

# Osteosarcoma with Pulmonary Metastasis in a German Shepherd Dog

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Osteosarcoma is the most common bone tumor in the dogs with highest incidence among bone neoplasms and exhibits aggressive behaviour characterized by both local invasiveness and distant metastases (Cavalcanti *et al.*, 2004; Withrow and Vail, 2007). Osteosarcoma can arise in any bone of appendicular skeleton, in the following order of frequency: humerus, radius, ulna, femur, and tibia (Liu *et al.*, 1977). Osteosarcoma is a highly metastatic neoplasia, mainly towards the lungs, with 90% of the animals developing metastases within one year after limb amputation (Brodey and Riser, 1969). Some breeds like Doberman Pinscher, Saint Bernard, German Shepherd, Golden Retriever, Great Dane and Irish Setter are described as having an increased risk of developing osteosarcoma (McNeill *et al.*, 2007; Morello *et al.*, 2010). The present paper describes appendicular osteosarcoma with metastasis of lungs in 12 year old German shepherd dog.

## CASE HISTORY AND OBSERVATIONS

The carcass of a 12 year old female German Shepherd dog with the history of swelling at right forelimb since 2 months and died with respiratory distress was presented at Regional Animal Disease Diagnostic Laboratory, Vishakapatnam (Andhra Pradesh) for post-mortem examination. External examination revealed a large mass located on the right forelimb at the humerus, extending into the thoracic region. The entire right forelimb was swollen (Fig. 1). Internally, consolidated areas in lung parenchyma were observed (Fig. 2). Tissue samples from tumor growth and lungs were collected in 10% formalin for histopathology and Immunohistochemistry. Sections measuring 4 µm were obtained and stained with Haematoxylin and Eosin staining method and Masson's trichrome stain. Immunohistochemistry was conducted using a mouse monoclonal primary PCNA (Proliferating Cell Nuclear Antigen) on tissue sections.

Histologically, sections revealed the presence of neoplastic spindle to polyhedral cells and multinucleated giant cells, with the production of osteoid and few areas of mineralization (Fig. 3). Nuclei were spindle to plump shaped, nucleoli were prominent, many mitotic figures with abnormal mitosis were observed. Multinucleated giant

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cells were scattered among neoplastic cells and had many nuclei, with a range from 2 to 5 (Fig. 4). Foci of neoplastic cells with production of osteoid matrix in lungs confirmed the metastasis of osteosarcoma to lungs (Fig. 5). Osteoid stained deep blue by Masson's trichrome stain in lungs and tumor growth (Fig. 6, 7). Immunohistochemically neoplastic cells showed positive nuclear expression of the PCNA marker (Fig. 8).

## DISCUSSION

Osteosarcomas may vary widely in their histological appearance, but in all cases a definitive diagnosis is based on the production of osteoid and/or bone by malignant mesenchymal cells. In productive osteoblastic osteosarcomas the osteoid component of the tumor is abundant (Thompson and Pool, 2002). In this case production of osteoid by spindle-to-polyhedral cells was clearly observed. Cytoplasm and nuclei of osteoblast like neoplastic cells showed pleomorphism and atypia. In certain areas, osteoid produced by neoplastic cells formed thin strands arranged in a lace-like pattern and in few areas osteoid surrounded the neoplastic cells entrapping

them in lacunar spaces. These histological features were in accordance with the features of osteosarcoma in dogs. Osteoid stained deep blue with Masson's trichrome staining. On the basis of these findings the tumor in this case was confirmed as osteoblastic osteosarcoma.

Cavalcanti *et al.* (2004) stated that, there was a considerable prevalence of osteosarcoma (OSA) in the appendicular skeleton (75.6%), with the radius, ulna, femur, tibia, scapula, humerus and phalanges in decreasing order of frequency. Appendicular OSA appears more often in forelimbs than in hind limbs, whereas extra skeletal OSA develops primarily in visceral organs (adrenal gland, eye, gastric ligament, ileum, kidney, liver, spleen, testicle and vagina) (Langenbach *et al.*, 1998). Szewczyk *et al.* (2014) opined that most osteosarcoma in dogs has high metastasis ability. 80 % of dogs with osteosarcoma die due to lung metastasis.

