Nursing the patient with parvovirus

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ABSTRACT Parvovirus is a debilitating, life-threatening disease, which affects the canine population. Promptly instituted intensive treatment and nursing protocols are the key to increasing survival rates. Supportive care and nursing is possibly the most important aspect in the overall management of the parvovirus patient. This article discusses the essential aspects of nursing the parvovirus patient in relation to the overall therapeutic plan, including prevention of the spread of the disease.

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Introduction

Canine parvovirus can pose a serious threat to life in all individuals from the young to old. The speed at which the virus replicates and destroys infected cells corresponds to a rapid onset of clinical signs and patient deterioration. In order to maximize the chances of survival, rapid implementation of intensive treatment, particularly supportive nursing, is vital, as most of these patients will be severely debilitated.

Background

Canine parvovirus (CPV) belongs to a family of small DNA viruses, which require actively dividing cells, such as those in the gastrointestinal tract and immune system, in which to replicate (Nelson & Guillermo Couto, 2014). Three variants of CPV2 are currently known to infect dogs in the UK, CPV2-a, 2-b and 2-c (Decaro & Buonavoglia, 2012). The virus is highly contagious and resistant in the environment, providing a source of re-infection during outbreaks. Routine disinfectants will not kill parvovirus, so parvocidal disinfectants, such as Vira-Care (GHS Direct), must be used to prevent the spread (Lane, Cooper & Turner, 2009).

Up-to-date vaccinations, in line with the manufacturer's guidelines, are protective but one must remember the role of 'herd immunity'. Vaccination of a large proportion of individuals within a population (or 'herd') indirectly protects the unvaccinated individuals. This is effective because a high percentage of protected (vaccinated) individuals keep the incidence of the disease low in the overall population by indirectly protecting the unvaccinated individuals, as vaccinated animals are less likely to contract and spread disease. With this in mind, if the critical number of vaccinated animals is not maintained, the disease is more likely to spread, possibly even to vaccinated individuals. This is especially relevant for more susceptible breeds, such as Rottweilers and Labradors (Nelson & Guillermo Couto, 2014).

Presentation and diagnosis

Presentation

The most common clinical signs result from the destruction of the intestinal lining and immune-system disruption. Vomiting, diarrhoea, pyrexia, dehydration and lethargy are common signs, though not specific for parvovirus.Other causes of these clinical signs can include: dietary indiscretion, idiopathic haemorrhagic gastroenteritis, *Salmonella* or *E. coli* infections, intussusception and foreign bodies (Nelson & Guillermo Couto, 2014).

It is important that any puppy with vomiting or diarrhoea is considered to be infected, even if it has started its first

Figure 1. Patient-side tests such as Speed Parvo FC® (Virbac) can speed up time to diagnosis

vaccination course. As soon as it enters the practice, a dog with suspicious clinical signs should be separated from the general population in the waiting room, to prevent contact with at-risk dogs. The RVN can play a key role in recognizing the clinical signs and identifying potential risks at the front line. It may seem an over-reaction to isolate every animal with suspicious signs as it enters the waiting room, however protecting the wider population is a vital step in preventing the spread of the disease.

Diagnosis

Blood tests are not considered the first line method of choice for diagnosis of a parvovirus infection. A single serology sample is insufficient as some animals may still have circulating maternally derived antibodies. Paired serology 14-21 days apart may indicate exposure to the virus, but whilst waiting for the second sample for conformation of clinical disease many animals will die as prompt implementation of treatment is essential. Hence in-house tests are a much more effective means of diagnosis in parvovirus cases. Non–specific findings on haematology may include severe neutropaenia and lymphopaenia, anaemia or polycythemia.

In-house faecal testing for parvovirus is the diagnostic method of choice, being quick and cost effective, and nurses can start the process during the consultation with the veterinary surgeon. There are several tests currently on the market, such as SNAP Parvo® (IDEXX Laboratories), an ELISA test, and Speed Parvo FC® (Virbac), an immunochromatographic test (**Figure 1**).The tests will give a visual colour indication of the result within 10 minutes.

