CONTRAST RADIOGRAPHY OF THE GASTROINTESTINAL TRACT IN SEA TURTLES

ANTONIO DI BELLO, CARMELA VALASTRO, FRANCESCO STAFFIERI, ANTONIO CROVACE

Intestinal obstruction by radiolucent foreign bodies is common in sea turtles. The absence of clinical signs and the extended fasting periods in these animals means that intestinal obstructions may not be diagnosed early. Digestive tract radiographic contrast procedures were performed to evaluate the gastrointestinal transit time and intestinal obstructions in loggerhead sea turtles. Barium sulfate and nonionic iodinate contrast medium were used for radiographic contrast procedures. Contrast medium was administered via a gastric tube or into the colon. These procedures are often necessary and are useful to document intestinal obstruction and foreign objects. The diagnostic procedures were not easily performed in some turtles, but often they were adequate for the diagnosis. *Veterinary Radiology & Ultrasound, Vol. 47, No. 4, 2006, pp 351–354.*

Key words: foreign bodies, gastrointestinal contrast radiography, loggerhead sea turtle.

Introduction

LOGGERHEAD SEA TURTLES (*Caretta caretta*, Linnaeus 1758) are often found along the Ionian Sea, south Adriatic, and Sicilian coasts. Many of these reptiles ingest fishing hooks or other foreign bodies.[1–4] The nonradiopaque nature of many of these objects (nylon fishing line, plastic bags, etc.), along with the frequent absence of clinical signs, can delay the diagnosis of a gastrointestinal obstruction. In this paper, we describe gastrointestinal contrast examinations in 15 sea turtles. The aims of this study were to evaluate gastrointestinal transit time in these animals and to assess obstruction or lesions of the intestinal wall.

Material and Methods

Fifteen loggerhead sea turtles with gastrointestinal disease, weighing between 2.5 and 31 kg, were studied. For contrast examination, a positive contrast medium was administered by means of an orogastric tube in eight turtles (upper GI examination) or a rectal probe in seven turtles (contrast medium enema). After contrast medium administration, radiographs were made in the dorsoventral projection.

In six turtles, the upper GI examination was performed after removal of gastric or intestinal fishing hooks. During the third week after surgery, a solution of 60% barium sulfate* was added to the food (1:3) and administered by the same gastric tube that was used to feed the animals during the postoperative period. A radiograph was acquired in all animals immediately after contrast medium administration to evaluate the stomach (Fig. 1), and then a follow-up radiograph was acquired every 12 h during the first week and then daily until complete elimination of the contrast medium (Fig. 2). An upper GI examination was also performed in two other turtles with suspected intestinal obstruction. In these turtles, we administered iopamidol† (61.2 g/100 ml) in a 1:1 dilution with sterile 0.9% saline solution, at a dosage of 8–12 ml/kg b.w. In both turtles, the placement of the gastric tube and contrast medium administration was performed under fluoroscopic control (Fig. 3). The radiographs were acquired immediately after contrast medium administration (Fig. 4) and every 30 min for the first 4 h and then every 120–150 min until the ileocolic valve was seen (Fig. 5). Radiographs were then acquired daily until complete elimination of the contrast medium.

In seven turtles, a contrast medium enema was performed because clinical and radiographic examination suggested fishing line obstruction in the small intestine. Two turtles had fishing lines emerging from the ramphotheca, but in radiographs there was no evidence of a fishing hook in the gastrointestinal tract. In the other five turtles, the contrast examination was performed to exclude the presence of a fishing line because fishing hooks were detected radiographically. In these turtles, we used iopamidol† (61.2 g/100 ml) in a 1:1 dilution with sterile 0.9% saline solution, at a dosage of 10–15 ml/kg b.w.

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FIG. 1. Dorso-ventral radiograph immediately after barium administration. Note the normal completely filled stomach.

FIG. 2. Dorso-ventral radiograph of same turtle in Fig. 1 made 12 days after barium administration. Note contrast medium progression through the transverse colon.

Results

The six barium upper GI examinations allowed us to evaluate the morphology and functional activity of the intestinal tract after an enterotomy was performed. Moreover, we could evaluate the emptying time of the stomach and transit through the intestinal tract (Table 1).

In the other two upper GI examinations with iodinated contrast medium, the normal intestinal filling time and progression of the contrast medium allowed us to exclude the presence of a linear foreign body (Table 1).

