

MALIGNANT MASTOCYTOMA IN A NIGERIAN LOCAL DOG

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SUMMARY

An 8-month old male Nigerian local dog had multicentric mastocytoma of the skin with metastasis to the lymph nodes, liver, spleen and heart. Over a period of few weeks, cutaneous and subcutaneous nodules grew to several centimeters in size and ulcerated, leading to rapid deterioration of body condition. Histochemical staining of smears from aspiration biopsies and histologic sections of nodules showed immature neoplastic mast cells that were characterized by a high degree of nuclear and cellular pleomorphism, with dust-like granules. Being the only one affected of the three dogs in the household, a non-infectious aetiologic agent was suspected. This to the knowledge of the authors is the first report of malignant mastocytoma in the Nigerian local breed of dogs.

KEY WORDS: Malignant; mastocytoma; Nigerian local dogs

INTRODUCTION

Mast cell tumors are probably the most common skin neoplasm of the dog, representing about 20% of all possible skin tumors; and as high as 43% occurrence rate in certain brachycephalic breeds of dogs (Gross *et al.*, 1992; Yager and Wilcock, 1994; Morrison, 1998). Mast cells are a connective tissue cell that secrete heparin and histamine, hence they are involved in the inflammatory response.

Mastocytomas are usually presented in middle-age or older dogs. However, in spite the high prevalence rate of canine cutaneous mast cell tumors, certain aspects of the disease, such as aetiology, clinical manifestations and biological behaviours are still poorly understood. For example, despite the strong evidence in support of viral aetiology, non-infectious aetiologic agents have been mentioned (Bowles *et*

al., 1972; Goldschmidt and Hendrick, 2002). Similar controversy surrounds the reports of age and breed disposition, and the likelihood of tumors to metastasize (Hallstrom, 1970; O'keete *et al.*, 1987). All these explain the inaccurate diagnosis and prognosis often provided for many cases of canine cutaneous mastocytomas (Bostock, 1973).

In spite the diversity of the breed, and the high population of the dogs in Nigeria, cutaneous mast cell tumors appear to be one rare neoplastic disease as it has never been mentioned as a diagnosed skin neoplasm of dogs in Nigeria (Uzoukwu, 1979). This report describes the clinical, pathological and biological behaviour of malignant mastocytoma in a Nigerian local dog (NLD).

MATERIALS AND METHODS

Case History

A six-month old male Nigerian local dog (NLD) was presented at the University of Nigerian Veterinary Teaching Hospital, Nsukka; with history of intense itching (consistent rubbing and scratching), cutaneous erythema and other pruritic lesions. A tentative clinical diagnosis of mange (mite infestation) was made, even though mites were not seen in the skin scrapings. The dog was treated with Ivermectin®, (MSD) at the rate of 6 micrograms per kg body weight. The other two dogs in the household (one a litter-mate) were not affected. Some six weeks later when the dog was returned to the clinic for castration, the pruritic lesions had disappeared and open castration was successfully carried out. Three weeks after castration, the dog was re-presented at the clinic with the report of delay in the healing of the castration (incision) wound. On examination, tiny circular nodules were observed around the scrotal sac and prepuce. On palpation, larger, firm cutaneous and subcutaneous nodules were located all over the body, but most especially around the ventral abdominal and pelvic areas; along the ribs and the dorsal midline. The right subiliac lymph node was slightly enlarged. The dog was hospitalized for detailed clinical examination. Over the next two weeks, the cutaneous nodules increased in number and size, and ulcerated; the dog was anorectic with severe weight loss. Euthanasia was carried out at owners request on twelfth day of hospitalization.

Haematology, Cytology and Histopathology: Whole blood collected antemortem into anticoagulant was used for the determination of packed cell volume (PCV), total and differential white blood cells (WBC) counts, and

haemoglobin concentration (Hb) as routinely done (Davies, 1978). Biopsies (aspiration and tissue) of neoplastic nodules and superficial lymph nodes were prepared for cytology by the method of Benjamin (1978). The smears were stained with Giemsa's and Wright-Leishman stains; and aqueous (0.1%) toluidine blue. Incisional biopsy of skin nodules (collected antemortem), and organ sections collected postmortem for histopathologic studies were fixed in 10% buffered formal saline, processed as routinely done and embedded in paraffin wax. Sections 6 microns thick were cut and stained with Haematoxylin and Eosin (H&E) stains. Giemsa's stain and aqueous (0.1%) toluidine blue were used for staining of selected sections (Drury *et al.*, 1976).

