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# Clinical features and outcomes of dogs with attempted medical management for discrete gastrointestinal foreign material: 68 cases (2018–2023)

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**OBJECTIVE**
To retrospectively describe clinical characteristics of canine gastrointestinal foreign bodies (GIFB) that were successfully and unsuccessfully managed conservatively.

**ANIMALS**
68 client-owned dogs presented to the Texas A&M Small Animal Teaching Hospital between January 1, 2018, and October 1, 2023, for GIFB where medical management was attempted.

**CLINICAL PRESENTATION**
Medical records were reviewed for signalment, history, physical examination, bloodwork, diagnostic imaging, foreign body type, location, treatments, and outcome. Success was defined as the passage of the foreign body through the colon, while failure was defined as requiring surgery, endoscopy, or euthanasia.

**RESULTS**
Medical management was successful in 32 cases (47%; 95% CI, 0.32 to 0.66). Gastric dilation resolved in all success cases (n = 5 [100%]; 95% CI, 0.32 to 2.3) but did not resolve in any failure cases (13 [0%]). Small intestinal dilation resolved in all success cases (n = 13 [100%]; 95% CI, 0.53 to 1.7) but progressed in most failure cases (9 [75%]; 95% CI, 0.34 to 1.4). In the success group, 31 GIFB were nonlinear (96.9%; 95% CI, 0.66 to 1.4), while 1 was linear (3.1%; 95% CI, 0.001 to 0.17). In the failure group, 29 GIFB were nonlinear (80.6%; 95% CI, 0.54 to 1.16), while 7 were linear (19.4%; 95% CI, 0.08 to 0.4). Of the cases that elected surgery (n = 29 [42.7%]; 95% CI, 0.29 to 0.61), resection and anastomosis was performed in 3 cases (10.3%; 95% CI, 0.02 to 0.3). All cases that required resection and anastomosis were nonlinear GIFB.

**CLINICAL RELEVANCE**
Conservative management of GIFB provides a feasible treatment option and may be considered based on presentation, foreign body location, hemodynamic stability of the patient, diagnostic imaging, and type of foreign body.

**Keywords:** soft tissue surgery, emergency surgery, canine, foreign body, fluid therapy

Dogs with gastrointestinal foreign bodies (GIFB) are commonly presented to emergency veterinarians.[1–5] Clinical presentation is often variable and dependent on the location of obstruction, duration, type and size of object, presence and degree of obstruction, and associated pathophysiologic variations.[5–8] Obstruction secondary to GIFB may result in abnormal serum-electrolyte concentrations, acid-base imbalances, and fluid disturbances often requiring hemodynamic stabilization.[6,7,9] Diagnosis of GIFB is often based on historical indiscriminate consumption, clinical presentation, bloodwork abnormalities, and diagnostic imaging.[2,6,10–13] Treatment options include conservative management, endoscopic retrieval, and surgical management.[3] Conservative management may be defined as some form of fluid therapy, gastrointestinal support, and pain management. Not all treatment options may be appropriate for all cases and are generally considered on an individual basis based on several clinical factors.

In human literature, most GIFB are managed conservatively with supportive care.[14] Supportive care in human literature is widely varied and based on individual criteria. Conservative management of GIFB in veterinary medicine has been minimally reported.[3,15,16] To the best of the authors' knowledge, there are no reports describing the clinical presentation, diagnostic findings, foreign body location, and outcome of GIFB passage with medical

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management in dogs. The objective of this study was to retrospectively describe clinical characteristics of canine GIFB that were successfully and unsuccessfully managed conservatively.

# Methods

## Case selection

Cases were identified by a search through all documents containing the words *foreign body* in the electronic medical record system at the Texas A&M Small Animal Teaching Hospital between January 1, 2018, and October 1, 2023. Based on the search criteria, cases were excluded if they were defined as foreign bodies outside the gastrointestinal tract, were unconfirmed foreign bodies, or were deemed not foreign bodies. Case inclusion criteria included dogs presenting for GIFB where medical management was attempted. Medical management was defined as a minimum of fluid therapy with or without additional pain management or gastrointestinal support with serial abdominal imaging to monitor for passage of foreign gastrointestinal material. Cases were excluded if bloodwork (either an abbreviated bloodwork panel or complete bloodwork) and repeat diagnostic imaging were not obtained, the final outcome of the foreign body was unknown, or the foreign bodies were identified exclusively in the colon. Approval by the IACUC of Texas A&M University was not required for this study, as data were acquired retrospectively.

