SURGICAL AND MEDICAL MANAGEMENT OF A GASTROINTESTINAL OBSTRUCTION IN AN ALDABRA TORTOISE, Geochelone gigantea

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Abstract: An approximately 40-year-old, 90 kg female Aldabra tortoise, Geochelone gigantea, was evaluated for anorexia, ptyalism, and a soft intermittent cough one day after regurgitating while being placed in dorsal recumbency for transport during a routine physical examination. A complete blood count and plasma chemistry panel taken at the time of the examination were within normal reference range for this species. Fecal flotation revealed nematode ova and ciliated protozoa. The differential diagnosis at this time was aspiration pneumonia, esophagitis, pharyngitis and or tracheitis subsequent to regurgitation. Antibiotic therapy was initiated with ceftiofur sodium (Naxcel, SmithKline Beecham Corp., Philadelphia, PA) 10 mg/kg im sid x 5 d. The tortoise was also given 1 L of lactated ringers solution with 2 ml of vitamin B complex (Phoenix Pharmaceutical Inc., St. Joseph, MO) intracoelomically sid x 5 d. The tortoise remained anorectic despite the availability of treat food items. Nine days after initial presentation a bilateral nasal discharge was noted. Horizontal beam radiology was used to evaluate the lung fields and no obvious pulmonary disease was noted in either the lateral or anterior-posterior views. Dorsoventral radiographs of the coelomic cavity revealed gas distention in the bowels and a large amount of gastrointestinal foreign material with a mineral density. The tortoise was anesthetized with 500 mg of combined tiletamine hydrochloride and zolazepam hydrochloride (Telazol, Fort Dodge Animal Health, Fort Dodge, IA) im and maintained on 2 - 3% isoflurane (Isoflo, Abbot Laboratories, N. Chicago, EL) via endotracheal intubation. Endoscopic evaluation of the mouth, esophagus, stomach and colon revealed no abnormalities. Subsequently 500 ml of mineral oil and 500 ml of barium sulfate (HD-85, Lafayette Pharmaceuticals Inc, Lafayette, IN) was given by stomach tube. The tortoise was also treated for nematodes at this time with fenbendazole (Panacur 10%, Hoechst-Roussel Vet. Pharmaceuticals, Somerville, NJ) 50mg/kg via stomach tube. A gastrointestinal radiographic contrast series taken at 24 hour intervals for nine consecutive days was performed revealing no movement of contrast past the mineral density, which appeared to be located near the colonic flexure. A diagnosis of impaction with possible torsion was made, and an exploratory celiotomy was scheduled.

The tortoise was anesthetized as previously described. A jugular catheter was placed and normal saline with 2 ml of vitamin B complex and 5% dextrose was given at a rate of 300 ml/hr. Ceftriaxone (Rocephin, Roche Laboratories Inc., Nutley, NJ) at 10 mg/kg was given iv preoperatively. The tortoise was placed in sternal recumbency and tilted cranio-ventrally 45 degrees. The right rear limb was retracted caudally and the inguinal fossa was aseptically prepared. The coelomic cavity was entered using a combination of sharp and blunt dissection. The descending colon was palpated and the area of impaction was identified at the descending colonic flexure.
The size of the animal made it difficult to palpate the entire length of the colon, and exteriorization of the obstructed portion was not possible; however, a more mobile portion distal to the impaction was retracted gently into the surgical field and an enterotomy was performed. The obstructive material was manipulated into the enterotomy site and removed. The material consisted of 355 g of small gravel, undigested food material and barium streaked fluid and fecal material. The colon was flushed several times through the enterotomy site with warm sterile saline in order to break up and remove any remaining material. The enterotomy was closed in two layers with 2-0 polydioxanone (PDS, Ethicon Inc., Somerville, NJ) the first layer being a simple interrupted pattern, the second being a continuous Lembert pattern. The celiotomy site was closed routinely in three layers with 1 PDS. Ketoprofen (Ketofen, Fort Dodge Animal Health, Fort Dodge, IA) at 2 mg/kg was given iv for post-operative analgesia. Anesthetic recovery was prolonged; however, within 48 hours the tortoise was alert and responsive. Post surgical care consisted of continued intracoelomic fluids; (1 L saline with B-vitamins), and ceftriaxone sodium 10 mg/kg im sid x 5.

