were females (6 sexually intact and 14 spayed). Similar to the ages of the dogs in the study, most cats were young, with a median age of 1.5 years (range, 0.2 to 19 years). Almost all were domestic shorthair cats (36/37 [97.3%]); the other cat was a purebred Siamese.

Recent medical history—Sewing needle ingestion was witnessed or suspected for 13 of 21 (61.9%) dogs

Table 1—Number (percentage) of animals with sewing needle foreign bodies examined because of suspected or witnessed ingestion or because of clinical signs associated with sewing needle ingestion, described by anatomic location identified during physical examination or radiography in 58 animals from January 2000 to February 2012.

Anatomic location	Dogs (n = 21)	Cats (n = 37)	P value
Oropharyngeal region	7 (33.3)	11 (29.7)	0.776
Upper gastrointestinal tract	10 (47.6)	19 (51.4)	0.785
Lower gastrointestinal tract	4 (19.0)	7 (18.9)	0.990

Sewing needles were detected in an extragastrointestinal location as an incidental finding in 7 other animals. The oropharyngeal region was defined as the oral cavity and pharynx, the upper gastrointestinal tract was defined as the esophagus and stomach, and the lower gastrointestinal tract was defined as the small and large intestines.

with clinical signs. Only 5 of these 13 dogs had other historical findings noted by the owner at home. Retching (4/7 dogs) was significantly ($P = 0.006$) associated with sewing needle foreign bodies found in the oropharyngeal region, compared with sewing needles found in the other locations. A prior history of dietary indiscretion was reported in 4 of the 21 (19.0%) dogs.

Sewing needle ingestion was witnessed or suspected for 29 of 37 (78.4%) cats with clinical signs. Only 11 of these 37 (29.7%) cats with suspected sewing needle ingestion had other abnormalities noted by the owner at home. When evaluated on the basis of location of a sewing needle, significantly more cats with a sewing needle in the oropharyngeal region had anorexia (5/11; $P = 0.035$), retching (4/11; $P = 0.051$), and cervical swelling (3/11; $P = 0.021$), compared with the number of cats with a sewing needle in the upper or lower gastrointestinal tract.

Cats with a sewing needle foreign body in the upper gastrointestinal tract were significantly more commonly lethargic (2/18; $P = 0.024$) and anorectic (1/18; $P = 0.017$) than were cats with a sewing needle in the oropharyngeal region or lower gastrointestinal tract. Cats with a sewing needle in the lower gastrointestinal tract did not have distinguishing historical abnormalities. Only 1 of 37 (2.7%) cats with clinical signs had a prior history of dietary indiscretion.

Oropharyngeal location of a foreign body—The median body weight of the 7 dogs with a sewing needle foreign body in the oropharyngeal region was 7.2 kg (15.84 lb; range, 3.5 to 49.2 kg [7.70 to 108.24 lb]). Physical examination findings for 6 of these 7 dogs were suggestive of an oropharyngeal location for the foreign body; these findings included resistance to examination of the oral cavity (2 dogs), excessive swallowing (1 dog), sensitivity to ventral cervical flexion (1 dog), or ventral mandibular swelling (1 dog). The sewing needle was visible during examination in 1 dog. Additional physical examination findings included a median rectal temperature of 39.33°C (102.8°F; range, 38.11° to 39.83°C [100.6° to 103.7°F]) and a median heart rate of 126 beats/min (range, 120 to 168 beats/min).

For the 11 cats with a sewing needle foreign body in the oropharyngeal region, median body weight was 5.2 kg (11.44 lb; range, 1.4 to 7.6 kg [3.08 to 16.72 lb]), median rectal temperature was 38.83°C (101.9°F; range, 37.5° to 40.61°C [99.5° to 105.1°F]), median heart rate was 190 beats/min (range, 160 to 240 beats/min), and median respiratory rate was 49 breaths/min (range, 30 to 140 breaths/min). Physical examination findings consistent with a foreign body in the oropharyngeal region included a visible needle (8 cats) and ventral cervical swelling (3 cats). Of these 11 cats, there was 1 with a ruptured abscess, 1 with ptyalism, and 1 with signs of ventral cervical discomfort. One cat did not have physical examination findings suggestive of oropharyngeal involvement; however, only a brief examination was performed because of the cat's aggressive behavior.

