

Perforated GI Ulcer in a Dog


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Tucker, an 11-year-old male German shepherd dog, is hospitalized for vomiting and collapse. For the past 6 months, he has received meloxicam treatment for arthritis. Physical examination reveals a painful abdomen, elevated heart rate of 195 bpm (normal, 70-120 bpm), and respiratory rate of 42 breaths/min (normal, 18-34 breaths/min), with fair pulses and injected mucous membranes, a rapid capillary refill time, and a rectal temperature of 103.2°F (39.6°C; normal, 102°F ± 1°F [38.9°C]). Systolic blood pressure is 75 mm Hg (normal systolic, 110-160 mm Hg). Serum chemistry profile results indicate moderate hypoglycemia (blood glucose, 60 mg/dL; normal, 70-143 mg/dL), and CBC results show a neutrophil count of $23 \times 10^3/\mu\text{L}$ (normal, $5.05\text{-}16.76 \times 10^3/\mu\text{L}$) with 10% bands (normal, 0%-3%) and hematocrit of 26% (normal, 37.3%-61.7%). Abdominal ultrasonography confirms free abdominal fluid, which is sampled by fine-needle aspiration. The glucose concentration in the abdominal fluid is 32 mg/dL; total solids are 4.2 g/dL. Cytology of the aspirate shows marked neutrophilic inflammation; many of the neutrophils are degenerate, with occasional neutrophils containing intracellular bacilli. There is no evidence of masses or a foreign body. Based on patient history and presence of septic peritonitis, the dog is prepared for abdominal surgery to confirm a suspected perforated gastric or duodenal ulcer secondary to NSAID treatment.































Which of the following drugs would be appropriate in the management of this patient?

Based on the information provided, how would you grade the following drugs and why?

 RED = do not use

 YELLOW = proceed with caution

 GREEN = safe

Carprofen	 RED	 YELLOW	 GREEN
Hydromorphone	 RED	 YELLOW	 GREEN
Dexamethasone	 RED	 YELLOW	 GREEN
Ampicillin-sulbactam	 RED	 YELLOW	 GREEN
Pantoprazole	 RED	 YELLOW	 GREEN
Ketamine	 RED	 YELLOW	 GREEN
Imipenem	 RED	 YELLOW	 GREEN
Buprenorphine	 RED	 YELLOW	 GREEN
Maropitant	 RED	 YELLOW	 GREEN
Hetastarch	 RED	 YELLOW	 GREEN

**TURN THE PAGE TO
COMPARE YOUR RESULTS**

Did you answer?

The following represents the best responses based on drug metabolism, pharmacokinetics, species, diagnostic differentials, clinical and laboratory data, and other pertinent findings.

Carprofen

CORRECT RESPONSE



Although analgesia is required in this dog, adding another NSAID (ie, carprofen) to current treatment with meloxicam would be contraindicated (NSAIDs should not be combined).¹ In addition, GI ulceration secondary to NSAID administration is suspected; if ulceration is confirmed during abdominal surgery, NSAID use will likely be contraindicated for the remainder of this dog's life.

Hydromorphone

CORRECT RESPONSE



As a pure agonist opioid, hydromorphone is an excellent choice both for initial analgesia and as part of premedication before anesthetic induction. Pure agonist opioids provide good analgesia for invasive procedures with minimal cardiovascular side effects¹; they can also reduce the doses of induction agent and inhaled gas needed to achieve the required plane of anesthesia, minimizing the hypotension caused by larger doses of induction and inhaled anesthetic drugs.

Dexamethasone

CORRECT RESPONSE



Dexamethasone is contraindicated in this dog because of suspected GI ulceration and concurrent administration of the NSAID meloxicam.¹

Ampicillin-sulbactam

CORRECT RESPONSE



Antibiotics are essential in managing septic peritonitis. Ampicillin-sulbactam is a good choice as a broad-spectrum antimicrobial for community-acquired infection.¹ It could be argued, however, that ampicillin-sulbactam is not an adequate antimicrobial for a patient with abdominal sepsis due to high rate of community-acquired *Escherichia coli* resistance to first-line antimicrobials.² Consideration of a combination of antibiotics that initially provides broader coverage, followed by reduced coverage based on culture and susceptibility test results (eg, ampicillin-sulbactam combined with amikacin for a dog in which resistant *E coli* infection is a potential concern), might be advisable.

Pantoprazole

CORRECT RESPONSE



Pantoprazole is an effective proton pump inhibitor (PPI) that can be administered by injection. Some clinicians suggest that twice-daily administration of PPIs may be most effective.^{3,4} If ulceration is identified or highly suspected, a PPI could help reduce gastric pH and allow for ulcer healing.

Ketamine

CORRECT RESPONSE



Ketamine is a dissociative anesthetic and should be used with an analgesic for invasive pain procedures.¹ When given as a CRI at low doses, it can provide analgesia and usually is used in conjunction with an opioid.¹ Of note, ketamine is cardiovascularly sparing and does not cause respiratory depression when administered at lower doses.¹ In addition, the drug is often used with a benzodiazepine to provide better induction and reduce muscular rigidity, which can occur secondary to ketamine administration.¹ At low doses, ketamine may also provide some immunomodulatory benefits in septic patients.⁵

Imipenem

CORRECT RESPONSE



When canine patients, such as this dog, are at lower risk for highly resistant infections, imipenem and other antibiotics in the carbapenem line of antibiotics would be contraindicated. This line of antibiotics needs to be reserved only for use when absolutely essential to combat specific highly resistant infections for which other medications (eg, aminoglycosides) might be unavailable or contraindicated (eg, due to azotemia).

Buprenorphine

CORRECT RESPONSE



Buprenorphine can be an effective analgesic but, because it is a partial agonist, may be inadequate for patients undergoing major abdominal surgery. In addition, buprenorphine is not easily reversible, requiring high doses of naloxone for reversal¹ and potentially placing very critical patients at risk for catastrophic complications. In addition, if buprenorphine is administered before surgery, use of pure agonist opioids before or during surgery may have reduced effect because of buprenorphine's high affinity for μ opioid receptors.¹

Maropitant

CORRECT RESPONSE



Antiemetic medications can be used to reduce nausea and lower patient risk for postoperative vomiting¹ and aspiration pneumonia. Maropitant would be a safe option in this dog.

Hetastarch

CORRECT RESPONSE



Although hetastarch can be an effective fluid for volume replacement in hypotensive patients, it may cause adverse effects, including coagulopathy and acute kidney injury.⁶ In this dog, fluid replacement is essential; however, at least initially, a balanced electrolyte solution is probably more appropriate. ■■■

CRI = constant-rate infusion
PPI = proton pump inhibitor

Continues on page 58



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