Pruritus & Neuropathic Pain in a Dog

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History

A 4-year-old, 55-lb (25-kg), neutered male Portuguese water dog was presented for a 1-year history of intractable pruritus and excessive licking of the lateral aspect of the 5th digit of the left pelvic limb. BCS was 5/9. The pruritus began concomitantly with the growth of an erythematous cutaneous mass localized between the 4th and 5th digit on the same paw, which was later diagnosed as an abscess. The patient received an injectable course of antibiotics and corticosteroids followed by 2 oral antibiotic and corticosteroid courses over a 5-month period. There was no treatment response, so surgical excision of the mass was performed.

After the surgery, pruritus became almost continuous (10/10 using a canine pruritus severity scale[1]) and persisted even after the wound had healed. A second surgical procedure was performed 3 months after the first surgery to debride the wound, and the skin over the 4th and 5th digits was fused. The patient continued to exhibit compulsive licking and biting of the pelvic limb postoperatively, so the owners were instructed to use an Elizabethan collar or a sock over the affected paw to prevent self-mutilation.

Because pruritus persisted, radiography and ultrasonography of the distal limb were performed; no abnormalities were present. Prednisone (0.5 mg/kg PO q24h) and diphenhydramine (2.2 mg/kg PO q8h) were administered, and the degree of pruritus decreased to 3/10. The patient was referred to a dermatologist, who administered amoxicillin–clavulanic acid for treatment of suspected pyoderma. Pruritus was diminished but not resolved (2/10). Localized biting and licking in absence of an obvious local underlying cause was suggestive of a neurologic etiology, and the dog was

referred to a board-certified neurologist for further diagnostic investigation.

Physical Examination

Physical examination was unremarkable except for a 4-cm area of alopecia over the distal and dorsolateral aspect of the left pelvic limb and compulsive licking induced by a light touch and pin prick over the sensory distribution of the tibial nerve from the tibiofemoral joint to the extremity of the limb. The patient's responses to the light touch and pin prick were thought to represent allodynia and hyperalgesia, respectively. Neurologic examination revealed the following changes:

- Stiffness of the left pelvic limb characterized by weak flexion of the stifle and short strides
- The patient favored a resting position in semisternal recumbency (ie, patient lying on his chest and left pelvic limb).
- Decreased postural reactions on the left pelvic limb as compared with the ipsilateral side, which was normal
- Normal spinal reflexes except for an incomplete left pelvic limb withdrawal reflex as compared with the ipsilateral side, which was normal
- Pain elicited (ie, the patient flinched) on palpation of the lumbosacral junction

TREATMENT AT A GLANCE

- Gabapentinoids (eg, gabapentin) to block calcium currents involved in the maintenance of spinal cord central sensitization
- *N*-methyl-D-aspartate antagonists (eg, amantadine, ketamine) to prevent or treat central sensitization
- NSAIDs to reduce peripheral inflammation and hyperalgesia
- Transcutaneous electrical nerve stimulation used as an adjuvant therapy and as part of a multimodal analgesic approach

Diagnosis

CBC and serum chemistry profile results were within normal limits. CT of the left pelvic limb and lumbosacral junction revealed a mild protrusion of the intervertebral disk at the lumbosacral junction, without evidence of compression of the cauda equina or L7 spinal root. Left iliac medial and popliteal lymphadenopathy were reported. MRI of the lumbosacral junction confirmed the protrusion at L7-S1 and showed another protrusive but apparently noncompressive disk at L6-L7. Bone remodeling of the cranial facet of S1 was noted protruding into the vertebral canal. Dynamic impingement could not be ruled out.

Concomitant allodynia and hyperalgesia localized over the area of the tibial nerve were suggestive of neuropathic pain.

DIAGNOSIS:
INTERVERTEBRAL DISK DISEASE

Discussion

In this case, spontaneous pruritus and excessive licking resulting in secondary abscess formation were thought to represent a sign of abnormal sensation in the affected limb (ie, dysesthesia). Neuropathic pain has no physiologic purpose and involves a lesion of the somatosensory system. Concomitant allodynia and hyperalgesia constitute a component of neuropathic pain. According to the International Association for the Study of Pain, *allodynia* refers to pain caused by a stimulus that does not normally provoke pain, whereas *hyperalgesia* corresponds to an increased sensitivity to noxious stimulation.[2] Limb nerve entrapment and lumbosacral lesions have been described as potential causes for neuropathic pain in dogs.[3,4] Diagnosis of neuropathic pain may be challenging due to the lack of validated tools for its assessment.

Treatment & Long-Term Management

The owners declined surgery and opted for medical

management. The patient was successfully treated with gabapentin (10 mg/kg PO q8h), meloxicam (0.1 mg/kg PO q24h), and amantadine (3 mg/kg PO q24h). Pruritus decreased with therapy (2/10). The patient itched occasionally. Gabapentinoids (eg, gabapentin) bind to $\alpha_2\delta$-subunits of voltage-dependent calcium channels and block calcium currents involved in the maintenance of spinal cord central sensitization. Nerve injury causes increased glutamate activity. Glutamate binds to *N*-methyl-D-aspartate receptors, which contribute to spinal central sensitization.[5]

Transcutaneous electrical nerve stimulation—a technique used in physiotherapy to alleviate pain via inhibition of presynaptic transmission in the dorsal horn of the spinal cord and increased release of enkephalins, endorphins, and dynorphins—was used as an adjuvant therapy and as part of this patient's multimodal analgesic approach. Transcutaneous electrical nerve stimulation has been used in humans with neuropathic pain as adjunct therapy.[6,7]

Prognosis & Outcome

After 2 months of treatment, meloxicam was decreased to 0.1 mg/kg q48h and amantadine was decreased to approximately 1-2 mg/kg q48h for 2 weeks, when treatment with both drugs was discontinued. Gabapentin (5 mg/kg PO q8h) was used as maintenance therapy, as the dog was mostly comfortable and only occasionally exhibited shaking of the left pelvic limb. Follow-up consultations every 3 months were suggested.

Take-Home Messages

Neuropathic pain is pain caused by a lesion or disease of the somatosensory system and should be suspected in the presence of central sensitization resulting in allodynia and hyperalgesia.[2] Clinical signs of neuropathic pain are nonspecific and often require multidisciplinary collaboration to reach diagnosis. Surgery, primary neurologic disease, diabetes, and osteoarthritis are potential causes of neuropathic pain. The underlying mechanism of neuropathic pain is not fully understood but likely involves hyperexcitability of afferent neurons, peripheral and central sensitization, and activation of the microglia.[3] Neuropathic pain is commonly refractory to conventional analgesia and requires a multimodal approach.[4]

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References

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