The proportion of cats with a sewing needle foreign body in the oropharyngeal region was not significantly ($P = 0.776$) different, compared with the proportion of dogs with a sewing needle foreign body in the oropharyngeal region (Table 1). However, a needle was visible during physical examination in significantly ($P = 0.05$) more cats than dogs.

Upper gastrointestinal tract (esophagus and stomach) location of a foreign body—The 10 dogs with a sewing needle foreign body in the stomach had a median body weight of 17.9 kg (39.38 lb; range, 5.6 to 29.7 kg [12.32 to 65.34 lb]). Median rectal temperature was 39.22°C (102.6°F; range, 38.44° to 39.78°C [101.2° to 103.6°F]), and median heart rate was 132 beats/min (range, 95 to 176 beats/min). Hydration status was assessed as normal. Respiratory rate was reported for only 5 dogs, with a median of 48 breaths/min (range, 28 to 80 breaths/min). Four dogs had physical examination findings suggestive of a foreign body in the stomach; these findings included tensing of the abdominal muscles or signs of pain during palpation of the abdominal region. Thread presumably attached to a sewing needle was not detected in the sublingual region in any of the dogs.

For the 19 cats with a sewing needle foreign body in the upper gastrointestinal tract, median body weight was 4.2 kg (9.24 lb; range, 2.5 to 6.6 kg [5.50 to 14.52 lb]), median rectal temperature was 39.22°C (102.6°F; range, 37.72° to 40.28°C [99.9° to 104.5°F]), median heart rate was 200 beats/min (range, 150 to 240 beats/min), and median respiratory rate was 40 breaths/min (range, 24 to 72 breaths/min). Hydration status was assessed as normal for 18 of these 19 cats. Physical examination findings suggestive of a foreign body in the upper gastrointestinal tract were found in 6 cats; these findings included tensing of the abdominal muscles or signs of pain in 5 cats and coughing in 1. Thread presumably attached to a sewing needle was not detected in the sublingual region in any of the cats.

Lower gastrointestinal tract (small and large intestines) location of a foreign body—For the 4 dogs with a sewing needle foreign body in the lower gastrointestinal tract, median body weight was 7.4 kg (16.28 lb; range, 4.4 to 21.6 kg [9.68 to 47.52 lb]), median rectal temperature was 39.11°C (102.4°F; range, 38.39° to 39.44°C [101.1° to 103.0°F]), and median heart rate was 115 beats/min (range, 72 to 180 beats/min). Respiratory rate was reported for only 2 dogs (28 and 30 breaths/min). Hydration status was abnormal in 2 of the 4 dogs. Tensing of abdominal muscles or signs of pain were detected during palpation of the abdominal region in 3 dogs; in 1 of those dogs, thread presumably attached to a sewing needle was visible protruding from the rectum.

For the 7 cats with a sewing needle foreign body in the lower gastrointestinal tract, median body weight was 5.1 kg (11.22 lb; range, 3.1 to 5.6 kg [6.82 to 12.32 lb]), median rectal temperature was 38.56°C (101.4°F; range, 37.33° to 39.5°C [99.2° to 103.1°F]), median heart rate was 200 beats/min (range, 120 to 240 beats/min), and median respiratory rate was 35.5 breaths/min (range, 30 to 80 breaths/min). Hydration status was assessed as abnormal for 3 cats. Physical examination findings were suggestive of a sewing needle foreign body in the lower gastrointestinal tract in 2 cats (tensing of abdominal muscles or signs of pain in one cat

and thread [presumably attached to a sewing needle] protruding from the rectum of the other cat). A thread was also visible in the sublingual region of 1 cat with a sewing needle in the lower gastrointestinal tract.

Hematologic and laboratory findings—Determination of electrolyte (sodium, chloride, and potassium) status, PCV, and total solids, BUN, blood creatinine, blood glucose, and venous blood gas concentrations was performed on an emergency basis for 40 of 58 (69.0%) animals (11/21 dogs and 29/37 cats). The median values for all variables were within reference ranges, and there were no significant differences in the median values based on the location of the sewing needle for both dogs (range of *P* values, 0.204 to 0.907) and cats (range of *P* values, 0.086 to 0.887).