RESULTS

Haematology: The severe anaemia in the dog was more or less pancytopenic, with a PCV of 0.23L/L (Normal, N = 0.39±0.04; Bobade *et al.* 1985) and Hb concentration of 85g/L (N=134±15). For the leucocytic series, the total WBC count was $12.2 \times 10^9 /L$ (N=17.7±2.0), the lymphocytic count $3.2 \times 10^9 /L$ (N= 5.0±0.9×10⁹/L, and the neutrophils count $8.0 \times 10^9 /L$ (N=11.1±1.4×10⁹/L), the eosinophil count of $0.9 \times 10^9 /L$ (N= 0.4±0.3×10⁹/L) was moderately elevated.

Cytology: The impression smears of cutaneous/subcutaneous nodules and subiliac lymph nodes showed neoplastic cells with much pleomorphism with a few of the cells showing tiny, bluish-black granules with Giemsa's stain.

Necropsy Findings: Carcass was emaciated and hairs all over the body matted with clotted blood. Multiple tiny nodules, generally less than 20mm in diameter were found on the scrotal sac,

prepuce and anal region (Fig 1). Larger nodules (3 to 6cm in diameter) were mostly on the pelvic and ventral abdominal areas; but widely distributed over the body. The dermal nodules were firm, and white to light orange in colour, while the larger subcutaneous nodules were cystic. Of all the superficial lymph nodes; only the right subiliac was enlarged. The fundic areas of the stomach had multiple tiny foci of erosions, while the pylorus and duodenum had wider and deeper erosions/ulcers. The liver was pale, petechiated and friable. Lungs were congested, while the spleen, heart and kidney did not show any gross lesions.



Fig. 1: An 8-month old, castrate Nigerian Local dog with cutaneous mastocytoma. Note nodules (arrowheads) around the empty scrotal sac and mid ventral abdominal areas.

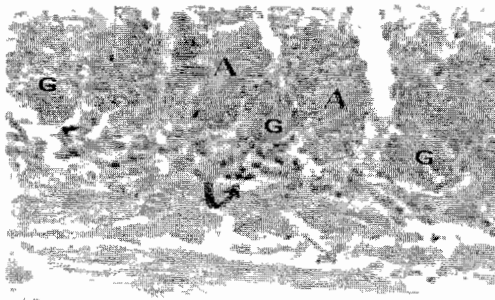


Fig.2: Histopathologic section from the duodenum of dog with malignant mastocytoma showing Villi (A), Duodenal glands (G), and neoplastic cells aggregation (curved arrow) around the glands. H & E, X400.

Histopathology: Skin section adjacent to the nodules showed moderate to severe infiltration of the papillary dermis and less so the hypodermis by neoplastic mast cells which aggregate mostly around the hair follicles, cutaneous blood vessels and glands. Mitotic figures were few. Inflammatory cells, especially eosinophils and lymphocytes also infiltrated the areas. Vascular thrombosis was common in areas of neoplastic and inflammatory cells aggregation. Foci of cellular aggregation in the skin were never clearly demarcated from the surrounding tissues. Neoplastic cells aggregation was generally associated with degeneration of collagenous and elastic fibers. Subcutaneous nodules were encapsulated with central necrotic areas just like a granuloma. The neoplastic cells in the right subiliac lymph node were closely packed around the margin of the hyperplastic follicles. In the stomach and duodenum, neoplastic and inflammatory cells were mostly around the perivascular and peri-glandular areas (Fig. 2). The different organs without gross lesions (nodules) were mildly, but diffusely infiltrated by neoplastic cells. The cells were around the vessels and ducts of the portal areas in the liver; and the peri-follicular areas and sinuses of the red pulp in the spleen. In the heart, there were foci of neoplastic cells aggregation, with mild eosinophils and macrophages infiltration; but without fibrous capsules (Figs. 3 and 4). There were also foci of mild to moderate neoplastic cells aggregation in the interstices and interalveolar spaces of the kidney and lungs respectively.



Fig.3: Histopathologic section from the heart of dog with malignant mastocytoma showing area of neoplastic mass cells aggregation (N) and degenerating myocardial fibers. H & E, stain. X100.

