Spinal nephroblastoma in an Irish wolfhound

T Vaughan-Scott[a], J Goldin[b] and J W Nesbit[c]

ABSTRACT

A 1-year-old Irish wolfhound was presented with a history of slowly progressive left pelvic limb paresis. A neurological examination demonstrated bilateral deficits referable to the thoracolumbar spinal cord. Lumbar cerebrospinal fluid contained neoplastic cells. An intradural, extramedullary mass was demonstrated by myelography at the caudal aspect of T_{13}. Surgical excision was abandoned owing to severe macroscopic damage to, and apparent infiltration of, the cord, and the dog was euthanased. The tumour was diagnosed histologically as an extrarenal nephroblastoma. Nephroblastoma should be suspected in young, large-breed dogs with intradural extramedullary masses over spinal segments T_{10}–L_2. The prognosis for complete recovery after surgical excision is guarded to poor.

Key words: dog, extrarenal, neoplasm, nephroblastoma, spinal, tumour.

Vaughan-Scott T, Goldin J, Nesbit J W **Spinal nephroblastoma in an Irish wolfhound**. *Journal of the South African Veterinary Association* (1999) 70(1): 25–28 (En.). Department of Medicine, Faculty of Veterinary Science, University of Pretoria, Private Bag X04, Onderstepoort, 0110 South Africa.

INTRODUCTION

Spinal nephroblastoma is an intradural extramedullary tumour affecting the spinal cord of young, large-breed dogs[8,10,12]. It occurs consistently between spinal segments T_{10}–L_2. The tumour has been reported under a variety of names, including neuroepithelioma, nephroblastoma, ependymoma, medulloepithelioma and hamartoma, owing to failure to identify the cell of origin[11,12]. A recent study, utilising histochemical staining for Wilms tumour gene product WT1, demonstrated that this tumour contains primitive glomerular structures and recommended that it be referred to as an extrarenal nephroblastoma[9]. Nephroblastoma is a rare tumour in the dog and has not previously been reported in South Africa.

CASE HISTORY

A 1-year-old, 45 kg male Irish wolfhound was referred to the Onderstepoort Veterinary Academic Hospital with a history of left pelvic limb paresis of 3 weeks' duration. The paresis was of gradual onset and the dog had not received any treatment before referral. The general clinical examination was normal apart from the unilateral pelvic limb paresis. Complete blood count, urinalysis and faecal analysis were normal. On neurological examination, conscious proprioception was absent in both pelvic limbs. Extensor strength was reduced in the left pelvic limb and a positive Babinski sign was present. Spinal reflexes in the pelvic limbs (gastrocnemius, patellar and cranial tibial) were normal to slightly increased. Deep and superficial pain were preserved in both pelvic limbs. The dog had urinary incontinence.

The neurological findings indicated a lesion of the thoracolumbar spine (spinal segments T_3–L_3)[2]. Differential diagnoses at this stage included focal myelitis, diskospondylitis, neoplasia, disk disease and vertebral malformation.

Lumbar myelography and cerebrospinal fluid (CSF) analysis were performed under general anaesthesia. Survey radiographs of the affected area of the vertebral column were unremarkable. A spinal needle was introduced at the L_{5-6} interarcuate space and CSF was collected for analysis. Approximately 9 mℓ of iohexol (Omnipaque, Nycomed) was introduced into the subarachnoid space. Myelography demonstrated an intradural extramedullary mass (20×10 mm) at the caudal aspect of T_{13} lying to the left of the spinal cord (Fig. 1).

Analysis of the CSF showed an elevated protein level of 1 g/ℓ (normal 0.45 g/ℓ). The cell count was also elevated and the population consisted of red blood cells, which were considered to be contaminants, and numerous nucleated cells. The nucleated cells revealed neoplastic and epithelial characteristics, and consisted of groups of cells joined at the cell membrane, with poor differentiation and mitotic figures (Fig. 2).

