

CYTOHISTOLOGICAL AND IMMUNOHISTOCHEMICAL STUDIES ON DISSEMINATED ANAPLASTIC AGGRESSIVE SARCOMA IN DOG

M. THANGAPANDIYAN*, P. KRISHNAVENI, SWATI CHOUDHURY, V. KUMAR and C. BALACHANDRAN
Veterinary Clinical Complex

Veterinary College & Research Institute, TANUVAS, Udumalpet-642126, Tamilnadu, India

Received: 10.08.2021; Accepted: 03.09.2021

SUMMARY

A 6-years-old female Labrador was presented with anorexia, weight loss and numerous small (0.3-1 cm), hard, greyish white subcutaneous nodules throughout the body. Necropsy revealed the presence of multiple, hard, varying sized, greyish white nodules on the pericardial sac, epicardium, endocardium, diaphragm, liver, gall bladder, kidneys and pancreas indicating metastasis. On histopathology, spindle-shaped or stellate tumour cells were seen irregularly arranged. They showed moderate anisocytosis and anisokaryosis and varying numbers of mitotic figures. A few cells showed polyhedral shape with cytoplasmic vacuolations. Immunohistochemistry revealed strong positive for vimentin and negative for S100, cytokeratin and desmin. Based on the cytology, histopathology and immunohistochemistry, the case was diagnosed as anaplastic aggressive sarcoma.

Keywords: Anaplastic sarcoma, Dog, Immuno-histochemistry, Metastasis, Vimentin

How to cite: Thangapandiyar, M., Krishnaveni, P., Choudhury, S., Kumar, V. and Balachandran, C. (2022). Cytohistological and immunohistochemical studies on disseminated anaplastic aggressive sarcoma in dog. *Haryana Vet.* 61(SI): 160-162.

