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CASE REPORT

Fibroblastic Variant of Osteosarcoma in a Male Alsatian Dog - A Case Report

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INTRODUCTION

Osteosarcoma (OS) is a primary malignant neoplasm of mesenchymal tissue that gives rise to the production of bone by osteoblasts (Slayter *et al.,* 1994). It is the most common malignant bone tumour in dogs (Garjoaba *et al.,* 2009; Kudnig *et al.,* 2012), but incidence rate and epidemiology of this neoplasm among the Nigerian dog population have not been reported. The tumour metastasizes early to the lungs leading to early mortality (Thompson, 2007). Medium, large and giant sized breeds of dogs are particularly at high risk (Kudnig *et al.,*2012), with the risk in dogs weighing over 80 pounds estimated to be 61-185 times the risk in dogs weighing less than 20 pounds (Kelsey *et al.,*1998). The two most common anatomical locations for this tumour are the distal radius (35%) and proximal humerus (18%) (Mueller *et al.,* 2007). Here, we describe a case of fibroblastic appendicular osteosarcoma in a male Alsatian dog.

CASE HISTORY:

A nine year old male Alsatian dog was presented to the Small Animal Clinic of the Veterinary Teaching Hospital, University of Ibadan, with a swelling in the subcutis of the dorsal surface of the distal radius of the left forelimb (Fig.1). The swelling was first observed two weeks prior to the day the dog was presented to the small animal clinic for medical attention. Initially, the swelling was small, but started to progressively increase in size over the course of two weeks prior to presentation.

Physical examination:

At the time of presentation, the dog weighed 31kg. Clinical examination revealed a rectal temperature of 39.7^{0}C (Reference range: 37.9–39.9^{0}C). Blood pressure values obtained via indirect sphygmomanometry (Beevers *et al.,* 2001) of the brachial artery were very high (hypertension): 189/135mmHg (Reference range: 132 ± 13/75 ± 10mmHg).

Laboratory investigation:

Blood was collected via venepuncture of the cephalic vein and a complete blood count was carried out serially on three different occasions. The second and third complete blood counts were carried out one week and eight weeks respectively, following the first. The complete blood count was carried out using standard methods as described by Duncan *et al.* (1994) and Jain (1986). Serum

biochemical analysis was conducted once using standard methods as described by Jain, (1986). Lateral radiographs of the distal radius and ulna of the affected limb were taken. Following euthanasia, the carcass was completely necropsied and tissue samples from the mass were fixed in 10% neutral buffered formalin, routinely processed, sectioned and stained with haematoxylin and eosin.

Case management and final outcome:
A clinical diagnosis of osteosarcoma and differential diagnosis of chondrosarcoma was made following the laboratory investigations. As a consequence of this diagnosis, doxorubicin hydrochloride (30mg/m^2) was administered once, after the first complete blood count was carried out. This intervention however did not lead to a resolution of the condition, as the tumour continued to grow several weeks following this treatment. The dog's owner subsequently requested that the dog be euthanized. The dog was euthanized with an overdose of barbiturates prior to necropsy.