Cytologic examination findings, microbial culture results, or gross description of local discharge was available for 7 of 10 animals (2/5 dogs and 5/5 cats) with perforation and suspected infection. In all animals, the discharge was described as septic or suppurative inflammation. Aerobic bacterial culturing was performed on samples from 2 animals. An α -hemolytic *Streptococcus* sp was cultured from a cat with perforation of the thoracic portion of the esophagus, and *Escherichia coli* and an *Enterococcus* sp were isolated from a dog with septic peritonitis secondary to perforation in the ileocolic region.

Diagnostic imaging—Radiography was performed on 50 (86.2%) animals (19/21 [90.5%] dogs and 31/37 [83.8%] cats), but correlation of radiographic findings with clinical findings at the time of sewing needle removal could be compared in only 34 animals. Radiographic findings correlated well with the surgical location of a sewing needle for the oropharyngeal region (7/7) and upper gastrointestinal tract (21/23) but poorly for the lower gastrointestinal tract (1/4). Advanced imaging techniques were required for 4 of 58 (6.9%) animals; this included ultrasonography in 2 animals to confirm radiographic suspicion of perforation and fluoroscopy in 2 other animals to identify a sewing needle that perforated the cervical portion of the esophagus of 1 dog and to identify the location of a sewing needle in the small intestines that was not detected via palpation during initial assessment of 1 cat.

Definitive treatment—Definitive treatment was provided to 52 (89.7%) animals (20/21 [95.2%] dogs and 32/37 [86.5%] cats). For 6 animals, treatment was declined, and animals (1 dog and 5 cats) were discharged from the hospital and lost to follow-up monitoring. Sewing needle foreign bodies were radiographically identified in the lower gastrointestinal tract of each of these 6 animals.

Overall, the median interval from witnessed exposure to definitive treatment increased as the sewing needle in the gastrointestinal tract became less accessible in both dogs (oropharyngeal region, 240 minutes; upper gastrointestinal tract, 375 minutes; and lower gastrointestinal tract, 365 minutes) and cats (oropharyngeal region, 87 minutes; upper gastrointestinal tract, 250 minutes; and lower gastrointestinal tract, 722 minutes); however, there were too few animals with a foreign body in the lower gastrointestinal tract to make meaningful statistical comparisons.

All sewing needle foreign bodies in the oropharyngeal region were removed in animals (7 dogs and 11 cats) that had been sedated or anesthetized. There were no immediate complications recorded. Endoscopy was initially performed in all animals with a suspected sewing needle foreign body in the stomach. Endoscopic removal of the foreign body was successful in 8 of 9 dogs and 18 of 19 cats; the 2 failures resulted because the sewing needle had moved into the small intestines. A sewing needle foreign body was successfully removed via enterotomy, with no postoperative complications, in 3 of 3 dogs (2 jejunum and 1 ileum) and 2 of 2 cats (1 jejunum and 1 ileum); these 5 animals included the 2 animals in which attempts to endoscopically remove a sewing needle from the stomach were unsuccessful. One dog was monitored in the hospital and passed the sewing needle from the lower gastrointestinal tract in < 24 hours with no complications. One dog was transferred to another hospital, where a laparotomy and gastrotomy were used successfully to remove a sewing needle that had perforated the stomach; there were no postoperative complications in that dog.

Perforation was confirmed at the time of surgery in 10 of 58 (17.2%) animals (5/21 [23.8%] dogs and 5/37 [13.5%] cats); there was no significant (*P* = 0.471) difference between dogs and cats with regard to perforation. The most common location for perforation was the oropharyngeal region in 5 of 10 animals (2/5 dogs and 3/5 cats). Perforation of the upper gastrointestinal tract was the second most commonly identified site (2/5 dogs and 2/5 cats), with specific locations including the cervical portion of the esophagus (1 cat and 1 dog), thoracic portion of the esophagus (1 cat), and stomach (1 dog). Only 1 dog had a perforation in the lower gastrointestinal tract, which was at the ileocolic junction. Perforation was significantly (*P* < 0.001) more common in animals for which an owner was unaware of sewing needle ingestion (8/16), compared with the proportion of animals for which an owner witnessed or suspected sewing needle ingestion (2/42 [4.8%]).

Thread was attached to the sewing needle in 13 of 18 (72.2%) dogs and 24 of 33 (72.7%) cats. None of the animals underwent surgery because of signs of intestinal obstruction caused by the thread, and intestinal intussusception was not evident at the time of surgery. The length of the attached thread was rarely and inconsistently recorded.