## Medical record review

Medical records were initially reviewed for outcome and separated into 4 categories: medical management attempted, immediate surgery, immediate scope +/– success, and immediate euthanasia. For cases where medical management was attempted, medical records were reviewed for information regarding signalment (age, breed, and sex); foreign body type (linear vs nonlinear); presenting complaint; duration of clinical signs (0 to 1 day, 2 to 3 days, > 3 days); physical examination findings; hematologic, biochemical, and metabolic parameters; radiographic findings at presentation; ultrasound findings; time between diagnostic imaging series (hours); number of diagnostic imaging series obtained; location of foreign body (gastric, small intestinal, colon); treatments attempted (fluid therapy, electrolyte supplementation, constipation management, pain management, gastrointestinal protectants, and antiemetics); duration of attempted medical management (hours); and final outcome (medical management success, surgery required +/– resection and anastomosis, scope required, or euthanasia). The presenting complaint was further characterized as vomiting, inappetence, lethargy, diarrhea, constipation, tenesmus, or witnessed consumption of the foreign body by the owner. Physical examination findings were further characterized as abdominal pain, palpable intestinal foreign body, rectal temperature, hydration status, respiratory rate, heart rate, and mentation (bright, alert, and responsive; quiet, alert, and responsive; stuporous; obtunded; or comatose). Radiographic findings at presentation were further characterized as segmental intestinal dilation, diffuse dilation, lack of dilation, colonic dilation, gastric dilation, gravel sign, radiopaque foreign body, suspected radiolucent foreign body, plication, or reduced serosal detail. Ultrasound findings were further characterized as distension of stomach, small intestine, or colon; free peritoneal fluid; intestinal plication; presence of fluid in the stomach, small intestine, or colon; increased intestinal wall thickness; loss of intestinal wall layering; presence of a nonlinear or linear foreign body; lymphadenopathy; or hyperechoic mesentery. Medical management success was defined as passage of the foreign body through the colon. Medical management failure was defined as surgery required, endoscopy required, or euthanasia. Either a full bloodwork panel, including a CBC and chemistry panel (ProCyte Hematology Analyzer, Catalyst One Veterinary Blood Chemistry Analyzer; Idexx Laboratories Inc), or an abbreviated bloodwork panel (Blood Gas Analyzer; Nova Biomedical) was included. The length of medical management was defined as the time from presentation to final outcome. The maximum segmental small intestinal dilation in comparison to the height of the midbody of L5 (reported as a ratio [SI:L5]), gastric dilation, and colonic dilation noted on abdominal radiographs were compared to final abdominal radiographs to evaluate for resolution or progression.[10]

## Statistical analysis

For analysis, descriptive data were converted to categorical data and tabulated using an electronic spreadsheet (Sheets; Google LLC). The dogs were grouped based on medical management success versus medical management failure, and results were described across groups. Results were reported as numbers, percentages, 95% CIs for the incidence rate, medians, and ranges. The 95% CIs for the incidence rate were calculated with an online calculator (Confidence Interval for Rate; MedCalc Software Ltd).

# Results

## Case selection

Between January 1, 2018, and October 1, 2023, a total of 4,640 cases were identified as containing the words *foreign body* in the electronic medical record system. Of the 4,640 cases identified, 374 (8.1%; 95% CI, 0.07 to 0.09) were confirmed intestinal foreign bodies with known final outcomes. Of the 374 confirmed foreign bodies, immediate endoscopy was attempted in 90 cases (24.1%; 95% CI, 0.19 to 0.29) with 11 requiring surgical intervention, immediate surgery was performed in 196 cases (52.4%; 95% CI, 0.45 to 0.6), medical management was attempted in 78 cases (19.8%; 95% CI, 0.16 to 0.26), and euthanasia was immediately elected in 10 cases (2.7%; 95% CI, 0.01 to 0.05). Of the 78 cases where medical management was attempted, 4 cases were excluded due to a lack of repeat imaging and 6 cases were excluded due to



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being identified exclusively in the colon. A total of 68 cases met the selection criteria.

## Animals

The sample population was representative of 30 breeds, with mixed-breed dogs (n = 13 [19.1%]; 95% CI, 0.1 to 0.33) being most prevalent, and included castrated males (28 [41.2%]; 95% CI, 0.27 to 0.6), spayed females (24 [35.3%]; 95% CI, 0.23 to 0.53), intact males (11 [14.9%]; 95% CI, 0.08 to 0.29), and intact females (5 [7.4%]; 95% CI, 0.02 to 0.17). The overall median age was 2 years (range, 2 months to 13 years). Median age for the medical management success group was 2 years (range, 2 months to 13 years) and 2.5 years (range, 2 months to 13 years) for the failure group. The overall median weight was 19.4 kg (range, 3 to 56.6 kg). Median weight for the medical management success group was 19.4 kg (range, 3 to 56.6 kg) and 20 kg (range, 3.7 to 56 kg) for the failure group.

