J. Comp. Path. 2017, Vol. 157, 280–283

Available online at www.sciencedirect.com

ScienceDirect

ELSEVIER

www.elsevier.com/locate/jcpa

NEOPLASTIC DISEASE

Endocardial Peripheral Nerve Sheath Tumour with Features of a Benign Schwannoma in a Donkey

G. Paraschou*,‡, A. Suárez-Bonnet‡, V. Grove† and S. L. Priestnall‡

Pathology Laboratory, †Veterinary Department, The Donkey Sanctuary, Brookfield Farm, Offwell, Honiton, Devon and ‡Department of Pathobiology and Population Sciences, Royal Veterinary College, Hatfield, Hertfordshire, UK

Summary

A peripheral nerve sheath tumour, with features of a benign schwannoma and arising from the endocardium of the right ventricle, was found incidentally during routine post-mortem examination of a 28-year-old gelding donkey. Macroscopically, five round to oval, white to grey and red, firm masses, firmly attached to the endocardium were identified. Microscopically, the endocardium and adjacent subendocardium were infiltrated by a variably demarcated, non-encapsulated mesenchymal neoplasm with features of a benign schwannoma, including concurrent presence of Antoni A and Antoni B areas, nuclear palisading, neoplastic cells with enlarged bizarre nuclei ('ancient change') and the formation of Verocay-like bodies. Immunohistochemically, the tumour cells were variably strongly positive for expression of S100 and glial fibrillary acidic protein. This is the first cardiac tumour reported in a donkey and is macroscopically, histologically and immunohistochemically similar to endocardial schwannoma occurring in Wistar rats.

Keywords: donkey; heart; peripheral nerve sheath tumour; schwannoma

The donkey is a unique equine species (Burden and Thiemann, 2015). In one study (Davis *et al*., 2016) there were important differences in the occurrence of neoplasia in donkeys compared with horses, such as rarity or absence of squamous cell carcinoma in any organ system, and scarcity of lymphoma and grey horse melanoma. Although the donkey is frequently treated as a 'small horse' by clinicians, the detection and characterization of salient differences between the two species may further benefit donkey health and help elucidate details of the pathogenesis of some common equine diseases (Davis *et al*., 2016). Primary cardiac neoplasia is rare in equids (Buergelt, 2003; Knottenbelt *et al*., 2015), with only three cases reported in horses and none in donkeys, zebras or other equids. A primary malignant peripheral nerve sheath tumour in the proximal aorta and the right atrium (Quinn *et al*., 2005), a T-cell rich B-cell lymphoma (Penrose *et al*., 2012) and an infiltrating lipoma in the heart (Baker and Kreeger, 1987) have been described in horses. Metastatic cardiac neoplasia is also rare in horses, with only a few cases described, including lymphoma, melanoma, myxoma, granular cell myoblastoma, squamous cell carcinoma, testicular embryonal carcinoma, pulmonary carcinoma, rhabdomyosarcoma, mesothelioma and haemangiosarcoma (Dill *et al*., 1986; MacGillivray *et al*., 2002; Castleman *et al*., 2011; Knottenbelt *et al*., 2015).

A 28-year-old gelding donkey with a history of moderate ataxia in the hindlimbs and heart rate of 60 beats per minute (reference range: 36–52 beats per minute), found recumbent three times over 48 h, was humanely destroyed and presented for post-mortem examination at the Pathology

Correspondence to: G. Paraschou (e-mail: Georgios.paraschou@thedonkeysanctuary.org.uk).

0021-9975/$ - see front matter
https://doi.org/10.1016/j.jcpa.2017.09.003

Laboratory of The Donkey Sanctuary, Devon, UK. Post-mortem examination was carried out within 3 h of death. During the examination the main macroscopic finding was mild to moderate suffusive haemorrhage affecting the deep gluteal muscles adjacent to the sciatic nerve of the right hindlimb. On opening the heart, firmly attached to the endocardium of the right ventricle was a 5 × 3 × 3 cm round to oval, white to grey, firm mass and four smaller masses (up to 3 × 0.5 × 0.5 cm), one of which contained a 0.5 cm reddened area (Fig. 1). Representative tissue samples from the larger heart mass were fixed in 10% neutral buffered formalin.

The fixed tissue was processed routinely and embedded in paraffin wax. Sections were stained with haematoxylin and eosin (HE). The samples were further evaluated immunohistochemically for expression of S100 protein (1 in 2,000 dilution; Leica Biosystems, Newcastle Upon Tyne, UK), glial fibrillary acidic protein (GFAP; 1 in 100 dilution; Leica Biosystems), neuron specific enolase (NSE; 1 in 200 dilution; Leica Biosystems) and desmin (1 in 250 dilution; Leica Biosystems).