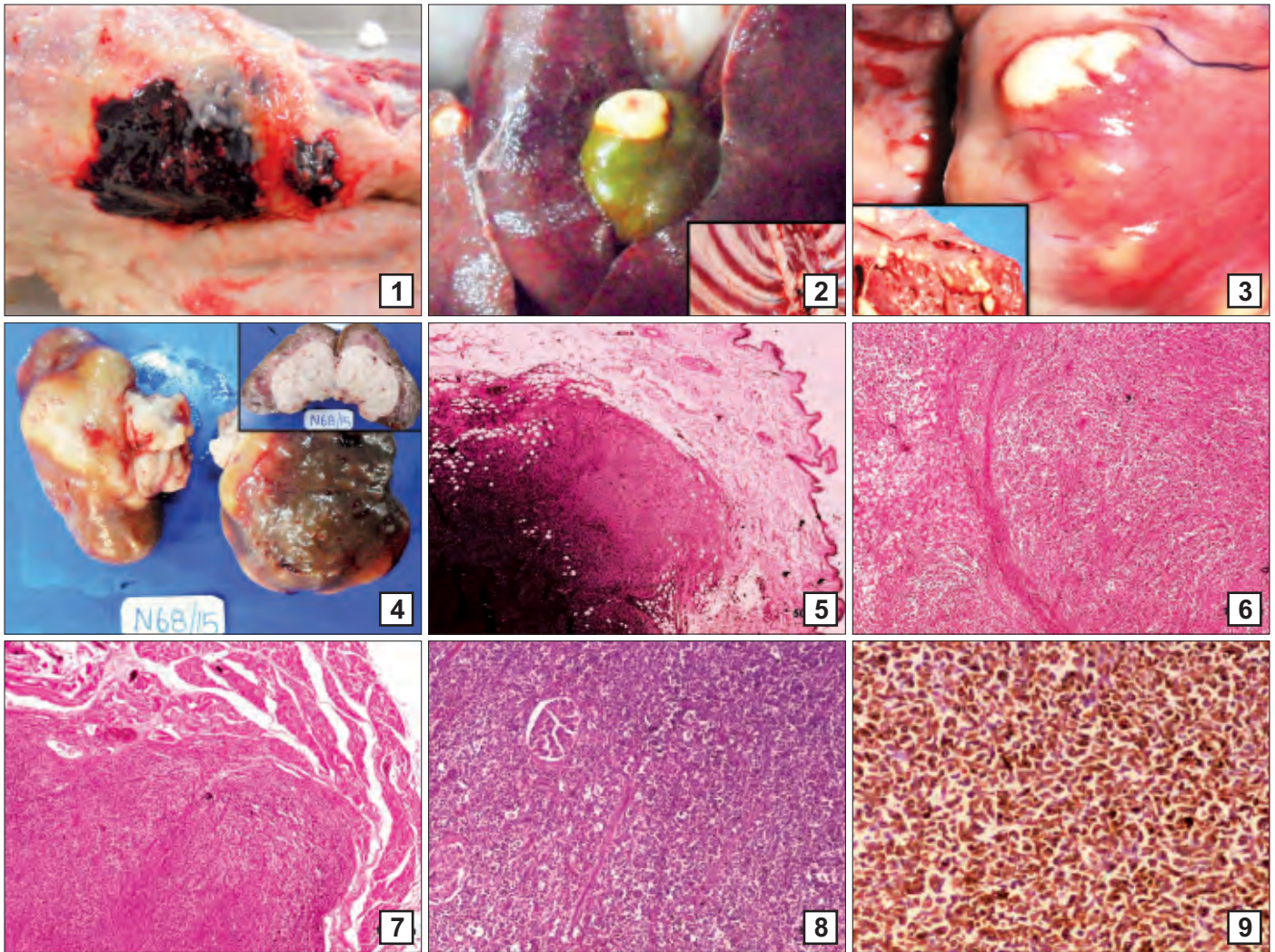
Soft tissue sarcoma developing from the mesenchymal cells of soft tissues accounts for 15 % of the all skin and subcutaneous tumors in dogs. Tumors that are grouped under soft tissue sarcoma are fibrosarcoma, hemangiopericytoma, liposarcoma, rhabdomyosarcoma, leiomyosarcoma, Malignant Fibrous Histiocytoma (MFH), malignant nerve sheath tumors, myxosarcoma, myxofibrosarcoma, mesenchymoma and spindle cell tumor. Other sarcomas like osteosarcoma, chondrosarcoma, hemangiosarcoma, lymphangiosarcoma and synovial cell sarcoma which are having high metastatic rate are not usually considered as soft tissue sarcoma (Ehrhart, 2005). 'Pleomorphic sarcoma' or 'anaplastic sarcoma with giant cells' is histologically and immunohistochemically diverse group of neoplasm which includes tumor which is originating from primitive myofibroblast in dogs and cats (Meuton, 2017) and is analogous to malignant fibrous histiocytoma in humans. Malignant fibrous histiocytoma was reported in dogs, cats, horses, cow and pig (Tanimoto *et al.*, 1988; Hamir, 1989; Sartin *et al.*, 1996). Malignant fibrous histiocytoma is commonly seen in subcutis of trunk or hind limbs in dogs and cats. In dogs it is more common in spleen also (Hendrick *et al.*, 1992; Clifford and Skorupski, 2007). Mostly middle aged to older dogs are affected and Golden retrievers and Rottweilers are the most affected breeds. The cell of origin of MFH is still controversial, supposed to be arising from the pluripotent mesenchymal cells.

A 6-years-old female Labrador was presented with anorexia and weight loss. Radiographic examination revealed cardiac enlargement and multiple dense opaque

areas. Ultrasound revealed hyper-echoic areas of 2.95 × 3.11 cm in the medullary region of the right kidney and 3.72 × 3.33 cm in left kidney. Fine needle aspirate was taken and stained using Leishman Geimsa stain. Animal collapsed and brought for necropsy to Department of Veterinary Pathology. A detailed necropsy was done, represented tissue samples were taken for histopathological examination and were fixed in 10% formalin and embedded in paraffin wax. Sections of 5 µm thickness were taken and stained using Haematoxylin and Eosin stains. For immunohistochemistry (IHC), thin tissue sections were taken on the slides precoated with Poly L-Lysine (Sigma Pvt. Ltd.) and stained with vimentin, S100, cytokeratin and desmin antibodies to assess the expression. After deparaffinisation, specimens were stained by a streptavidin horseradish peroxidase method according to the manufacturers instruction (Pathnsitu, USA). Sections were treated with DAB and counterstained by haematoxylin.