## Presentation

Dogs were presented with a wide range of clinical signs, including vomiting (n = 59), lethargy (33), inappetence (26), diarrhea (15), constipation (3), and tenesmus (2). Owners witnessed consumption of the foreign body in 13 cases. Clinical signs were present for 0 to 1 day (n = 40 [58.8%]; 95% CI, 0.42 to 0.8), 2 to 3 days (10 [14.7%]; 95% CI, 0.07 to 0.27), and > 3 days (18 [26.5%]; 95% CI, 0.16 to 0.42). Initial clinical assessment and duration of clinical signs prior to presentation were described for medical management success and failure groups **(Table 1)**.

## Bloodwork

Overall, hypokalemia (median, 3.823; reference range, 3.91 to 4.4 mmol/L) and hyponatremia (median, 145.2; reference range, 146.8 to 153.1 mmol/L) were noted; however, hyperlactatemia was only noted in 19 cases (27.9%; 95% CI, 0.17 to 0.44). Lactate was not reported in 10 cases (14.7%). Bloodwork parameters were described for medical management success and failure groups in **(Table 2)**. All parameters except albumin were recorded from the abbreviated bloodwork panel (Blood Gas Analyzer; Nova Biomedical); albumin was recorded from the chemistry panel (ProCyte Hematology Analyzer, Catalyst One Veterinary Blood Chemistry Analyzer; Idexx Laboratories Inc).

## Diagnostic imaging

Abdominal radiographs were repeated in 61 cases (89.7%; 95% CI, 0.69 to 1.2), while abdominal ultrasound was selected for repeat imaging in 7

**Table 1**—Summary data for initial clinical findings and physical examination parameters of 68 dogs that presented to the Texas A&M Small Animal Teaching Hospital between January 1, 2018, and October 1, 2023, for gastrointestinal foreign bodies where medical management was attempted. Dogs were grouped based on medical management success and failure.

| | Successful medical management | | Failed medical management | |
|---|---|---|---|---|
| **Parameter** | **n (%)** | **95% CI** | **n (%)** | **95% CI** |
| **Rectal temperature**[a] | 39 °C (37.4–39.72)[a] | NA | 38.6 °C (37.3–40.1)[a] | NA |
| **Heart rate (beats/min)** | | | | |
| < 60 | 0 | NA | 0 | NA |
| 60–160 | 30 (93.8) | 0.63–1.3 | 34 (94.4) | 0.65–1.3 |
| > 160 | 2 (6.3) | 0.01–0.23 | 2 (5.6) | 0.01–00.2 |
| **Respiratory rate (respirations/min)** | | | | |
| < 10 | 0 | NA | 0 | NA |
| 11–30 | 11 (34.4) | 0.17–0.62 | 17 (47.2) | 0.28–0.76 |
| 30–50 | 14 (43.8) | 0.23–0.73 | 11 (30.6) | 0.15–0.55 |
| > 50 | 7 (21.9) | 0.09–0.45 | 8 (22.2) | 0.09–0.44 |
| **Mentation** | | | | |
| BAR | 25 (78.1) | 0.51–1.2 | 24 (66.7) | 0.43–0.99 |
| QAR | 7 (21.8) | 0.09–0.45 | 12 (35.3) | 0.17–0.58 |
| Stuporous | 0 | NA | 0 | NA |
| Obtunded | 0 | NA | 0 | NA |
| Comatose | 0 | NA | 0 | NA |
| **Dehydration** | | | | |
| Mild (5–6%) | 14 (43.8) | 0.24–0.73 | 17 (47.2) | 0.27–0.76 |
| Moderate (7%–8%) | 3 (9.4) | 0.02–0.27 | 4 (11.1) | 0.03–0.28 |
| Severe (9%–10%) | 0 | NA | 0 | NA |
| **Abdominal pain** | 7 (21.9) | 0.09–0.45 | 12 (33.3) | 0.17–0.58 |
| **Palpable foreign body** | 1 (3.1) | 0.001–0.17 | 3 (8.3) | 0.02–0.24 |
| **Duration of clinical signs (d)** | | | | |
| 0–1 | 23 (71.9) | 0.46–1.1 | 17 (47.2) | 0.28–0.76 |
| 2–3 | 4 (12.5) | 0.03–0.32 | 6 (16.6) | 0.06–0.36 |
| > 3 | 5 (15.6) | 0.05–0.36 | 13 (36.1) | 0.19–0.62 |

[a]Data are reported as median and range.
BAR = Bright, alert, and responsive. QAR = Quiet, alert, and responsive.



