Clinical findings and patient outcomes following surgical treatment of chronic gastrointestinal foreign body obstructions in dogs and cats: 72 cases (2010–2020)

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Abstract

The objective of this study was to characterize clinicopathologic factors and outcomes for dogs and cats with chronic small intestinal foreign body obstructions (CFBO). Medical records of 72 dogs and cats diagnosed with CFBO between 2010 to 2020 were reviewed for duration of clinical signs, pre-surgical and intraoperative findings, complications, and outcomes. A chronic foreign body was defined as clinical signs, or the observation of foreign material ingestion, at least 7 days prior to presentation. Twenty-two (31%) patients had a small intestinal resection and anastomosis (SIRA) and were more likely to have longer duration of clinical signs (P = 0.01). Eleven (15%) patients developed major post-operative complications. Sixty-eight (94%) patients survived to follow-up. Although all patients that did not survive (n = 4, 100%) had a SIRA, patients with CFBO had a high survival rate. Therefore, clients should not be deterred from pursuing surgical intervention.

Résumé

*L'objectif de cette étude était de caractériser les facteurs clinico-pathologiques et les résultats pour les chiens et les chats atteints d'obstructions chroniques par corps étrangers de l'intestin grêle (CFBO). Les dossiers médicaux de 72 chiens et chats diagnostiqués avec CFBO entre 2010 et 2020 ont été examinés pour la durée des signes cliniques, les résultats pré-chirurgicaux et peropératoires, les complications et les résultats. Un corps étranger chronique était défini comme des signes cliniques ou l'observation d'une ingestion de corps étrangers au moins 7 jours avant la présentation. Vingt-deux (31 %) patients ont subi une résection et anastomose de l'intestin grêle (SIRA) et étaient plus susceptibles d'avoir des signes cliniques de plus longue durée (*P = *0,01). Onze (15 %) patients ont développé des complications postopératoires majeures. Soixante-huit (94 %) patients ont survécu jusqu'au suivi. Bien que tous les patients qui n'ont pas survécu (*n = *4, 100 %) aient eu un SIRA, les patients avec CFBO avaient un taux de survie élevé. Par conséquent, les clients ne doivent pas être dissuadés de poursuivre une intervention chirurgicale.*

(Traduit par Docteur Serge Messier)

Introduction

Gastrointestinal foreign body obstructions are a common clinical finding in small animal veterinary patients that can lead to detrimental changes in hydration, mentation, acid/base disturbances, and electrolyte abnormalities (1–6). The onset of clinical signs is variable and depends on the location of the foreign body, nature of the obstruction (complete *versus* partial obstruction), whether or not there is a linear component, and the duration of obstruction (1–3,7–9). The most common clinical signs include vomiting, regurgitation, lethargy, anorexia or hyporexia, weight loss, and abdominal discomfort that can develop within hours of ingestion and persist for weeks if left untreated (1–3,5,7). Foreign body obstructions can also alter intestinal thickness as well as compromise the intestinal microvasculature. Intestinal thickness may be decreased in cases of tissue devitalization in more chronic cases (10). These patients may be more likely to require a small intestinal resection and anastomosis (SIRA), which has been shown to significantly increase the risk of intestinal dehiscence compared to patients undergoing enterotomy (11). Other factors that have been shown to be associated with increased morbidity or mortality following intestinal surgery include presence of a linear foreign body, preoperative and postoperative hypoalbuminemia, intra-operative hypotension, increased duration of surgery and anesthesia, and delayed enteric nutrition (10,12–15). The success rate of surgery following a foreign body obstruction has been documented to decrease with increased duration of clinical signs of obstruction (5). For this reason, prompt stabilization and surgical intervention is necessary

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Table I. Descriptive statistics.

