Diagnosis of a brachial plexus tumour using magnetic resonance imaging assisted by fine-needle aspiration biopsy in a dog: a case report

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ABSTRACT: This study describes a case of a six-year-old female crossbreed dog that had a three months history of progressive right thoracic limb lameness. Palpation revealed muscle atrophy of the scapular and humeral area and painfulness in this region. Magnetic resonance imaging was performed in T1- and T2-weighted and STIR (short inversion recovery) sequences in sagittal and transverse planes. The masses around the scapula and humerus were heterogeneously hyper-intense in STIR and measured about 9 cm. The tumour was heterogeneously iso-intense relatively to the surrounding tissues in T-2 weighted Gradient Echo and Spin Echo sequences. After MRI fine needle aspiration of a central part of the tumour was performed. The biopsy revealed multiple round cells with very little cytoplasm and fusiform cells in which the cytoplasm created protrusions. Cells were arranged in rows or formed a homogeneous cell mass. A malignant peripheral nerve sheath tumour was diagnosed cytologically.

Keywords: magnetic resonance imaging; brachial plexus; tumour; fine needle biopsy; dog

Primary tumours of peripheral nerves are rarely reported in animals, and they most often originate from myelin sheaths surrounding nerve axons. They are treated most effectively when diagnosed at early stages of disease. Neoplastic changes in peripheral nerves are diagnosed with the aid of clinical examinations, electromyography, myelography and image analysis (Bradley et al. 1982; Brehm et al. 1995). Various ultrasonography, computed tomography and magnetic resonance techniques for imaging peripheral nerve sheath tumours have been described in human and veterinary medicine (Cerofolini et al. 1991; McCarthy et al. 1993; Brehm et al. 1995; Hudson et al. 1996). In human medicine, documented attempts have been made to analyse these tumours with the use of fine-needle aspiration biopsies (Stastny and Frable, 1993; Dodd et al. 1997).

The brachial plexus comprises somatic nerves that originate from spinal nerve roots between the sixth cervical vertebra and the second thoracic vertebra (Evans 1993). Brachial and lumbar plexus tumours account for 26% of nervous system neoplasms in dogs (Hayes et al. 1975). Many of them metastasise to distant tissues or infect surrounding tissues. Prognosis is guarded or poor even after limb amputation because these tumours have a tendency to recur from the remaining nerve cells (Carmichael and Griffiths 1981; Brehm et al. 1995).

This report describes the effectiveness of magnetic resonance imaging combined with fine-needle aspiration biopsy (FNAB) in diagnosing malignant tumours of peripheral nerves originating from the brachial plexus in dogs.

Case description

A six-year-old mixed breed female dog with a body weight of 17 kg was admitted to the Department of Surgery and Radiology of the University of Warmia

and Mazury in Olsztyn with a complaint of right thoracic limb lameness persisting for three months. Prior to admission, the patient had been treated with non-steroidal anti-inflammatory drugs and chondroprotective drugs for one month. Lameness had progressed despite the applied pharmacological treatment. The clinical evaluation revealed severe lameness, no loading of the affected limb, absence of deep sensibility, no proprioceptive positioning response, skin chaffing on the dorsal surface of the right metacarpus and extensive muscle atrophy in the region of the right scapula and the humerus. The physical exam revealed pain on palpation of the scapula and the humerus. The results of clinical and neurological examinations of the remaining limbs were within the norm.

In view of the nature of the observed changes, a decision was made to analyse the proximal humerus using magnetic resonance imaging with the low-field Vet Grande Esaote (0.25 Tesla) system. The examination was performed in transverse and sagittal planes using T1-weighted, T2-weighted and STIR (short inversion recovery) sequences. In the STIR sequence, the tumour was visualised as a non-homogeneous hypertensive mass with an estimated size of 9 cm in the region of the scapula and the humerus (Figure 1). T2-weighted Gradient Echo and Spin Echo images revealed the presence of non-homogeneous iso-intense mass relative to surrounding tissues (Figure 2).