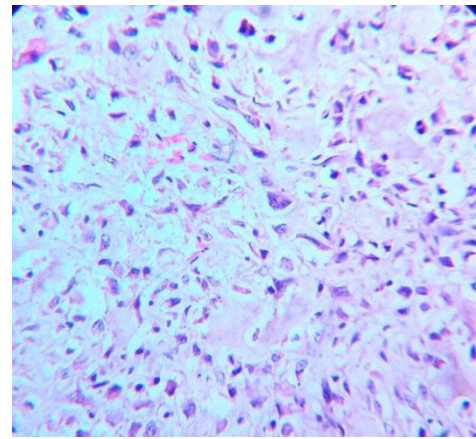
In conclusion, canine osteosarcomas are highly malignant bone tumors with high metastatic ability to lungs. This case report describes the histopathological features of a German shepherd dog died due to appendicular osteosarcoma showing metastasis to lungs.



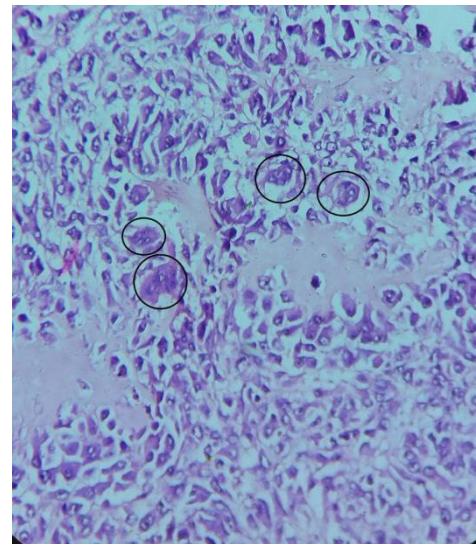
**Fig. 1:** A large mass located on the right forelimb



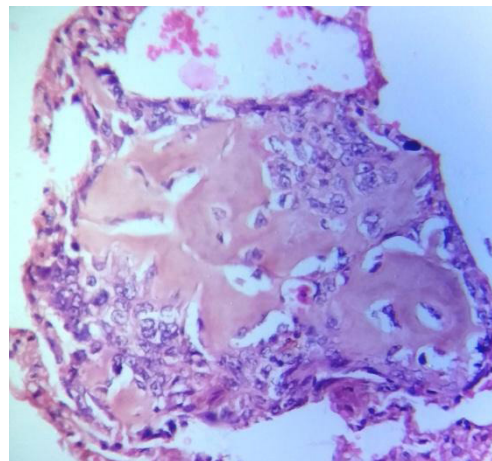
**Fig. 2:** Lungs: Consolidated area on lung parenchyma



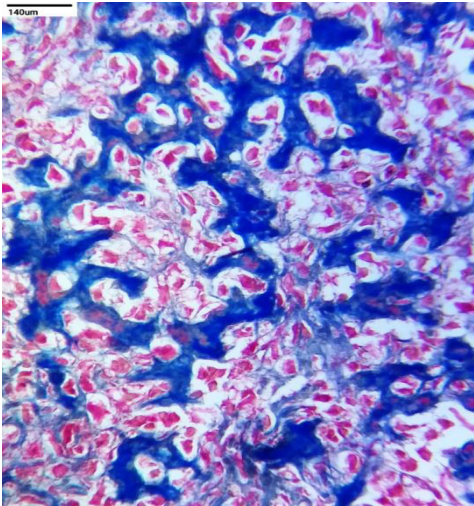
**Fig. 3:** Osteosarcoma: Proliferation of spindle to polyhedral cells with osteoid production. H&E 400X



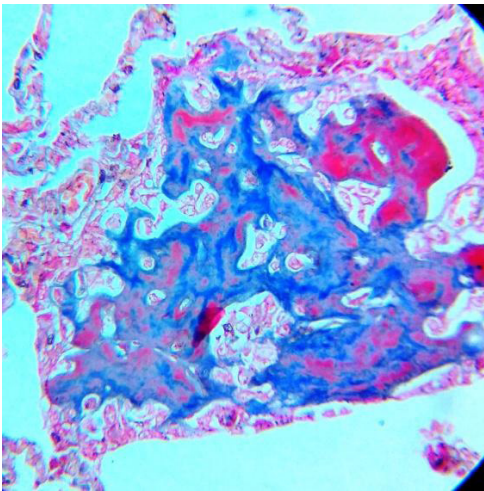
**Fig. 4:** Osteosarcoma: Section showing multiple multinucleated giant cells. H&E 400X.