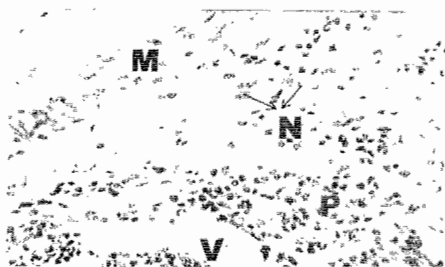


Fig.4: Histopathologic section from the heart of dog with malignant mastocytoma showing diffuse infiltration of myocardium by neoplastic mast cells (arrow), areas of myocardial necrosis (N), and myocardial degeneration (M). Note lymphatic vessel (V) and area of fibroblast proliferation (P). H & E stain X 400.

DISCUSSION

The gross histologic and histochemical features of the neoplasm observed in this dog were very similar to those of mast cell tumors (Goldschmidt and Hendrick, 2002; Moore, 2005; Sfiligoi *et al.*, 2005). The aggregation and diffuse infiltration of pleomorphic mast cells, including variable numbers of mitotic figures identified in the skin section and widely separated visceral organs clearly indicate the tumor was highly metastatic. Consequently, this was diagnosed as a case of mast cell sarcoma, also called malignant mastocytoma (Moulton, 1978).

The Nigeria local dog (NLD), which represent about 80% of the total dog population in Nigeria is a brachycephalic breed (Esuruoso, 1972), and some other dog breeds of the brachycephalic group are equally present in Nigeria (Onamegbe, 1980). It is therefore a curious observation that canine mast cell tumors have not been reported in the country to our knowledge, since the brachycephalic breed have been suspected to be genetically predisposed (Peters, 1969; Moore, 2005). Malignant mastocytoma was diagnosed in this dog at the age of eight months whereas reports suggest most cases occur in dogs of middle

age or older dogs (Patnaik, *et al.*, 1984; Moore, 2005). The clinicopathologic characteristics of the malignant mastocytoma in the dog were similar to what had been reported for this neoplastic disease (Morrison, 1998; Moore, 2005). The anaemia was most probably multifactorial, with the invasion of bone marrow by neoplastic mast cells a likely important factor. This same factor might have been responsible for the low neutrophils count in this dog when compared with values previously reported for clinically normal dogs of the same breed and age (Bobade *et al.*, 1985). The invasion of the spleen and lymph nodes by the neoplastic mast cells could explain the low lymphocytes count. Gastrointestinal ulceration which was observed in this dog has also been reported, and has been explained to be a consequence of the release of large amounts of histamine by tumor cells which cause receptor mediated hypersecretion of HCl by the parietal cells (Howard *et al.*, 1969; Morrison, 1998; Takahashi *et al.*, 2000).

Mastocytosis which had been observed in some reported cases of mast cell tumors was not a feature in this dog (Hottendorf and Nielsen, 1969; Moore, 2005). The delay in wound healing following infiltration of tumor cells had been previously reported (Thomson, 1984); and was most likely responsible for the delay in the healing of the castration (incision) wound in this dog. The diagnosis of malignant mastocytoma in this dog was based on the histology/cytology of neoplastic cells and the biological behavior of the tumor. The malignant mastocytoma in this dog was considered a stage IV on the grading system (Morrison, 1998), because the neoplastic cells were pleomorphic, with large nuclei and prominent nucleoli while the cytoplasmic granules were almost undetectable without

the use of the special histochemical stains. We were unable to make an aetiological definitive diagnosis of the neoplasm in this dog. Mange was the only infectious disease suspected in this dog, almost two months before the appearance of neoplastic nodule. It has been reported that parasitic mites infestation of the skin is capable of inducing mast cells proliferation (Muller *et al* 1983); with the possibility of mast cells hyperplasia transforming to mast cells neoplasm. But since the suspended mange infection did not spread to two other dogs in the household, the aetiology of this case of canine malignant mastocytoma might be a non-infectious agent. There is the need to identify such aetiological agent since the NLD is now known to be very susceptible to mastocytoma; benign or malignant.