Magnetic resonance imaging was followed by fine-needle aspiration biopsy from the central part of the tumour. The biopsy specimen was subjected to a smear test which revealed numerous round cells with very small amounts of cytoplasm and spindle cells with cytoplasmic tails trailing away from the nucleus in opposing directions. The cells were arranged in layers or formed a homogenous cellular mass. Numerous leukocytes, eosinophils and blood clots were observed. The image was indicative of a malignant inflammatory tumour. A histopathological analysis was not performed.

DISCUSSION AND CONCLUSIONS

Peripheral nerve tumours originate from myelin sheaths surrounding nerve axons. They include

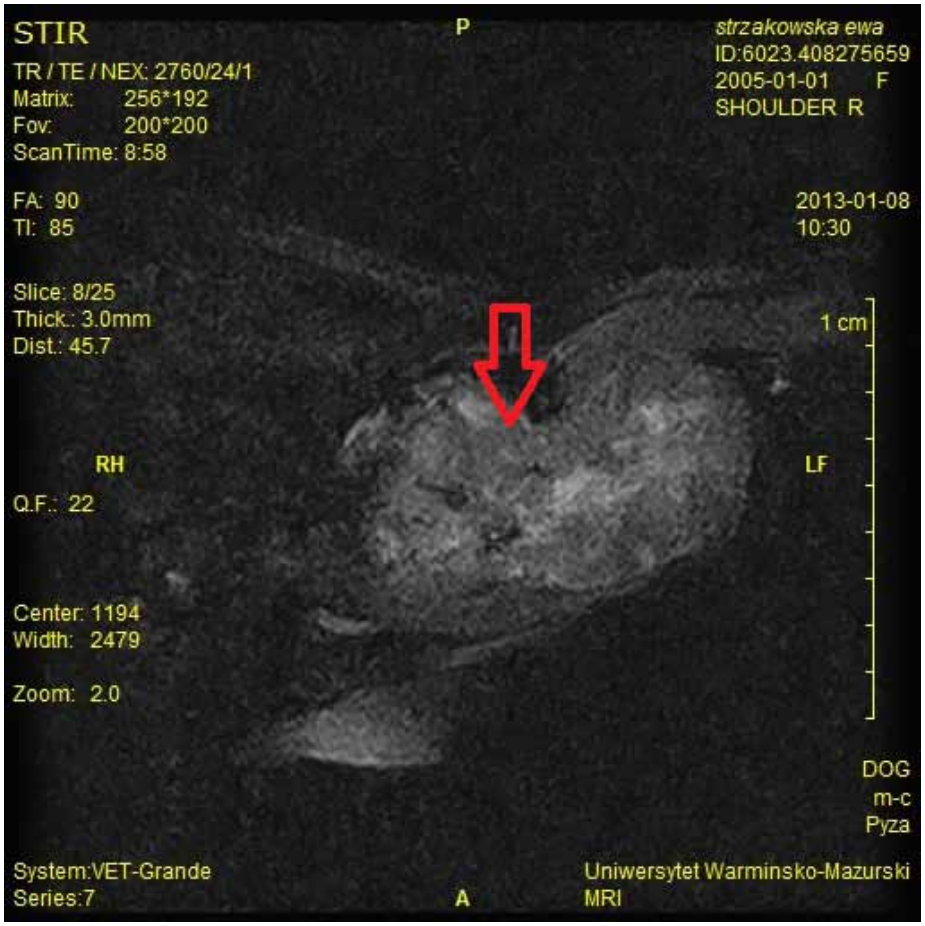

Figure 1. STIR sequence in sagittal plane. The tumour was visualised as a non-homogeneous hypertensive mass with an estimated size of 9 cm in the region of the scapula and the humerus

