Intestinal Obstruction in a Savannah Monitor

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\textbf{ABSTRACT:} A savannah monitor (\textit{Varanus exanthematicus}) was presented with a 2-month history of lethargy, anorexia, and lack of stool production. A radiographic diagnosis of constipation with a high probability of intestinal obstruction was made. Medical therapy to soften the stool and allow the evacuation of the fecal masses was attempted without success. Attempts to fragment and remove the stool boluses by colonoscopy were also unsuccessful. Celiotomy and colonic enterotomy were then performed, allowing for complete removal of the fecal masses. The monitor recovered uneventfully from surgery and was maintaining optimal clinical status and behavior 4 months later. Inadequate husbandry and diet were the origins of the intestinal obstruction; readjustment of both factors avoided recurrence of the problem.

\textbf{Case Report Background}
A 7-year-old savannah monitor (\textit{Varanus exanthematicus}) weighing 6 kg was presented with a 2-month history of lethargy, anorexia, and lack of stool production. The animal was housed alone in a glass enclosure with a heating pad and a commercial fluorescent bulb to provide ultraviolet B light. The animal had access to a large dish of water for drinking and soaking. The diet was composed mainly of quail eggs with raw meat and mature, small mammals.

\textbf{Evaluation and Clinical Findings}
On presentation, the animal appeared depressed and lethargic and had a severe coelomic cavity distension that made locomotion difficult. Viewed dorsally, the monitor had a dishlike shape, which the owners considered to be normal because it appeared that way when they bought it 5 years earlier. The dorsal scales had lost their normal appearance, becoming less hard. The ventral body wall and the rear limbs showed healed lesions from thermal injuries. The owner reported that the animal did not eat anything but did defe cate. However, from the description of the feces, it was deduced that they were in fact only urine and urates. Two firm masses were palpated within both lateral areas of the coelomic cavity. The monitor showed no signs of dehydration.

Following physical examination, dorsoventral and lateral radiographs were obtained. Several irregular, radiodense masses located in the dorsal area of the clearly distended coelomic cavity were observed in the lateral radiograph (Figure 1). A slight and uniform increase of coelomic radiodensity was observed in an ascites-like pattern, leading to the loss of detail in coelomic structures normally seen. The dorsoventral radiographic view allowed for the location of the radiodense masses in the midline, preceded by a completely distended and gas-filled large intestine segment. Two large fat bodies were identified. No other significant radiographic findings were observed.

A diagnosis of large intestine obstruction was made based on history and clinical and radiographic findings. The owners declined hematologic and plasma-biochemical analyses.

\textbf{Treatment}
Medical therapy included:
- Paraffin oil (1 ml/kg PO bid; Hodernal G \textsuperscript{R} [Rottapharm, Valencia, Spain])
- Lactulose (0.3 ml/kg/day PO; Duphalac \textsuperscript{R} [Duphar, Kalifarma S.A., Barcelona, Spain])
- Cisapride (0.5 mg/kg/day PO; Prepulsid \textsuperscript{R} [Janssen Farmaceutica, Madrid, Spain])
- Enrofloxacin (5 mg/kg/day PO; Baytril \textsuperscript{R} [Bayer S.A., Barcelona, Spain])
- Metronidazole (15 mg/kg/day PO; Flagyl \textsuperscript{R} [Rhône-Poulenc Rorer S.A., Madrid, Spain]).
ence of fecal masses inside the large intestine. Because medical therapy was unsuccessful, surgical management was proposed and accepted by the owner. Before surgical exploration, colonoscopy revealed that the stool boluses were 20 cm from the cloaca, but attempts to fragment and remove them were unsuccessful. A mild erosion was also identified in the rectal mucosae.

Intraosseous balanced-electrolyte solutions (20 ml/kg/day) were given preoperatively to promote diuresis and aid in maintaining adequate hydration. The monitor was mask-induced with 5% isoflurane and 1 L/min oxygen (Figure 2), intubated, and maintained on 2% isoflurane and 1 L/min oxygen with intermittent positive-pressure ventilation at a rate of four breaths/min. After placing the patient in dorsal recumbency, the ventral midline area was aseptically prepared with alcohol and povidone–iodine scrub solution. The whole ventral area was covered by a clear plastic, iodine-impregnated adhesive drape, which acted as a sterile surgical barrier and facilitated patient monitoring.

The coelomic cavity approach was achieved by a right paramedian incision (Figure 1—Lateral radiograph showing coelomic distention and radiodense masses).

A vitamin complex (0.2 ml/kg/day PO; Dayamineral® [Abbott Laboratorios SA, Madrid, Spain]) was also given. The animal was discharged from the hospital with the recommendation to put it in warm water for an hour once or twice a day.