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REFERENCES

- BENJAMIN, M.M. (1978). *Outline of Veterinary Clinical Pathology*. 3rd Ed. The Iowa University Press, Annes Jowa: 299-307.
- BOBADE, P.A; ODUYE, O.O and AGHOMO,H.O. (1985). Haemogram of clinically normal dogs with particular reference to local (Nigerian) and German shepherd dogs *Nig. Vet. J.* **14**:7-11
- BOSTOCK, D.E. (1973). The Prognosis following surgical removal of mastocytoma in dogs. *J. Sm Anim Prac.*, **14**:27-40.
- BOWELES, C.A; KERBER, W.J; RANGAN, S.R.C; KWAPIEW, R; WOODS, W. and JEWSEN, E.M. (1972). Characterization of a transplantable canine immature mast cell tumor. *Cancer Res.***32**: 1434-1441.
- DAVIE, E.T. (1978). Haematologic In: *Manual of Veterinary Investigation Laboratory Techniques*. **Vol 1 2**. Her Majesty's Stationery Office, London: 72-100.
- ESURUOSO, G.O. (19972). Observation in an experimental Veterinary Clinic in Ikeja Area of Lagos. *J. Nig. Vet. Med. Ass.* **1**:7-15.
- DRURY, R.A.B., WALLINGTON, E.A. and CAMERON, R. (1976). Preparation of Tissues for Microtomy. In: *Carleton's Histological Techniques* 4th Ed. Oxford University Press. London: 48-137.
- GOLDSCHMIDT, M.H. and HENDRICK, M.J. (2002). Mast cell Tumor. In: *Tumors in Domestic Animals*. 4th Ed. Meuten, D.J. Ed. Iowa State Press. A Blackwell Publishing Coy: 105-107.
- GROSS, T.L; IHRKE, P.J. AND WALDER, E.J. (1992). Histiocytic and mast cell tumors. In: *Veterinary Dermatology*, ed. Reinhardt, R.W. 1st Ed. Mosby Year Book, St. Louis, MO: 465-473.
- HOTTENDORE, G.H. and NIELSEN, S.W. (1969). Canine mastocytoma – a review of the clinical aspects. *J. Ame. Vet. Med. Ass.* **154**: 917-924.
- HOWARD, E.B; SAWA, T.R. NIELSEN, S.W. and KENYON, A.J. (1969). Mastocytoma and Gastroduodenal ulceration. *Path. Vet.* **6** : 146-158.
- MOORE, A.S. (2005). Cutaneous Mast Cell Tumors in Dogs. Proceedings of the 30th World Congress of the

- World Small Animal Veterinary Association.
- MORRISON, W.B. (1998). Cancer in Dogs and Cats. 1st Ed. Williams and Wilkins.
- MOULTON, J.E. (1978). Tumors of the skin and soft tissues. In: Tumors in Domestic Animals. 2nd Ed. University of California Press, Los Angeles: 26-31
- MULLER, G.H; KIRK, R.W. and SCOTT, D.W. (1983). Small Animal Dermatology. 3rd Ed. W.B. Saunders and Company, Philadelphia: 519-520.
- O'KEEFE, D.A; COUTO, C.G; BURKE - SCHWARTZ, C and JACOBS, R.M. (1987). Systemic mastocytosis in 16 dogs. *J. Vet. Intern Med.* **1**: 75-80.
- OMAMEGBE, J.O. (1980). A survey of dogs and their owners seen at two Veterinary Clinics in the Enugu and Nsukka areas of Anambra State, Nigeria. *The Nig. Vet J.* **9**: 10-16.
- PATNAIK, A.K, EHLER, W.J, and MacEWEN, E.G. (1984). Canine mast cell tumor: morphologic grading and survival time in 83 dogs. *Vet. Pathol.* **21**: 469-473.
- PETERS, J.A. (1969). Canine mastocytoma. Excess risk as related to ancestry. *J. Nat. Cancer Inst.* **42**:435-443.
- SFILIGOI, G; RASSNICK, K. M; SCARLETT, J M; NORTHRUP, N.C. and GIEGER, T.L. (2005). "Outcome of dogs with mast cell tumors in the inguinal or perineal region versus other cutaneous locations:124 cases (1990-2001)". *J. Am. Vet. Med. Ass.* **226**. (8): 1368-1374.
- TAKAHASHI, T; KADOSAWA, T; NAGASE, M; MATSUNAGA, S; MECHIZUKI, M; NISHIMURA, R. and SASAKI, N. (2000). "Visceral mast cell tumors in dogs: 10 cases (1982-1997)". *J. Am. Vet. Med. Ass.* **216**: 222-226.
- THOMSON, P.G. (1984). Inflammation and Repair. In: General Veterinary Pathology. 2nd Ed. W.B. Saunders Coy. Philadelphia **261**: 322-342.
- UZOUKWU, M. (1970). Some skin tumors of domestic animals. *Nig. Vet. J.* **8**: 7-11.
- YAGER, J.A. and WILCOCK, B.P. (1994). Surgical Pathology of the Dog and Cat. Dermatology and Skin Tumor, Mosby, London: 30-38.