



CASE REPORT

Nephroblastoma with Pulmonary Metastasis in 33 Month Old Neutered Piedmontese Male Cattle

Frine Eleonora Scaglione*, Parola Riccardo¹, Botta Michelangelo², Abrate Mario³, Chiappino Laura, Fiorito Eligio², Valenza Federico and Bollo Enrico

Dipartimento di Patologia Animale, Università degli Studi di Torino, Via L. da Vinci 44, 10095 Grugliasco (To), Italy; ¹Practicing Veterinarian, Frazione Valsuolo 56, 14017 Valfenera (At), Italy; ²Servizio Veterinario ASL CN1, Via Lancimano 51, 12045 Fossano (Cn), Italy; ³Direttore Struttura Complessa Anatomia Patologica Ospedale di Savigliano, Via Ospedali 14, 12038 Savigliano (Cn), Italy

*Corresponding author: frineeleonora.scaglione@unito.it

ARTICLE HISTORY

Received: April 11, 2012
Revised: April 27, 2012
Accepted: April 27, 2012

Key words:

Bovine
Histology
Immunohistochemistry
Nephroblastoma
Transmission electron
microscopy

ABSTRACT

A renal neoplasia was observed in a slaughtered 33 month old neutered Piedmontese male cattle. The neoplastic tissue was characterized by lardaceous features, and fibrotic tissue was evident with boundless interlacing, which separated the lesion in distinct diffusely irregular lobules. The lungs showed several macroscopical subpleuric nodules. Histological investigations showed multiform and distinct features of renal tumour. Anaplastic and embryonal aspects were represented by poorly differentiated or undifferentiated cells. Rarely, neoplastic epithelial elements were organized in pseudo-tubular formations. Immunohistochemical staining for detection of cytokeratins, vimentin, actin, S100, desmin and factor VIII was performed. Ultrastructural findings revealed two different populations of epithelial cells. Histological, immunohistochemical and ultrastructural findings in the lungs confirmed the diagnostic hypothesis of a metastatic tumour from the kidney.

©2012 PVJ. All rights reserved

To Cite This Article: Scaglione FE, P Riccardo, B Michelangelo, A Mario, C Laura, F Eligio, V Federico and B Enrico, 2012. Nephroblastoma with pulmonary metastasis in 33 month old neutered Piedmontese male cattle. *Pak Vet J*, 32(4): 627-630.

INTRODUCTION

Nephroblastomas are embryonal tumours generally thought to be mixed renal tumors arising from metanephric blastema (nephrogenic mesenchyme) (Meuten, 2002). Morphologic similarities between nephroblastomas and the developmental stages of embryonic kidneys have resulted in strong support for speculations that the tumour results from malignant transformation that occurs during normal nephrogenesis or from neoplastic transformation of rests of tissue with embryonic potentialities that persist in postnatal kidneys (Vujančić *et al.*, 2002).

These tumours are common in young animals, especially pigs and chickens (Maxie and Newman, 2007). Bovine cases have been reported in calves or fetuses (Misdorp, 2002a; 2002b; Devi *et al.*, 2011) with a few cases in adult cattle (Yamamoto *et al.*, 2006).

Clinical and post-mortem findings: A renal neoplasia was observed in regularly slaughtered 33 month old

neutered Piedmontese male cattle. At clinical examination the bovine showed a good state of health and nutrition. After slaughter, the left kidney showed an increase in volume and a deformation of the surface. The cortex revealed a variegated colour and some lobules presented haemorrhages with whitish lardaceous nodules. The cutting surface was diffusely irregular. A restricted number of lobules were normal, but showed deformation and degeneration of the parenchyma. In the neoplastic tissue with lardaceous features, fibrotic tissue was evident with boundless interlacing, which separated the lesion in distinct diffusely irregular lobules. The contralateral kidney was larger in size but without alterations. The lungs showed several macroscopical subpleuric nodules. No gross lesions were observed in other organs.

Diagnosis: Tissue samples from kidney, lung, renal and mediastinal lymph nodes for histological, immunohistochemical and ultrastructural investigations were collected. Samples fixed in 10% neutral buffered formalin (pH 7) were processed by routine methods and embedded in wax.

Sections were cut at 4µm thickness, mounted on glass slides and stained with haematoxylin and eosin. Immunohistochemical staining for detection of cytokeratins (clone AE1/AE3, Dako Laboratories, Glostrup, Denmark), vimentin (clone V9, Dako Laboratories, Glostrup, Denmark) actin (clone HHF35, Dako Laboratories, Glostrup, Denmark), S100 (Dako Laboratories, Glostrup, Denmark), desmin (clone D33, Dako Laboratories, Glostrup, Denmark) and factor VIII (Dako Laboratories, Glostrup, Denmark) was also performed.

