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CORRESPONDENCE

Gabapentin as part of multi-modal analgesia in two cats suffering multiple injuries

We would like to report our experience using gabapentin in two cats which had suffered major trauma resulting from a road traffic accident (RTA). Pain scoring for both cats utilized a modified 4avet scale (Coppens et al. 2001). Table 1 provides a summary of the pain scores, and of the dosage and frequency of administration of analgesic drugs for both cats.

Cat 1

A 16-month-old male neutered Domestic Short Hair (DSH) was presented with diaphyseal fractures of the left distal tibia and fibula and a transverse fracture of the right talus. During the first 2 days of hospitalization, intravenous (IV) buprenorphine (Vetergesic; Alstoe Ltd, UK) and *per os* (PO) meloxicam (Metacam; Boehringer Ingelheim, UK) were administered for analgesia.

The animal appeared comfortable, had a good appetite and was able to urinate spontaneously. The initial surgery stabilized the tibial fracture with a plate. Extradural (L7-S1) morphine (0.1 mg kg^{-1}, Morphine 1% Preservative Free; Martindale, UK) with bupivacaine (1 mg kg^{-1}, Marcaine 0.5%; AstraZeneca, UK) were injected preoperatively. Postoperative analgesia consisted of meloxicam and methadone (Physeptone; Martindale, UK) administered intramuscularly (IM) if the pain score ≥ 4/12. This resulted in the administration of methadone every 4 hours overnight. A second surgical procedure 36 hours later carried out pantarsal arthrodesis. In order to provide perioperative analgesia, a sciatic nerve block (bupivacaine, 1 mg kg^{-1}) was performed. Meloxicam administration was continued postoperatively and methadone administered every 4 hours.

The following morning the cat was alert, relaxed and friendly. However, gentle touch of the cervical and thoracolumbar area consistently elicited an aggressive response. Gabapentin (10 mg kg^{-1} PO every 8 hours, Gabapentin; TEVA, UK) administration was then commenced. Twenty-four hours later, the animal appeared more comfortable, and did not respond to touch or bandage changes. Methadone administration was then stopped and IM buprenorphine administration commenced – initially every 6 hours for 24 hours, then only if necessary on the basis of pain score. No further buprenorphine was required 72 hours after the second surgery. The cat was discharged 5 days after the final surgery with the instruction to continue administration of gabapentin (10 mg kg^{-1} PO every 8 hours) for 2 weeks and meloxicam (0.1 mg kg^{-1} PO every 24 hours) for 5 days.

Cat 2

A 15-month-old male neutered DSH was referred 4 days after a RTA. Injuries consisted of a fracture of the left tarsus, instability of the right stifle and split fracture of the symphysis of the mandible. Preanaesthetic blood screening demonstrated acute renal failure: azotaemia was 88.2 mmol L^{-1} (reference interval 6–10); creatinine 1058 μmol L^{-1} (reference interval 40–150); K^+ 9 mmol L^{-1} (reference interval 3.6–5.6); inorganic phosphate 5 mmol L^{-1} (reference interval 1–2.46); further, absent P and tall T waves were recorded on electrocardiographic investigation. Initially, medical treatment consisted of NaCl 0.9% with 2.5% dextrose infusion, administration of Ca^{2+} gluconate, glucose boluses and insulin, and furosemide. During the first week of hospitalization azotaemia, creatinine, electrolytes and urine output were measured routinely; fluid therapy was adjusted accordingly. Ultrasound examination detected neither bladder rupture, nor free abdominal fluid. A gastrostomy tube was endoscopically placed and used to

Table 1 Pain scores (Coppens et al. 2001), doses and frequency of administration of the analgesic drugs given to two cats suffering multiple injuries