After the onset of clinical signs, infective virus may not be shed in the faeces for up to 48 hours, the virus is then shed for 2–7 days after which levels will start to decrease over the following seven days (Nelson & Guillermo Couto, 2014).Remembering this when testing for parvovirus is important as animals with clinical signs should not be ruled out on the basis of one negative result and repeat testing may be needed to confirm the diagnosis.

Nursing considerations

During a hospitalisation stay animals, especially the young, can become bored and depressed due to lack of socialisation with other animals or people. It is advisable to ask owners to bring something from home that can be disposed of afterwards or can be sterilised. Advise the owner to bring in any toys their pet really enjoys playing with or bedding they like to use, as all these items will still have familiar scents and can be comforting to the patient. Not only may this promote well-being but, along with lots of TLC from the nurse, this can make the hospitalisation stay more comfortable for the patient.

Barrier nursing is vital to prevent the spread of parvovirus both within the practice and to the external environment (**Figure 2**).The isolation facility should be equipped with foot baths, shoe covers, gloves, gowns, separate monitoring equipment (see **Table 1**), dedicated sterilization areas for dirty or contaminated equipment, such as bedding, and separate waste disposal.This 'contaminated' equipment needs to be pre-soaked for 10-15 minutes in a parvocidal disinfectant before washing to kill the virus before the equipment is cleaned. The bedding should be kept separate from everyday wash loads and preferably this area should be close to the laundry area to keep contamination to a minimum. All dirty bedding should always be handled wearing protective clothing and bagged when moving to the laundry area for soaking.

There should be prominent signs to raise the awareness of the appropriate precautions to be taken when entering. The nurse should be prepared to complete all aspects of patient care including observations, replacement of bedding if needed, and patient cleaning, at each session. Leaving the isolation facility during this process will only increase the risk of spreading the virus. Only designated members of staff should be allowed entry and, although distressing to owners, visitors should be discouraged to prevent further spread (Mullineaux & Jones, 2007).

Table 1.

Stethoscope
Thermometer
Blood sampling equipment and tubes
Blood Pressure monitor and selection of cuffs

A parvocidal footbath should be placed outside the room to ensure that the virus is not transferred from the isolation area. The use of a parvocidal footbath is a secondary measure to ensure footwear has not been contaminated. Unfortunately in a busy practice it is made more difficult to continue with everyday practice alongside strict isolation procedures. If there are sufficient nurses within the practice to dedicate a single person to look after isolation patients, the footwear should be changed to something that is suitable for sterilising/disinfecting such as clogs. These should be kept in the isolation room at all times and shoe covers can still be worn.

Having clinical waste bins inside the quarantine area helps to keep the risk of spread to a minimum.When leaving the isolation facility, gowns, masks, and gloves should be removed, once the external door has been opened, so as not to contaminate the external handle, and placed in the bin before hand washing with an appropriate parvocidal agent. Ensure hands are washed properly using a surgical scrub technique, such as that outlined by the World Health Organisation, more details can be found at www.who.int. Remove the first shoe cover to step in the parvocidal footbath before stepping over the

Figure 2. Barrier nursing is a key component in the treatment of a parvovirus patient

threshold and repeat with the other foot. The surrounding area should be cleaned on a daily basis and the footbath changed after every use. Once the footbath has been soiled it becomes less effective so for optimal infection control the footbath should be changed after every use.

As parvovirus patients are likely to be immunocompromised, barrier nursing is important to also minimise the risk of bringing further pathogens into the isolation unit (Sykes, 2010).The prevalence of hospital or healthcare-acquired infections (HCI) is not well documented in veterinary medicine, however some attempts have been made to quantify risk factors.One veterinary teaching hospital evaluated levels of methicillin-resistant *Staphylococcus aureus* (MRSA) and methicillin-resistant *Staphylococcus pseudintermedius* (MRSP) contamination on white coats and surgical scrubs and found that 17.5% of this clothing was contaminated with methicillin-resistant *Staphylococcus*, giving rise to the assumption that it could therefore act as a possible source of hospital acquired infections (Singh, Walker, Rousseau, Monteith & Weese, 2013).

One of the main risk factors identified for the development of resistant hospital-acquired infections is prolonged hospitalization (Hamilton et al., 2013; Ruple-Czerniak et al., 2013). This emphasises the need both for rapid and effective treatment, to aid in the reduction of the length of hospitalisation, as well as appropriate barrier nursing techniques.

