PRACTICAL TECHNIQUES FROM THE NAVC INSTITUTE

ENDOSCOPY IN PRACTICE: A PENNY FOR YOUR THOUGHTS

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*Each year, the **NAVC Institute** takes place in Orlando, Florida, and top specialists in select areas of veterinary medicine provide hands-on, one-on-one continuing education to the Institute attendees.*

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At the NAVC Institute 2014, veterinarians were introduced to small animal endoscopy and common procedures in clinical practice that utilize rigid and flexible endoscopy. The course incorporated lectures with hands-on wet labs. Lectures focused on:

- Endoscopy equipment
- Indications for endoscopy
- Appearance of normal images
- Identification of common lesions.

For the wet labs, both live animals and models were used, and each participant—under the supervision of a board-certified specialist—practiced:

- Upper gastrointestinal (GI) endoscopy
- Rhinoscopy and bronchoscopy
- Cystoscopy of female dogs
- Otoscopy.

Participants performed endoscopic retrieval of cotton balls from the stomach, and the techniques, equipment, and required skills for this procedure are similar to those highlighted in the following case study.

CASE PRESENTATION

A 1-year-old neutered male Jack Russell terrier was presented to its primary veterinarian for acute onset of anorexia, weakness, and vomiting. The owner noted that the urine of the dog was red in color.

Initial Evaluation

Physical examination by the primary veterinarian revealed icteric mucous membranes.

Pertinent blood analysis results are listed in the **Table**; other than those values, the complete blood count, serum biochemical profile, and blood smear examination were unremarkable.

Urinalysis revealed hemoglobinuria and bilirubinuria, but no red nor white blood cells were identified on microscopic sediment examination.

Abdominal ultrasound was unremarkable.

TABLE. Pertinent Blood Analysis Results

COMPONENT	RESULT	REFERENCE RANGE
Hematocrit (%)	10	37–55
Total bilirubin (mg/dL)	5.6	0–0.4
Reticulocytes (/mcL)	50,000*	< 60,000

* Indicates nonregenerative anemia

Initial Diagnosis & Treatment

A presumptive diagnosis of immune-mediated hemolytic anemia (IMHA) was determined.

Treatment included a blood transfusion and initiation of immunosuppressive therapy. Injectable medications (dexamethasone, 0.25 mg/kg IV, and cyclophosphamide, 200 mg/m^2 IV) were administered rather than oral medications because the dog was vomiting.

While the packed cell volume was 34% immediately post-transfusion, by the next morning, it had dropped to 22%.

Referral

Based on the response to initial treatment, the dog was referred for additional diagnostics and more intense management of IMHA.

Definitive Diagnosis

Due to the vomiting, abdominal radiographs were obtained (**Figures 1 and 2**). The radiographs revealed the presence of a metallic gastric foreign body, likely a coin. This finding, in conjunction with hemolytic anemia lacking spherocytes and agglutination, was consistent with zinc toxicity.

A diagnosis of **intravascular hemolysis from zinc toxicity**, rather than immune-mediated hemolysis, was made. Immunosuppressive therapy was discontinued.

Definitive Treatment

An emergency endoscopy was performed, and a penny was removed from the stomach (**Figure 3**, page 47). A lateral radiograph was obtained postendoscopy and confirmed removal of all foreign bodies (**Figure 4**, page 47).

After endoscopic retrieval of the penny, along with administration of intravenous fluids and famotidine, the patient made a complete recovery. No chelation therapy was required for the zinc toxicity.

CASE CONSIDERATIONS

- Pennies minted after 1982 contain 2440 mg of elemental zinc.[1]
- Vomiting is a common sign of zinc toxicity. In addition, zinc toxicity causes oxidative injury to erythrocytes, resulting in Heinz body or eccentrocytic hemolytic anemia. Intravascular hemolysis can result in hemoglobinemia and/or hemoglobinuria (as seen in this case).
- Rarely, zinc toxicity can result in kidney failure, liver failure, or pancreatitis.[1-4]

The Literature

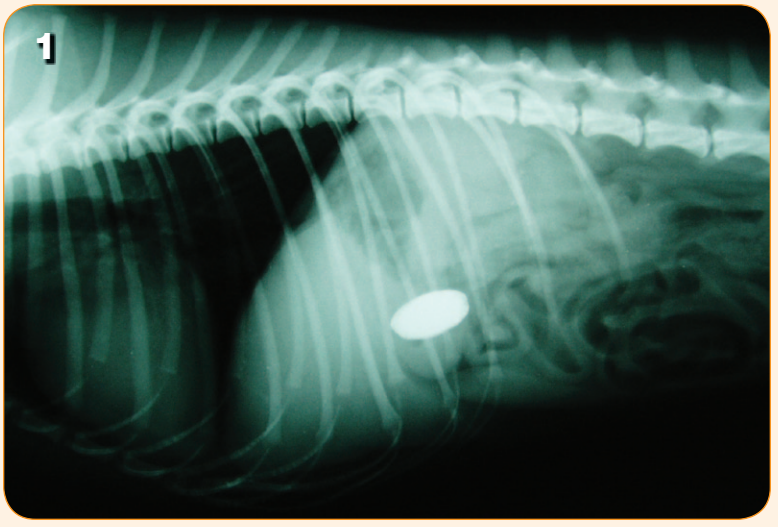
In a review of 19 dogs with zinc intoxication, most of the dogs were successfully treated with endoscopic retrieval of zinc foreign body and supportive care (IV fluids, blood products, H2 blockers, sucralfate). Chelation with Ca-EDTA was only used in 2 dogs. Of 19 dogs, 17 survived, and most were released from the hospital within 2 to 3 days.[5] In another study, the half-life of plasma zinc levels was approximately 7.6 days.[2]