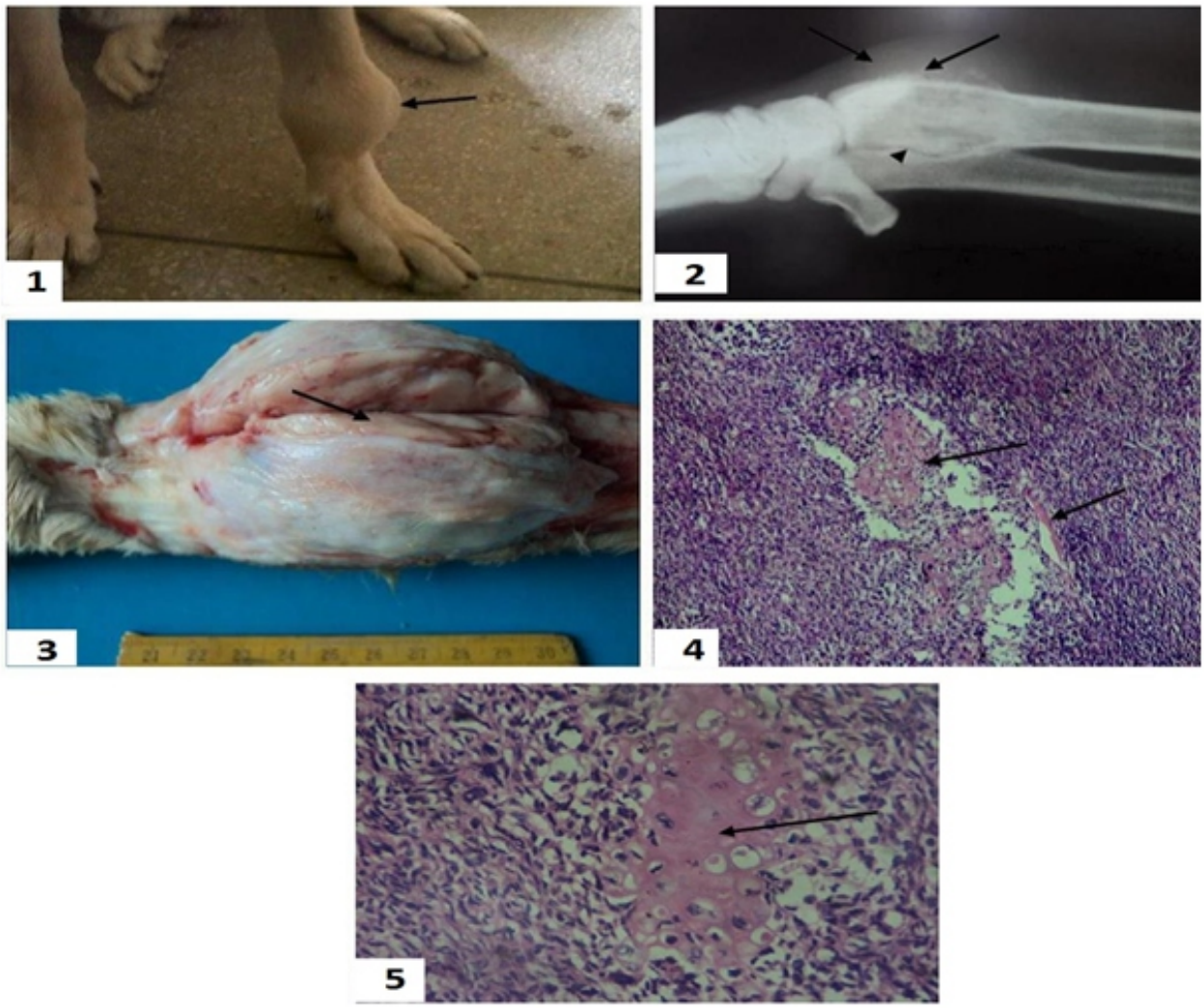
RESULTS

Radiography of the affected limb revealed a lytic mass on the periosteal surface of the dorsal aspect of the distal radius with severe periosteal reaction. Radiographical signs associated with primary bone neoplasms were observed and they include the following: lifting of the periosteum, periosteal proliferation, and soft tissue swelling (Fig.2). The first complete blood count carried out revealed moderate hyperproteinaemia (9g/dl) (Reference range: 5.4-7.5g/dl), while all the other parameters were within normal reference range. The remaining two haemograms obtained one week and eight weeks after the first were unremarkable. Serum chemistry analysis carried out simultaneously with the last complete blood count revealed a mild hypoalbuminaemia (1.8g %) (Reference range: 2.3-3.1g/dl). Sequel to these laboratory investigations, a clinical diagnosis of osteosarcoma with a differential diagnosis of chondrosarcoma was made.At necropsy, there was a firm, spheroid, subcutaneous mass (5x5x4cm) firmly adherent to the dorsal surface of the distal radius of the left forelimb. The cut surface of the tumour was white, lobulated and firm (Fig.3). Other gross lesions observed include; numerous pinpoint black foci in all lobes of the lungs and severely pale kidneys. Grossly, there was no evidence of tumour metastasis to other organs. No other gross lesions were observed in other organs.