Therapeutics

Affected animals are likely to be receiving multiple therapies, to address hydration and electrolyte disturbances, prevent secondary bacterial infections, and reduce emesis.

Fluids

Severe dehydration and electrolyte disturbances are common clinical problems, making fluid therapy possibly the most important medical consideration. Therapy should focus on correcting hydration and replacing ongoing losses whilst allowing for the maintenance of normal fluid levels.Close monitoring of electrolyte balance for hypokalaemia and hypoglycaemia, both of which will occur rapidly in young/anorexic patients that are vomiting and are less able to compensate, is essential.

Antibacterials

Due to damage to the intestinal epithelium, there is a high risk of bacterial translocation, secondary bacterial infections and possible septicaemia, therefore antibiotic therapy is indicated.

Broad spectrum antibiosis, including gram positive and anaerobic bacteria, is essential. In some cases, gram negative cover may also be required, so often multimodal antibiotic therapy is instituted. Taking into account the clinical condition of the patient and concurrent medical considerations, a risk/benefit analysis can be made to choose the appropriate antimicrobial combination.

Appropriate antimicrobial choices include B lactams such as amoxicillin clavulanic acid for gram positive and anaerobic cover, second or third generation cephalosporins for gram negative and gram positive cover and enrofloxacin or gentamycin for gram negative cover. It is important to note that enrofloxacin has been associated with arthropathies related to articular cartilage damage in dogs aged 4-28 weeks (Riviere & Papich, 2009). Aminoglycosides should not be administered until fluid therapy has commenced and dehydration has been corrected.

Anti-emetics and anti-diarrhoeals

Anti-emetics should be considered, depending upon the severity of vomiting, as increased emesis can exacerbate dehydration and electrolyte imbalances if untreated. Agents such as metoclopramide (Emeprid, Ceva Animal Health) can be administered in sequential doses or constant rate infusion (CRI) with strict monitoring as metoclopramide has prokinetic properties (Riviere & Papich, 2009), which may be beneficial in ileus, however it could also predispose to intussusception, so careful monitoring is essential. Other anti-emetics, such as maropitant (Cerenia®, Zoetis), may be more effective by preventing both central and peripheral emesis pathways, compared with other drugs which only act on one pathway (Sedlacek, H.S., et al. 2008). Anti-diarrhoeal agents are not recommended, as retention of intestinal contents with potentially compromised intestinal epithelium increases the risk of bacterial translocation and systemic complications.

Anti-virals

Recombinant feline interferon omega or rFeIFN (Virbagen Omega®, Virbac) is authorized in the EU for the reduction in clinical signs and mortality of parvovirus infection in dogs from one month of age. Interferons have antiviral, anti-proliferative neoplasia and immunomodulatory properties (Riviere & Papich, 2009). Specifically, interferon omega is released by cells in response to viral infection, and rFeIFN significantly reduces the severity of enteritis, vomiting and anorexia, with rapid effect, in experimentally

induced parvovirus (Ishiwata, Minagawa & Kajimoto, 1998).Interferon administration in the field correlates with a 4.4-fold reduction in mortality compared to a placebo when implemented early and combined with relevant supportive treatment such as that outlined above (Mari, Maynard, Eun & Lebreux, 2003). In an unvaccinated population, along with supportive therapy, it was found to reduce mortality to less than 3% (Mari et al., 2003).

Nutrition

Critical illness induces metabolic changes, which place patients at higher risk of malnutrition. During initial starvation, liver glycogen stores are used as energy. They are quickly depleted, leaving the body to mobilise energy from muscle stores, known as a catabolic state, before metabolism switches to using stored body fat. The inflammatory response, which is triggered by disease, changes hormone levels and releases inflammatory molecules, shifting the body back to using muscle as an energy source (Chan & Freeman, 2006).

Human patients that are undernourished when admitted to hospital have a higher percentage of weight loss whilst hospitalised compared to patients of a normal weight (McWhirter & Pennington, 1994). In addition, being undernourished is associated with an increased risk of complications during hospitalisation (Naber et al., 1997). This data has not been replicated on a large scale in the veterinary sector, but similar principles can be applied. Equally, it may be easy to overlook the nutritional needs of overweight patients because of their body-condition score. Taking into account these factors, nutrition should be just as important in the therapeutic plan as pharmaceutical therapy and the veterinary nurse can play a key role in this vital part of the treatment.