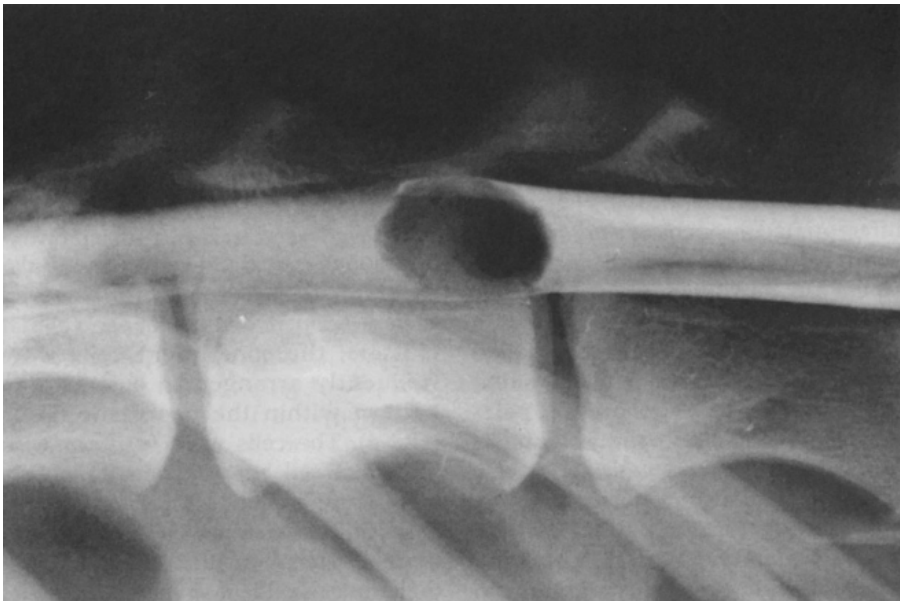

Fig. 1: **Lateral view of vertebral column centred over T_{13}, showing a clearly demarcated intradural mass outlined by contrast medium at the caudal border of T_{13}.**

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A diagnosis of intradural extramedullary neoplasia was made. After consultation with the owners, surgical removal was attempted. The patient was anaesthetised and positioned in ventral recumbency. A standard dorsal approach to the thoracolumbar vertebrae was used to expose the lamina and pedicles along the left sides of vertebrae T_{12}–L_1. A left dorsal hemilaminectomy, centred over the caudal articular facet of T_{13}, was performed, and the epidural space over the caudal aspect of T_{13} and the cranial aspect of L_1 was exposed. The dural tube appeared to swell over the body of T_{13}, but was otherwise macroscopically normal. A horizontal durotomy was performed and dorsal and ventral stay sutures were placed through the dura. This exposed the mass (Fig. 3).

The tumour appeared as a 20 × 10 mm, friable, dark grey cauliflower-like mass. It was pedunculated, with its short stalk intimately attached to the dura on the left side. The mass compressed the spinal cord to approximately 50 % of its normal diameter, and displaced the cord to the right. Careful dissection revealed that the tumour infiltrated the cord medially via a number of string-like projections. The tumour was resected as far as possible but examination of the spinal cord revealed severe macroscopic damage. Owing to these findings, the owner elected euthanasia before the dog recovered from anaesthesia.

Histopathological examination of the mass revealed a well-demarcated but poorly encapsulated intradural mass. The neoplasm had incorporated elements of the left dorsal and ventral roots of the 1st lumbar nerve and had induced considerable regional distortion accompanied by multifocal malacia of the spinal cord at the thoracolumbar junction. The neoplastic tissue comprised 2 apparently distinct tissue types, epithelial and blastematous, of which the former was dominant (Fig. 4). The epithelial component consisted predominantly of well-differentiated branching and tortuous tubular structures, some exhibiting papilliform infoldings into the lumens. On occasion, the infoldings assumed a rudimentary glomeruloid differentiation (Fig. 5). The cells were essentially columnar with distinct cell borders, pale-staining amphophilic to faintly basophilic cytoplasm and round vesicular nuclei, with 1 or 2 indistinct nucleoli. Large, single, clear cytoplasmic vacuoles were present in some of the cells. Mitoses were abundant with up to 16 per ×40 field. Sloughed cells and debris together with eosinophilic globules were present within some of the tubular lumens.