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**Table 2**—Summary data for initial bloodwork parameters of 68 dogs that presented to the Texas A&M Small Animal Teaching Hospital between January 1, 2018, and October 1, 2023, for gastrointestinal foreign bodies where medical management was attempted. Dogs were grouped based on medical management success and failure.

| Parameters | Reference range | Successful medical management (median [range]) | Failed medical management (median [range]) |
|---|---|---|---|
| PCV (%) | 35–57 | 54.5 (38–78) | 55 (35–74) |
| TP (g/dL) | 5.7–7.8 | 6.8 (5.2–9.8) | 7 (5.4–10) |
| Hct (%) | 35–51 | 44.75 (36–65.6) | 47.5 (35–64.8) |
| pH | 7.38–7.49 | 7.403 (7.274–7.466) | 7.407 (7.338–7.54) |
| $P\bar{v}co_2$ (mm Hg) | 29.8–40.8 | 31 (23.8–39.6) | 34 (24.5–49.4) |
| $P\bar{v}o_2$ (mm Hg) | 43.8–110 | 57.1 (28.8–191.6) | 51 (28.4–129.9) |
| Albumin (g/dL) | 2.4–3.6 | 3.5 (2.7–7.2) | 3.5 (2.2–4.3) |
| Sodium (mmol/L) | 146.8–153.1 | 146 (138–156) | 145 (131.2–157) |
| Potassium (mmol/L) | 3.91–4.4 | 4.03 (3.2–4.72) | 3.71 (2.3–5) |
| Chloride (mmol/L) | 110.6–115.5 | 111.9 (99–115.5) | 109 (82.3–117.4) |
| BUN (mg/dL) | 7–32 | 14.5 (7–32) | 14 (8–32) |
| Creatinine (mg/dL) | 0.2–2.5 | 0.9 (0.1–1.7) | 0.8 (0.5–1.4) |
| Glucose (mg/dL) | 83–112 | 103.5 (82–169) | 106 (74–158) |
| Lactate (mmol/L) | < 2.5 | 1.9 (0.6–9.8) | 1.8 (0.6–8.4) |

TP = Total protein. $P\bar{v}co_2$ = Mixed venous partial pressure of carbon dioxide. $P\bar{v}o_2$ = Mixed venous partial pressure of oxygen.

cases (10.3%; 95% CI, 0.04 to 0.21). Both abdominal ultrasound and repeat abdominal radiographs were performed in 13 cases (19.1%; 95% CI, 0.1 to 0.33). The number of abdominal radiograph series ranged from 1 to 4 (median, 2.2), while the number of abdominal ultrasounds ranged from 1 to 3 (median, 1). The time between the initial abdominal radiographs and first repeat abdominal radiographs ranged from 1 to 24 hours (median, 10.9; n = 61 [89.7%]; 95% CI, 0.69 to 1.2). The time between the initial abdominal radiographs and second repeat abdominal radiographs ranged from 12 to 48 hours (median, 30; n = 15 [22.1%]; 95% CI 0.12 to 0.36). The time between the initial abdominal radiographs and third repeat abdominal radiograph ranged from 26 to 53 hours (median, 31; n = 3 [4.4%]; 95% CI, 0.01 to 0.13). The time between the initial abdominal radiographs and initial abdominal ultrasound ranged from 1 to 36 hours (median, 9; n = 20 [29.4%]; 95% CI, 0.18 to 0.45). The time between the initial abdominal radiographs and second abdominal ultrasound ranged from 3 to 42 hours (median, 14; n = 3 [4.4%]). Only 1 case had a third abdominal ultrasound performed at 62 hours after the initial abdominal radiographs. In the medical management failure group, 14 cases (36.8%; 95% CI, 0.2 to 0.62) had abdominal ultrasounds performed. In the medical management success group, only 7 cases (21.9%; 95% CI, 0.09 to 0.45) had abdominal ultrasounds performed.

Overall, the initial radiology report noted gastric dilation in 18 cases (26.4%; 95% CI, 0.16 to 0.42), small intestinal segmental dilation in 25 cases (36.8%; 95% CI, 0.24 to 0.54), and no dilation in 25 cases (36.8%; 95% CI, 0.24 to 0.54). Diagnostic imaging findings were described for medical management success and failure groups **(Table 3)**.

Radiographic resolution or progression of gastric, small intestinal, or colonic dilation was described for medical management success and failure groups. Gastric dilation resolved in all medical management success cases (n = 5 [100%]; 95% CI, 0.32 to 2.3); however, gastric dilation did not resolve in any medical management failure cases (13 [0%]). Small intestinal dilation (reported as SI:L5 ratios) and percent change from the first to final set of radiographs are graphically presented in **(Figure 1)**. The median SI:L5 in the medical management failure group was 1.4 (range, 0.7 to 3.9) on the first set of radiographs. The median SI:L5 in the medical management success group was 1.0 (range, 0.6 to 2.6) on the first set of radiographs. Small intestinal segmental dilation noted in the radiographic report resolved in all medical management success cases (n = 13 [100%]; 95% CI, 0.53 to 1.7); however, small intestinal segmental dilation progressed in most medical management failure cases (9 [75%]; 95% CI, 0.34 to 1.4). The median SI:L5 in the medical management failure group was 1.7 (range, 0.6 to 5.6) on the final set of radiographs, with a median percent change of +8.8% (range, –45.4% to +118.1%). The median SI:L5 in the medical management success group was 0.8 (range, 0.5 to 1.4) on the final set of radiographs, with a median percent change of –25.6% (range, –76.0% to +60.3%).

