PERITONITIS: ANESTHESIA AND PERIOPERATIVE MANAGEMENT
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Key Points:
• Patients with peritonitis are very challenging to maintain under anesthesia due to significant problems with fluid balance, pain and clotting or thromboembolic abnormalities.
• Preoperative evaluation and stabilization to address above conditions is essential
• Attention to physiologic variables monitored and aggressive response to problems is necessary.

Patients with peritonitis are probably the sickest patients encountered by the anesthetist in the small animal clinic. By the time they are identified as surgical candidates they usually have significant sepsis with all of the associated medical problems; hypovolemia and DIC are probably the two of most consequence to the anesthetist, but pain, fever and general malaise are significant as well. I describe these patients as “doggy colics” because their management is similar to anesthetizing horses with severe colic; they will require multiple catheters to facilitate aggressive fluid, colloid and inotrope therapy required to maintain blood pressure.

Preoperative evaluation, premedication and induction
It is important for the anesthetist to evaluate the degree of illness in the patient with peritonitis. Is the patient septic? If so, blood glucose should be monitored and supplemented preoperatively. Has the patient been vomiting or regurgitating? If so, is there any evidence of aspiration pneumonia? Choice of premedicants will be affected by the presence of vomiting; my preference is to give preoperative opioids IV, rather than IM, and then induce before further vomiting (which may be caused by the opioid) occurs. Pre-existing clotting abnormalities must be evaluated; the presence of DIC is not an anesthetic problem but gives the patient a grave prognosis. Patients with peritonitis are also usually quite painful; analgesics already given must be taken into account when building the anesthetic protocol.

Use of an anticholinergic may depend on the patient’s preoperative heartrate but my preference is usually to give glycopyrrolate (0.01 mg/kg) IM prior to induction. Handling the gastrointestinal tract as well as concurrent opioid administration may produce significant bradycardia. Prior treatment with an anticholinergic prevents bradycardia; giving the drug IV, usually produces tachycardia. As previously mentioned, premedication with an opioid (oxymorphone or hydromorphone) can be given IM or IV depending on the patient’s condition. Connecting the patient to ECG and blood pressure (non-invasive) monitors before induction and pre-oxygenation via face mask or flow-by is recommended.

There is probably not good consensus on which induction drug is safest for the septic patient. Propofol has a very short duration of action (making it preferred for a very sick patient), but could support sepsis if contaminated. Etomidate produces very little cardiovascular depression, but produces transient adrenocortical suppression. Ketamine (used with diazepam or midazolam) generally supports heartrate, but will last longer than the other drugs. Cautious use of propofol is usually acceptable unless the patient is sick enough to allow mask induction with inhalant (generally sevoflurane). Certainly any of these choices is reasonable when used in minimal doses with good preoperative patient preparation.
Maintenance, monitoring and intra-operative support

Maintenance can be with an inhalant (isoflurane or sevoflurane) unless the patient is not tolerant of the inhalant. If the patient is profoundly hypotensive when maintained at an appropriate anesthetic depth with inhalant alone, adding a constant rate infusion of opioid (usually fentanyl) or opioid and midazolam will allow the vaporizer settings to be greatly reduced. Other choices for reducing the vaporizer setting include constant rate infusions of lidocaine or ketamine. The author’s clinical impression is that lidocaine is a better analgesic for abdominal surgery than ketamine, but it will also produce hypotension if the vaporizer is not turned down enough; lidocaine produces an inhalant sparing effect of 30-50%.

Routine recommendations for monitoring high-risk abdominal procedures include having 2 intravenous catheters (of the largest size appropriate for the patient) and an arterial catheter for monitoring direct arterial blood pressures as well as providing samples for blood-gas analysis. One might argue that an arterial catheter should not be placed in the face of sepsis or clotting problems; however the benefit of accurate blood pressures must be weighed against the risk of introducing a site of infection. Other monitoring includes ECG, pulse oximetry, capnography, heart and respiratory rate and temperature. If it is not possible to place an arterial catheter, indirect blood pressure monitoring is used. Our goal is to maintain reasonable blood pressures (systolic > 100 mm Hg, mean > 60 mm Hg, diastolic > 40 mm Hg). Higher pressures are desirable, but may not be achieved.

Another possibly controversial decision is whether to give the patient an epidural or not. The author’s subjective clinical impression is that patients survive better (especially when the surgical problem involves the gall bladder and/or pancreas) if they have received an epidural with morphine or local anesthetic to provide additional analgesia in the operative and post-operative period. However, again, if the patient is septic or has clotting abnormalities, an epidural might not be in the patient’s best interest.

Intraoperative fluid support usually starts with a crystalloid like lactated Ringer’s (given at 10-20 mls/kg/hr), but will be customized to the patient’s needs depending on preoperative lab work. Glucose supplementation will be given if post-induction glucose is below normal, usually by adding glucose to produce a 2.5% solution. Hetastarch (4-20 mls/kg) is often needed to support blood pressure and may be used with hypertonic saline (4 mls/kg given over 30 minutes) when blood pressure is very low. Inotropes (dobutamine, dopamine, vasopressin) may also be required to treat hypotension; patients with peritonitis (especially if septic) often seem to be very vasodilated and aggressive treatment is required. Choice of which inotrope will work best seems to be anesthetist and individual dependent; dobutamine or dopamine (approximately 3-5 micrograms/kg/min as a starting point). If dobutamine infusion produces tachycardia or “damping” of the arterial pressure wave, that is evidence that the patient is hypovolemic and further fluid resuscitation is warranted. Vasopressin seems to be “in vogue” as an inotrope at the current time; however it seems that the patient requiring vasopressin for hypotension has a very poor prognosis. Checking a blood gas sample to make sure that the patient’s ionized calcium is in the normal range and supplementing it if low seems to help with treatment of hypotension.

Hypothermia must also be monitored and actively treated. The open abdomen radiates the patient’s heat so hypothermia develops rapidly. Inhalant requirements decrease by 5% for each degree Cº lost so it is easy to under-anesthetize the cold patient. Bradycardia in hypothermic patients will not respond to anticholinergics, but responds quickly to improvement in the hypothermia. Active warming systems (eg, Bair Hugger and Hot Dog warmers) are helpful as is warm lavage of the abdomen.
Recovery

Good monitoring and supportive care must continue into recovery. It is important to ensure that the patient’s temperature returns to normal, that blood glucose is normal and that the patient can oxygenate and maintain blood pressure. Analgesics are important to the recovery process, but in my experience, must be customized for the individual patient. Some patients will require multi-modal analgesia (eg, combinations of an opioid with lidocaine or ketamine) post-operatively but others will be overly depressed with aggressive analgesic cocktails. I prefer to let the patient show me what it needs.