The contrast medium enema showed a long small intestinal tract occupied by the foreign body in the two turtles that had a fishing line emerging from the oral cavity. The contrast medium enema also allowed us to diagnose a nylon line attached to the fishing hook in the small intestine in the other two subjects. In these turtles, there was no retrograde progression of contrast medium due to impaction of the intestinal tract and wall edema (Fig. 6). In the other three turtles that had a fishing hook in the stomach (shown by radiography), the contrast medium enema allowed visualization of the entire large intestine and part of the ileum without identification of occlusion or other morphologic modifications (Fig. 7). In these three turtles, the radiographic findings were confirmed during surgical exploration.

Discussion

Contrast medium administration was accomplished with some difficulty in both procedures. The most difficult phase during the upper GI was the bypass of the gastroesophageal sphincter with the gastric tube that, in marine turtles,

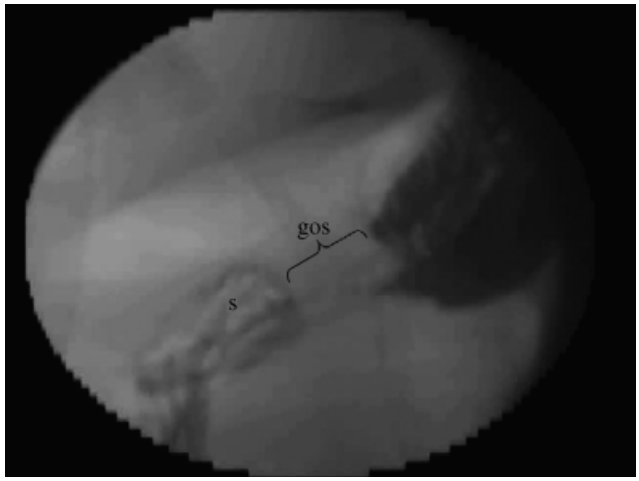

FIG. 3. Fluoroscopic imaging after a small amount of barium was injected through the gastric tube to verify correct placement in the stomach (s) through the gastroesophageal sphincter (gos).

FIG. 4. Dorso-ventral radiograph immediately after iodinated contrast medium administration. The stomach is completely filled, while the duodenum is partially filled with contrast medium.

FIG. 5. Dorso-ventral radiograph of the same turtle in Fig. 4 made 48 h after iodinated contrast medium administration. Residual contrast medium in the stomach and a completely filled small intestine can be seen as the contrast medium progresses through the ileocolic valve (icv).

is particularly narrow. For this reason, the upper GI procedure was often performed under a fluoroscopic guidance. Contrast medium administration for the enema was performed by means of a rectal probe. The probe was always introduced under endoscopic guidance into the distal colon to avoid an accidental introduction of contrast medium into the urinary bladder.[5] Moreover, in small turtles, this procedure is not easily performed.

The barium meal always allowed a good functional evaluation of the gastrointestinal tract and verified the absence of stenosis or other morphologic alterations of enterotomized bowel. Furthermore, the barium meal confirmed the longer intestinal transit times of turtles compared with mammals.[5–7] However, a limitation of the barium meal technique is the absence of normal examples in the loggerhead.

Water-soluble contrast media were used in those turtles where the presence of a linear foreign body or an intestinal perforation was suspected, and surgical intervention may be necessary.[6] We diluted the iodinate

TABLE 1. Gastrointestinal Transit Times During Descending Contrastography

Turtle	Body Weight (kg)	Contrast Medium	T1 (h)	T2 (h)	T3 (h)	T4 (h)	T5 (h)
03Cc237	7.5	Barium sulfate	24	96	120	144	192
03Cc276	6.8	Barium sulfate	26	120	168	240	432
03Cc394	18.3	Barium sulfate	96	264	192	408	576
03Cc487	21.5	Barium sulfate	72	264	216	528	960
04Cc172	16.7	Barium sulfate	24	216	168	264	384
04Cc330	2.7	Barium sulfate	30	168	168	216	360
04Cc373	5.3	Iodinated	0.1–0.5	48	16	96	288
05Cc064	2.7	Iodinated	0.1–0.5	34	9	96	216

T1, beginning of the gastro-duodenal transit; T2, gastric emptying time; T3, beginning of the ileocolic transit; T4, small intestine emptying time; T5, large intestine emptying time.