Variable	Dogs (n = 52)	Cats (n = 20)	Total (N = 72)
Female	15 (29%)	12 (60%)	27 (38%)
Male	37 (71%)	8 (40%)	45 (63%)
Duration of clinical signs (days)	25 ± 53.19	12 ± 5.77	21 ± 45.52
ALB level	(n = 43)	(n = 13)	(n = 56)
Normal	27 (63%)	11 (85%)	38 (68%)
Hypoalbuminemia	12 (28%)	N/A	12 (21%)
Hyperalbuminemia	4 (9%)	2 (15%)	6 (11%)
PSP	(n = 52)	(n = 20)	(n = 72)
	9 (18%)	0 (0%)	9 (13%)

ALB — Albumin; PSP — Pre-operative septic peritonitis; n — Number of cases; N — Total number of cases.

to prevent patient decompensation and further damage to the gastrointestinal tract including intestinal perforation or necrosis and subsequent septic peritonitis. Aside from this observation, there is limited literature evaluating the clinical implications of chronic small intestinal foreign body obstructions (CFBO).

Given the concern for decreased surgical success with prolonged clinical signs of foreign body obstruction, the objective of this study was to describe clinicopathologic characteristics and determine outcome for dogs and cats with CFBO. Since intestinal resection and anastomoses increase incidence of intestinal dehiscence and chronicity of obstruction can lead to decreased intestinal thickness, our secondary objective was to determine if CFBO was associated with the need for a SIRA.

Materials and methods

Case selection criteria

Medical records of cats and dogs admitted to the Matthew J. Ryan Veterinary Hospital of the University of Pennsylvania and diagnosed with a small intestinal CFBO between January 2010 and February 2020 were retrospectively reviewed. Cases were included if dogs and cats had a known foreign body ingestion and/or clinical signs of small intestinal obstruction for a minimum of 7 d before presentation, and when foreign body obstructions were confirmed *via* exploratory laparotomy. Cases were excluded if the medical record was incomplete (surgical reports, anesthesia records, and post-operative records with duration of hospitalization, and immediate postoperative outcome recorded), there was other known gastrointestinal disease processes (*e.g.,* inflammatory bowel disease, protein losing enteropathy, or gastrointestinal neoplasia), if exploratory surgery was negative, or if the foreign body had passed into the colon. Post-operative follow-up, if available, was assessed by in-person evaluations by the surgical team or referring veterinarian, client telephone call, or a combination thereof.

Medical record review

Chronic foreign body was defined as the development of clinical signs, or the observation of ingestion of foreign material along with clinical signs, at least 7 d before presentation. Medical records were reviewed for signalment, physical examination findings, medical history, preoperative bloodwork [packed cell volume (PCV), total solids (TS), albumin concentrations], preoperative imaging, and post-operative management. Foreign body obstructions were diagnosed by either a radiology resident or Board-certified radiologist using abdominal radiographs and/or ultrasonography. Subjective description of the gastrointestinal tract and information about intestinal perforations, septic peritonitis, type of foreign body obstruction [linear (a pyloric or sublingual anchor with small intestinal plication) *versus* non-linear], and procedure type (gastrotomy, enterotomy, intestinal resection and anastomosis) were noted. Diagnosis of septic peritonitis was made based on cytologic findings of intracellular bacteria on peritoneal fluid obtained pre-operatively *via* abdominocentesis, and/or positive bacterial culture results from free peritoneal samples taken at the time of surgery. Major complications were defined as complications associated with the surgical procedure requiring additional surgical intervention, prolonged hospitalization, or readmission.

Statistical analysis

Distribution of continuous variables was evaluated visually and by the Skewness and Kurtosis tests for normality, and most continuous variables were not normally distributed. Therefore, results are reported as median (range) and counts (percentages). The Fisher's exact test was used to examine the relationship between categorical variables because the number of observations in some cells was 5 or fewer. A P-value < 0.05 was considered significant for all tests. All statistical evaluations were performed using a statistical software package (Stata, version 14.0 for Mac; Stata Corp, College Station, Texas, USA).

Results

Seventy-two cases were included in the study. Descriptive data are listed in Table I. Twenty-one dog breeds were represented, with the most common breeds being mixed breed dogs (16/52, 31%), American pitbull terriers (7/52, 13%), Labrador retrievers (5/52, 10%), English bulldogs (4/52, 8%), and Bernese Mountain dogs (4/52, 8%). Domestic shorthairs represented

Table II. Surgical procedure.

