A Team Approach to Managing the Parvovirus Patient

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Canine parvovirus type 2 (CPV-2) is a leading infectious cause of morbidity and mortality in young dogs.[1-3] Untreated, mortality can be as high as 90%.[1] When treated, survival ranges from 60% to 90%, with newer treatment options showing promise of improved survival.[1,4] Because CPV-2 is endemic in many environments, all puppies are effectively at risk for infection with this deadly disease.[1] In addition, CPV-2 is highly contagious, which makes outbreaks in veterinary clinics a very real possibility.[1,3,5]

Regularly reviewing clinic protocols and team member roles in CPV-2 infection control can help improve treatment outcomes and minimize spread of disease.[5,6]

What Is Parvovirus?

CPV-2 is a virus that infects rapidly dividing cells, such as those found in the intestinal lining and bone marrow.[1,3] The loss of the intestinal lining causes vomiting and diarrhea, as well as life-threatening fluid loss and infection through the compromised gut wall.[1,3] Meanwhile, the destruction of white blood cells in the bone marrow means the body cannot fight these infections, resulting in septic shock.[1,3] Left untreated, all these factors can lead to death.[1,3]

CPV-2 is a remarkably hardy virus that is shed in the vomitus and feces.[1,3] Infected dogs typically start shedding the virus in their stool several days before they show any clinical signs and will continue shedding it for several weeks after.[1,3] Under the right conditions, the virus can then last in the environment for >1 year.[1,3] Consequently, CPV-2 can be found in virtually any environment, and spread to at-risk populations (ie, puppies, unvaccinated dogs) is quite common.[1,3]

Diagnosis

Presentation of CPV-2 is nonspecific and can mimic other GI diseases.[3] Lethargy, inappetence, vomiting, and, potentially, hemorrhagic diarrhea are all common.[1,3] On physical examination, CPV-2 patients may have pale mucous membranes, delayed capillary refill time, either fever or hypothermia, and abdominal discomfort.[1] Patient age and vaccination status can help raise or lower suspicion of CPV-2.[1]

Clinicopathologic changes are likewise nonspecific.[3] Neutropenia and/or lymphopenia are classically seen on CBC.[1,3] Changes seen frequently on serum chemistry include hypoproteinemia, hypoalbuminemia, hypoglycemia, prerenal azotemia, and electrolyte abnormalities.[1,3] Diagnostic imaging may show large gas- or fluid-filled loops of bowel and is primarily useful for ruling out other or concurrent causes of GI disease, such as intestinal foreign bodies or intussusception.[1,3]

Fecal testing with cage-side ELISA is the most common method for diagnosing CPV-2 and is recommended for all puppies with vomiting and diarrhea.[1,3] These point-of-care tests have the advantage of being both cost-effective and rapid.[1,3] However, false-negative results are possible due to factors such as intermittent viral shedding or dilution by diarrhea.[1,3] When a false-negative result is suspected on ELISA testing, DNA-based PCR tests can be considered, as they are most sensitive and specific although not as readily available.[1,3]

Individual Treatment & Outbreak Prevention

Inpatient Treatment

The mainstay of CPV-2 treatment is supportive care, consisting of fluid therapy and symptomatic treatment.[1,3] Newly available therapies now allow for targeted treatment of the virus as well.[4]

Fluid Therapy

Gold standard treatment of CPV-2 includes aggressive fluid therapy.[1] Establishing venous access is key and can be difficult in dehydrated and hypovolemic puppies, potentially requiring venous cutdown or an intraosseous catheter.[1,3] A jugular catheter can also be considered, as it is less likely to be contaminated with diarrhea and vomitus and improves blood sampling.[1,3] Because of the risk for contamination, all peripheral IV catheters should be replaced every 72 hours.[3]

Hypovolemic dogs will initially require boluses of balanced isotonic crystalloid fluids to restore circulating blood volume.[1,3] Once perfusion parameters have improved, daily fluids can be calculated to provide maintenance fluids, correct dehydration, and account for ongoing losses.[1,3] Oncotic support may be necessary as well.[1,3]

Additional Supportive Care

Along with fluid therapy, symptomatic care can improve patient comfort and outcomes.

- Antiemetics reduce fluid loss from vomiting, aid in feeding, and may decrease length of hospital stay.[1]
- Broad-spectrum antibiotics can address bacterial infections entering through the compromised gut wall and persisting due to lack of a functional immune system.[1]
- Enteral nutrition supports the integrity of the gut while supplying essential nutrients for healing.[1] Placement of a nasogastric tube may be necessary.[1]
- Partial opioid agonists, lidocaine, and maropitant can all be considered to help reduce abdominal discomfort.[1] However, both NSAIDs and alpha$_2$ agonists should be avoided because of their effects on GI perfusion.[1]
- Antiparasitic medications should be administered as soon as they can be tolerated, as coinfections with intestinal parasites are common in puppies with CPV-2.[1]

