Nursing the canine myasthenic patient

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Michelle qualified as a veterinary nurse in 1995. She holds both the surgical and medical diplomas in Advanced Veterinary Nursing and the Certificate in Emergency and Critical Care Nursing. Her experience within the field of veterinary nursing is extensive, ranging from general practice to referral nursing both in the UK and USA. She is passionate about veterinary nursing and education. In 2011 she proudly launched a unique veterinary nursing in-house CPD Company – The Veterinary Nursing Consultancy – bringing CPD and training where it is needed most – with the patients and veterinary staff across the UK.

Myasthenia gravis (MG) is a condition resulting from a deficiency of nicotinic acetylcholine (ACh) receptors on the postsynaptic membrane of skeletal muscle. The resulting impairment of neuromuscular transmission is clinically manifested as muscle weakness. Dewey (1997) reported MG in dogs, cats and in humans. Acquired (immune mediated) myasthenia gravis is characterised by the antibody-mediated destruction of ACh receptors at the neuromuscular junction.

Neuromuscular transmission is disrupted when acetylcholine released from the presynaptic vesicles at the nerve terminal is unable to bind to receptors on the postsynaptic muscle fibre membrane. This disruption of neuromuscular transmission leads to muscle weakness and excessive fatigue, with severe cases being associated with non-ambulatory tetraparesis and respiratory failure.

Epidemiology

Signalment

Myasthenia gravis can affect dogs of either gender. Although any age group can be affected there is a bimodal age distribution, animals 2–3 years of age and those older than 9 years are more likely to be affected, but any age can be affected.

The breeds most predisposed to developing MG include: Golden Retrievers, German Shepherds, Dachshunds, Scottish Terriers and terriers in general, Akitas, German Shorthaired Pointers and Chihuahuas.

Other predisposing conditions

MG can be part of a paraneoplastic syndrome associated with a thymoma or thymic hyperplasia (**Figure 1**). Third-degree heart block and hypothyroidism can also be associated with MG.

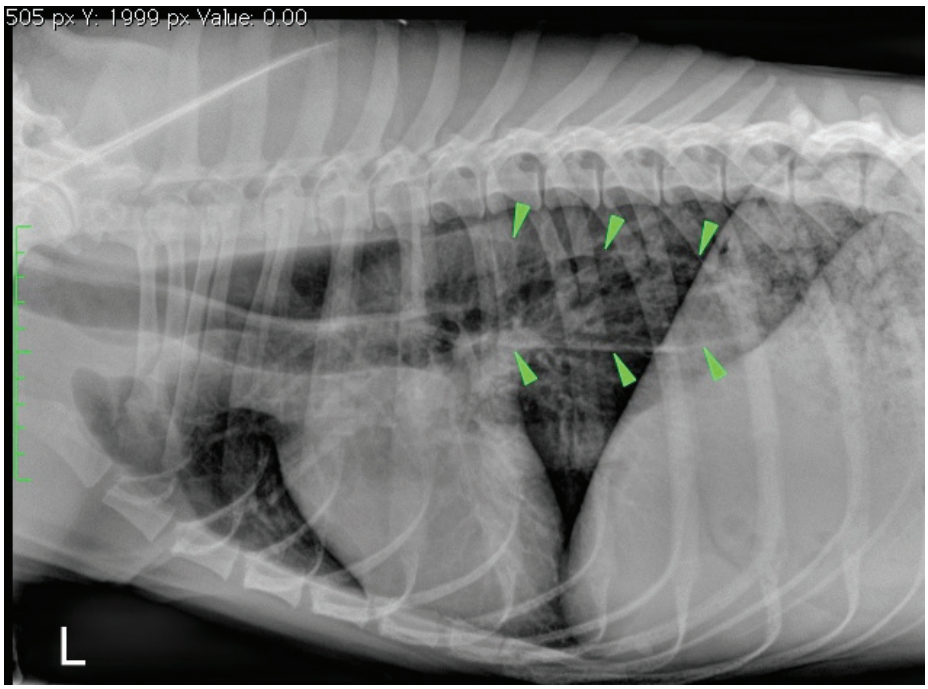

Figure 1. MG can be part of a paraneoplastic syndrome associated with a thymoma (arrows show tumour)

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Presentation

These patients are often referred to orthopaedic or neurological specialists for general muscle weakness and lameness. Often muscle weakness worsens with exercise and improves with rest. Other signs include:

- collapse
- regurgitation – often mistaken by owners for vomiting
- hypersalivation
- vocal changes
- dysphagia
- often owners will describe the dog sleeping with its eyes open

Clinical presentation

Acquired MG has been divided into three separate categories, with no concept of a 'classic' clinical presentation (**Figure 2**).