Samples processed for transmission electron microscopy (TEM) evaluations were fixed in 2.5% glutaraldehyde phosphate (pH 7.3) and stored at 4°C for 24 hours. After the post-fixation process (1% osmium for

2 hours and a quick wash out in 30% acetone) the samples were dehydrated in acetone and Spurr resin embedded. From each sample, using the ultramicrotome, thin sections (0.90 µm) were obtained, stained with toluidine blue, and subsequently ultrathin sections (70 nm) contrasted by uranyl acetate and Pb citrate were prepared. The grids were evaluated using a transmission electron microscope (Zeiss mod. EM 109 JD, Oberkochen, Germany).

RESULTS

Histopathological investigations showed multiform and distinct features of renal tumour. A prevalence and deployment of epithelial and mesenchymal element and

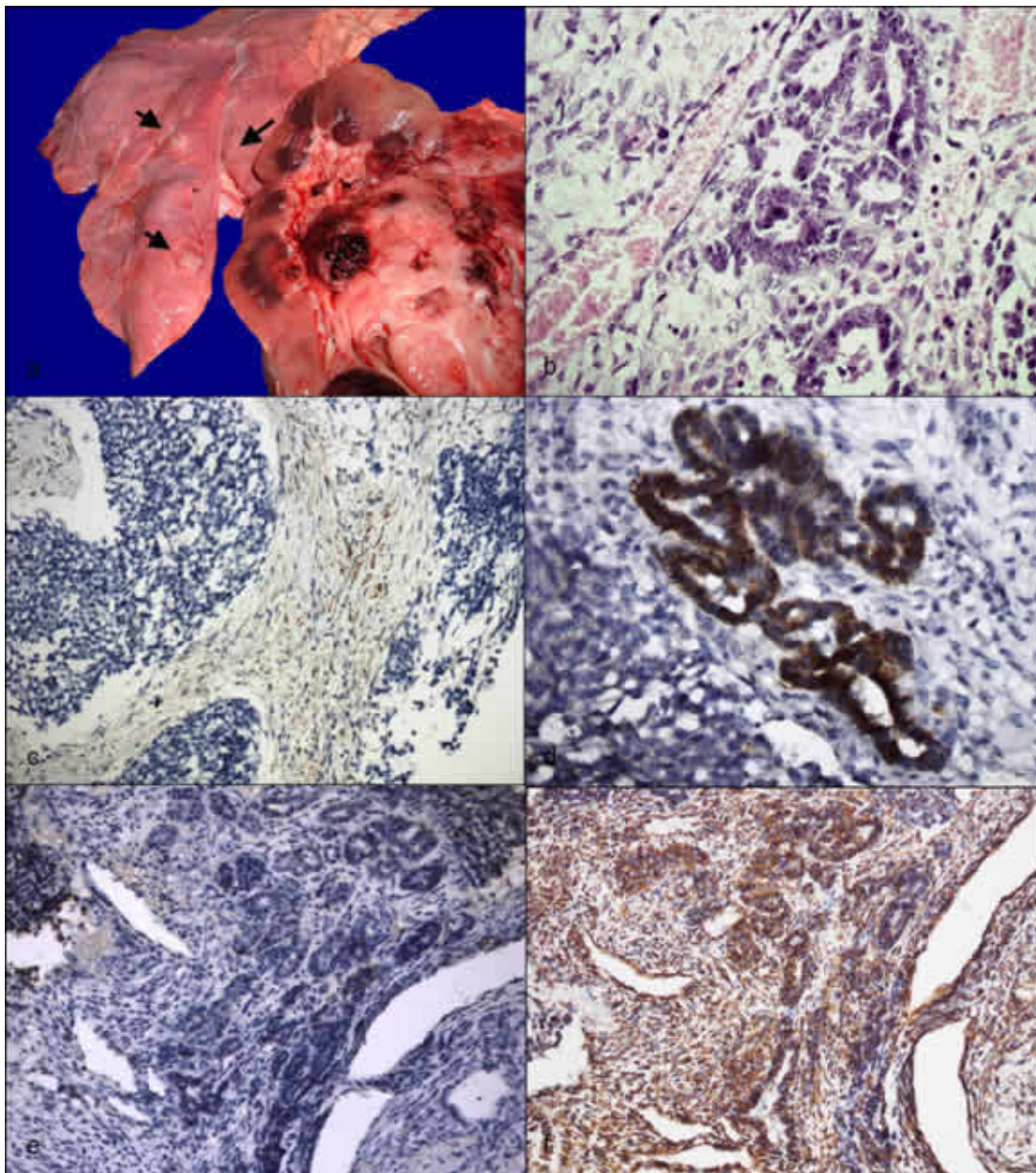


Fig. 1: a) Bovine, kidney: increase in volume, variegated colour of the cortex, extensive areas of hemorrhagic necrosis and myxomatous white tissue. Lung: disseminated subpleuric nodules (arrows), b) Bovine, kidney: poorly differentiated and undifferentiated cells with large hyperchromatic nuclei and evident nucleoli. Neoplastic differentiated epithelial elements are organized in pseudo-tubular formations. (HE 400X), c) Bovine, kidney: immunopositivity of spindle cells in the stroma (Actin, 200X), d) Bovine, kidney: immunopositivity of differentiated neoplastic epithelial cells organized in pseudo-tubules (Cytokeratin, 400X), e) Bovine, kidney: focal cytoplasmic immunopositivity of undifferentiated cells (S100, 200X) and f) Bovine, kidney: immunopositivity of spindle cells in the stroma and in blastemal cells cytoplasm (Vimentin, 200X).