Fifty-one of 52 (98.1%) animals that received definitive treatment made a complete recovery. The 1 nonsurvivor was a cat in which a sewing needle had perforated the distal aspect of the thoracic portion of the esophagus, which resulted in septic mediastinitis. The cat was euthanized at the owner's request because of a poor prognosis and the estimated cost of care.

Incidental finding of a sewing needle foreign body—Sewing needle foreign bodies were identified incidentally in 7 of 65 (10.8%) animals (6 dogs and 1 cat). Dogs were significantly (*P* = 0.017) more likely than cats to have a sewing needle identified as an incidental finding. Location of the sewing needle included 4 in the abdominal region (2 in the liver, 1 in the omentum, and 1 unspecified), 1 in the thoracic region, and 2 in the oropharyngeal or cervical region. The incidentally

identified sewing needle was surgically removed from 4 of 7 animals; thread was attached to only 1 of these 4 sewing needles. All 4 animals recovered without complications. The remaining 3 animals with incidentally identified sewing needle foreign bodies did not receive further treatment. Variable amounts of follow-up information were available on these animals for 7 days to 6 weeks. During the follow-up period, no complications or signs of further migration of the sewing needle were detected for these 3 untreated animals.

Discussion

To our knowledge, the study reported here is the first in which there is a description of sewing needle foreign bodies in a large number of dogs and cats. It is standard care at our veterinary medical teaching hospital that animals with known sewing needle ingestion or clinical signs attributable to a sewing needle receive definitive treatment for the sewing needle because of concerns about extragastrointestinal migration⁴⁻⁷ that may result in life-threatening complications. This treatment approach to sewing needle ingestion was highly successful and resulted in survival to discharge of 98.1% of treated patients. In the present study, the perforation rate for the gastrointestinal tract was 17.2% (10/58). The authors are not aware of any comparable rates in the veterinary literature, but similar rates for perforation of sharp foreign bodies (15% to 35%) have been reported in humans.²

Sewing needles were found in an oropharyngeal location in approximately one-third of animals with clinical signs associated with the foreign body. Pets with a sewing needle foreign body in the oropharyngeal region typically had a shorter interval from time of ingestion or suspected exposure until time of evaluation at the emergency service. In contrast to findings in animals with a sewing needle foreign body in the upper or lower gastrointestinal tract, 6 of 7 dogs and 10 of 11 cats with a sewing needle in the oropharyngeal region had abnormalities that were detected during physical examination. It could be hypothesized that the clinical abnormality increased the owners' concerns, which led them to bring their animal in for evaluation. The clinical signs most commonly found during physical examination included retching in dogs and anorexia, retching, or cervical swelling in cats.

Both anatomic and physiologic barriers likely contribute to resistance of passage of sewing needles through the oropharynx. To pass successfully through the gastrointestinal tract, a sewing needle must traverse over the base of the tongue without penetrating the hard or soft palate, then pass through the oropharynx, which is located dorsal to the cervical portion of the esophagus. Additionally, the physiologic barrier of the gag reflex must be overcome before a sewing needle can pass into the esophagus because the horizontal fibers of the cricopharynx typically are under involuntary control. These barriers all inhibit progression of a sewing needle foreign body into the upper gastrointestinal tract. In the present study, a sewing needle foreign body was successfully removed without complication for all animals with a sewing needle located in the oropharyngeal region.

Three animals with a sewing needle foreign body in the upper gastrointestinal tract that had clinical signs associated with the foreign body also had esophageal perforation. Foreign bodies in the esophagus typically are found at 4 naturally narrow locations: immediately caudal to the pharynx (cricopharyngeus muscle or superior esophageal sphincter), thoracic inlet, heart base, or distal portion of the esophagus.¹¹ In the present study, 2 of 3 sewing needles were suspected to have penetrated the esophagus at a point immediately caudal to the pharynx, and the third was suspected to have penetrated the esophagus at a point immediately caudal to the heart.