1. Focal MG

- no clinical signs of appendicular weakness
- facial muscle weakness with decreased palpebral reflexes
- decreased arytenoid and focal fold abduction resulting in respiratory stridor or decreased gag reflex due to the pharyngeal muscle weakness
- the patient may also suffer from a megaoesophagus

Figure 2. Border collie with myasthenia gravis exhibiting the typical facial muscle weakness, hypersalivation and reduced palpebral reflexes

2. Generalised MG

Described by Dewey (1997)

- clinical signs of appendicular weakness
- predominately with pelvic limb weakness
- with or without focal signs

3. Acute fulminating MG

This form of MG is characterised by rapid onset, which quickly progresses to non-ambulatory tetraparesis and respiratory compromise. These patients can also develop dyspnoea with harsh lung sounds, which occur secondary to respiratory muscle weakness and/or aspiration pneumonia associated with megaoesophagus and/or laryngeal/pharyngeal dysfunction.

Hereditary MG

MG can also be a congenital, hereditary disorder, which occurs due to a deficiency of ACh receptors on the postsynaptic membrane. Dewey (1997) and King and Vite, (1998) reported hereditary MG in Dachshunds, Fox Terriers, Springer Spaniels and Jack Russell Terriers, signs can begin to develop as early as 6–8 weeks.

Diagnosis

One of the most dramatic diagnostic procedures that often astounds the veterinary teams, is a positive response to the edrophonium challenge (often known as the tensilon response test) (**Box 1**).

The test involves the intravenous administration of the ultra-short-acting anticholinesterase edrophonium chloride. This acts by prolonging the length of time ACh remains at the synaptic cleft, hence improving muscle strength where a neuromuscular blockade is present. The response is rapid, with dogs being able to stand, walk and even run in some cases, even though previously unable to do so! A positive result is very short lived, with the weakness recurring rapidly. A positive response to the edrophonium supports a diagnosis of MG.

You can view a patient's positive response to the tensilon test, with remarkable results, at http://youtube/wo0YLfbbTeE, and I urge you to do so. Witnessing a positive test result in a canine patient with severe appendicular weakness is something which, once witnessed, will never be forgotten!

It is vital that all veterinary staff involved with the test are also aware of the significant clinical signs of a canine patient that does ***not*** have MG or one that may have received an overdose of edrophonium. An overdose of edrophonium results in worsening of the clinical signs of MG such as nausea, vomiting, diarrhoea, sweating, bradycardia and increased salivation (drooling). (**Box 2**).

Some myasthenic dogs may have an insufficient number of acetylcholine receptors (AChR) and therefore may not show a positive response to the edrophonium challenge test. For these dogs, other diagnostic tests may have to be considered by the veterinary surgeon.

Nursing the myasthenic patient

Due to the diversity of the clinical signs exhibited by canine patients, there are a number of treatment options dependent upon patient response and financial implications.

Aspiration pneumonia

Aspiration pneumonia is associated with high morbidity and mortality

Box 1 The edrophonium challenge test

- Place an intravenous catheter – this is vital for the administration of the edrophonium chloride and, if a cholinergic crisis occurs, permits the rapid administration of a muscarinic anticholinergic drug.
- Prepare the edrophonium chloride. 0.1–0.2 mg/kg is administered immediately after exercise-induced muscle weakness.
- A positive result is noted when a significant increase in muscle strength is observed- The response to edrophonium is immediate, with dramatic improvements in clinical signs, the duration of this improvement is variable.

Box 2 Edrophonium overdose

Clinical signs:
- bronchoconstriction
- bradycardia
- salivation
- lacrimation
- retching
- vomiting
- diarrhoea

Treatment:
- 0.02 to 0.04 mg/kg atropine sulphate administered intravenously

rates according to Bartges *et al* (1997). Preventing its development and managing existing pneumonia involves diligent nursing care.

Patients with a degree of ambulation should be offered food and water from an elevated position to assist their limited oesophageal function.