Procedure	Dogs (n = 52)	Cats (n = 20)	Total (N = 72)
Gastrotomy	4 (8%)	1 (5%)	5 (7%)
Enterotomy	19 (37%)	17 (85%)	36 (50%)
Gastrotomy + enterotomy(ies)	8 (15%)	1 (5%)	9 (13%)
Small intestinal resection and anastomosis (SIRA)	21 (40%)	1 (5%)	22 (31%)

n — Number of cases; N — Total number of cases.

most of the cat population (17/20, 85%). Median age was 4 y old for both dogs (range: 0.33 to 13 y old) and cats (range: 0.58 to 16 y old).

The duration of clinical signs or time from known foreign body ingestion before hospital admission ranged from 7 to 365 d (median: 10.5 d). For dogs, the range was 7 to 365 d (median: 10.5 d) and for cats, the range was 7 to 28 d (median: 11.5 d). Twenty of 72 patients (28%) were considered underweight at the time of presentation [body condition score (BCS) < 4/9]; 17/51 (33%) of dogs and 3/20 (15%) of cats were underweight. Albumin levels were available for 56 patients; 12/56 (21%) were hypoalbuminemic (< 2.5 g/dL), 6/56 (11%) were hyperalbuminemic (> 3.8 g/dL), and 38/56 (68%) had normal albumin levels [reference range (RR): 2.5 to 3.8 g/dL].

Surgical outcomes

Twenty of 72 patients (28%) had a linear foreign body (LFB), whereas in the remaining 72% of patients (52/72), the foreign body was non-linear (NLFB). The types of surgical procedures performed are listed in Table II. A small intestinal resection and anastomosis (SIRA) was performed in 22/72 (31%) patients. Half of the patients (10/20, 50%) with a LFB required a SIRA. Nine of 72 patients (13%) had a pre-surgical septic peritonitis (PSP) secondary to intestinal perforation confirmed at the time of surgery. Seven of the 9 patients (78%) with PSP required a SIRA.

Post-operative outcomes

For the patients that survived to discharge (70/72, 97%), post-operative hospitalization time ranged from 1 to 7 d (median: 2 d). Hospitalization times were shorter for patients with NLFB (median: 2 d) compared with LFB (median: 3 d). Fourteen of 72 (19%) patients had a feeding tube, 1/14 (7%) had an esophageal tube, and 13/14 (93%) had a nasogastric tube placed either intra-operatively or post-operatively. The reasons for feeding tube placement varied based on clinician preference, but common reasons included prophylactic placement (8/14, 57%), persistent regurgitation post-operatively (5/14, 36%), and ileus (1/14, 7%).

Major post-operative complications were noted in 11/72 (15%) of cases and included aspiration pneumonia requiring treatment and longer hospitalization (2/11, 18%), myocardial infarction (1/11, 9%), hypotension requiring post-operative pressors (2/11, 18%), cardiopulmonary arrest (2/11, 18%), and post-operative septic peritonitis (3/11, 27%). One patient (1/11, 9%) developed small intestinal obstruction secondary to a granuloma at the original SIRA site 3 d after surgery and required a second SIRA. For the patients that developed post-operative septic peritonitis, 1 occurred 2 d after surgery in hospital, whereas the other 2 were diagnosed during follow-up evaluation at 7 and 21 d after surgery. One of the 2 patients that suffered cardiopulmonary arrest developed aspiration pneumonia after successful resuscitation.

Of the 72 patients with CFBO, 68 (94%) survived. One patient was euthanized following cardiopulmonary arrest several hours after surgery. Although this dog was successfully resuscitated, humane euthanasia was elected due to poor prognosis and concerns for neurologic function. This patient had a septic abdomen noted at the time of surgery. Most patients with PSP survived to discharge (8/9, 89%). Three patients were euthanized due to the development of septic peritonitis following surgical intervention; all 3 patients had a SIRA performed (3/22, 14%) (P = 0.03), but none had evidence of PSP. Patients that had a SIRA were more likely to be euthanized or die (4/22, 18%) compared to others (0/50, 0%) (P = 0.007). All patients that did not survive (euthanized) had a SIRA performed at the time of initial surgery (n = 4, 100%).