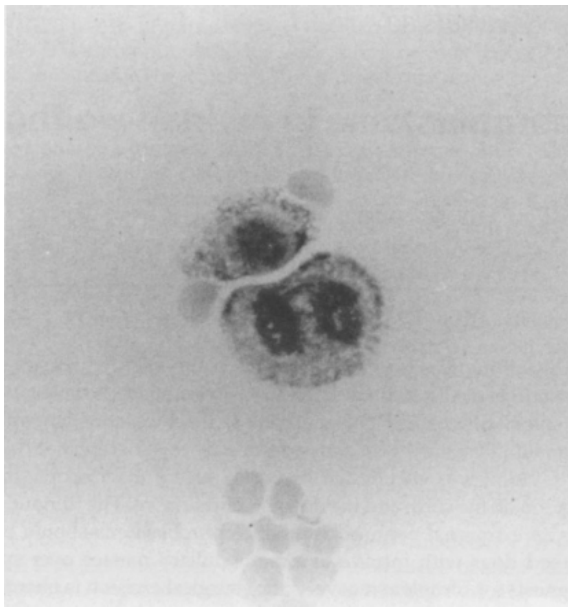

Fig. 2: **Cytospin preparation of cerebrospinal fluid, stained with a Romanowsky stain** (Cam Quick, C A Milsch)**. Note the 2 nucleated neoplastic cells, the larger of which contains a mitotic figure.** ×100.

Fig. 3: **Intraoperative view of spinal canal dorsal aspect. A durotomy exposed the intradural mass** (arrowhead)**, which measured 20 × 10 mm**.

Although overshadowed by the tubular structures, the blastematous areas nevertheless formed distinct dense cellular clusters; the constituent cells were frequently arranged in a streaming pattern within the neoplastic tissue (Fig. 4). The cells were fusiform with indistinct cell borders clear to poorly stained amphophilic cytoplasm and small basophilic oval nuclei with 1–3 small nucleoli. Transformation to tubular epithelium was evident at the periphery of the blastematous clusters. In contrast to the high mitotic index in the epithelial component, mitoses were scant in most of the blastematous foci and never exceeded 4 per ×40 field in any individual cellular cluster. Both the epithelial and blastematous components were supported on an inconspicuous stroma. Small isolated foci of coagulative necrosis were scattered at random throughout the neoplasm.

A diagnosis of extrarenal nephroblastoma was made.

DISCUSSION

Spinal nephroblastoma is usually diagnosed in dogs between 6 months and 3 years of age[4,7–12], but has been reported in a 7-year-old dog[3]. It is most commonly