Malignant fibrous histiocytoma in domestic animals was described as a locally invasive tumor arise in subcutis and rarely metastasize. The present study had a widespread distribution which appeared as numerous small grayish white firm nodules throughout the body. The nodule was necrohaemorrhagic on subcutis of thigh region (Fig. 1) on external examination and in diaphragm, pericardial sac, liver, gall bladder (Fig. 2), thoracic cavity (Fig. 2 Inset), epicardium (Fig. 3), endocardium (Fig. 3 Inset), kidney (Fig. 4) and pancreas on post-mortem examination. Multicentric malignant fibrous histiocytoma with heart, kidney, adrenal, lung and bone involvement which appeared as firm smooth white to reddish brown masses

*Corresponding author: sugigold@gmail.com



Figs. 1-9. (1) Thigh-Subcutis: Necrohaemorrhagic nodular growth; (2) Grayish white nodules in liver & gall bladder. Inset: Grayish white nodule on intercostal muscles; (3) Grayish white nodules on heart epicardium and endocardium (Inset); (4) Grayish white nodules in kidney parenchyma. Inset: Kidney cut section showing tumour mass; (5) Skin-HP: Spindle neoplastic cells in dermis. H&E. bar = 500 μ m; (6) Liver-HP: Irregularly arranged neoplastic cells displacing and compressing the hepatocytes. H&E. bar = 100 μ m; (7) Heart-HP: Neoplastic cells showing anisocytosis and indistinct cell borders in myocardium. H&E. bar = 100 μ m; (8) Kidney-HP: Irregularly arranged neoplastic cells displacing and compressing the renal tubules and glomerulus. H&E. bar = 50 μ m; (9) IHC-Neoplastic cells showing strong diffuse positive cytoplasmic reaction for Vimentin. DAB brown. bar = 20 μ m

was reported previously in two dogs (O'Brien *et al.*, 1991).

In malignant fibrous histiocytoma, five different histological types were described. They were storiform-pleomorphic, myxoid, giant cell, inflammatory and angiomatoid. In dogs mostly storiform-pleomorphic, giant cell and inflammatory type were reported. Microscopically, three components were present in case of MFH like fibroblastic cells, histiocytic round or polygonal cells and multinucleated giant cells. Morris *et al.* (2002) reported that the immunohistochemical and histopathological features of malignant fibrous histiocytoma in Flat coated Retrievers. Storiform-pleomorphic variant was having fibroblast like cells arranged in cart wheel pattern and histiocytoid cells along with inflammatory infiltrate. In present case, histopathological examination revealed the presence of

spindle or stellate shaped cells in skin (Fig. 5), liver (Fig. 6), heart (Fig. 7) and kidney (Fig. 8). Spindle shaped cells were arranged irregularly and characterised by the presence of elongated eosinophilic cytoplasmic process with indistinct cell borders and large atypical nucleus. They showed moderate anisocytosis and anisokaryosis and varying numbers of mitotic figures. A few cells showed polyhedral shape with cytoplasmic vacuolations.

Ghibhaudo *et al.* (2008) also reported similar findings in a seven-month-old puppy. They observed disseminated lesions in mesenteric and mediastinal lymph nodes, lungs, pleura, kidney, spleen, pancreas and liver. On histopathological examination, spindle shaped cells arranged in storiform pattern were observed. Immunohistochemical study revealed strong positive reaction to

vimentin and mild labelling to α - smooth muscle actin and lysozyme. Choi *et al.* (2011) reported the presence of undifferentiated pleomorphic sarcoma in head of a dog and observed the presence of numerous multinucleated giant cells along with spindle shaped tumor cells. Giant cell type of malignant fibrous histiocytoma was also reported in the salivary gland of a Boxer (Peerez *et al.*, 2000). Giant cell variant of MFH is considered to be highly metastatic in nature which showed involvement of subcutaneous tissue, lymph nodes, lungs and liver (Waters *et al.*, 1994). Storiform- pleomorphic variant in which pleomorphic spindle shaped cells arranged in storiform pattern mixed with histiocytic cells and inflammatory infiltrate was observed in retrobulbar region in a Keeshond dog (Lassaline *et al.*, 2005).

Thoolen *et al.* (1992) reported the expression of actin, lysozyme and desmin in canine malignant fibrous histiocytoma. Immunohistochemical studies with a panel of markers in fourteen MFH in flat coated retrievers revealed vimentin expression in almost all the tumors suggesting the mesenchymal origin. Desmin and actin immunoreactivity were found to be low in tumor cells but can be used to visualize the background network of supporting stromal cells indicating that the stromal cells could be myofibroblast (Morris *et al.*, 2002). Immunohistochemical study in this case revealed diffuse strong cytoplasmic positivity for vimentin (Fig. 9) and negative for S100, cytokeratin and desmin which was in concordance with the previous results. Vimentin is a commonly used immunohistochemical marker for confirming the mesenchymal origin of tumors. S100 and desmin immunoreactivity was noticed in splenic tumors by Hendrick *et al.* (1992).