## Type of foreign body

Overall, 60 foreign bodies (88.2%; 95% CI, 0.67 to 1.1) were nonlinear, while 8 foreign bodies (11.7%; 95% CI, 0.05 to 0.23) were linear. In the medical management success group, 31 foreign bodies (96.9%; 95% CI, 0.66 to 1.4) were nonlinear, while 1 foreign body (3.1%; 95% CI, 0.001 to 0.17) was linear. In the medical management failure group, 29 foreign bodies (80.6%; 95% CI, 0.54 to 1.16) were nonlinear, while 7 foreign bodies (19.4%; 95% CI, 0.08 to 0.4) were linear.

## Location

Overall, 29 dogs (42.6%; 95% CI, 0.29 to 0.61) had foreign bodies identified in the stomach exclusively. Of these, 15 dogs (46.9%; 95% CI, 0.26 to 0.77) were in the medical management success group and 14 dogs (38.9%; 95% CI, 0.21 to 0.65) were in the medical management failure group.



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**Table 3**—Summary data for diagnostic imaging findings of 68 dogs that presented to the Texas A&M Small Animal Teaching Hospital between January 1, 2018, and October 1, 2023, for gastrointestinal foreign bodies where medical management was attempted. Dogs were grouped based on medical management success and failure.

| | Successful medical management | | Failed medical management | |
|---|---|---|---|---|
| **Diagnostic imaging findings** | **n (%)** | **95% CI** | **n (%)** | **95% CI** |
| **Abdominal radiograph** | | | | |
| Gastric dilation | 5 (15.6) | 0.05–0.36 | 13 (36.1) | 0.19–0.62 |
| Segmental small intestinal dilation | 13 (40.6) | 0.21–0.69 | 12 (33.3) | 0.17–0.58 |
| Colonic dilation | 0 (0) | N/A | 0 (0) | NA |
| No dilation | 14 (43.8) | 0.24–0.73 | 11 (30.5) | 0.15–0.55 |
| Gravel sign | 2 (6.3) | 0.01–0.23 | 3 (8.3) | 0.02–0.24 |
| Radiopaque FB | 6 (18.8) | 0.07–0.41 | 11 (30.6) | 0.15–0.55 |
| Suspected lucent FB | 25 (78.1) | 0.51–1.2 | 27 (71) | 0.49–1.1 |
| Plication | 1 (3.1) | 0.001–0.17 | 1 (2.8) | 0.001–0.15 |
| Reduced serosal detail | 4 (12.5) | 0.03–0.32 | 7 (19.4) | 0.08–0.4 |
| **Abdominal ultrasound** | | | | |
| Gastric distension | 1 (16.7) | 0.004–0.93 | 9 (64.3) | 0.29–1.2 |
| Small intestinal distension | 4 (66.7) | 0.18–1.7 | 10 (71.4) | 0.34–1.3 |
| Colonic distension | 1 (16.7) | 0.004–0.93 | 1 (7.1) | 0.002–0.4 |
| Free peritoneal fluid | 5 (83.3) | 0.27–1.9 | 11 (78.6) | 0.39–1.4 |
| Intestinal plication | 0 | NA | 4 (28.6) | 0.08–0.73 |
| Fluid stomach | 2 (33.3) | 0.04–1.2 | 10 (71.4) | 0.24–1.3 |
| Fluid intestines | 3 (50) | 0.1–1.5 | 10 (71.4) | 0.24–1.3 |
| Fluid colon | 0 | NA | 1 (7.1) | 0.002–0.4 |
| Increased intestinal wall thickness | 3 (50) | 0.1–1.5 | 9 (64.3) | 0.29–1.2 |
| Loss of intestinal wall layering | 2 (33.3) | 0.04–1.2 | 3 (21.4) | 0.04–0.62 |
| Nonlinear FB | 4 (66.7) | 0.18–1.7 | 9 (64.3) | 0.29–1.2 |
| Linear FB | 1 (16.7) | 0.004–0.93 | 5 (35.7) | 0.12–0.83 |
| Lymphadenopathy | 2 (33.3) | 0.04–1.2 | 7 (50) | 0.2–1.0 |
| Hyperechoic mesentery | 2 (33.3) | 0.04–1.2 | 9 (64.3) | 0.29–1.2 |

FB = Foreign body.