Patients with severe muscle weakness and resulting recumbency will require frequent turning to prevent decubital ulcer development and hypostatic congestion/collapsed lungs relating to the pneumonia. Rotating through the lateral recumbent positions may be contraindicated however, if bilateral lung function is compromised. The patient should be nursed in the sternal position with its head being supported in an elevated but neutral position to reduce the risk of regurgitation. The clinical status of these patients often fluctuates, with periods of improvement followed by periods of relapse, until medical management has reached a therapeutic level.

Oxygen supplementation is valuable in assisting patients with aspiration pneumonia. The method of administration should be stress-free for the patient, with nasal oxygen prongs/catheters being one of the best-tolerated methods in recumbent patients (**Figure 3**).

Nebulizing the patient with a sterile saline solution instilled into an over-the-counter human nebuliser, assists with keeping the airways moist and enhances the break-up of secretions within the lung parenchyma (**Figure 4 and 5**).

Coupage is often considered beneficial for a patient with pneumonia, but a cautious approach is required in the myasthenic patient. Any secretions produced should be rapidly cleared from the oral cavity, as due to oesophageal and pharyngeal dysfunction there is a significant risk of airway obstruction because the secretions often have a high viscosity and may be purulent. The sputum mixes with the excessive salivation in the oral cavity and hinders the patient's ability to expel the sputum. If an oral suction device can be tolerated by the patient, it should be readily available at all times and used during coupage to remove the secretions and thus prevent airway obstruction. Have an 'emergency' box prepared and located next to the patient's kennel, including all the equipment needed for rapid airway management, and the pre-calculated atropine sulphate dose for the patient's bodyweight in the event of a cholinergic crisis.

Figure 3. A Golden Retriever receiving nasal oxygen – Golden Retrievers have a breed predisposition for MG

Nutritional assistance and gastrostomy feeding

Often these patients continue to suffer from regurgitation, increasing the likelihood of aspiration pneumonia (or complicating pneumonia which is already present). The placement of a gastrostomy tube provides valuable nutritional support and permits direct delivery of oral medication into the stomach Otte *et al* (2003)

Elevated feeding is often considered a suitable option for myasthenic dogs with mild clinical signs; however, often patients will continue to regurgitate even when elevated feeding is undertaken. The placement of a gastrostomy tube has many advantages, ensuring that adequate nutrition can be provided, along with measured fluid requirements. **Figure 6**. One of the

Figure 4. Using a human nebuliser

Figure 5. Nasal discharge in a puppy with aspiration pneumonia (note that it is sleeping with eyes open)

Figure 6. A gastrostomy PEG tube *in situ*

most vital advantages is that drug delivery is greatly improved, as drugs administered orally can often linger in the dilated oesophagus, or be regurgitated, and the risk of aspiration pneumonia can be reduced. Dewey (1998) Barges, *et al* (1997) Otte *et al* (2003)

The nurse's role in ensuring the patient's calorific requirements are met during any period of hospitalisation can be challenging, especially if the patient has to undergo repeated episodes of starvation in order to allow surgical/medical procedures to be undertaken. The care and management of the gastrostomy tube is usually the responsibility of the nursing staff (**Box 3**). As myasthenic patients are often discharged with the feeding tube *in situ,* nursing staff are generally responsible for advising owners of the correct feeding technique and the importance of maintaining tube patency as well as care of the stoma site.

Box 3 Care and management of gastrostomy tubes

1. The stoma site/insertion site of the tube should be examined twice daily, examining for signs of swelling, dermatitis, leakage, patient interference and infection, and the site should be cleaned using chlorhexidine or povidone-iodine solution.

   A topical antimicrobial dressing should be placed over the site.