	Before 1st SX	Between 1st–2nd SX	24 hours after 2nd SX	24–48 hours after 2nd SX	48–72 hours after 2nd SX	72 hours after 2nd SX
Cat 1						
Buprenorphine 20 μg kg^{-1} q6 hours	X (IV)				X (IM)	N/C
Methadone 0.2 mg kg^{-1} q4 hours		X (IM)	X (IM)	X (IM)		
Meloxicam 0.1 mg kg^{-1} q24 hours	X (PO)	X (PO)	X (PO)	X (PO)	X (PO)	X (PO)
Gabapentin 10 mg kg^{-1} q8 hours				X (PO)	X (PO)	X (PO)
Median (range) pain score/12	N/A	5 (3–8)	5 (3–9)	5 (3–9)	2 (1–3)	2 (1–2)
	Before SX	**First 24 hours after SX**	**24–48 hours after SX**	**48–72 hours after SX**	**72 hours after SX**	
Cat 2						
Buprenorphine 20 μg kg^{-1} q6 hours	X (IV)					
Methadone 0.2 mg kg^{-1} q4 hours		X (IM)	X (q5 hours)	N/C		
Gabapentin 10 mg kg^{-1} q8 hours			X (PO)	X (PO)	X (PO)	
Median (range) pain score/12	N/A	7 (3–9)	2 (2–4)	2 (1–3)	2 (1–2)	

SX: surgery; q: every; N/A: not available; N/C: not necessary; IV: intravenously; IM: intramuscularly; PO: *per os*.

administer both fluid and food. During this period buprenorphine was administered IV every 6 hours for analgesia.

The surgical procedure utilized an external fixator for pantarsal arthrodesis and an extracapsular technique to stabilize the stifle. Perioperative analgesia was provided by administering morphine (30 μg kg^{-1}) and bupivacaine (0.25 mg kg^{-1}) intrathecally, at the L5-L6 intervertebral space. Postoperative pain was treated initially with methadone administered IM according to the pain score. The following day, the cat appeared comfortable; however gently touching the thoracolumbar spine evoked a pain response. Administration of gabapentin (10 mg kg^{-1} PO every 8 hours) was commenced and methadone was administered IM every 5 hours for the first 24 hours, then only if necessary, which it was not as 24 hours after the first gabapentin administration pain scores < 4, and the cat did not react to the palpation of thoracolumbar area. A week later the animal was discharged with instructions to continue administration of gabapentin (10 mg kg^{-1} PO every 8 hours) for 2 weeks.

Gabapentin is a drug chemically related to γ-aminobutyric acid (GABA) and binds Ca^{2+} α_2-delta receptors mainly in dorsal horn of the spinal cord and forebrain (Siao et al. 2010); it is used as an anticonvulsant in veterinary and human medicine, and as an adjunctive analgesic in humans (Platt et al. 2006). In veterinary anaesthesia, gabapentin has been investigated clinically as analgesic only in dogs undergoing forelimb amputation (Wagner et al. 2010) and in an acute pain model in cats (Pypendop et al. 2010) using a thermal stimulus; in both cases a significant analgesic effect could not be demonstrated.

Pain management in cats with multiple injuries is challenging: opioids alone do not always produce adequate analgesia and in some situations may cause hyperalgesia. Non steroidal anti-inflammatory drugs (NSAIDs) may be contraindicated in subjects where shock, hypovolaemia, severe liver contusion or renal dysfunction are present. Continuous nociceptive inputs may cause temporary or permanent changes in the dorsal horn of the spinal cord, leading to hyperalgesia and allodynia. In humans these conditions are successfully treated with gabapentin, therefore we decided to administer gabapentin in the two cats here reported as opioids and NSAIDs were failing fully to control the pain.

In our institution gabapentin (10 mg kg^{-1} PO every 8 hours) often is used postoperatively in dogs and cats after spinal surgery. At this dose gabapentin is characterized by low volume of distribution and slow clearance in the feline species (Siao et al. 2010).

However, the metabolic pathway has not been fully investigated and the dose-response effect of gabapentin might be unpredictable, especially in animals with multiple injuries and after prolonged administration. Therefore, its effect should be carefully monitored and its administration suspended should side effects – such as lethargy, depression and ataxia, occur. Nevertheless, gabapentin as adjuvant for the treatment of hyperalgesia and allodynia in cats should be considered in a clinical setting, although further investigation is needed to better characterize its' effects.

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