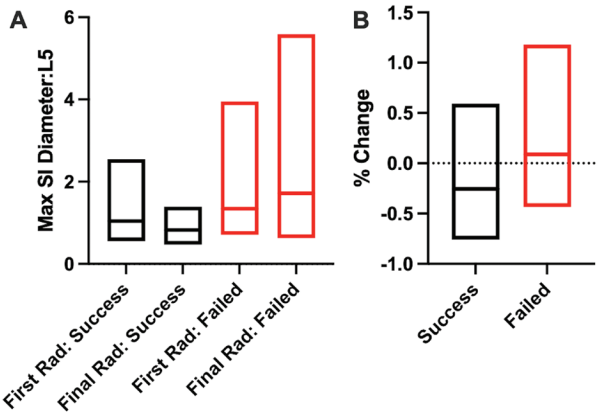



**Figure 1**—A—Maximum radiographic small intestinal (SI) dilation (cm) compared to the height of the body of L5 (cm) in 61 dogs with repeated abdominal radiographs that presented to the Texas A&M Small Animal Teaching Hospital between January 1, 2018, and October 1, 2023, for gastrointestinal foreign bodies where medical management was attempted. B—Percent change from the first to final radiograph. Ratios of the first and final radiographs were compared between medical management success and failure groups. The percentage of change in small intestinal dilation compared to the height of the body of L5 between the first and final radiograph was compared between medical management success and failure groups. For each plot, the horizontal line in the box represents the median; the upper and lower limits of the box represent the maximum and minimum, respectively.

Overall, 29 dogs (42.6%; 95% CI, 0.29 to 0.61) had foreign bodies identified in the small intestine exclusively. Of these, 14 dogs (43.8%; 95% CI, 0.24 to 0.73) were in the medical management success group and 15 dogs (41.7%; 95% CI, 0.23 to 0.69) were in the medical management failure group.

Overall, 10 dogs (14.7%; 95% CI, 0.07 to 0.27) had foreign bodies identified in multiple locations. In the medical management success group, 1 dog (3.1%; 95% CI, 0.001 to 0.17) had a foreign body identified within the small intestine and colon and 2 dogs (6.3%; 95% CI, 0.008 to 0.23) had foreign bodies identified within the stomach and small intestine. In the medical management failure group, 1 dog (2.8%; 95% CI, 0.001 to 0.15) had a foreign body identified in the small intestine and colon, 5 dogs (13.9%; 95% CI, 0.05 to 0.32) had a foreign body identified in the stomach and small intestine, and 1 dog (2.8%; 95% CI, 0.001 to 0.15) had a foreign body identified in the stomach, small intestine, and colon.

## Treatment

Fluid therapy was administered in all cases (n = 68 [100%]; 95% CI, 0.78 to 1.3). In the medical management success group, IV fluid therapy was administered in 31 cases (96.9%; 95% CI, 0.66 to 1.4), while SC fluid therapy was administered in 1 case (3.1%; 95% CI, 0.001 to 0.17). Lactated Ringer solution (Vetivex; Dechra Veterinary Products) was administered in all medical management success cases (n = 32 [100%]; 95% CI, 0.68 to 1.4). In the medical management failure group, IV fluid therapy was administered in all cases (n = 36 [100%]; 95% CI, 0.7 to 1.4), with additional SC fluid therapy administered in 2 cases



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(5.6%; 95% CI, 0.007 to 0.2). Lactated Ringer solution (Vetivex; Dechra Veterinary Products) was administered in a majority of medical management failure cases (n = 34 [94.4%]; 95% CI 0.65 to 1.3), while Normosol-R (Vetivex; Dechra Veterinary Products) was administered in only 2 medical management failure cases (5.6%; 95% CI, 0.007 to 0.2).

Potassium chloride supplementation was administered in 8 cases (11.8%; 95% CI, 0.05 to 0.23) overall. Of these, 4 cases (12.5%; 95% CI, 0.03 to 0.32) were in the medical management success group and 4 cases (11.1%; 95% CI, 0.03 to 0.28) were in the medical management failure group.

Analgesics were administered in 19 cases (27.9%; 95% CI, 0.17 to 0.44) overall. In the medical management success group, pain management (methadone) was administered in 5 cases (15.6%; 95% CI, 0.05 to 0.36). In the medical management failure group, pain management was administered in 14 cases (38.9%; 95% CI, 0.21 to 0.65). Butorphanol was administered in 3 failure cases (21.4%; 95% CI, 0.04 to 0.63). Methadone was administered in 10 failure cases (71.4%; 95% CI, 0.34 to 1.3). Hydromorphone was administered in 1 dog (7.2%; 95% CI, 0.002 to 0.4).