Early enteral nutrition is associated with more rapid clinical improvement and significant weight gain when compared with delaying offering food until vomiting has ceased for 12 hours (Mohr et al., 2003). During hospitalisation, the initial goal is to provide for the resting energy requirements of the patient (Chan & Freeman, 2006).If per-os feeding is not suitable for a patient, early enteral nutrition can be implemented via a nasogastric or oesophagostomy tube. Nutrients such as glutamine are important for enterocyte health and contribute to the replacement of cells during normal epithelial turnover but also the repair of mucosal injury. Implementing early nutritional support may decrease the length of hospitalisation and therefore risk of contracting an HCI (Liu, Brown & Silverstein, 2012). Early enteral nutrition may also improve gut barrier function, limiting the translocation of bacteria or endotoxins (Mohr et al., 2003).

Figure 3. Getting the patient home as quickly as possible to familiar surroundings can help to speed up their complete recovery

Monitoring

Close and regular monitoring is vital throughout the patient's hospitalisation period.Heart rate, respiratory rate and mucous membrane colour should be checked on an hourly basis, as well as monitoring for signs of pain, dehydration and infection. The patient's temperature should be taken at least twice a day or more frequently if the temperature is outside the normal range. In addition to checking the patient's temperature, the room temperature should be regularly checked and adjusted to meet the patient's needs to ensure they are comfortable during their stay. Any changes in responsiveness and alertness may indicate a deterioration in the patient's condition, so regular clinical and laboratory parameter monitoring, including white blood cell count, kidney and liver function, is also appropriate.

Recovery

Getting a patient through the acute stages can be tough. However, once a patient reaches the recovery phase, with an improved demeanour, normal hydration and eating and drinking without further vomiting or diarrhoea, it is time to go home.

Before discharge it is important to ascertain whether there are other animals in the household that may be at risk by checking their vaccination status and ensuring that they receive prophylactic therapy if necessary. The client should also be advised regarding the need to thoroughly clean the home environment with a parvocidal disinfectant (Nelson & Guillermo Couto, 2014). During the first few weeks after recovery, the patient will still need to be isolated from other animals, as the virus can continue to be shed for up to four weeks (Nelson et al., 2014), but being back at home with it's owners can make a big difference to a patient's complete recovery. Home routine and familiar toys, beds and blankets help them feel more relaxed, happy and content, which all contributes to their improvement (**Figure 3**).

Conclusion

Nursing the parvovirus patient is intensive and needs precise planning to implement a multimodal treatment regime, taking into account measures to prevent spread of the virus within a practice. It is, however, very rewarding to see an animal that has been severely debilitated return to health. Rapid diagnosis, implementation of treatment and identification of risk factors for further complications will result in the best chances of a positive outcome.

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Multiple Choice Questions

1. How many variants of canine parvovirus are currently circulating within the UK?

(a) 1

(b) 2

(c) 3

2. How long can it take before detectable levels of parvovirus are present in the faeces?

(a) 4 hours

(b) 24 hours

(c) 48 hours

3. How long is the virus initially shed in the faeces post infection and can be detected by faecal testing?

(a) 1-7 days

(b) 2-7 days

(c) 7-14 days

4. Which two biochemical parameters need to be closely monitored during rehydration?

(a) Potassium and glucose

(b) Sodium and glucose

(c) Potassium and sodium

5. Which of the following therapeutic options is contra-indicated in parvovirus?

(a) Anti-emetics

(b) Anti-diarrhoeal agents

(c) Interferon

6. By what factor does recombinant feline interferon omega (Virbagen Omega®, Virbac) reduce mortality in parvovirus?

(a) 3 fold

(b) 4.4 fold

(c) 6.4 fold

7. Which of the following nutrients is especially important for enterocyte health?

(a) Glutamine

(b) Taurine

(c) Glucose

7. How long after recovery from clinical disease can parvovirus be intermittently shed for in the faeces?

(a) 2 weeks

(b) 4 weeks

(c) 6 weeks

For the answers to the MCQs, please go to: http://www.bvna.org.uk/publications/veterinary-nursing-journal