Discussion

Patients with gastrointestinal foreign body obstructions that have longer duration of clinical signs have an increased mortality based on a study by Hayes (5). However, the mean duration of signs was evaluated with no control of potential confounding variables that may have also affected outcomes such as type of surgical intervention. To our knowledge, the study reported here is the first to characterize clinicopathologic factors and outcomes of dogs and cats suffering from small intestinal CFBO. Irrespective of the dogma that patients with CFBO may have a poor outcome following surgical intervention, survival rate was high in the present study. In addition, having a CFBO does not change post-operative hospitalization times (mean: 2.67 d) compared to a previous study of cats and dogs with small intestinal foreign body obstructions, with reported means of 2.2 and 2.8 d, respectively (5). That report, however, included both acute and chronic foreign body obstructions, with a mean duration of clinical signs of 4.8 d.

In total, 4 patients with CFBO did not survive (were euthanized) following surgery. All patients that did not survive to the recheck had a SIRA performed. Patients with longer duration of clinical signs or longer known time since foreign body ingestion were more likely to require a SIRA (P = 0.013). Since foreign body obstructions can lead to pressure necrosis on the intestinal mucosa due to compromise of the intestinal microvasculature and decreased intestinal thickness in more chronic cases, it makes sense that longer duration obstructions were more likely to need a SIRA (10). This is particularly important as it can help guide client consultation regarding the need for SIRA and associated risks in small animals with CFBO. Patients undergoing SIRA are at significantly higher risk of intestinal dehiscence and post-operative septic peritonitis compared to others, which leads to a higher risk of non-survival (11). Overall, however, the literature supports that SIRA carries a low risk of failure, ranging from 6.6 to 14.4% in dogs (12–14,16,17). Some data suggest that this number can be shifted by factors including pre-operative septic peritonitis, foreign body obstruction, location of SIRA and intraoperative hypotension (12,13,16). In addition, some papers suggest

that hand-sewn SIRA have a higher dehiscence rate than stapled SIRA (13,15), whereas Duell *et al* (17) suggest both hand-sewn and stapled SIRA to have no difference in the frequency of dehiscence. Since closure technique was not evaluated in the present study, it is not possible to know how this information applies to patients with CFBO.

Studies have shown conflicting correlations between PSP and increased post-operative SIRA dehiscence rate (12–14,16,18). In our study, only 9 patients with CFBO had PSP diagnosed either prior to surgery or intraoperatively, and 1 did not survive. Our paper, however, did not distinguish between partial *versus* complete foreign body obstructions. The risk of intestinal anastomotic leakage can be affected by the cause of obstruction, ischemic tissue, and malnutrition (19). Therefore, a complete obstruction can predispose a patient to having a higher risk of pre-surgical and post-surgical septic peritonitis. It has been reported that patients with complete obstructions, however, have more severe clinical signs (8). Given the chronicity of clinical signs of patients included in this study, it is possible that many of the cases had partial foreign body obstructions instead of complete obstructions, and therefore lower incidence of perforation and subsequent PSP.

In a large series of 208 patients, LFB and NLFB have been shown to have similar prognosis and no evidence of worsened mortality although patients with LFB tend to have longer hospitalization stays (2), which was also noted in our study. Hayes (5), on the other hand, reported that the presence of a LFB was associated with a higher mortality rate than the presence of a NLFB. It was noted, however, that the number of intestinal incisions was a more significant predictor of a poor outcome than the presence of the LFB itself (5). In our study, most patients with CFBO had a discrete foreign body. Hobday *et al* (2) reported that dogs with LFB had more frequent reports of clinical signs (vomiting, anorexia, lethargy, pain on abdominal palpation), which could explain why those patients are less likely to have chronic obstructions and more likely to be treated sooner. Survival rate of patients with chronic LFB from this study (94%) is comparable to the survival rate of patients with LFB reported by Hobday *et al* (2) (96%) and Boag *et al* (6) (98%). Evans *et al* (9) noted that dogs with more long-term chronic LFB did not have increased occurrence of peritonitis or mortality compared to dogs with more acute LFB, however, they reported a survival rate of 78%.