Surgical versus medical management of esophageal lacerations remains a debated subject. Healing potential of the esophagus is limited by its lack of a serosal surface and constant mobility, which increases incisional stress and delays healing.¹¹ However, healing of experimentally induced esophageal perforations up to 12 mm in diameter without surgical intervention has been described in dogs.¹² In that study,¹² an effective seal was formed as a result of substantial local contraction of the esophagus after removal of the perforating object, and no additional surgical debridement or repair was needed. However, delayed intervention (ie, removal of the penetrating foreign body) increases tissue exposure to bacteria-laden saliva, which increases the risk of delayed healing and may complicate recovery secondary to extension of bacteria into the mediastinum.^{11,13-15}

Prognosis for an animal with esophageal perforation differs depending on the location, extent of esophageal trauma, and time to intervention.¹⁶ In humans, mortality rates of 6% for perforation of the cervical portion of the esophagus and 44% for perforation of the thoracic portion of the esophagus have been reported.¹⁷ To our knowledge, mortality rates have not been reported for perforation of the cervical portion of the esophagus in domestic animals, but in the present study, none of the animals developed fatal complications. However, the mortality rate for animals with perforation of the thoracic portion of the esophagus reportedly is 42% in those managed medically¹⁶ and as high as 75% in those requiring surgical intervention.^{13,14} Esophageal perforation secondary to ingestion of other foreign bodies, most commonly reported secondary to ingestion of bones or rawhides, has been described in dogs.^{13,14,16,18} Esophageal perforation secondary to a bone foreign body with successful recovery after esophageal resection and anastomosis was described in a cat in 2011.¹⁹ In the present study, the only death was a cat that was euthanized; that cat had ingested a sewing needle 77 hours prior to hospitalization, which perforated the caudal aspect of the esophagus and caused local septic mediastinitis. The location of the lesion and delay until examination and potential treatment were suspected to have increased the risk for development of septic mediastinitis. It is unknown whether this cat would have survived had the owners opted for treatment.

In the present study, 8 of 10 perforations in animals with clinical signs associated with the foreign body were oral to the stomach. Although the exact etiology has not yet been determined, the narrow anatomic locations throughout the upper gastrointestinal tract are, at least in part, responsible for the increased risk of perfo-

ration. There were only 2 perforations in the stomach and lower gastrointestinal tract, despite the fact they have similar narrow locations. Possible explanations for the decreased incidence of perforations of the stomach and lower gastrointestinal tract include retraction of the local intestinal mucosal, increased mucous production, and local intestinal dilation attributable to mechanical stimulation by the needle. Interestingly, investigators in previous studies^{20,21} found that mechanical stimulation of the intestines by a sharp needle results in mucosal retraction, marked localized pallor, increased mucous production, and local dilation. This local physiologic response may in part explain the decreased incidence of perforations.

Given the high incidence of perforation (10/58 [17.2%]) in the present study and the known risk of problematic migration of sewing needle foreign bodies, which may result in septic peritonitis (which was reported in 1 dog of the present study), traumatic pericarditis,⁴ caval syndrome,⁶ and urolithiasis,⁷ we urge adoption of the American Society for Gastrointestinal Endoscopy Practice Guidelines.³ These guidelines recommend endoscopic removal of all amendable ingested sharp objects.³ In the present study, there was a high success rate for endoscopic retrieval of a sewing needle foreign body from the stomach, with the only failures occurring secondary to advancement of the sewing needle aboral to the stomach. Increased gastric ingesta, debris, or fluid can complicate endoscopic retrieval,²² although we did not find evidence of this in the present study. A previous veterinary study¹³ conducted to evaluate the success of endoscopy for foreign body retrieval revealed success rates of 26% to 86%. This is similar to the results for the present study, in which endoscopy was successful in 26 of 28 (92.9%) animals. To the authors' knowledge, the present study is the first in which endoscopic success rates for retrieval of sewing needle foreign bodies in the stomach of cats (18/19) has been reported.