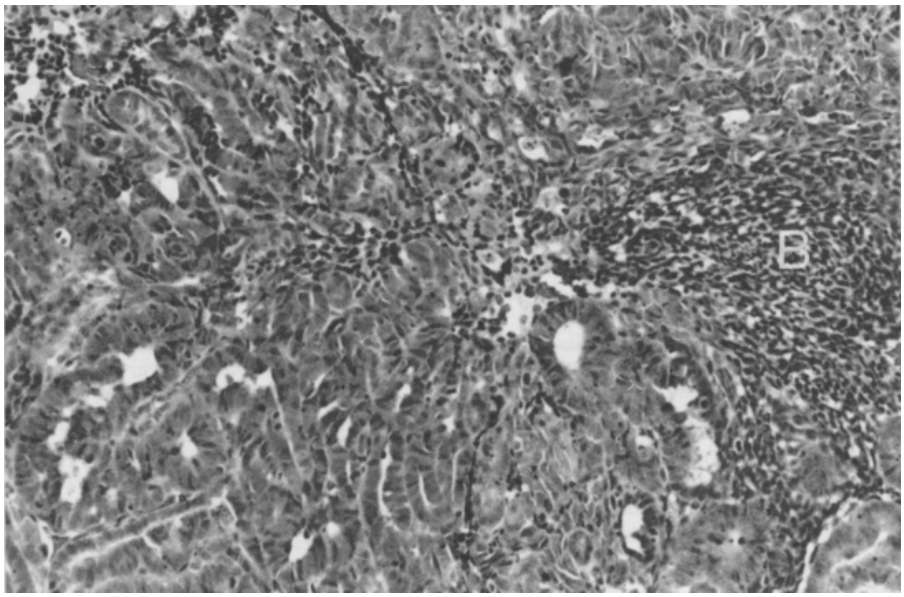

Fig. 4: **Dominant epithelial component of the mass consisting of well-developed tubules lined by columnar epithelium on the left with a blastemous focus** (B) **comprising fusiform cells arranged in a streaming configuration on the right.** HE, ×100.

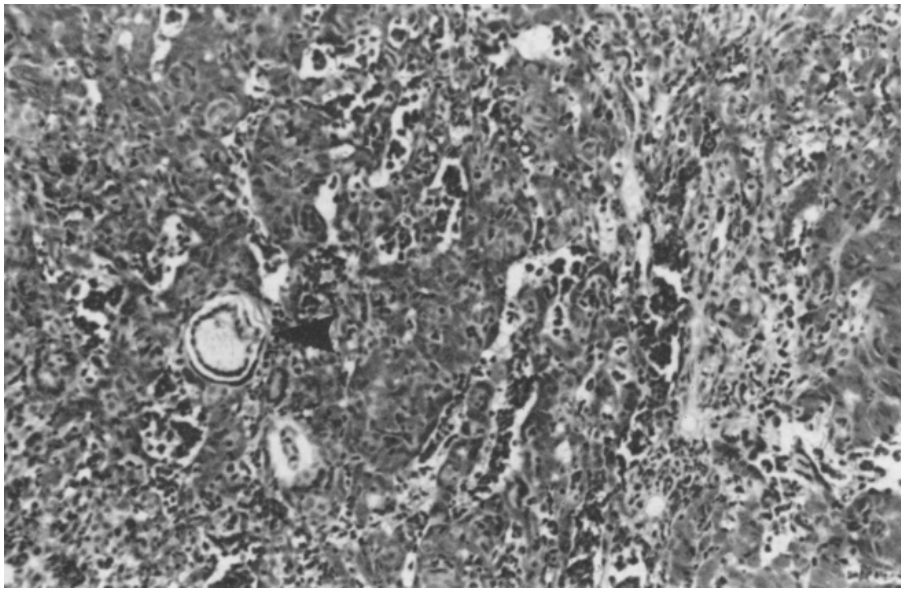

Fig. 5: **Glomeruloid differentiation** (arrowhead) **at the junction of the epithelial and blastematous components.** HE, ×100.

seen in medium to large-breed dogs, with one study indicating a possibly higher incidence in German shepherd dogs[11]. The location of the tumour at the caudal aspect of T_{13} was characteristic as all previously reported cases of spinal nephroblastoma occurred from spinal segments T_{10}–L_2[9,11]. The pathogenesis of this consistent anatomical location has not been explained[11]. A recent study has demonstrated the presence of primitive glomerular structures that stained positively with immunohistochemical stains specific for Wilms tumour gene product WT1[9]. Wilms tumour is a pseudonym for nephroblastoma in humans, and extrarenal nephroblastomas have been described in people, mainly in the retroperitoneum[9]. There is therefore evidence that this type of tumour is an extrarenal nephroblastoma. It has been postulated to occur owing to displacement or trapping of a segment of the mesonephric or metanephric primordium within the dura during embryonal development[11]. The general histological features of the neoplasm in the case reported here are in accordance with previous reports[6,10,11], although the relatively high mitotic index of the epithelial component of the neoplasm differed from a previous series of 12 cases, in which mitoses were considered to be uncommon in glandular areas[11].