Microscopically, the endocardium and the subendocardial cardiac muscle were infiltrated by a variably demarcated, non-encapsulated mesenchymal neoplasm composed of spindle shaped to oval neoplastic cells. Approximately 70% of the neoplasm was densely cellular, forming interlacing bundles and short fascicles separated by a sparse fibrovascular stroma resembling Antoni type A areas (Fig. 2). Occasionally, within these areas, small foci of nuclear palisading around a central core composed of eosinophilic cytoplasmic processes, resembling Verocay bodies, were observed (Fig. 2 inset). Hypocellular areas in a myxomatous stroma, similar to Antoni type B areas, were distributed multifocally within the densely cellular areas forming streams representing the remaining 30% of the neoplasm. The neoplastic cells had sparse, pale eosinophilic cytoplasm and indistinct cytoplasmic borders. The nuclei were round to oval with finely stippled to clumped chromatin and one, variably distinct, nucleolus. There was mild to moderate anisocytosis and anisokaryosis. There was a low to moderate number of neoplastic cells with enlarged bizarre nuclei ('ancient change'), which is consistent with degenerative atypia, a typical histological feature in long-standing, benign schwannomas. There was one mitotic figure per 10 high-power (×400) fields examined. Multifocally within the neoplasm there were low numbers of entrapped adipocytes, occasional multinucleated cells, a moderate amount of haemorrhage and a low number of haemosiderophages. Within the myocardium adjacent to the mass, the cardiac muscle fibres exhibited one of the following degenerative changes: muscle fibre separation, sarcoplasmic eosinophilia or atrophy. Neoplastic cells surrounded and separated Purkinje cells.

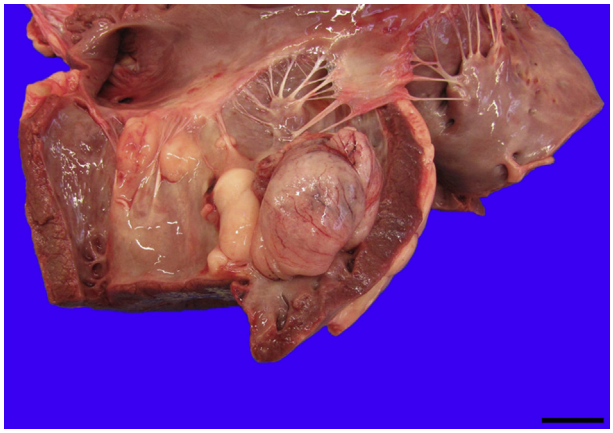

Fig. 1. Macroscopic appearance of the endocardial masses. Firmly attached to the endocardium there are five round to oval, white to grey and red, firm masses. Bar, 3 cm.

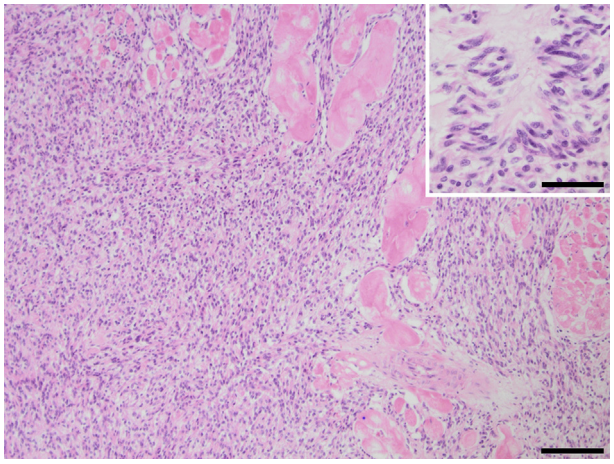

Fig. 2. Densely cellular areas (Antoni type A) of neoplastic cells forming short intersecting bundles surrounding Purkinje cells. HE. Bar, 200 μm. Inset: Verocay-like body. HE. Bar, 50 μm.

Immunohistochemically, approximately 60% and 50% of the neoplastic cells showed moderate or strong cytoplasmic expression of S100 (Fig. 3) or GFAP (Fig. 4), respectively. Neoplastic cells were negative for NSE and desmin.

Schwannomas have been reported in dogs, cattle and horses, less commonly in cats, goats and pigs, and in one camel (Khodakaram-Tafti and Khordadmehr, 2011; Higgins *et al.*, 2017). Devil facial tumour disease, which causes transmissible facial tumours in Tasmanian devils, is a peripheral nerve sheath tumour with a Schwann cell origin