TREATMENT

THERAPEUTIC GOAL(S)

- Provide supportive therapy until gastrointestinal (GI) tract returns to normal.
- Remove underlying cause if known.

ACUTE GENERAL TREATMENT

- Nothing by mouth (NPO) for 12 to 48 hours.
- Frequent small quantities of oral fluids may be offered if vomiting is infrequent.
- Subcutaneous crystalloids may be used for animals with mild dehydration deficits.
- Intravenous fluids are required if patient is moderately or severely dehydrated or has any evidence of hypovolemia.
- After vomiting has ceased for 12 hours, offer small amounts of water or ice cubes.
- Initial diet should be easily digestible starch, low protein, and low fat (such as rice with cottage cheese or boiled chicken).
- Acid blockers (H_2 blockers: famotidine [0.5 mg/kg PO, IV, or SC q 24h], ranitidine [0.5–2 mg/kg PO or SC q 12h], cimetidine [10 mg/kg PO, IV, or SC q 6–8h]): indicated if hematemesis or melena is present.
- Antiemetics: usually not necessary, metoclopramide (0.2–0.4 mg/kg SC q 8–12h) or phenothiazine (0.1–0.5 mg/kg SC q 8–24h) derivatives (chlorpromazine, prochlorperazine) are good first choices if needed.
- Protectants/adsorbants: bismuth subsalicylate (1 ml/4 kg PO up to q 4–6h), kaolin-pectin, activated charcoal and aluminum-, magnesium-, or barium-containing products are often used for coating GI mucosa and binding bacteria and their toxins.
- Anticholinergics (e.g., atropine, propantheline) are not recommended.
- Antibiotics are not indicated unless there is evidence of a bacterial cause or breech of GI mucosal integrity (hematemesis or melena).

DRUG INTERACTIONS

- High-dose phenothiazine derivative antiemetics (e.g., chlorpromazine, prochlorperazine) can cause or exacerbate hypotension, especially in dehydrated or hypovolemic patients.
- Bismuth subsalicylate should be used cautiously, especially in cats, due to generation of salicylate (aspirin) in intestine.
- Bismuth subsalicylate will normally cause stool to turn black in color, which can be mistaken for melena.

RECOMMENDED MONITORING

- Vital parameters.
- Frequency, volume, and character of diarrhea and vomiting.

PROGNOSIS AND OUTCOME

Prognosis is excellent, usually resolves 24 to 48 hours after onset of signs.

PEARLS & CONSIDERATIONS

COMMENTS

- If vomiting is not frequent, foregoing antiemetics allows better assessment of response to supportive therapy. If no response occurs within 1 to 2 days, other differentials should be investigated.
- Animals with marked dehydration or hypovolemia at presentation should have more detailed diagnostic evaluation; acute nonspecific gastroenteritis rarely produces severe systemic signs.

SUGGESTED READING

Webb C, Twedt DC: Canine gastritis. *Vet Clin North Am Small Anim Pract* 33(5): 969–985, v–vi, 2003.

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Gastrointestinal Endocrine Disease

BASIC INFORMATION

DEFINITION

Gastrointestinal (GI) endocrine disease occurs as a result of a tumor of one or more hormone-secreting cells in the GI tract. Insulin-secreting β-cell tumors are discussed elsewhere (p XXX).

AU: Please give topic name for cross reference.

SYNONYM(S)

General: amine precursor uptake and decarboxylation (APUD) tumors; APUDoma
Specific: gastrinoma (Zollinger-Ellison syndrome), VIPoma (Verner-Morrison syndrome)

EPIDEMIOLOGY

SPECIES, AGE, SEX

- Gastrinoma: rare; middle-aged to old dogs and cats.
- Glucagonoma: rare; middle-aged to old dogs; not reported in cats.
- Carcinoid syndrome: rare; middle-aged to old dogs and cats.

ASSOCIATED CONDITIONS AND DISORDERS: Necrolytic migratory erythema and diabetes mellitus (glucagonoma).

CLINICAL PRESENTATION

DISEASE FORMS/SUBTYPES

- Gastrinoma: gastrin
- Glucagonoma: glucagon
- Carcinoid syndrome: serotonin
- Somatostatinomas*: somatostatin
- Pancreatic polypeptide-oma*: pancreatic polypeptide
- VIPoma*: vasoactive intestinal polypeptide

HISTORY, CHIEF COMPLAINT

- Gastrinoma: vomiting, weight loss, anorexia , diarrhea.
- Glucagonoma: ulcerative dermatitis, diarrhea, lethargy, weight loss, inappetance, possible polyuria and polydipsia.
- Carcinoid syndrome: often no overt clinical signs; possible abdominal pain, vomiting, weight loss, anorexia.