In the days that followed, the animal showed partial recovery and started to defeate soft stools. However, 3 days after starting treatment, the animal rejected it and the owners were not able to medicate the patient. A new lateral radiograph was obtained, demonstrating the persistence of the intestinal obstruction.

The patient was then admitted to the hospital and placed in an enclosure with an electric heating pad to provide an optimum temperature range of 28°C to 32°C; it was also soaked in warm water (30°C) for an hour twice daily. The animal became more active. Paraffin oil was administered again with enrofloxacin (5 mg/kg/day IM), and three 10-ml washes of commercial balanced-electrolyte stool softener (Enema Casen® [Fisons Iberica S.A., Zaragoza, Spain]), 50% diluted with warm sterile saline, were performed twice a day. Fluid therapy was administered (lactated Ringer’s solution [20 ml/kg/day]). A blood sample (3 ml of heparinized blood) was collected from the ventral coccygeal vein using a 22-gauge, 1.25-inch needle. The hematologic and biochemical analyses were normal except for slight anemia and a high leukocyte count (Table 1).

Some soft stools were evacuated and collected for fecal examination. A flotation technique was performed, which was negative for parasitic ova. The culture was negative for Salmonella but positive for Escherichia coli.

Two days later, the radiographic examination still revealed the presence of fecal masses inside the large intestine. Because medical therapy was unsuccessful, surgical management was proposed and accepted by the owner. Before surgical exploration, colonoscopy revealed that the stool boluses were 20 cm from the cloaca, but attempts to fragment and remove them were unsuccessful. A mild erosion was also identified in the rectal mucosae.

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Table 1. Patient’s Blood and Chemistry Values

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Measurement</th>
<th>Reference Range (Mean ± SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Packed cell volume (%)</td>
<td>20</td>
<td>32.1 ± 8.3</td>
</tr>
<tr>
<td>Leukocyte count (10³/µl)</td>
<td>22</td>
<td>5.1 ± 3.001</td>
</tr>
<tr>
<td>Total protein (g/dl)</td>
<td>5.59</td>
<td>6.5 ± 1.2</td>
</tr>
<tr>
<td>Albumin (g/dl)</td>
<td>2.17</td>
<td>3.0 ± 0.7</td>
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<tr>
<td>Globulin (g/dl)</td>
<td>3.42</td>
<td>4.1 ± 0.9</td>
</tr>
<tr>
<td>Aspartate aminotransferase (IU/L)</td>
<td>25</td>
<td>37 ± 24</td>
</tr>
<tr>
<td>Lactate dehydrogenase (IU/L)</td>
<td>310</td>
<td>1123 ± 1033</td>
</tr>
<tr>
<td>Creatine phosphokinase (IU/L)</td>
<td>1800</td>
<td>1163 ± 90</td>
</tr>
<tr>
<td>Uric acid (mg/dl)</td>
<td>6.9</td>
<td>7.1 ± 3.9</td>
</tr>
<tr>
<td>Creatinine (mg/dl)</td>
<td>0.42</td>
<td>0.4 ± 0.3</td>
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<tr>
<td>Calcium (mg/dl)</td>
<td>13.9</td>
<td>14.1 ± 1.3</td>
</tr>
<tr>
<td>Phosphorus (mg/dl)</td>
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<td>4.5 ± 1.3</td>
</tr>
<tr>
<td>Sodium (mEq/L)</td>
<td>161</td>
<td>158 ± 5</td>
</tr>
<tr>
<td>Potassium (Eq/L)</td>
<td>3.2</td>
<td>4.1 ± 1.4</td>
</tr>
</tbody>
</table>
sion to avoid damaging the large ventral abdominal vein. A 10-cm incision was made through the three layers of the abdominal wall: skin, muscle, and pleuroperitoneum. Once inside the coelomic cavity, a large amount of fluid and an amorphous, yellowish material were found. After fluid aspiration, the obstipated colon area was located (Figure 3). The intestine was distended, but neither pressure necrosis nor perforated areas were observed despite the chronicity of the process. To avoid enterotomy, digital fragmentation and evacuation of the two fecal masses were attempted without success.