Ondansetron was administered in 9 cases (13.2%; 95% CI, 0.06 to 0.25) overall. In the medical management success group, ondansetron was administered in 3 cases (9.4%; 95% CI, 0.02 to 0.27). In the medical management failure group, ondansetron was administered in 6 cases (16.7%; 95% CI, 0.06 to 0.36). Pantoprazole was administered in 6 cases (8.8%; 95% CI, 0.03 to 0.19) overall. In the medical management success group, pantoprazole was administered in 2 cases (6.3%; 95% CI, 0.008 to 0.23). In the medical management failure group, pantoprazole was administered in 4 cases (11.1%; 95% CI, 0.03 to 0.28). Metoclopramide was only administered in 1 case (1.5%; 95% CI, 0.0003 to 0.08) overall, which failed medical management. Maropitant was administered in 56 cases (82.4%) overall. In the medical management success group, maropitant was administered in 29 cases (90.6%; 95% CI, 0.6 to 1.3). In the medical management failure group, maropitant was administered in 27 cases (75%; 95% CI, 0.49 to 1.1).

### Final outcome

Medical management was successful in 32 cases (47%; 95% CI, 0.32 to 0.66). Twenty-nine cases (42.7%; 95% CI, 0.29 to 0.61) ultimately resulted in surgery. Of the cases that resulted in surgery, resection and anastomosis was performed in 3 cases (10.3%; 95% CI, 0.02 to 0.3). All cases that required resection and anastomosis were nonlinear foreign bodies. Of the 8 linear foreign bodies where medical management was attempted, 7 (87.5%; 95% CI, 0.35 to 1.8) ultimately resulted in surgery while 1 (12.5%; 95% CI, 0.003 to 0.7) was successfully medically managed. Endoscopy was ultimately elected in 5 cases (7.4%; 95% CI, 0.02 to 0.17). Euthanasia was elected in 2 cases (2.9%; 95% CI, 0.004 to 0.1) due to failure of medical management. Owners in both of these cases cited financial concerns as well as historic foreign body consumption as the reason for euthanasia.

Overall, the length of medical management ranged from 4 to 96 hours (median, 17). In the success group, medical management ranged from 4 to 96 hours (median, 17). In the failure group, medical management ranged from 8 to 48 hours (median, 17.5).

## Discussion

Conservative management of GIFB presents potential benefits including possible financial feasibility (if successful) and avoiding an invasive procedure with possible anesthetic and surgical complications. However, delaying surgery may be associated with inherent risks including gastric and small intestinal hypomotility, luminal distension with increased intraluminal pressure, mucosal ischemia and intestinal wall edema, bacterial proliferation and translocation, bowel integrity compromise leading to changes in gastrointestinal blood supply, and progressive necrosis leading to septic peritonitis and perforation.[6,9,15] Risks and benefits of conservative management should be carefully evaluated on an individual basis based on presenting clinical signs, physical examination findings, hemodynamic stability, diagnostic imaging findings, and client financial limitations.

The dogs in this study were presented with a wide range of clinical signs including vomiting, lethargy, inappetence, diarrhea, constipation, and tenesmus. The noted clinical signs are often vague and can be associated with numerous other gastrointestinal and nongastrointestinal diseases.[1,4,6] Dogs within the medical management success and failure groups had clinical signs present for varying durations, but a majority in both groups presented within 1 day. More dogs, however, were presented with a longer duration of clinical signs in the medical management failure group. In a previous study[4] evaluating GIFB in dogs and cats that underwent surgery, a longer duration of clinical signs associated with obstruction was associated with significant increases in mortality. Further research is warranted to evaluate whether a particular duration of clinical signs increases the likelihood that surgery may create a better outcome than medical management.

Within the study population, hyponatremia and hypokalemia were common. These electrolyte imbalances may reflect loss through vomiting and sequestration through the gastrointestinal tract, as noted in a previous study[7] evaluating acid-base and electrolyte imbalances in dogs with GIFB. Hyperlactatemia was noted in less than a quarter of the population, which is less than previously noted in dogs with GIFB that underwent surgery, suggesting systemic hypoperfusion.[7] The present study population selected only for cases where medical management was deemed appropriate by the admitting clinician, which may suggest that these cases were considered more stable than those described in the previous study. The acid-base and electrolyte balance outside of hyponatremia and hypokalemia were within the reference range for the median population. This may suggest reduced pathophysiologic derangements



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secondary to the mechanism of loss associated with GIFB on presentation in which medical management could be attempted. However, further studies evaluating the differences of presenting bloodwork between medical management and immediate intervention cases are warranted.

