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Nursing patients with meningoencephalomyelitis of unknown origin

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ABSTRACT: Meningoencephalomyelitis of unknown origin (MUO) has two main forms: a granulomatous form that appears less aggressive (more common) and a necrotising form that typically causes more severe deficits and progresses more quickly. Diagnosis requires specialist diagnostic tests, but a suspected diagnosis is often achieved based on the patient's signalment and clinical presentation. Nursing should be tailored to each individual, and communication with the veterinary surgeon and dog owners is of utmost importance.

Introduction

Meningoencephalomyelitis of unknown origin (MUO) consists of a group of inflammatory diseases of the central nervous system (CNS), of suspected immune-mediated aetiology, that accounts for about 25% of all CNS diseases in the dog. These conditions have not been reported in the cat, where infectious diseases (such as FIP and *Toxoplasma*) are significantly more common than immune-mediated diseases.

MUOs have two main forms: a *granulomatous form* that appears less aggressive (more common) and a *necrotising form* that typically causes more severe deficits and progresses more quickly. They typically affect small-breed dogs such as the terrier breeds (although any breed can be affected) and young to middle-aged dogs between two and five years of age (although any age is possible). The clinical signs tend to develop over a few days and will continue to become more severe with time; this helps to distinguish MUOs from neoplastic conditions, such as brain tumours, as these tend to worsen at a slower rate.

Presentation

Many different clinical presentations are possible: the inflammation can develop anywhere within the CNS and often the neurological examination points to

lesions within different parts of the brain and spinal cord. There can be patches of inflammation in several regions of the CNS at the same time.

Granulomatous form

Most commonly, dogs with the granulomatous form of MUO present with a head tilt, nystagmus (rapid eye movements) and ataxia (unco-ordinated gait), while at other times they present with circling, blindness and seizures. In a number of dogs, the inflammation affects only the spinal cord and in these cases they present with difficulty walking or even complete inability to walk. It can be very difficult to differentiate these cases from dogs with intervertebral disc disease (slipped discs) without performing further diagnostic investigations. Less commonly, when the inflammation is confined to the optic nerves, dogs present with acute bilateral blindness with dilated pupils.

Necrotising form

The necrotising form often develops at a faster pace and most dogs present with seizures, blindness, circling and depression. This form is most common in Pugs and Yorkshire Terriers but has also been seen in French Bulldogs and Chihuahuas among others.

Nursing considerations

On admission, the veterinary surgeon will assess the patient by performing a thorough physical and neurological

examination. At this stage, it is important for the VN/RVN to discuss the patient's presenting clinical signs so that appropriate measures can be put into place. Patients with MUO can present in many different ways as this disease can affect all parts of the brain and also the spinal cord.

Ataxia/paresis

Some patients present with ataxia (unco-ordinated gait) or paresis (weakness of all or just the pelvic limbs) as a result of involvement of the brainstem and/or spinal cord. Harnesses and support slings (if necessary) should be used in these cases (Figures 1 and 2). Rubber matting can be used to steady patients when walking them out of the kennel area.

Head tilt/circling

Patients may present with a head tilt and/or circling. A head tilt is characterised by a rotation of the median plane of the head causing one ear to be held lower than the other. These patients should be provided with flat, level bedding. Dogs should be placed in kennels that are at floor level, avoiding any steps. Water should be offered every four hours and syringe fed slowly if necessary. A suitable diet can be rolled into meatball-sized pieces and hand fed to reduce stress for the animal and maximise intake.



▲ Figure 1. Harnesses suitable for use in cases with ataxia/paresis



▲ Figure 2. Slings suitable for use in cases with ataxia/paresis

Seizures

Other patients may present with seizures and it is important in these cases that a seizure protocol, drawn up by the veterinary surgeon, is placed in clear view along with the appropriate medication at the front of the kennel. These patients should be monitored very closely in an environment where noise is kept to a minimum and where members of staff are constantly present. A 'seizure watch' sign can be placed on the front of the kennel to draw people's attention to the patient, with details of who should be contacted in the event of a seizure.

Ophthalmic changes (including blindness)

Patients may have ophthalmic changes or blindness. During the neurological examination, the veterinary surgeon will check the patient's menace response and palpebral reflex. If an animal's blink response is absent, a suitable eye lubricant should be dispensed and administered to the affected eye every two to four hours. It is a good idea to ask owners of blind patients to bring an item of clothing or a toy from home so that the patient has a familiar smell in their kennel to help reduce stress and provide some comfort. Visual impairment should be highlighted on the animal's hospitalisation sheet, especially if they are blind, so that staff can handle them appropriately.