Most cases of spinal nephroblastoma have been associated with acute to subacute onset of pelvic limb paresis and loss of conscious proprioception[3,8,12], but the onset of paresis can be more gradual[7], as in the case reported here. As in other case reports, myelography was successful in demonstrating the lesion. CSF analysis permitted diagnosis of intradural neoplasia in this patient. This has not previously been reported in spinal nephroblastoma and illustrates the usefulness of collecting CSF downstream from a suspected lesion, as opposed to cervical cisternal CSF collection, which, in other cases, failed to demonstrate neoplastic cells[11].

Unlike renal nephroblastoma[13], the spinal form is not invasive and does not metastasise[7,11], but requires rapid intervention owing to its location. Surgical removal may be beneficial if performed before severe cord compression occurs[1,3,7]. Some animals show dramatic improvement after surgery, but this is often short-lived owing to tumour recurrence at the original site[5,8,11]. One dog was clinically normal 22 months after surgical removal[7], while another improved but did not recover full neurological function with no tumour recurrence 3 years after surgery[4]. Combination treatment of spinal tumours with radiation or chemotherapy has been described[1], and should be considered in spinal nephroblastoma owing to the potential for recurrence; however, efficacy has not yet been assessed in this tumour type. The severity of neurological deficits as well as macroscopic appearance of the cord should be used in intra-operative decision-making. In the present case, the spinal cord appeared to be severely damaged and this was a deciding factor. Although the tumour appeared macroscopically to have invaded the spinal cord *via* tiny string-like projections (previously reported by Moissonnier and Abbott[8]), there was no microscopic evidence of spinal cord invasion.

Spinal nephroblastoma should be suspected in a young, large-breed dog with a focal intradural extramedullary lesion between spinal cord segments T_{10}–L_2. The prognosis for complete recovery is guarded to poor following surgical excision.

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Book review — Boekresensie

Toxic plants and other natural toxicants

Edited by T Garland and A C Barr

1998. CAB International, Wallingford, United Kingdom, 585 pp. Hardcover. Price £75.00 (US$140.00). ISBN 0 85199 263 3.

This book comprises edited papers from the Fifth International Symposium on Poisonous Plants, held in Texas in May 1997. It is high-quality, essential reading for toxicologists concerned with animal and human health, food industry regulators and plant scientists.

Toxic plants and other natural toxicants have a variety of roles in the fields of animal and human health, veterinary and medical research and the production of safe food and also represent an economic problem in terms of animal health and crop production. The economic impact on livestock has been estimated to be millions of dollars in countries such as Australia, the United States and South Africa.

This book brings together applied and fundamental research from botanists, chemists, biochemists, agricultural scientists, veterinarians and physicians and advice from regulatory bodies. All aspects of poisonous plants, mycotoxicoses and herbal intoxications are covered. Their adverse effects are described, such as fatalities, reduced or failed reproduction, foetotoxicity, spontaneous abortions, deformities, reduced productivity and organ-specific toxicity. Methods of detection, isolation and identification of the chemical compounds responsible are included. The biochemistry of the plant-associated toxins and elucidation of their mechanisms of action are investigated, including protocols for management or eradication, immunisation programmes, behaviour modification, withholding periods for metabolic detoxification, perspectives on human usage of natural products and suggestions concerning toxin residues in agricultural produce. The development of non-toxic strains of plants for use as fodder is also discussed.

The 112 chapters in this volume have been fully edited to conform to consistency of style. It is recommended for researchers in the general field of plant toxicology and chemistry.

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