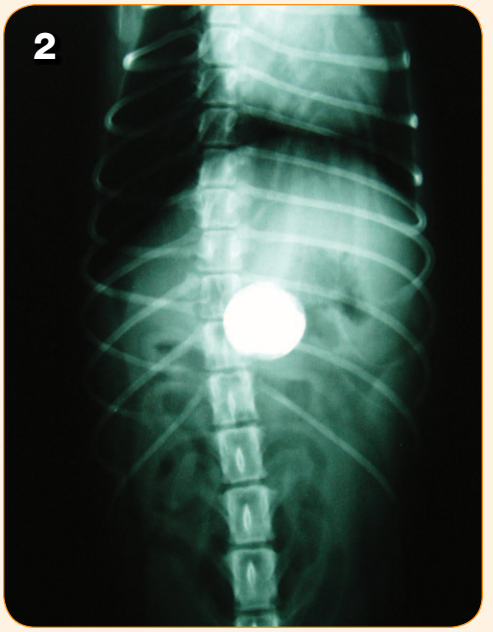
CASE STUDY CLINICAL PEARLS

Ultrasonography versus Radiography

In today's world, some practices are tempted to skip abdominal radiographs and go straight to abdominal ultrasonography. However, ultrasonography and radiography have different strengths and are often complementary.

Abdominal Ultrasonography for Masses. Ultrasonography readily identifies liver masses, splenic masses, and hemoabdomen, and can also be useful for diagnosis of some





Figures 1 and 2. Presence of a metallic gastric foreign body, likely a coin, in conjunction with hemolytic anemia lacking spherocytes and agglutination, is consistent with zinc toxicity.

causes of anemia. While GI masses can be detected, gas can interfere with imaging of some masses. In my experience, intestinal masses are easier to detect than gastric masses, and endoscopy may be needed to detect the latter.

The quality of ultrasonographic evaluation depends greatly on the experience and training of the person performing the examination.

Ultrasound for Detection of GI Foreign Bodies. Two studies have compared the ability of radiography and ultrasonography to detect GI foreign bodies.[6,7] In both studies, ultrasonography was more sensitive than radiography for diagnosis of obstructive intestinal foreign bodies.

In the first study, radiographs identified foreign bodies in 9/16 dogs, including 1 gastric and 1 colonic foreign body. Of dogs with obstructive intestinal foreign bodies, survey radiographs revealed small intestinal overdistension in only 7/14 dogs, whereas ultrasound identified all dogs with intestinal foreign bodies.[6]

In the other study, radiographs were only diagnostic in 70% of dogs with obstructive intestinal foreign bodies, while ultrasound was diagnostic in 97% of patients.[7]

Role of Radiography. Although ultrasound was sensitive for diagnosing obstructive intestinal foreign bodies, it has been my experience that ultrasound is not as useful in detecting gastric foreign bodies due to gas interference.

For gastric foreign bodies, survey radiographs—which readily identify radiodense foreign bodies, such as bones or metal—should be performed initially. If a radiolucent foreign body is suspected, a contrast study should be performed.

Contrast Studies. Barium is generally the preferred positive contrast agent for most cases (see **Step-by-Step Approach to Upper GI Barium Study**). However, barium should be avoided in patients suspected of having a GI perforation (ie, free air or fluid in the abdomen). Barium can also clog the biopsy/suction channel during endoscopy; therefore, its presence in the stomach is a relative contraindication if endoscopy is anticipated.

Pneumogastrogram Studies. Air gastrogram studies, which are performed by passing an orogastric tube and administering 13 mL/kg of room air into the stomach—are underutilized in most small animal practices. The advantages of using room air as contrast include:

- No delay in endoscopic foreign body retrieval
- Ready availability in most general practices.

STEP-BY-STEP APPROACH TO UPPER GI BARIUM STUDY

In most cases, to perform an upper GI barium study:

1. Administer mild IV sedation (ie, ketamine/diazepam)
2. Pass an orogastric tube
3. Administer barium (11–17 mL/kg)
4. Take lateral and ventrodorsal radiographs at 0 min, 15 min, 30 min, 1 H, and then hourly until the stomach is empty and barium reaches the colon.

Ideally, lesions should be visible in multiple time periods to confirm that they represent real findings.