Recumbency

In some cases, patients may be recumbent and therefore will need to be placed on thick bedding to reduce the risk of decubitus ulcers developing. A mattress lined with incontinence pads and a Vetbed™ should be used if available; however, incontinence pads do not allow the urine to pass through and away from the patient's skin and so should not be placed directly under a recumbent patient. Prompt removal of soiled bedding, thus keeping the patient dry and clean, will reduce the risk of associated complications.

When dealing with patients that are short-coated or entire males, Vetbed™ can often be abrasive and lead to erythema of the skin and/or testes. As veterinary nurses, it is our responsibility to choose the bedding that is most suitable for each individual patient. A cotton duvet or sheet may be appropriate. Foam wedges can be used to prop the patient into sternal recumbency if necessary.

Recumbent patients should be turned every four hours to reduce the risk of hypostatic pneumonia. Massage of pressure points should be carried out to promote local blood flow. Early and aggressive treatment should be pursued if these complications develop.

Recumbent patients will require physiotherapy. The physiotherapy routine should be performed every four hours throughout the day to reduce muscle atrophy and stiffness, increase circulation and encourage lymphatic drainage. All physiotherapy should be performed under the guidance of the veterinary surgeon in charge of the case. Techniques such as effleurage, petrissage, friction, stretching and range of movement of the affected limbs should always be carried out before taking a patient out of the kennel for assisted or active exercise. Warm wheat packs can be used over the affected limbs for 10 minutes prior to starting physiotherapy to promote blood flow to the muscles and decrease muscle spasms. If there is a continued need for physiotherapy after discharge, referral to a qualified physiotherapist should be recommended to owners.

Tests and treatments

Tests

Once magnetic resonance imaging has been performed (which will typically show patches of inflammation within the nervous system) and cerebrospinal fluid has been analysed to confirm the inflammation, blood should be collected and submitted to rule out infectious diseases (*Toxoplasma gondii* and *Neospora caninum*) as possible causes of the inflammation.

Treatments

Treatment of MUO involves the use of immunosuppressive drugs. Corticosteroids are the mainstay of treatment but often other drugs are added to reduce the likelihood of relapse. These are frequently chemotherapy drugs such as cytarabine or lomustine, but drugs such as ciclosporin or azathioprine can also be used. The most common treatment protocol involves corticosteroid therapy along with cytarabine.

In general, it is a good idea to add gut protectants as these drugs (mainly the corticosteroids at high doses) can cause gastric upset. Routine haematology and biochemistry must be carried out prior to each cytarabine treatment to

look for possible myelosuppression or liver toxicity. As with any chemotherapy regime, consider delaying treatment if any of these is identified.

Doses and routes of administration of cytarabine in the treatment plan for MUO are not yet firmly established. Subcutaneous administration of 50 mg/m² given twice daily (12 hours apart) over two days or continuous-rate intravenous administration (CRI) at 200 mg/m² over an eight-hour period (25 mg/m²/h) are the most commonly used protocols. Doses are lower than those used in the treatment of neoplasia. These treatment protocols are repeated every three weeks. The CRI protocol has been shown to have some pharmacokinetic benefits over the subcutaneous route.

The treatment interval is sometimes increased (between four and six weeks) and some dogs receive cytarabine only in the initial stages of treatment (for three or four cycles) if there has been complete resolution of the clinical signs and the improvement has been maintained. If, at any point between visits during treatment, there are signs of relapse, cytarabine can be reintroduced as a rescue protocol or the dosing intervals can be shortened, but to not less than every three weeks and kept at that interval if needed. For some patients, treatments will need to be continued indefinitely but it is important to attempt to stop treatment in order to assess the need for it, because in many cases this form of treatment can be stopped without relapse occurring.

Health and safety considerations

When dealing with cytarabine, it is imperative to follow correct health and safety protocol. Staff must wear the appropriate protective clothing (gloves, gown and mask) when handling or administering chemotherapy drugs (Figure 3). Two members of staff should be involved when administering subcutaneous cytarabine, with one member restraining the patient. The treatment should be administered in an area with no through traffic.