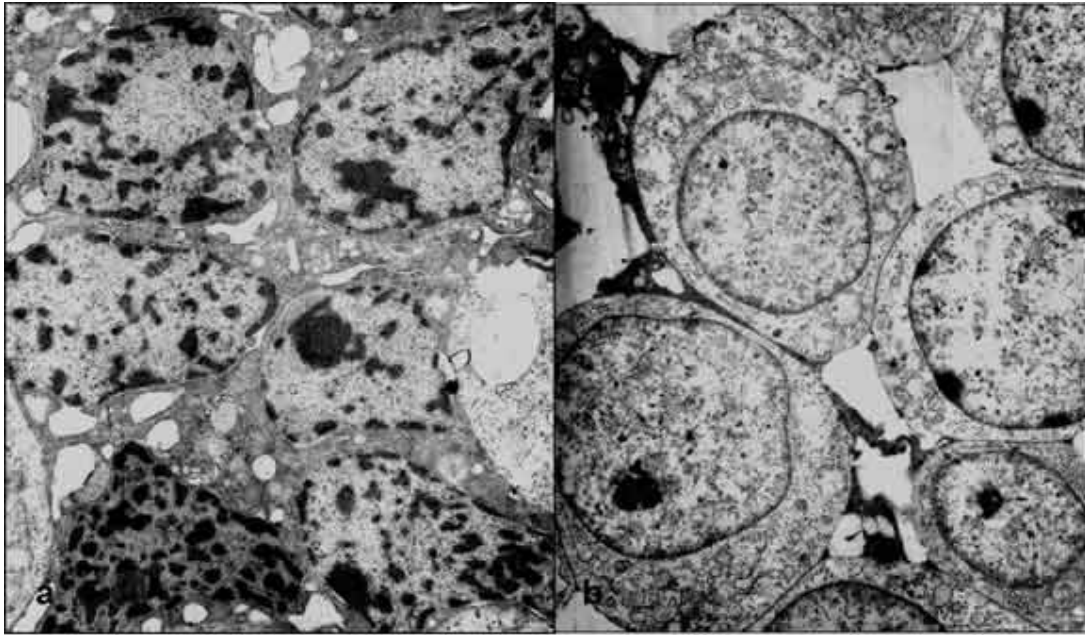


Fig. 2: a) Bovine, kidney: epithelial cells organized in irregular nests or clusters with lengthened and irregularly indented nuclei, multifocal chromatin and scanty cytoplasm (TEM, 3000X) and b) Bovine, kidney: epithelial cells organized in cords or nests, with large nuclei including clear nucleoli and cytoplasm with scanty organelles (TEM, 3000X).

hemorrhagic, necrotic and cystic areas were observed. Anaplastic and embryonal aspects were represented by poorly differentiated or undifferentiated cells with atypical mitotic figures with large hyperchromatic nuclei and evident nucleoli. Cells were organized in cords, nests or irregular clusters in the mesenchymal component, constituted of myxo-fibromatous tissue or thick collagen bundles (Fig. 1a). Rarely, neoplastic epithelial elements were organized in pseudo-tubular formations or in rudiments that resembled primitive glomeruli, without vascularization, morphologically atypical. Histological findings in the lungs confirmed the diagnostic hypothesis of a metastatic tumour from the kidney. In pulmonary metastasis, mesenchymal stroma was scanty and it consisted of thin bundles which penetrated the neoplastic epithelial tissue (Fig. 1b). Lymphoid tissues were normal.

Spindle cells in stromal elements were positive for actin (Fig. 1c), for vimentin (Fig. 1f), and focally for S100 (Fig. 1e). Immunopositivity was also present in pseudotubular formation for cytokeratins (Fig. 1d) and for vimentin in some foci of blastemal cells cytoplasm (Fig. 1f). Immunohistochemical staining for detection of desmin and factor VIII resulted negative in both primary and metastatic tumor.