   A suitable dressing (such as a body stocking) should cover the tube to aid in preventing the tube from becoming damaged by the environment or the patient. This also aids in keeping the tube clean, reducing the risk of ascending infection.
2. The tube requires flushing prior to any form of feeding to ensure that stomach contents can be aspirated without complications such as blockages. Using lukewarm water in small quantities (5–20 ml) can ensure patency. Often these tubes are manufactured in a transparent material which allows observation of the tube being flushed.
3. The stomach contents should be aspirated and measured, note that this will include the amount of water used to flush the tube. If gastric emptying is delayed, the last feed may still be present, indicating gastric motility complications. In this case, the veterinary surgeon should be informed before feeding commences. Often the contents may be instilled back into the stomach, to ensure gastric acid and digestive enzymes levels remain constant.
4. The food is administered as directed by the veterinary surgeon. Flushing the feeding tube with water after feeding ensures that the tube maintains patency between feeds, with a water block present in the tube. The veterinary nurse must ensure that this is fully explained to the owner when the patient is discharged.
5. Care should be taken when attempting to administer medication. Ensure that the medication is suitable for crushing (some coated medication should not be crushed) and that the diameter of the feeding tube will permit administration of the medication without causing a blockage.
6. If blockage does occur, a number of products can be administered directly into the tube to dislodge/break down the obstruction. Begin with carbonated water and leave in situ for 15 minutes, if necessary progress to carbonated drinks such as cola or fruit juices such as pineapple or cranberry. Pancreatic enzyme powder has also been proven to be successful.
7. Ensure that patient interference is prevented. Using an Elizabethan collar in some patients can be traumatic due to the reduction of the field of vision. The author's choice includes an elasticated body stocking, or a commercially available body suit that stays securely in position and helps keep the patient warm. Both of these options enable free movement and help in preventing interference from the environment (**Figure 7**).

Medical management – understanding treatment options

Dewey (1997) and Otte *et al* (2003) provided clinical evidence of a variety of treatments that can be recommended and tailored to the needs of each individual. Understanding these will assist in effective nursing of these patients.

Anticholinesterase agents (acetylcholinesterase inhibitors)

Anticholinesterase therapy is the most effective in improving ambulatory function in generalised myasthenics. Anticholinesterase agents prolong the action of ACh at the neuromuscular junction by reversibly inhibiting acetylcholinesterase.

Drugs available include pyridostigmine bromide (Mestinon®, 1–3 mg/kg, PO q 8–12h) and neostigmine bromide (Prostigmin®, 2 mg/kg/day PO q 8–12h). Pyridostigmine bromide is available in four forms: syrup, tablets, slow release tablets and injectable. The doses are usually started at the lower end of the range and gradually increased to the desired effect. Side effects of excessive levels of anticholinesterase therapy are shown in Box 2 and can often be induced when attempting to find a suitable therapeutic dose.

Immunosuppressive drugs

- Immunosuppressive therapy involving corticosteroids is still considered controversial, first, because the immunosuppressive dose can exacerbate weakness and second, due to the susceptibility of myasthenic dogs to aspiration pneumonia. Corticosteroids can place the patient at constant risk of developing or worsening life-threatening aspiration pneumonia, which is the main reason for the death or euthanasia of dogs with MG. Contraindications for glucocorticoid therapy include ongoing infections or aspiration pneumonia.
- Cyclosporine is often used as an effective immunosuppressive therapy in treatment of MG in people and has also been introduced into canine treatment protocols.
- Mycophenolate mofetil is an immunosuppressive drug which acts specifically against T cells and B cells, again with clinical significance in human MG patients.