Waste must be separated into purple waste containers: the designated sharps bin should have a purple top and the separate pharmaceutical waste bin should have a purple lid or label. Purple waste bags should be used. The European Waste Catalogue (EWC) code and the hazardous



▲ **Figure 3.** Staff should wear appropriate protective clothing when handling cytotoxic drugs

property (HP) codes must be clearly visible. The waste should be consigned to a specialist contractor and a fee made payable to the Environment Agency on disposal. Protective clothing and gloves should be worn when handling any cytotoxic waste (see Figure 3).

Patients that are receiving treatment should be barrier nursed, and their kennels should be labelled appropriately. Pregnant women and immunosuppressed individuals should not handle chemotherapy drugs.

When patients are discharged back into their owners' care, it is very important to discuss the relevant precautions that the owner should take up until five days following administration of cytarabine. A handout containing all of the relevant information can be drawn up and should be given out as part of the discharge instructions (see box).

Key points on discharge

- **Strict hygiene is essential** when dealing with urine, faeces or vomit. Wear gloves, and, if any accidents happen within the home, minimise aerosol production during the cleaning process by wearing gloves and using copious amounts of soapy water. Wash your hands thoroughly afterwards.
- **Litter trays** should be paper-lined to reduce the amount of dust contamination. Empty the tray as soon as possible after soiling. Wear gloves.
- **Monitor your pet closely.** Seek veterinary advice if you see any of the following:
 - bruising of the skin
 - blood in urine, faeces or vomit
 - diarrhoea for more than 24 h
 - repeated vomiting
 - inappetence for more than 24 h, particularly if associated with vomiting and diarrhoea
 - extreme lethargy or reluctance to exercise
 - any marked changes in behaviour.

Conclusion

Patients with MUO present in many different ways. Diagnosis requires specialist diagnostic tests but a suspected diagnosis is often achieved based on the patient's signalment and clinical presentation. It is important to remember individual limitations within each practice setting and referral should be considered if necessary. Nursing should be tailored to each individual, and communication with the veterinary surgeon and owners is of utmost importance. [vni](#)

Further reading

CHERUBINI, G. B., PLATT, S. R., ANDERSON, T. J., RUSBRIDGE, C., LORENZO, V., MANTIS, P., & CAPPELLO, R. (2006). Characteristics of magnetic resonance images of granulomatous meningoencephalomyelitis in 11 dogs. *Veterinary Record*, **159**(4), pp. 110–115.

CROOK, K. I., EARLY, P. J., MESSENGER, K. M., MUÑANA, K. R., GALLAGHER, R., & PAPICH, M. G. (2013). The pharmacokinetics of cytarabine in dogs when administered via subcutaneous and continuous intravenous infusion routes. *Journal of Veterinary Pharmacology and Therapeutics*, **36**(4), pp. 408–411.

LOWRIE, M., SMITH, P. M., & GAROSI, L. (2013). Meningoencephalitis of unknown origin: investigation of prognostic factors and outcome using a standard treatment protocol. *Veterinary Record*, **172**(20), pp. 527.

MUÑANA, K. R. (2013). Head tilt and nystagmus. In: PLATT, S., & OLBY, N. Eds. *BSAVA Manual of Canine and Feline Neurology*, 4th Ed. Gloucester: BSAVA. Chapter 11.

PLATT, S., & OLBY, N. Eds. (2013). *BSAVA Manual of Canine and Feline Neurology*, 4th Ed. Gloucester: BSAVA.

SHERMAN, J., OLBY, N., & HALLING, K. B. (2013). Rehabilitation of the neurological patient. In: PLATT, S., & OLBY, N. Eds. *BSAVA Manual of Canine and Feline Neurology*, 4th Ed. Gloucester: BSAVA. Chapter 25.

TALARICO, L. R., & SCHATZBERG, S. J. (2010). Idiopathic granulomatous and necrotising inflammatory disorders of the canine central nervous system: a review and future perspectives. *Journal of Small Animal Practice*, **51**(3), pp. 138–149.

ZARFOSS, M., SCHATZBERG, S., VENATOR, K., CUTTNER-SCHATZBERG, K., CUDDON, P., PINTAR, J., WEINKLE, T., SCARLETT, J., & DELAHUNTA, A. (2006). Combined cytosine arabinoside and prednisone therapy for meningoencephalitis of unknown aetiology in 10 dogs. *Journal of Small Animal Practice*, **47**(10), pp. 588–595.