New Advancements

Recent developments in monoclonal antibodies for pets have led to the first and only USDA conditionally approved therapeutic for CPV-2.[4] Canine Parvovirus Monoclonal Antibody targets CPV-2 directly, stopping it from gaining entry into host cells.[4,7] Canine Parvovirus Monoclonal Antibody (CPMA) has been shown to be effective at decreasing mortality associated with CPV-2 and providing dogs with significantly faster resolution times for vomiting, inappetence, and lethargy and is given as a single-dose IV treatment.[7,8] In addition, treat-

ment with CPMA may result in decreased viral shedding from the infected patient.[7]

Outpatient Treatment

Hospitalization is not an option for every clinic or owner. Financial limitations can pose a significant barrier to care,[1] along with factors such as owner perception, staff shortages, and limited access to emergency or specialty services. In these situations, options include outpatient treatment or euthanasia.[1] Although outpatient care traditionally has lower survival rates than hospitalization, studies have shown that with proper initial stabilization, regular veterinary rechecks, and owner dedication, outpatient treatment can be moderately successful.[1] Hypovolemia should be corrected with IV crystalloids fluids in the clinic and antibiotic, antiemetic, and analgesic injections given as well.[1] Owners can be taught to give SC fluids at home and sent home with an enteral nutrition diet and oral medications.[1]

Outbreak Prevention

The highly contagious nature of CPV-2 requires stringent prevention protocols to avoid an outbreak in hospital patients.[5]

Syndromic Surveillance

Preventing an outbreak starts before an infected dog steps through the clinic door.[5,6] High-risk pets (eg, puppies) that are vomiting or have diarrhea can be flagged on the schedule or at check-in to allow for early implementation of biohazard protocols.[5,6]

Disinfection

All surfaces and instruments (eg, stethoscopes, thermometers) that come into contact by a CPV-2 patient must be immediately cleaned and disinfected before allowing contact with other patients.[1] Not all disinfectants are effective against CPV-2, and steps should be taken to confirm that the chosen product can deactivate CPV-2. Contact time according to product label should be followed for the solution to properly disinfect surfaces, meaning that examination rooms may need to be closed for a period of time before another patient enters.[5,6]

Owners should likewise be instructed to disinfect their homes, cleaning floors and washing bedding. However, infection may persist despite owners' best efforts due to the presence of difficult-to-disinfect surfaces (eg, carpets). Owners should be advised that their homes may remain infectious to other dogs for more than a year, which is how long the virus can remain viable in the environment.[1]

Isolation

CPV-2 patients should be isolated from all other patients and pets, ideally in a separate room with a separate set of instruments.[5,6] Personnel allowed into the room should be limited to a minimum to reduce traffic in and out of the isolation room and prevent spread to other patients.[6] Protective gear, including gloves, cap, gown, and booties, should be donned when interacting with the patient and removed immediately after.[1,6] Proper hand hygiene (eg, handwashing) should be strictly enforced.[1,6]

Vaccinations

The cornerstone of CPV-2 prevention is vaccination.[1-3] Creating consistent clinic-wide vaccine protocols and ensuring all team members are trained in and familiar with these protocols can help improve client compliance, ensuring that all puppies are appropriately vaccinated and protected.[1-3,9] Puppies should receive CPV vaccines every 2 to 4 weeks starting at 6 to 8 weeks of age through 16 to 20 weeks of age. In areas of high CPV-2 risk, the final puppy vaccination is preferred between 18 and 20 weeks.[9] The puppy vaccine series should be followed by a booster 1 year later, after which subsequent boosters can be given every 3 years.[9]

Most commonly, "vaccine failures" occur because of maternal antibody interference with the vaccine.[2] Maternal antibodies can block the vaccine in the same manner they clear an actual infection, which can prevent puppies from creating their own immunity in response to the vaccine. As maternal antibodies wane, they create gaps in immunity, during which puppies are not protected by the maternal antibodies anymore but also are yet to develop their own successful immune response.[2] Therefore, until the final puppy vaccine is given at 16 to 20 weeks of age, owners should strive to keep their puppies isolated from other dogs to prevent infection.[1] Because this is the prime age for socialization, veterinarians must use their clinical judgment to strike a balance between the dual importance of disease prevention and social exposure.[10]

Step-by-Step Team Approach to the CPV-2 Patient

Client Service Representative

Scheduling & Rooming Patients

Screening pets before they arrive at the clinic is key to identifying potentially contagious pets and proactively initiating biohazard protocols.[5]

- Flag all puppies with vomiting and diarrhea on the schedule when first booking an appointment.[5]
- If a pet is deemed high-risk, ask the owners to call when they arrive rather than entering the waiting room.[5]
- Consider performing the initial physical examination and parvovirus testing in the car. Otherwise, show flagged patients to their room as soon as they arrive, avoiding contact with other patients or personnel.[5]
- If the patient has any accidents on the premises, immediately disinfect.[5] Do not ask the owner to take the puppy outside to finish defecating.[5]
- If a dedicated isolation room is not an option, the schedule may need to be adjusted to allow for extra time to clean and disinfect the examination room.