Further investigation is needed for sewing needle foreign bodies that migrate into the intestines beyond the reach of an endoscope. Successful surgical retrieval of the sewing needle was performed in 6 animals in the present report. Even though there were no complications in the present study, there is still a risk of anesthetic and postoperative complications, such as dehiscence of the enterotomy incision, which has been reported in 7% to 17% of animals.²⁴ This treatment protocol is in contrast to traditional veterinary expert opinion and reports^{3,23} for humans, which have suggested that if a sewing needle reaches the stomach, it typically will pass through the intestinal tract without complications. Evidence for intensive monitoring versus surgical removal is lacking in veterinary medicine. In humans, the American Society for Gastrointestinal Endoscopy Practice Guidelines recommend intensive monitoring for signs of perforation and daily radiography. Surgical intervention is indicated when the patient has an acute onset of clinical signs or the sharp object fails to advance for 3 consecutive days.³ In the present study, only 1 dog was managed medically; that dog successfully passed the sewing needle. Because only 1 dog was managed medically and, to the authors' knowledge,

there have been no other reports of medically managed animals, future prospective studies are needed to evaluate the safety of this conservative treatment approach.

In the present study, 7 (10.8%) sewing needles were found incidentally; 4 of these were found in the abdominal cavity. The authors are aware of 1 other report⁵ of a dog with a sewing needle that migrated without causing clinical signs. In that report,⁵ the sewing needle migrated into the caudal mediastinum and heart of a 3-year-old dog, which remained free of clinical signs for 6 months before being lost to follow-up monitoring. Clinical signs following perforation are dependent on the duration of penetration, microenvironment at the site of perforation, and migration path. As indicated by the 7 animals in the present report, perforation does not always result in acute onset of clinical signs, and there is a possibility that migration of a sewing needle foreign body may be a subclinical condition.

However, extraintestinal migration of an ingested sewing needle can lead to serious morbidity and potentially to death. The authors of 1 case report⁴ described transdiaphragmatic migration in a dog that resulted in life-threatening pericardial effusion and hemothorax secondary to a myocardial laceration. In addition, various other aberrant migrations with serious clinical consequences have been reported, although most had positive outcomes.^{6,7}

Further evaluation is needed to determine the most appropriate monitoring and intervention for subclinical extragastrointestinal migration of a sewing needle. A report²⁵ of humans with asymptomatic extragastrointestinal migration of sewing needle foreign bodies reveals that foreign bodies can remain stable for 22 years. Analysis of results of the present study suggested that the clinical approach to a patient with an extragastrointestinal sewing needle foreign body may include intensive monitoring to detect clinical signs resulting from the migration of the sewing needle. Although initial interventions may be avoided with this approach, removal may still be necessary, depending on the risks associated with the procedures and continued migration of the sewing needle.

The present study had inherent limitations, including lack of long-term follow-up monitoring, missing data, treatment bias, and referral bias. Although our veterinary teaching hospital is a tertiary referral center, none of the animals were referred because of concerns about perforation, and many of the patients were evaluated by personnel in the emergency service, which possibly made the population more representative of a non-tertiary referral hospital.

Another potential limitation was the reported rate of perforation, excluding the 7 animals with a sewing needle identified as an incidental finding, which may have underestimated the true incidence. Animals with incidentally detected sewing needle foreign bodies represented a unique population, and despite surgical removal in many animals, definitive perforation of the gastrointestinal tract was not proven. In humans, abuse and mental disorders have led to percutaneous insertion of sewing needles, which has resulted in aberrant migration.²⁵ Although abuse was not suspected in any of the animals in the study reported here, it could not

be ruled out. Gastrointestinal tract perforation without clinical signs has been reported in humans.^{3,25,26} In the present study, only 8 of 21 (38.1%) dog owners and 8 of 37 (21.6%) cat owners reported that clinical signs were detected at home; therefore, there is a possibility that more animals may have had unwitnessed sewing needle ingestion and needle migration without clinical signs. The actual rate of perforation could not be determined.

Analysis of results of the present study suggested that an animal that ingests a sewing needle foreign body and receives definitive treatment has an excellent prognosis. Perforation was detected in 10 of 58 (17.2%) animals and may result in severe, potentially life-threatening complications. Future studies are required to determine whether an ingested sewing needle that passes atraumatically into the stomach can pass through the remainder of the intestines with minimal risk and whether such animals can be managed medically.

a. Stata, version 12 for Mac, Stata Corp, College Station, Tex.

