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Case Report Open Access

# Chondroblastic Osteosarcoma in a Cat: Case Report

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**Abstract**

Osteosarcoma is one of the most important bone tumors of human beings and pet animals. It is a rapidly progressive, early metastasize, osteolytic, highly fatal tumor. It may arise from central medullary osteoblasts, peripheral periosteal or perichonderal cells, and extra skeletal tissues or may have a pluripotent potential. A Shirazi Native breed cat was examined for the presence of multilocular lobulated partially encapsulated masses in the external ear. The excised tissue revealed anaplastic, chondroblast and osteoblast mesenchymal differentiations associated with hypercellularity, pleomorphism and increase in mitosis, consistent with chondroblastic osteosarcoma.

**Keywords:** Anaplastic; Chondroblast; Osteoblast; Mesenchymal; Differentiations; Mitosis; Pleomorphism

## Introduction

Primary bone tumors are commonly encountered in cats and dogs. The proportions of benign and malignant neoplasms of bones are approximately equal. In cats Osteosarcomas may be of central or medullary and peripheral (periosteal and parosteal=juxtacortical) origin. Sarcomas arising within bones are more common and consistently more malignant than sarcomas of periosteal origin. Parosteal osteosarcomas are included in the peripheral (surface) malignant tumors of bones with their well-differentiated osteosarcomatous features [1]. Besides, invasion of the underlying cortex which is a commonplace and a contrasting feature in distinguishing periosteal osteosarcoma of other peripheral malignant tumor of the bones from parosteal osteosarcoma [2]. Osteosarcoma is the most common neoplasm of the bone in human patients, cats, and dogs, and it is generally assumed that it derives from osteoblastic cells, but now pluripotent stem cells have also been under discussion as a source of neoplastic cells [3]. It is a rapidly progressive tumor with early metastasis to the lungs leading to early mortality. Most osteosarcomas arise from within bones, particularly in the metaphyseal regions of long bones, and are referred to as central osteosarcomas. Less commonly, osteosarcomas arise in the periosteum or even in extraskeletal tissues. Two types of peripheral osteosarcoma may arise in the periosteum. One is referred to as periosteal osteosarcoma and may show similar biologic behavior to central osteosarcoma; the other is parosteal (juxtacortical) osteosarcoma, which shows greater differentiation, slower growth, and a much better prognosis than central osteosarcoma. Osteosarcoma accounts for approximately 80% of primary bone tumors in dogs and 70% in cats. Osteosarcomas occasionally occur at sites of chronic irritation and repair, such as those associated with osteomyelitis, bone infarcts, or the presence of an internal fixation device. In such cases, the tumor may originate from the diaphyseal region of long bones, or other locations not normally considered predilection sites for osteosarcoma. The mean age of osteosarcoma in cats is 10.5 years (range 3-18 years) and there is no apparent breed predisposition. Most studies of osteosarcoma in cats involve fewer cases than in dogs and information on predilection sites is less precise. In chondroblastic osteosarcomas, the malignant mesenchymal cells directly produce both osteoid and chondroid matrices. Although the two components are usually intermixed, they remain separate in some tumors and small biopsy specimens may lead to an incorrect diagnosis of chondrosarcoma [4]. Differentiating chondroblastic osteosarcoma from other types of conventional osteosarcomas is of clinical importance because of the differences in their prognosis [5,6]. In comparison with other types of osteosarcoma despite similar therapeutic regimens [7], some studies have indicated a relationship between the histological subtype of osteosarcoma and the response to chemotherapy [6,8]. The rate of good response to preoperative chemotherapy was significantly higher in the fibroblastic and telangiectatic osteosarcoma and significantly lower in chondroblastic tumors. Although the histological subtype of osteosarcoma is closely correlated with the response to chemotherapy and probably also with the prognosis [6], the differentiation between chondroblastic osteosarcoma and chondrosarcoma is more important because of the clear differences in the treatment and prognosis [5]. Chondroblastic osteosarcoma is a high-grade malignancy needing pre and postoperative chemotherapy like other types of osteosarcoma [5].

## History

A 1.5 years old Shirazi native breed cat was submitted to Clinical Pathology, Faculty of Veterinary Medicine. Tripoli University, Libya with marked weight loss, anorexia ,hair loss and a masses in the concha and scaphoid fossa of the right ear. Bleeding scratches in the skin of the external ear and deviation of the head to the right side were observed.

## Clinical and Gross Findings

During physical examination, the cat was cachectic, emaciated and walk with deviated head. A raised multilocular lobulated partially encapsulated mass was seen in the concha of the right external ear with a smaller one in the scaphoid fossa (Figure 1). The masses were

surgically excised and the large one measured 1.5 × 1 × 0.8 cm meanwhile the small one was 0.5 × 0.5 cm. They were whitish blue in color, semi-hard in consistency, containing blood cavitations and bleed easy during handling. Blood sample and tissue specimens were collected for histopathologic and biochemical investigations. After routine tissue processing using tissue processing histokinate, 5 micron thin sections were prepared and stained by Hematoxlin and Eosin and examined microscopically [1].

## Results

Hematological and biochemical analyses revealed normocytic hypoochromic anemia, leucocytosis with slight relative lymphocytosis and normal biochemical markers.