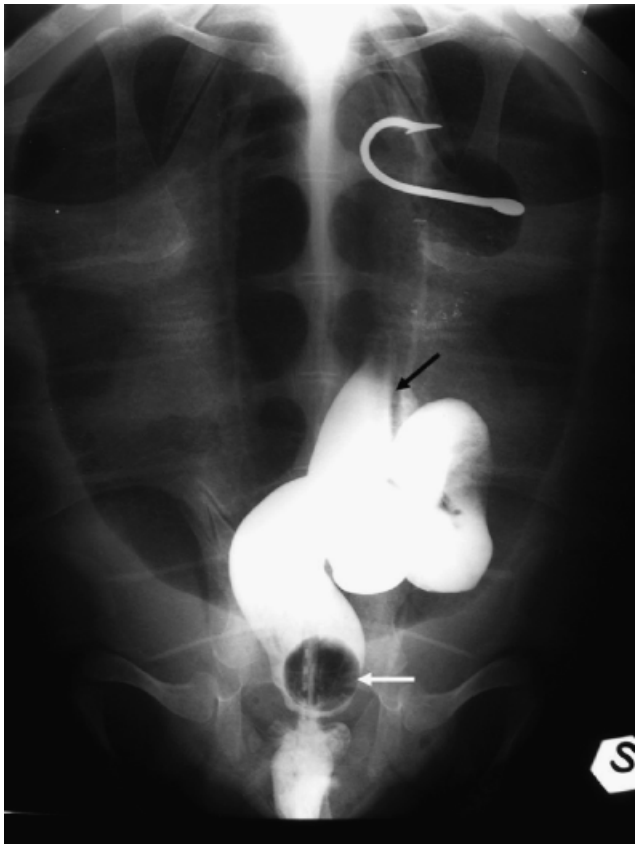

FIG. 6. Contrast medium enema. There is no retrograde progression of contrast medium due to impaction of intestinal tract occupied by a fishing line attached to the fishing hook. The balloon from a Foley catheter can be seen (white arrow). The radiolucent line (black arrow) at the proximal extent of the contrast medium is the terminal part of the thick nylon fishing line.

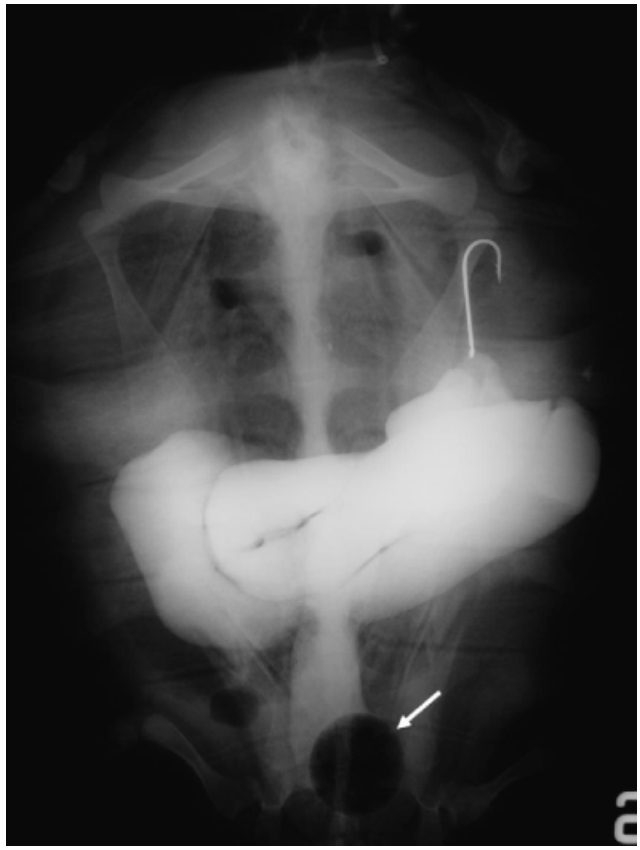

FIG. 7. Contrast medium enema. Note the entire large intestine and part of the ileum without occlusion or other morphologic modification. Note the fishing hook in the stomach. The white arrow indicates an inflated balloon from a Foley catheter.

contrast medium with 0.9% saline to reduce the osmolarity, which could be dangerous in dehydrated and critically ill patients. The continued visibility of the iodinated contrast medium for several days suggests poor intestinal absorption of this medium in sea turtles.

Whereas the iodinated contrast medium travels more rapidly than barium and retains its radiographic opacity in the gastrointestinal tract for a longer time than in other species, reaching a diagnosis more quickly may be another reason, besides potential intestinal perforation or possible subsequent surgery, to choose water-soluble contrast medium in sea turtles.

The particularly slow gastrointestinal transit time of turtles could be a limitation during an upper GI examination, especially in feeding turtles, causing delayed diagnosis. For this reason, the contrast medium enema allows a more rapid diagnosis of lower intestinal tract abnormalities.

Also, the contrast medium enema allowed us to identify fishing lines fixed to hooks that were identified radiographically and to evaluate the length of the intestine obstructed by the nylon line.

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