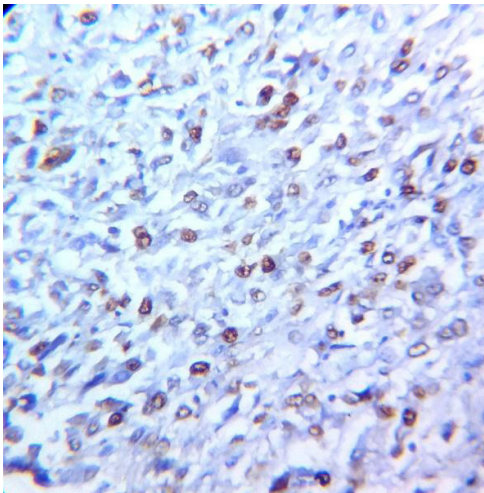
**Fig. 5:** Lung: Foci of neoplastic cells with osteoid matrix. H&E 400X.



**Fig. 6:** Osteosarcoma: Osteoid stained deep blue in tumor growth. Masson's trichrome 400X.



**Fig. 7:** Lung: Osteoid stained deep blue. Masson's trichrome. 400X.



**Fig. 8:** Osteosarcoma: Neoplastic cells showing positive immunostaining for PCNA

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## REFERENCES

- Brodey, R.S., & Riser, W.H. (1969). Canine osteosarcoma: A clinicopathologic study of 194 cases. *Clinical Orthopaedics*, 62(4), 26-32.
- Cavalcanti, J.M., Amstalden, E.M.I., Guerra, J.L., & Magna, L.C. (2004). Osteosarcoma in dogs: Clinical-morphological study and prognostic correlation. *Brazilian Journal of Veterinary Research & Animal Science*, 41, 299-305.
- Langenbach, A., Anderson, M.A., Dambach, D.M., Sorenmo, K.U., & Shofer, F.D. (1998). Extra-skeletal osteosarcomas in dogs: A retrospective study of 169 cases (1986-1996). *Journal of American Animal Hospital Association*, 34, 113-120.
- Liu, S.K., Dorfman, H.D., Hurvitz, A.I., & Patnaik, A.K. (1977). Primary and secondary bone tumors in the dog. *Journal of Small Animal Practice*, 18(4), 313-326.
- McNeill, C.J., Overley, B., Shofer, F.S., Kent, M.S., Clifford, C.A., Samluk, M., Haney, S., Van Winkle, T.J., & Sorenmo, K.U. (2007). Characterization of the biological behaviour of appendicular osteosarcoma in Rottweilers and a comparison with other breeds: A review of 258 dogs. *Veterinary Comparative Oncology*, 5, 90-98.
- Morello, E., Martano, M., & Buracco, P. (2010). Biology, diagnosis and treatment of canine appendicular osteosarcoma: Similarities and differences with human osteosarcoma. *The Veterinary Journal*, 189, 268-277.
- Szewczyk, M., Lechowski, K., & Zabielska, K. (2014). What do we know about canine osteosarcoma treatment? A review. *Veterinary Research Communication*, 39, 61-67.
- Thompson, K.G., & Pool, R.R. (2002). Tumors of bones. In: *Tumors in Domestic Animals*, 4<sup>th</sup> ed., Ed: Meuton D.J, Iowa State Press, Ames, IA, pp 245-317.
- Withrow, S.J., & Vail, D.M. (2007). *Withrow & MacEwen's Small Animal Clinical Oncology*. St Louis, MO: Saunders Elsevier.