In conclusion, the present paper describes the histopathological and immunohistochemical features of anaplastic aggressive sarcoma with multiorgan metastasis in a Labrador retriever.

REFERENCES

Choi, H., Kwon, Y., Chang, J., Jeong, S., Lee, H., Kim, J., Jung, J. and Lee, Y. (2011). Undifferentiated pleomorphic sarcoma

- (malignant fibrous histiocytoma) of head in a dog. *J. Vet. Med. Sci.* **73(2)**: 235-239.
- Clifford, C.A. and Skorupski, K.A. (2007). Histiocytic diseases. In: Withrow & MacEwen's Small Animal Clinical Oncology. (4th Edn.), Withrow, S.J. and Mac Ewen, E.G. (Edts.), Saunders Elsevier, St. Louis.
- Ehrhart, N. (2005). Soft-tissue sarcomas in dogs: a review. *J. Am. Anim. Hosp. Assoc.* **41(4)**: 241-246.
- Ghibaud, G., Bettini, G. and Abramo, F. (2008). Anaplastic and aggressive subcutaneous sarcoma in a seven month old dog. *J. Small Anim. Prac.* **49(6)**: 310-313.
- Hamir A.N. (1989). Equine giant cell tumor of soft tissues. *Cornell Vet.* **79**: 173-177
- Hendrick, M.J., Brooks, J.J. and Bruce, E.H. (1992). Six cases of malignant fibrous histiocytoma of the canine spleen. *Vet. Pathol.* **29(4)**: 351-354.
- Lassaline, M.E., Gelatt, K.N., Brooks, D.E. and Ellison, G.W. (2005). Orbitotomy for retrobulbar malignant fibrous histiocytoma in a dog. *Vet. Ophthalmol.* **8(1)**: 1-6.
- Morris, J.S., McInnes, E.F., Bostock, D.E., Hoather, T.M. and Dobson, J.M. (2002). Immunohistochemical and histopathologic features of 14 malignant fibrous histiocytomas from Flat-Coated Retrievers. *Vet. Pathol.* **39(4)**: 473-479.
- Meuton, D.J. (2017). Tumours in Domestic Animals, (5th Edn.), Ames, Iowa, 50010, USA, p.717
- O'Brien, R.T., Hendrick, M.J., Evans, S.M. and Brooks, J.J. (1991). Pathological and radiographical features of multicentric malignant fibrous histiocytoma in two dogs. *J. Comp. Pathol.* **105(4)**: 423-430.
- Peérez, M.C., Garcia-Fernandez, R.A., Avila, L.R., Perez-Perez, V., Gonzalez, N. and Garcia-Iglesias, M.J. (2000). Malignant fibrous histiocytoma (giant cell type) associated with a malignant mixed tumor in the salivary gland of a dog. *Vet. Pathol.* **37(4)**: 350-353.
- Sartin E.A., Hudson J.A., Herrera G.A., Dickson A.M. and Wolfe D.F. (1996). Invasive malignant fibrous histiocytoma in a cow. *J. Am. Vet. Med. Assoc.* **208(10)**: 1709-1710.
- Tanimoto, T., Ohtsuki, Y., Sonobe, H., Takahashi, R. and Nomura, Y. (1988). Malignant fibrous histiocytoma in the spleen of a pig. *Vet. Pathol.* **25(4)**: 330-332.
- Thoolen, R.J.M.M., Vos, J.H., Van der Linde-Sipman, J.S., De Weger, R.A., Van Unnik, J.A.M., Misdorp, W. and Van Dijk, J.E. (1992). Malignant fibrous histiocytomas in dogs and cats: an immunohistochemical study. *Res. Vet. Sci.* **53**: 198-204.
- Waters, C.B., Morrison, W.B., DeNicola, D.B., Widmer, W.R. and White, M.R. (1994). Giant cell variant of malignant fibrous histiocytoma in dogs: 10 cases (1986-1993). *J. Am. Vet. Med. Assoc.* **205(10)**: 1420-1424.