Histologically, the tumour consisted of interlacing streams and bundles of cells that were predominantly spindle (Fig.4) and less often polyhedral, in a moderately dense collagenous matrix often forming irregular islands of homogenous pink fibrillar material (unmineralised osteoid) that often trapped osteocytes (Figs.4 and 5). The nuclei of the spindle and polyhedral cells were hyperchromatic and pleomorphic. Mitotic figures were few.

DISCUSSION

The tumour in the present case was diagnosed as the fibroblastic variant of osteogenic sarcoma (osteosarcoma) based on the histological findings of interlacing streams and bundles of atypical spindle cells and the elaboration of osteoid by the neoplastic cells (Figs. 4 and 5). Fibroblastic osteosarcoma is one of the variants of osteosarcoma (Slayter *et al.,* 1994). Fibroblastic osteosarcomas usually consist of a population of spindle cells within which there is osteoid or bone formation by tumour cells (Thompson, 2007).



LEGEND FOR THE PICTURES

Fig 1: Canine forelimbs. Note the subcutaneous swelling on the dorsal surface of the distal radius of the left forelimb (arrow).

Fig. 2: Lateral radiograph of the distal radius and ulna of the dog with the swollen left forelimb. Radiographical signs associated with a primary bone tumour include the following : lifting of the periosteum (black arrowhead), periosteal proliferation (thick black arrow), and soft tissue swelling (thin black arrow).

Fig. 3: Tumour on the dorsal surface of the distal radius. The cut surface is whitish, firm and lobulated (black arrow)

Fig. 4: Photomicrograph of tumour showing interlacing streams and bundles of spindle cells. Note the islands of osteoid (black arrows) H&E, x40

Fig.5: Photomicrograph of tumour. Note the island of osteoid (black arrow) surrounded by bundles of atypical spindle cells, H&E, x400.

This description is in agreement with the histological features of the tumour mass in the present case. Chondrosarcoma was the differential diagnosis in this case. Thompson (2007) defined chondrosarcoma as malignant mesenchymal tumours in which the neoplastic cells produce variable quantities of cartilaginous or fibrillar matrix, but not osteoid. This definition is not in agreement with the findings in this case as there was osteoid production by the neoplastic cells (Fig.4). This fact also rules out the differential diagnosis of chondrosarcoma as osteoid production is not a feature of chondrosarcoma. Although osteosarcoma has been reported to metastasize early to the lungs (Thompson, 2007), in the present case, there was no evidence of metastasis to the lungs or other organs. The reason for this cannot be adduced at the moment and needs to be further investigated.

The aetiology of the neoplasm in the present case was not determined. The aetiology of canine osteosarcoma is not certain, however some authors have speculated that canine OS has a viral aetiology due to the fact that it can occur in litter mates and may be experimentally induced by injecting OS cells into canine foetuses (Withrow and Vail, 2013).

A few options exist for the treatment of appendicular osteosarcoma in dogs. These options include limb amputation alone and limb-sparing surgery combined with either chemotherapy or radiation therapy (Withrow and Vail, 2013). Limb sparing surgery combined with some form of adjuvant therapy (chemotherapy/ radiation therapy) would have prolonged the dog's life for several months, however, several complications such as recurrent local disease, allograft infection and implant complications (Withrow and Vail, 2013) arising from the therapy would still have resulted in the dog's death if left unattended to. In the same vein, a study that entailed the collection of long term follow up information on 162 dogs with appendicular osteosarcoma treated by amputation alone was carried out by Spodnick *et al.,* (1992). In that study, most of the dogs (72.5%) died or were euthanized because of problems documented to be related to metastases. Metastasis was predominantly to the lungs (60.8% of total).

In the present case, the tumour continued to grow in spite of the administration of 30mg/m^2 of doxorubicin hydrochloride, prompting the dog's owner to request for its euthanasia. This situation suggests that the growth of this tumour is unaffected by the administration of normal doses of doxorubicin hydrochloride. In line with this finding, systemic chemotherapy has been reported to have minimal effect on the growth of OS (Morris and Dobson, 2008).
Considering the facts above, we can conclude that the overall prognosis of osteosarcoma in dogs is poor, regardless of what treatment option is employed and that in most cases affected dogs will still die of the disease or therapy related complications. Furthermore, it is pertinent that more studies be carried out to determine the exact aetiology of this malignancy in dogs with a view to developing more effective preventive and therapeutic/curative options for this disease.

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