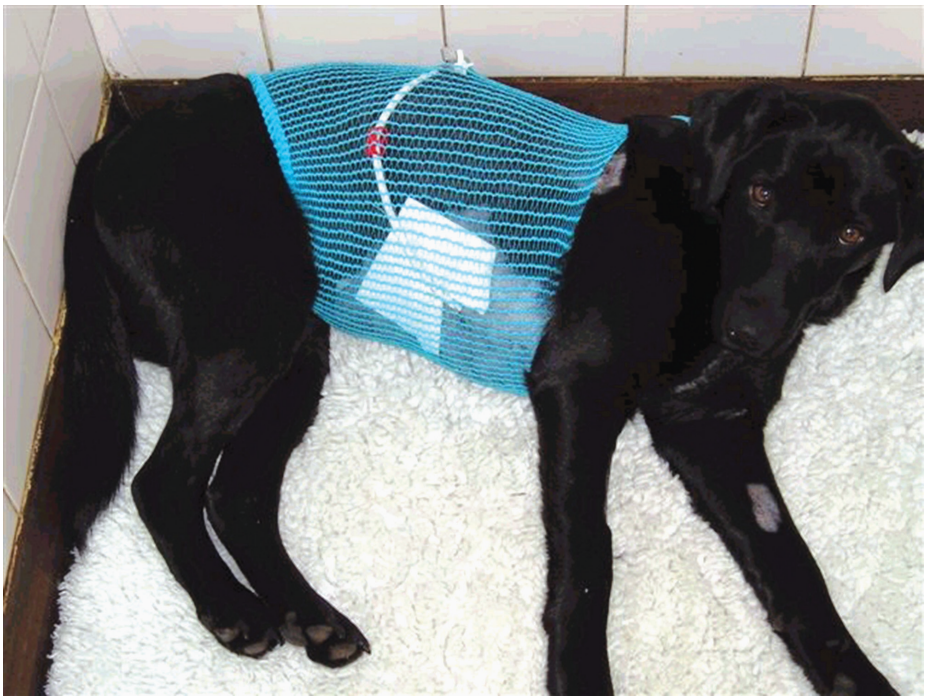

Figure 7. The elasticated body stocking used to protect gastrostomy tubes

Antibiotics

Antibiotics are used for the treatment of aspiration pneumonia, with the antibiotic being selected according to the results of culture and sensitivity from samples taken by trans-tracheal wash or broncho-alveolar lavage.

Therapeutic apheresis

One of the most significant advancements in the treatment of MG is therapeutic apheresis, which has been successful in canine patients at the University of California at Davis in the USA by Otte *et al* (2003) The procedure separates blood into its components, for removal of fractions contributing to disease, prior to the return to the patient. In the case of MG, antibodies that disrupt the receptors at the neuromuscular junction are contained in the plasma. Therapeutic plasma exchange (TPE) is an apheresis treatment in which plasma is removed and exchanged with donor plasma. Dogs chosen for treatment in the study were non-ambulatory, recumbent, with confirmed megaoesophagus and aspiration pneumonia. These dogs showed significant improvement after two treatments and became ambulatory within three days, with resolution of megaoesophagus and regurgitation. However the cost of such treatment, can be prohibitive.

Prognosis/recovery

Improvement in clinical signs, including resolution of weakness, occurs rapidly following anticholinesterase therapy.

The aim of the therapy is to provide prolonged clinical remission (in the absence of neoplasia) with the average time for remission of the disease being cited by King & Vite (1998) and Otte *et al* (2003) as 4–6 months with a range of 1 month to 1.5 years

The prognosis is often guarded with dogs suffering from acquired MG (immune-mediated) with, sadly, a one-year mortality rate of 60%. Bartges (1997) and Otte *et al* (2003) state that the main factor leading to death or euthanasia in the canine patient is related to aspiration pneumonia, with or without respiratory failure.

One of the key factors in the successful outcome of a case is the prevention or prompt resolution of aspiration pneumonia, and this requires considerable improvement in the muscle weakness of the oesophageal, pharyngeal and laryngeal musculature. Spontaneous clinical remission of MG has been recorded by Dewey (1998) and Otte *et al* (2003), often in young dogs, and with no set time scale for the length of remission.

The veterinary nurse is a major contributor to enhanced patient and owner relationships. Nursing/caring for a myasthenic dog can often be time consuming and prolonged, which negatively impacts on the owners' daily lives. Some owners feel overwhelmed by the care required; the administration of an assortment of medications, the care of, and feeding via a gastrostomy tube along with the balancing of working and family life can result in euthanasia in the early stages of the disease management.

Providing the owners with a tailor-made drug administration chart, designed with detailed timings and drug details/information may seem a very simple task but is one that is invaluable for owners. The pressure of having to regulate medication times can be extremely daunting, but with a clear basis to work from, owners can be supported to develop a suitable regime over time.

As the demonstration of feeding and the care of a gastrostomy tube at the time of patient discharge will prove overwhelming for most clients, involving them in tube care/feeding while the patient is still hospitalised will build their confidence in the procedure. Having a photographic/multimedia video of all the techniques (including nebulisation, which may need to continue at home) is an excellent way of providing remote support/reference for the owner at home.

Modern technology can now enable owners to send videos and/or photographs of problems that arise at home, for example skin maceration/discharge. This will help in describing complications to the veterinary nursing team who can then respond appropriately.

With the increasing availability of effective treatment options and early diagnosis as well as commitment on the part of both the client and veterinary staff, the number of cases of MG which result in a successful outcome, will also continue to increase.

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