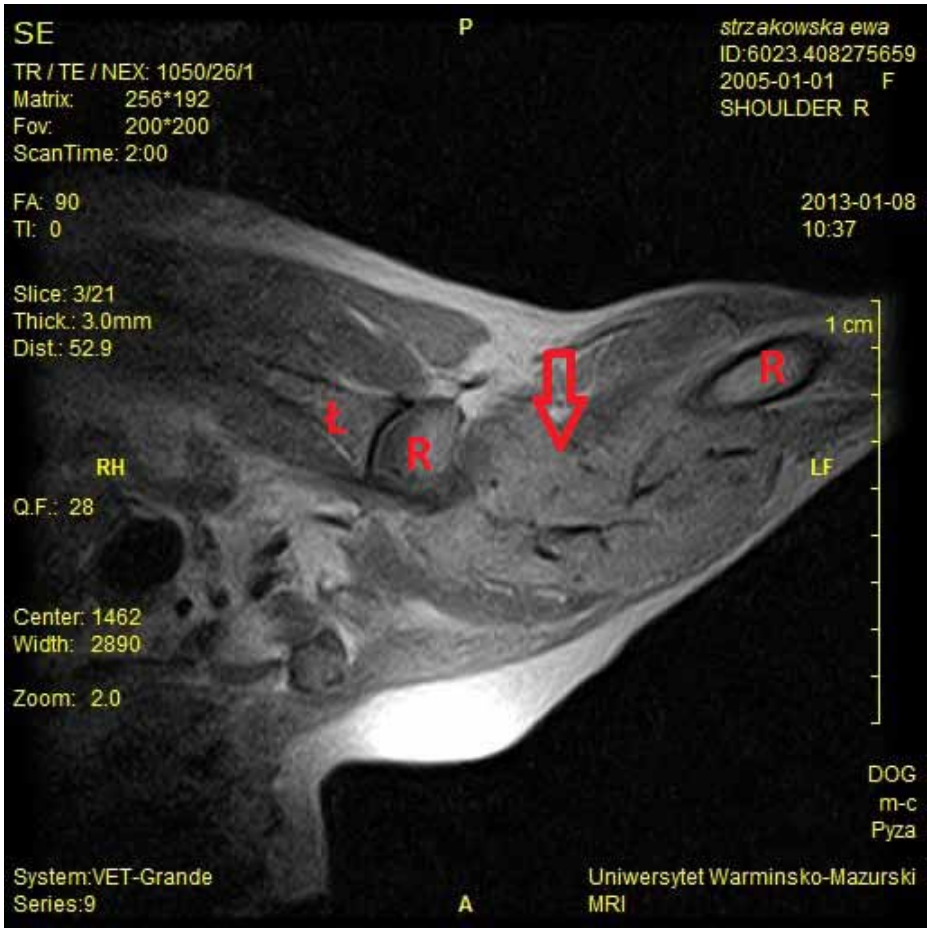

Figure 2. T2-weighted Spin Echo sequence image in sagittal plane. The presence of a non-homogeneous iso-intense mass relative to surrounding tissues in the region of the body and head of the humerus

neurinomas (schwannomas), neurofibromas, malignant schwannomas, neurosarcomas and neurofibrosarcomas. In current veterinary practice, they are referred to as peripheral nerve sheath tumours (PNST) (Wheeler et al. 1986; Targett et al. 1993; Brehm et al. 1995). PNSTs are very difficult to diagnose based solely on clinical symptoms, and they are rarely detected on palpation. Clinical changes progress slowly and usually affect a single limb, but when the tumour spreads to the vertebral canal, neurological deficits may be observed in all limbs. The most frequent clinical symptoms include limb lameness, muscle atrophy, neurological deficits, impaired deep sensibility and absence of proprioceptive positioning response (Carmichael and Griffiths 1981; Brehm et al. 1995). According to some reports, chronic unilateral lameness and atrophy of thoracic limb muscles were noted in 78.4% of patients and in 12 out of 13 examined dogs. The above symptoms indicate that lameness caused by neurological problems is very difficult to differentiate from lameness resulting from orthopaedic disorders. In many cases, correct diagnosis may take several months (Bradley et al. 1982; Brehm et al. 1995).

Brachial plexus tumours are diagnosed using clinical examination, myelography and electromyography tests, ultrasonography, computed tomography and magnetic resonance imaging (Cerofolini et al. 1991; McCarthy et al. 1993; Brehm et al. 1995; Hudson et al. 1996). In humans, brachial plexus tumours are more effectively diagnosed using magnetic resonance imaging than using computed tomography scans. It was previously reported that fifteen out of fifteen human patients were screened with magnetic resonance imaging (Castagno and Shuman 1987).

The treatment of brachial plexus nerve tumours involves limb amputation. In this case, the dog's owners refused to authorise amputation. The patient had not been euthanised at the time this paper was submitted for publication.

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