Additional variables that were previously shown to increase risk of surgical site dehiscence and overall morbidity include cachexia and preoperative hypoalbuminemia (12,13,16). Healing of visceral wounds can be affected by chronic weight loss of 15 to 20% due to malnutrition, decreased absorption, and cancer cachexia (10,19). Malnutrition induces intestinal mucosal atrophy, reduced motility, increased incidence of ileus, and the potential for bacterial translocation through the bowel wall, with resultant sepsis (19). Although it is reasonable to assume that a patient with a CFBO would be cachexic, in this study, less than half of patients were considered underweight with a BCS $< 3/9$. One explanation is that some patients may have had milder clinical signs, or the length of their clinical signs may have been too short to create an impact on their overall body condition. As described by Papazoglou and Rallis in 2003 (8), in general, complete obstruction is associated with more dramatic clinical signs and rapid deterioration compared to partial obstruction, which may be associated with more chronic signs of maldigestion and malabsorption. Patients with complete obstruction are often more clinically affected, therefore more likely to be seen and treated sooner (5,8). These patients may not exhibit the same degree of cachexia as patients with longer, but milder, clinical signs. In addition, our study did not evaluate weight before the onset of clinical signs. Some patients may have been obese, and therefore still in appropriate body condition at the time of presentation even after weight loss. Therefore, it may be more accurate to assess the overall percentage of weight loss rather than BCS to determine if there is correlation with patient outcome.

The role of hypoalbuminemia in the rate of intestinal dehiscence varies in the literature. Some studies have documented that patients with hypoalbuminemia (< 2.5 g/dL) are at higher risk for post-operative complications, mainly intestinal dehiscence (9,14). In other reports, no association between hypoalbuminemia and risk of intestinal dehiscence was reported (11,14,17,18). In our study, most patients with CFBO had normal to elevated albumin levels (albumin > 2.5 g/dL). Hemoconcentration secondary to dehydration may have masked underlying hypoalbuminemia in some patients. Since our evaluation is based on blood work from presentation, the number of hypoalbuminemic patients may have been under-detected in our study.

Patients had either preemptive feeding tubes placed intraoperatively or had feeding tubes placed due to a large amount of gastric fluid residual and frequent regurgitation episodes after surgery. In addition, most patients did not receive enteral nutrition through their feeding tubes after surgery. It is important to note that the placement of a feeding tube is not standardized and is also clinician and case-dependent; therefore, it is difficult to conclude why patients with feeding tubes have a tendency of being hospitalized longer than those without a feeding tube. It is possible that longer duration of hospitalization was anticipated by the clinician, which prompted placement.

There were multiple limitations associated with this study. First, the population size was small, leading to the possibility for type II error. Second, there was variability in pre-surgical treatment, anesthetic protocol, surgical techniques, and post-operative management that cannot be controlled in a retrospective study. Further studies with a larger population size, standardized physical examination parameters and re-assessments, and post-operative care protocols are needed to determine how any of the other factors are affected by chronicity of obstruction. It is possible patients had gastrointestinal signs present that were not attributable to the foreign body, which may have caused inclusion of patients with less chronic obstructions. Since this is a tertiary facility, many patients are lost to follow-up. Therefore, there may have been a higher number of patients which had post-operative complications than reflected in the results of this study. The authors are aware that in the absence of a comparison group, it is not possible to say whether a CFBO affects patient outcomes compared with more acute foreign body obstructions. Therefore, future studies with a comparison group and assessment of different variables are needed to better quantify the clinical impact.

Our study demonstrates that patients with CFBO are more likely to have a discrete foreign body and require a SIRA than other surgical procedures for foreign body retrieval. In addition, patients

with SIRA have a higher incidence of dehiscence followed by postoperative septic peritonitis, which is an important factor to discuss with owners before surgical intervention. However, overall, patients with a long duration of clinical signs and chronic foreign body ingestion had a high survival in this study, which can be useful when guiding surgical conversations with pet owners.

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