Abdominal radiographs are commonly used as a first-line diagnostic in dogs presenting with a suspected GIFB.[2,6,10–12] Although segmental small intestinal dilation is frequently considered when evaluating for obstruction, segmental small intestinal dilation was reported in less than half of the population in the present study, which is consistent with previous studies.[10] Evaluation of the small intestinal diameter in comparison to L5 has previously been shown to have a low sensitivity and poor interobserver agreement.[10-12] A previous study[17] evaluating the influence of repeat abdominal radiographs on the resolution of mechanical obstruction and gastrointestinal foreign material revealed that a majority of cases did not have resolution of dilation regardless of outcome. Furthermore, gastric dilation alone was more likely to resolve than small intestinal dilation or both gastric and small intestinal dilation. In contrast, all successful medical management cases in the present study had resolution of gastric and intestinal dilation while none of the medical management failure cases had resolution of gastric dilation. Furthermore, most medical management failure cases in the present study did not have resolution of small intestinal dilation. This may suggest that repeat abdominal imaging is helpful when evaluating medically managed cases in hospital. However, further studies are warranted to investigate radiographic changes in medical management of foreign bodies.

Ultrasonography is considered an excellent method for investigation of gastrointestinal disorders with improved sensitivity, specificity, positive predictive value, and negative predictive value in comparison to abdominal radiographs.[13] However, abdominal ultrasound was utilized less frequently than repeat abdominal radiographs in the present study. While the decision for choosing radiographs versus ultrasound was not immediately clear in the present study, ultrasound may have been selected less frequently due to timing and availability of ultrasound, financial constraints, and clinician comfort level.

Nonlinear foreign bodies were medically managed more frequently than linear foreign bodies in the present case series. Linear foreign bodies often only produce partial obstruction but have previously been associated with more severe clinical signs, gastrointestinal pathology, and increased duration and cost of hospitalization.[5-6] One study[4] found significantly increased mortality in dogs and cats with linear foreign bodies undergoing surgery, while another study[5] found no association. Of the linear foreign bodies that were medically managed, the majority ultimately resulted in surgery. However, none of the linear foreign bodies in the present study that resulted in surgery required resection and anastomoses. Only 1 case was successfully medically managed. This may suggest that medical management of linear foreign bodies in dogs has a low success rate; however, further studies with higher case numbers are warranted.

Gastrointestinal foreign bodies were noted within the stomach, small intestine, and colon of both medical management success and failure groups in the present study. In a previous study,[4] the majority (66%) of foreign bodies were noted within the small intestine (particularly the jejunum) in dogs and cats undergoing surgical management. In the present study, small intestinal foreign bodies were noted most frequently, albeit to a lesser extent (57%) as compared to the previous study.

Conservative management in the present retrospective case series primarily involved correction of dehydration, hypovolemia, and electrolyte imbalances; reduction of pain; prevention of vomiting; and supportive gastrointestinal care. Fluid therapy is considered a principal treatment in the management of GIFB.[6,9] Treatment protocols in the present study varied and were not standardized; therefore, it is challenging to appropriately draw conclusions regarding their impact. Further studies with standardized conservative management protocols are warranted. Antiemetics were used in a majority of cases within the present study. However, antiemetics have the potential to mask clinical symptoms, and therefore, further studies are warranted to determine if there is any relationship to medical management success or failure.

In the present study, conservative management of GIFB was successful in 47% of the cases where medical management was attempted. However, it is important to discuss that the decision to pursue medical management must be made on an individual basis rather than as a first-line treatment for all foreign bodies. Of the cases that required surgery, only 3 (approx 10%) required resection and anastomoses. It is unclear whether these cases would have required resection and anastomoses at initial presentation or if delay in surgical intervention led to progression of gastrointestinal injury. A previous study[9] evaluating the outcomes of dogs undergoing immediate or delayed surgical treatment for GIFB obstruction revealed that, although outcomes were not associated with surgical timing, gastrointestinal injury requiring more complex surgical procedures was higher in the delayed group. By delaying surgery, however, 7% of cases in the previous study[9] voided the intestinal foreign body. Based on the findings of the present study, conservative management of GIFB is a reasonable treatment choice with consideration of both benefits and risks.

Given the retrospective nature of this study, there were several limitations. Specifically, there was a lack of standardized protocols regarding diagnostics and medical management strategies. The small sample size, retrospective nature of data collection, and case variability limited the ability to perform comparative statistical analysis. The choice to attempt medical management over immediate surgical intervention may have been a result of the admitting



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clinician's preference, hemodynamic stability of the individual patient, availability of advanced imaging, and financial constraints. Reasoning behind the admitting clinician's choice or the client's choice to attempt medical management was not immediately clear in this retrospective case series. Therefore, selection bias was an inherent flaw of this retrospective study. Comparative statistics were not performed in the present study due to relatively low case numbers in each group, to minimize the risk of type I error. Additional prospective controlled studies to evaluate predictors of successful GIFB passage with medical management are indicated.

In conclusion, conservative management of GIFB provides a feasible treatment option and may be considered based on multiple factors by weighing the risks versus benefits on an individual basis. Future prospective studies with higher case numbers and a more standardized protocol are warranted.

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