References

- Weiland ST, Schurr MJ. Conservative management of ingested foreign bodies. *J Gastrointest Surg* 2002;6:496–500.
- Vizcarrondo FJ, Brady PG, Nord HJ. Foreign bodies of the upper gastrointestinal tract. *Gastrointest Endosc* 1983;29:208–210.
- Ikenberry SO, Jue TL, Anderson MA, et al. American Society for Gastrointestinal Endoscopy guideline: management of ingested foreign bodies and food impactions. *Gastrointest Endosc* 2011;73:1085–1091.
- Calvo I, Weiland L, Pratschke K. Traumatic myocardial laceration as a result of suspected cranial migration of a sewing needle from the stomach of a dog. *Aust Vet J* 2011;89:444–446.
- Hunt GB, Bellinger CR, Allan GS, et al. Suspected cranial migration of two sewing needles from the stomach of a dog. *Vet Rec* 1991;128:329–330.
- Smith KR. Acquired caudal vena cava occlusion and high protein ascites in a dog. *J Small Anim Pract* 1994;35:261–265.
- Houston DM, Eaglesome H. Unusual case of foreign body—induced struvite urolithiasis in a dog. *Can Vet J* 1999;40:125–126.
- Billen F, Day MJ, Clercx C. Diagnosis of pharyngeal disorders in dogs: a retrospective study of 67 cases. *J Small Anim Pract* 2006;47:122–129.
- Basher AWP, Fowler JD. Conservative versus surgical management of gastrointestinal linear foreign bodies in the cat. *Vet Surg* 1987;16:135–138.
- Felts JF, Fox PR, Burk RL. Thread and sewing needles as gastrointestinal foreign bodies in the cat: a review of 64 cases. *J Am Vet Med Assoc* 1984;184:56–59.
- Runge J, Culp W. Surgical treatment of esophageal disease. In: Monnet E, ed. *Small animal soft tissue surgery*. Ames, Iowa: Wiley-Blackwell, 2013;304–317.
- Killen DA, Pridgen WR. Tolerance of the dog to esophageal perforation. *J Surg Res* 1961;1:315–317.
- Gianella P, Pfammatter NS, Burgener IA. Oesophageal and gastric endoscopic foreign body removal: complications and follow-up of 102 dogs. *J Small Anim Pract* 2009;50:649–654.
- Parker NR, Walter PA, Gay J. Diagnosis of surgical management of esophageal perforation. *J Am Anim Hosp Assoc* 1989;25:587–594.
- Borgström S, Lundh B. Healing of esophageal anastomosis: animal experiments. *Ann Surg* 1959;150:142–148.
- Ryan WW, Greene RW. The conservative management of esophageal foreign bodies and their complications: a review of 66 cases in dogs and cats. *J Am Anim Hosp Assoc* 1975;11:243–249.
- Moberly AC, Fritsch MH, Mosier KM. Management of sword-swallower injuries. *J Laryngol Otol* 2011;125:217–219.
- Thompson HC, Cortes Y, Gannon K, et al. Esophageal foreign bodies in dogs: 34 cases (2004–2009). *J Vet Emerg Crit Care (San Antonio)* 2012;22:253–261.
- Cariou MPL, Lipscomb VJ. Successful surgical management of a perforating oesophageal foreign body in a cat. *J Feline Med Surg* 2011;13:50–55.
- King CE, Arnold LM, Church JG. The physiological role of the intestinal mucosal movements. *Am J Physiol* 1922;61:80–84.
- Guilford WG, Strombeck DR. Intestinal obstruction, pseudoobstruction, and foreign bodies. In: Guilford WG, Center SA, Strombeck DR, et al, eds. *Strombeck's small animal gastroenterology*. 3rd ed. Philadelphia: WB Saunders Co, 1996;487–502.
- Tams TR, Spector DJ. Endoscopic removal of gastrointestinal foreign bodies. In: Tams TR, Rawlings CA, eds. *Small animal endoscopy*. 3rd ed. St Louis: Elsevier, 2011;245–263.
- Strombeck DR. Obstruction of the gastrointestinal tract. In: Strombeck DR, ed. *Small animal gastroenterology*. Davis, Calif: Stonegate Publishing Co, 1979;291–300.
- Brown DC. Small intestine. In: Tobias KM, Johnston SA, eds. *Veterinary surgery small animal*. St Louis: Elsevier, 2012;1513–1541.
- Feng QZ, Wang J, Sun H. A sewing needle in liver: a case report and review of the literature. *Cases J* 2009;2:6520–6523.
- Hashmonai M, Kaufman T, Schramek A. Silent perforations of the stomach and duodenum by needles. *Arch Surg* 1978;113:1406–1409.