The tortoise remained nearly anorectic for the next 10 days. At that time, it was decided to provide enteral nutrition via pharyngostomy tube. At the time of tube placement the tortoise was estimated to be between 7 and 10% dehydrated and extremely depressed. The tortoise was anesthetized with 150 mg of tiletamine/zolazepam iv and maintained on isoflurane and oxygen via endotracheal tube. The pharyngostomy tube was a one meter, 20 ga foal nasogastric tube placed in the usual manner and secured to the carapace with tape, leaving only enough slack for the tortoise to withdraw its head and neck without kinking the tube. The nutritional needs of the tortoise were estimated to be 2,000 kilocalorie/day. Feedings consisted of a gruel made with herbivore biscuits (Marion Leafate Biscuits, Marion Zoological Inc., Plymouth, MN) and water given tid. Initially a volume of 120 ml was given at each feeding, increasing daily until a total of 500 ml per feeding was reached. The tortoise was medicated with trimethoprim and sulfamethoxazole (TMS-DS, Mutual Pharmaceutical Co. Inc., Philadelphia, PA), at a dose of 25 mg/kg of combined antibiotic bid x 7 d. Metronidazole (Metronidazole, Sidmack Laboratories Inc., East Hanover, NJ), 100 mg/kg was given po, and again in two weeks and metoclopramide (Metoclopramide, United Research Lab. Inc., Bensalem, PA), 0.06 mg/kg was given po sid x 10 d to encourage pyloric emptying and decrease the chance of esophageal reflux. All medications were given via the pharyngostomy tube during daily feedings. Evaluation of the complete blood count and serum chemistry profile taken at the time of the pharyngostomy tube placement was remarkable only for a hematocrit of 11%, (reference range: 14.8% to 36.5%). The anemia was contributed to chronic infection, debilitation or from blood loss during surgery. Iron dextran (Hemantic, Phoenix Pharmaceutical Inc., St. Joseph, MO) was given at 7 mg/kg im twice 2 wk apart. Ten days post pharyngostomy tube placement the tortoise had a normal bowel movement, and at three weeks the tortoise began drinking voluntarily, but was still disinterested in food. The tube was removed after five weeks and the tortoise began eating within three days.

DISCUSSION

Prior to arriving at the Saint Louis Zoo the tortoise was fed on a gravel substrate. Although it is not uncommon for a land tortoise to have foreign mineral material present in its gastrointestinal tract, the quantity of the gravel consumed combined with the stress of the transport may have caused a partial obstruction or torsion.
Mean transit times for digesta markers in Aldabra tortoises have been reported to be an average of 211 hours, with a range of 144 - 456 hours. The nine day barium series provided diagnostic evidence of a large bowel obstruction. Normal barium sulfate transit time through the colon has been reported to be between 144 and 166 hours in a healthy adult leopard tortoise, *Testudo pardalis*. Transit times can be significantly prolonged in a debilitated tortoise, but the contrast material traveled through the proximal gastrointestinal tract within the expected period of time. An amidotrizoate/diatrizoate based contrast media (Gastrografin, E.R. Squibb & Sons, Princeton, NJ) has been shown to have a much faster gastrointestinal transit time than barium sulfate in Greek tortoises, *Testudo hennanni*. Gastrografin may have been a more appropriate contrast material in the diagnosis of a possible gastrointestinal obstruction, because of this rapid transit time and its mild effect on serosal and peritoneal surfaces.

There are two surgical options for entering the coelomic cavity of a tortoise; the inguinal fossa approach discussed here, and plastronotomy. Plastronotomy gives greater accessibility to the coelomic organs, but disadvantages include increased healing time, a more traumatic surgical procedure, and the chance of a non-healing union of the bone flap. The inguinal fossa approach has been used occasionally for gastrointestinal procedures, but most commonly for access to the urinary bladder for removal of calculi, and to reach the reproductive organs for various procedures. Given the size and weight of this particular animal, we found the inguinal fossa produced adequate access to the gastrointestinal tract, while resulting in a relative decreased convalescence time. The use of tiletamine/zolazepam as an induction agent, combined with isoflurane inhalant anesthesia worked well, although recovery times were often prolonged. In the future, propofol (Propofol, Abbott Laboratories, North Chicago, IL) may be advisable for induction, as its use in reptiles has been well documented. If given intravenously it works quickly, allowing approximately 15 minutes of sedation for intubation or other short procedures, however; venous access in a conscious giant chelonian may present a challenge.

A pharyngostomy tube is an excellent method for providing enteral nutrition in anorectic tortoises. The tube can be placed quickly with mild sedation, and left in place for several months without complication, to allow maintenance of nutritional status in chronically debilitated animals, and for the administration of various enteral medications.

Key words: Aldabra tortoise, *Geochelone gigantea*, gastrointestinal obstruction, celiotomy, pharyngostomy tube.
REFERENCES