PHYSICAL EXAM FINDINGS

- Gastrinoma: weight loss; lethargy; abdominal pain, pale mucous membranes, melena, and/or collapse and shock as a result of GI ulceration.
- Glucagonoma: ulcerative dermatitis, lethargy.
- Carcinoid syndrome: no specific findings; possible anorexia, weight loss, acute abdomen due to obstruction.

*Not reported in dogs and cats.

ETIOLOGY AND PATHOPHYSIOLOGY

- Specialized endocrine cells that secrete peptides are found throughout the GI tract.

- Neoplasia of these cells results in excess secretion of the hormone(s).
- Clinical signs occur as a result of the specific hormone oversecretion.

DIAGNOSIS

DIFFERENTIAL DIAGNOSIS

See vomiting (p XXX), weight loss (p XXX), anorexia/inappetance (p XXX), diarrhea (p XXX), acute abdomen (p XXX), ulcerative dermatitis (p XXX), hepatocutaneous syndrome? (p XXX).

AU: Please verify 6 names of topics you want to cross reference.

INITIAL DATABASE

- The diagnosis is made based on appropriate clinical signs and immunohistochemical staining of the tumor
- A complete blood count, serum biochemical profile, and urinalysis should be evaluated to help rule out other diagnoses.
  - Mild hyperglycemia, increased liver enzymes, hypoalbuminemia, and possible glucosuria may be seen with glucagonoma.
  - A regenerative or iron-deficiency anemia, possible leukocytosis, hypoproteinemia, and increased liver enzymes may be seen with gastrinoma.
  - Results are usually normal with carcinoid syndrome.
- Radiographs and ultrasound results are usually normal but may help identify the primary tumor or metastatic lesions.

ADVANCED OR CONFIRMATORY TESTING

- Glucagonoma: Increased plasma glucagon concentrations (in the absence of other diseases causing hyperglucagonemia), histopathology of skin lesions, and hypoaminoacidemia are supportive. Results of liver function tests are normal (versus abnormal function with hepatocutaneous syndrome).
- Gastrinoma: Increased fasting serum gastrin concentration (in the absence of other diseases causing hypergastrinemia) and gastric hyperacidity; GI ulceration and/or increased gastric rugal folds seen with endoscopy or contrast radiography; and excessive response to a gastrin-secretagogue (secretin or calcium) are supportive.
- Carcinoid syndrome: Increased serotonin metabolites (5-hydroxyindoleacetic acid) in urine are supportive.
- Confirmation requires immunohistochemical staining of the tumor.

TREATMENT

THERAPEUTIC GOAL(S)

- Removal of tumor.
- Management of associated clinical signs.

ACUTE GENERAL TREATMENT

- Fluid and electrolyte abnormalities should be corrected if present.
- Gastrinoma: treat hyperacidity and GI ulceration (see Gastric Ulcer, p XXX).
- Surgical removal of the primary tumor and any visible metastasis, if possible. With gastrinoma, ulcer excision may also be needed.
- If the pancreas is manipulated during surgery, treat postoperatively for pancreatitis (see Pancreatitis, p XXX).

CHRONIC TREATMENT

- Because of the high incidence of metastasis at the time of diagnosis, surgery is not often curative and subsequent medical management is needed.
- Gastrinoma: treat hyperacidity and GI ulcerations (see above); somatostatin analog treatment (octreotide: 2 µg/kg SQ q 12h up to 10–20 µg/kg subcutaneously [SQ] q 8h) can be tried.
- Glucagonoma: amino acid supplementation (eggs, prescription diets, possible IV amino acid infusion) has been suggested but is unproven; manage skin lesions (see Hepatocutaneous Syndrome, p XXX, Ulcerative Dermatitis, p XXX); octreotide (6 µg/kg SQ q 8h) can be tried.
- Effective chemotherapy for these tumors has not been reported in the dog and cat.

POSSIBLE COMPLICATIONS

The most common postoperative complication is pancreatitis in dogs.

RECOMMENDED MONITORING

Monitor recurrence of clinical signs.

PROGNOSIS AND OUTCOME

- Glucagonoma: poor if concurrent advanced liver disease (mean 5 months) or metastasis.
- Gastrinoma: poor long-term prognosis because metastasis present in 70% of cases at time of diagnosis (mean 8 months).
- Carcinoid syndrome: Many are asymptomatic and are found postmortem. Prognosis is guarded if metastatic disease is present.

PEARLS & CONSIDERATIONS

COMMENTS

These are complex tumors and very difficult to diagnose; referral to a specialist center is advised.

SUGGESTED READING

Feldman EC, Nelson RW: Gastrinoma, glucagonoma, and other APUDomas. In Felman EC, Nelson RW (eds): *Canine and Feline Endocrinology and Reproduction*, ed 3. Philadelphia, WB Saunders, 2004, pp 645–658.

Johnson SE: Pancreatic APUDomas. *Semin Vet Med Surg Small Anim Pract* 4:202–211, 1989.

Au: pls list specific section above

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