When IMHA Doesn't Respond to Therapy

IMHA may not respond to therapy due to:

- Client or patient compliance issues
- Inadequate dosage of medication
- Inadequate immunosuppression (ie, subtherapeutic levels of current medications and/or need for additional medication)
- True refractoriness of the patient.

Figure 3. Penny retrieved with endoscopic rat tooth forceps.

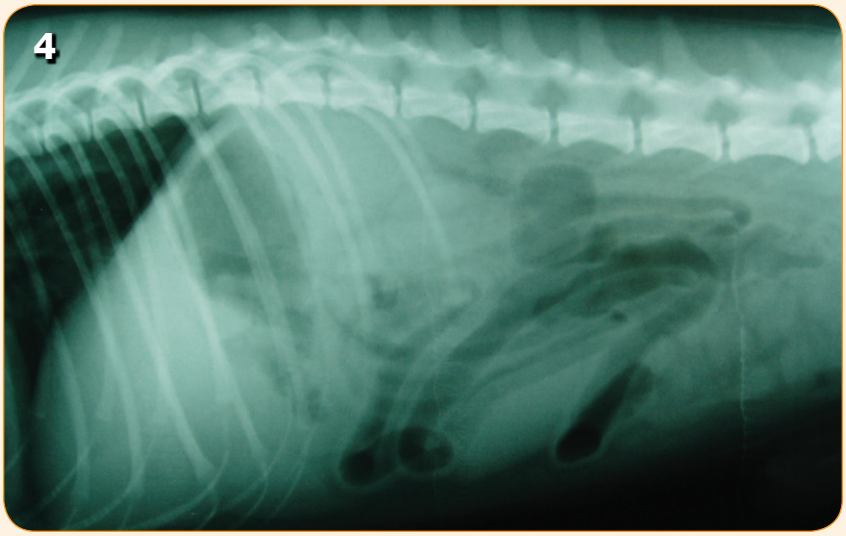


Figure 4. Postendoscopic lateral radiograph confirming all coins removed.

The other important reason that a patient fails to respond to therapy is an incorrect diagnosis. Although IMHA is probably the most common cause of hemolytic anemia in dogs, other differential diagnoses (that should particularly be considered if the patient is exhibiting intravascular hemolysis) include:

- Babesiosis
- Hypophosphatemia
- Phosphofructokinase deficiency
- Pyruvate kinase deficiency
- Zinc toxicity.

In the case study presented here, the diagnosis of IMHA was questioned due to unusual signalment, lack of autoagglutination/spherocytosis, and presence of vomiting.

Signalment. IMHA is more common in middle aged (average age, approximately 6 years), female dogs of certain breeds (eg, cocker spaniels, poodles, Old English sheepdogs) than the dog in this case—a 1-year-old neutered male Jack Russell terrier.

Laboratory Results. In a series of 151 dogs with IMHA, 134 dogs (89%) had spherocytosis, and 118 dogs (78%) had autoagglutination.[8]

However, lack of regeneration, as seen in this case, can be seen in cases of IMHA. In one study, approximately 70% of dogs with IMHA had reticulocytosis, whereas 30% did not have evidence of regeneration.[8] Since it takes 3 to 5 days for bone marrow to respond and increase the reticulocytes in circulation, in acute cases, the anemia is nonregenerative initially.

Also, some cases of immune-mediated anemia target the red blood cell precursors in the bone marrow, which can result in nonregenerative anemia.

Radiography. Vomiting is not common in dogs with IMHA, making radiographs an important part of the diagnostic workup. Zinc-induced hemolytic anemia was suggested based on the presence of a metal gastric foreign body found on survey radiographs.

Endoscopic Retrieval of Foreign Bodies

In the Literature. In a review of 102 cases, endoscopy was successful in foreign body retrieval in 90.2% of those cases.[9] Complications (eg, rupture, esophageal stricture, esophageal diverticulum) were seen in only 12.7% of cases, and were most common with esophageal foreign bodies—especially bone foreign bodies, dogs less than 10 kg body weight, and foreign bodies present for more than 3 days.[9]

When to Refer. Due to the risk of complications, esophageal foreign bodies should be referred, if possible. Gastric foreign bodies (especially coins), on the other hand, can often be successfully retrieved by veterinarians in general practice with endoscopic training.

Postendoscopy Radiography. Postendoscopic radiographs are recommended to document that all foreign bodies have been removed. Radiographs should also be examined for any evidence of perforation (ie, pneumomediastinum or pneumothorax for esophageal foreign bodies, pneumoperitoneum for gastric foreign bodies).

IN SUMMARY

Endoscopy, like any other skill or procedure in veterinary medicine, requires training and practice. The Introduction to Small Animal Endoscopy Course at the NAVC Institute in May 2014 provided an excellent foundation for the participants, who were encouraged to gain more training and experience so that they could incorporate endoscopy in their practices. ■

GI = gastrointestinal; IMHA = immune-mediated hemolytic anemia

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