Before performing the enterotomy, the obstipated intestinal area was adequately exteriorized and isolated with surgical drapes to avoid coelomic contamination (Figure 4). One full-thickness, 5-cm incision was made along the antimesenteric border of the intestine. Once exposed, the stool boluses were fragmented to avoid a long intestinal incision or intestinal wall tearing. Both fecal masses, formed mainly by compacted, fragmented quail shells and other hard digestive material, were removed through the same intestinal incision (Figure 5). The enterotomy incision was closed using a 3-0atraumatic needle with polyglycolic acid in a simple continuous pattern, then oversewn using an inverting Cushing’s pattern (Figure 6). Copious coelomic lavage with warmed 0.9% sterile saline was performed before suturing the pleuroperitoneum using a 3-0 needle with polyglycolic acid in an interrupted cruciate mattress. The muscular layer was sutured in the same manner as the pleuroperitoneum, and the skin incision was closed with 2-0 nylon in a horizontal mattress to avoid damaging the monitor’s skin. Butorphanol (0.4 mg/kg IM [Torbugesic®, Fort Dodge Veterinaria S.A., Vall de Bianya, Spain]) was administered to provide analgesia.

Recovery from surgery was uneventful. Postoperative radiographs demonstrated a complete removal of the stool boluses. Once the patient was awake and responsive, it was placed in a warm, dark, quiet place with clean paper to prevent contamination of the incision. Four months after surgery, the monitor was reported to have a normal appetite and attitude without digestive or behavioral problems.
DISCUSSION

Constipation is a relatively frequent problem in reptiles and is associated with poor captive husbandry, inappropriate temperature, helminth parasitism, dehydration, inactivity, inappropriate food, cloacoliths, fecaliths, cloacitis, and intussusception. Several cases have been reported in turtles that have ingested a large amount of stones, sloughed shell material and scutes, or other foreign bodies. Lizards are also similarly affected but are poorly represented in the scientific literature. The origin most frequently related to lizard constipation or obstruction seems to be the ingestion of foreign bodies, although some neoplastic or intussuscepted cases have also been described. Coke reported chronic intestinal constipation in a savannah monitor, but it was due to trauma (pelvic stenosis due to bilateral sacroiliac luxation) rather than nutrition or husbandry. Intestinal obstruction can also be caused by confinement in an environment that is too small to allow for sufficient exercise.

Conservative management of intestinal constipation using fluids, tepid water soakings, laxatives, and enemas has been reported and may be successful but many intestinal obstructions require surgical intervention. Indications for celiotomy in reptiles include gastrointestinal (GI) obstruction, egg binding, egg peritonitis, ovariohysterectomy for uterine prolapse, colopexy for colon prolapse, cystotomy for urolithiasis, and exploration for obtaining biopsies. A variety of GI surgical procedures have been described in reptiles, including gastrotomy, intestinal resection-anastomosis, and enterotomy. Very few data are available on the frequency of enterotomies in lizards. Although some authors believe that this procedure is performed infrequently in chelonians, the frequency has probably increased in the last few years.

Different options have been described for approaching the coelomic cavity and suturing the enterotomy. Despite the fact that a ventral midline approach was described for exploring the coelomic cavity, a paramedian ventral incision is preferred to avoid damaging the ventral abdominal vein. Thus a paramedian approach is safer and no important differences are noted in wound healing or exploration of the coelomic viscera. The most important morphologic characteristics of the savannah monitor’s GI tract are the presence of a simple, elongated stomach and the absence of the cecum. Because savannah monitors are carnivorous, they have a simple colon without saculations, which are usually present in many vegetarian lizards (e.g., green iguanas).

Histopathologic evaluation of the amorphous, yellowish material observed within the coelomic cavity revealed that it consisted of inflammatory cells and proteins, probably due to causes other than intestinal constipation considering that the monitor had shown coelomic distention for at least 5 years before surgery. The isolation of *E. coli* in the fecal analysis was not considered to be relevant because gram-negative bacteria are frequently recovered from clinically healthy captive reptiles. The presence of one dominant form may indicate overgrowth of that population. Although *E. coli* has been isolated in cases of reptile severe necrotizing dermatitis, it is not considered to be a primary pathogen in GI diseases.

Adequate nutrition and husbandry are decisive for avoiding recurrence of intestinal obstruction. Feeding mature prey is not recommended because the dense fur and skin and large bones and teeth are digested slowly. Raw meat and puppy mice over 1.5 g are digested more quickly, their fat content is lower than that of adults, and their water content is higher.

Monitors and other heavy lizards tend to be sedentary. Thus obesity is a likely problem. Without sufficient energy demands on a reptile, excess food energy is stored as fat. Habitat enlargement, enclosure enrichment, and improved feeding strategies can be employed to increase activity.

The digestive process depends greatly on food content and environmental temperature. The preferred optimum temperature zone for savannah monitors is 28˚C to 32˚C. In the case reported here, the environmental temperature was achieved with a heating pad, which did not provide enough of a heat gradient to allow for thermoregulation. Big enclosures need primary and secondary heat sources to maintain the temperature and provide the temperature gradient that all reptiles need. An incandescent spotlight placed over the basking area was recommended for maintaining optimum temperature.

Acknowledgment

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References