Veterinary Technician & Veterinary Assistant

Obtaining a Patient History

If infection risk was not identified when the appointment was scheduled, the patient history is another opportunity to recognize risk and halt spread.

- As part of a complete history, always ask if a puppy has had any vomiting, diarrhea, lethargy, and/or inappetence.[6]
- Verify past vaccination history to identify if any gaps in vaccination exist. A verbal recollection of vaccinations can be unreliable. A written record is required to ensure an accurate vaccine history.
- Inquire as to whether the puppy has had any exposure to high-risk social settings, such as dog parks or play groups.

Minimizing Spread of Infection During the Examination

As soon as a patient is identified as high-risk for CPV-2, biohazard protocols must be enacted to contain infection within the examination room.[5,6]

- To reduce traffic in and out of the room, team members already in the room can ask a "clean" individual to fetch any additional equipment.[6]
- All diagnostics and treatments should be performed within the room. Do not take the puppy to a shared treatment room.[6]
- When ready for hospitalization, carry (if possible) the puppy directly to an isolation kennel.[6]
- Examination room and instruments should be immediately disinfected after the appointment, taking care to adhere to the recommended contact time.[3,5,6]
- Exposed team members should change clothing and wash hands thoroughly. Full protective gear should be worn for any future contact with the puppy.[1,5,6]

Preparing an Isolation Kennel

Careful planning of the patient's stay can help streamline care, reducing movement in and out of the isolation area.

- Set up an isolation kennel as far away from all other hospitalization kennels as possible, ideally in a separate room.[6]
- Think ahead of all instruments and supplies needed (eg, syringes, needles, IV tubing, tape, thermometers, bedding) and stock the isolation room accordingly to prevent repeated restocking trips.
- Place plenty of gloves, booties, caps, and gowns at entrance to the isolation kennel for easy access to protective gear. Footbaths may be set up nearby as well.
- Appoint one person to monitor the patient and administer all the treatments to reduce personnel exposure. This may require shuffling responsibilities around, as CPV-2 patients are labor- and time-intensive.
- Any items removed from the isolation room must be immediately disinfected. Bedding should have any solid material removed, then washed in hot water with bleach and dried in a hot cycle. Trash should be double-bagged and taken immediately to outside trash.[6]

Veterinarian

Diagnosis

Timely fecal testing for CPV-2 requires early recognition of CPV-2 risk factors.

- Recommend CPV-2 testing for all puppies with vomiting and diarrhea, especially if they are undervaccinated.[1]
- Rule out other causes of vomiting and diarrhea with routine laboratory testing, fecal testing, and/or diagnostic imaging as necessary.

Client Education

The medical, financial, and long-term implications of CPV-2 infection can be quite serious and should be communicated with both transparency and empathy.

- Discuss prognosis with and without treatment.
- Explain what gold-standard hospitalization entails in terms of treatments and labor, and provide a cost estimate for care.
- Educate owners of the highly contagious nature of this disease so they can update vaccinations of other dogs in the household and alert owners of dogs that may have been exposed by their pet. Owners should also be advised that their puppy may continue shedding CPV-2 virus—and therefore expose other dogs—for several more weeks after recovery.[1,3]
- Inform owners that their home will remain contagious for >1 year, making it unsafe for puppies and undervaccinated dogs during that time.[1,3]

Financing Care

Financial concerns are a common barrier to CPV-2 treatment, making financing options and alternative treatment plans welcome to some owners.[1]

- Offer a payment plan, if available.
- Introduce owner to outside financing options.
- Outpatient treatment plans may be an option for the right owners and the right patients; however, owners must be committed to intensive at-home care and made fully aware of the potentially poorer prognosis.[1]

Coordinating Treatment

CPV-2 patients are typically complex cases that require close monitoring and around-the-clock treatment.

- Create a treatment plan that follows gold-standard protocols and incorporates newest advancements for improved outcomes and potentially reduced stays.[7,8]
- Time treatments together to reduce back-and-forth entry into the patient's kennel.
- Reassess the patient throughout the day using physical parameters and blood work (eg, blood glucose levels, electrolyte status, acid-base status), and adjust treatment as necessary. Consider further diagnostics (eg, radiography, CBC) to evaluate for secondary complications, such as intussusception and sepsis.[1,3]
- Regularly check in with the owner to provide updates and ensure continued acceptance of the plan.

Conclusion

Navigating the serious and contagious nature of parvovirus can be an incredible challenge for even the most experienced veterinary teams. The new Canine Parvovirus Monoclonal Antibody treatment is the first targeted treatment for parvovirus and has been shown to improve patient outcomes. Utilizing the latest medical therapies, along with educating the whole team in the process of caring for the parvovirus patient, can help to ensure the best possible patient outcomes.

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