Ultrastructural findings revealed two different populations of epithelial cells: some smaller, elongated and organized in irregular nests or clusters with lengthened and irregularly indented nuclei, multifocal chromatin and scanty cytoplasm (Fig. 2a). Other cells were organized in cords or nests, with large nuclei including clear nucleoli and cytoplasm with scanty organelles (Fig. 2b).

DISCUSSION

Nephroblastoma is a congenital neoplasm and it is the most common malignant primary renal neoplasm in men

(Salgado *et al.*, 2010) and swine (Grieco *et al.*, 2006). Characteristically, the neoplasms are unilateral, single, and are located in the cortex and extending through the capsule at one pole of the kidney, adhering to the body wall or mesentery. They usually occupy a large proportion of the affected kidney and may be large enough to compress abdominal viscera (Meuten, 2002). Even if the macroscopic findings are similar in all species (Salgado *et al.*, 2010) and malignant nephroblastomas are considered rare in adult cattle, has been reported in a three year old Japanese black bull with pulmonary metastasis (Yamamoto *et al.*, 2006).

Histologically tubular and glomerular differentiation may indicate a less aggressive growth, while sarcomatous, anaplastic differentiation is usually indicative of an increased likelihood of metastasis, that are anticipated if the host is a species other than swine. In our case metastasis were present in the lung and the predominant aspect of the primary tumor consisted in poorly differentiated or undifferentiated cells showing atypical mitotic figures with large hyperchromatic nuclei and evident nucleoli, confirming therefore the malignancy of the tumor.

As previously seen by light microscopy, ultrastructural findings clearly showed two different epithelial cell populations. Nephroblastomas express various immunohistochemical features depending on the cell types and levels of differentiation (Simpson *et al.*, 1992; Yamamoto *et al.*, 2006). Immunoreactivity for actin and vimentin is consistent with human and canine nephroblastomas. Immunohistochemical staining for detection of cytokeratins resulted negative in both primary and metastatic tumor. The latter finding is probably due to the presence of undifferentiated epithelial cells.

The diagnosis of a nephroblastoma with metastasis to the lung is a rare finding in adult cattle, and we consider that further investigations are necessary to clarify the epidemiology and pathogenesis of this tumour.

Acknowledgement: The authors gratefully acknowledge the Centro di Referenza di Patologia Comparata “Bruno Maria Zaini”, Italy.

REFERENCES

- Devi VR, G Veeraiah, K Yedukondalu, SK Begum, P Annapurna, P Sunitha and MA Devi, 2011. Congenital nephroblastoma in a buffalo calf. *Braz J Vet Pathol*, 4: 225-226.
- Grieco V, E Riccardi, S Belotti and E Scanziani, 2006. Immunohistochemical study of porcine nephroblastoma. *J Comp Pathol*, 134: 143-151.
- Maxie MG and SJ Newman, 2007. Urinary sistem. In: *Pathology of Domestic Animals*, 5th ed, vol 2, (Jubb KVF, PC Kennedy and N Palmer, eds), Academic Press, San Diego, CA, pp: 425-522.
- Meuten DJ, 2002. Tumors of the urinary sistem In: *Tumors in Domestic Animals*, 4th ed (Meuten DJ, ed), Iowa State University Press, Ames, IA, pp: 518-521.
- Misdorp W, 2002a. Tumours in calves: comparative aspects. *J Comp Pathol*, 127: 96-105.
- Misdorp W, 2002b. Congenital tumours and tumour-like lesions in domestic animals. I. Cattle A review. *Vet Quart*, 24: 1-11.
- Salgado RL, PR Millar, FMX Alves, D de O Almeida, FL Cunha, GA Damo and R Tortelly, 2010. Comparative aspects between Nephroblastoma in slaughter animals and in man. *Pubvet*, 4: Art 895.
- Simpson RM, JM Gliatto, HW Casey and WG Henk, 1992. The histologic, ultrastructural, and immunohistochemical features of a blastema-predominant canine nephroblastoma. *Vet Pathol*, 29: 250-253.
- Vujančić GM, B Sandsted, D Harms, A Kelsey, I Leuschner and J de Kraker, 2002. Revised international society of pediatric oncology (SIOP) working classification of renal tumors in childhood. *Med Pediatr Oncol*, 38: 79-82.
- Yamamoto Y, M Yamada, K Nakamura, Y Takahashi and T Miyamoto, 2006. Nephroblastoma with transcoelomic metastasis in a Japanese black bull. *J Vet Med Sci*, 68: 891-893.