Histopathological investigation revealed mesenchymal proliferative reaction in different parts of the tumor with cartilaginous and osseous differentiations. Hypercellularity, pleomorphism, blood vascular spaces, and focal degenerative and necrotic changes with mononuclear cells infiltration were seen (Figures 2 and 3). The characteristic outstanding feature was the presence of sheets, masses and individual cells of chondrocytes and chondroblasts. The latter showed hyperchromacia, increased nuclear/cytoplamic ratio and mitosis (Figure 4). Ossious differentiations with formation of wavy bone, bony spicules and incomplete haversian system were observed (Figure 5). Proliferated osteoblasts with increased mitotic activity were seen intermixed with the bony structures.

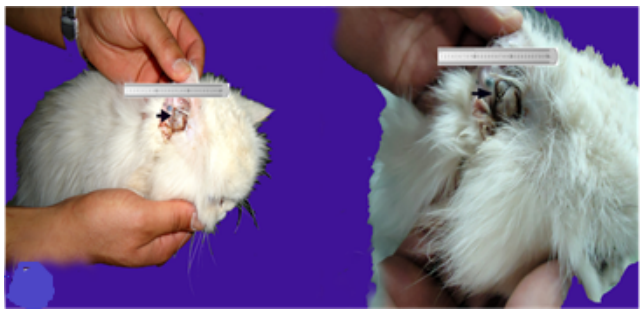
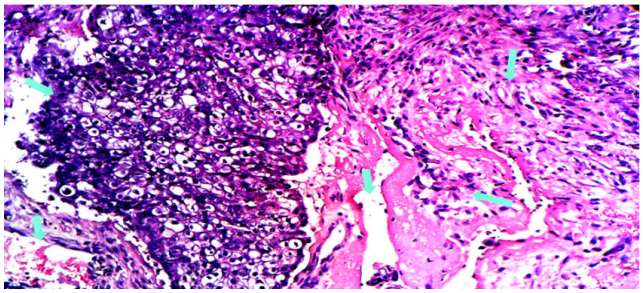


**Figure1:** A photograph showing tumor masses in the concha and in the scaphoid fossa of the external ear (arrows). They are whitish blue, multilocular, lobuated and partially encapsulated.



**Figures 2:** Photomicrograph of the tumor tissue showing, mesenchymal proliferative reaction with cartilaginous and osseous differentiations and blood vascular spaces. (arrows). H and E 300X.

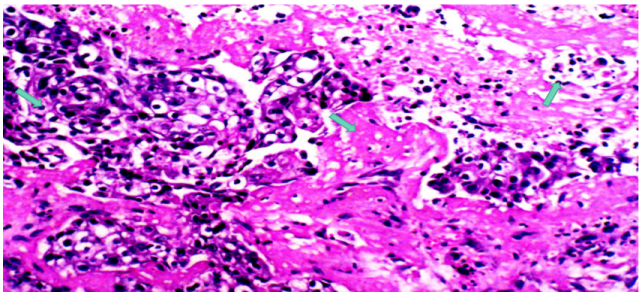


**Figure 3:** Photomicrograph of the tumor tissue showing, mesenchymal proliferative reaction with cartilaginous and osseous differentiations., pleomorphism , degenerative and necrotic changes and lymphocytic infiltration (arrows). H and E 300X.

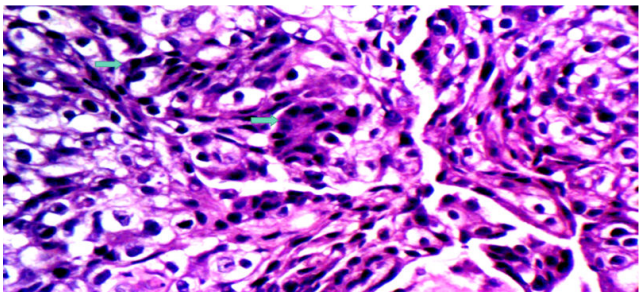


**Figure 4:** Photomicrograph of the tumor tissue showing cartilaginous differentiations, with hyperchromacia ,increased nuclear/cytoplamic ratio and mitosis (arrows). H and E 1200X.

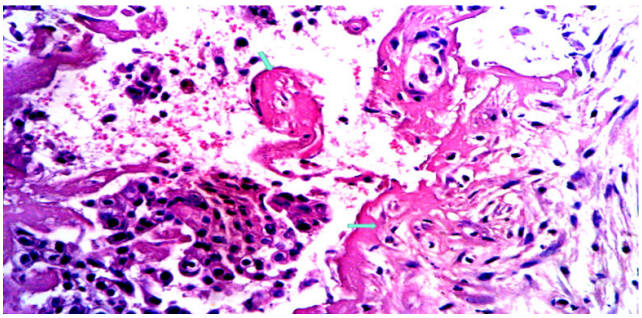


**Figure 5:** Photomicrograph of the tumor tissue Showing Ossious differentiations with formation of wavy bone and bony spicules. (arrows). H and E 300X.

## Discussion

Peripheral osteosarcomas are malignant neoplasms particularly seen in cats and dogs. The number of cases reported in cats is too small to determine age, sex, clinic characteristic, or site incidence. Furthermore, previously reported data are insufficient to conclude that the prognosis for cats, and dogs or humans with peripheral osteosarcoma differs from that of central osteosarcoma [9]. In peripheral osteosarcomas, no specific tumor site was indicated for the cat [10]. It is of great

important to declare the possibility of tumor evolution from pre-existing osteochondroma. In the latter, both the solitary and multiple forms have been reported in the cat. Solitary osteochondromas are rare and are found in mature cats, arising only on the axial skeleton [11]. The author added that no relationship with the feline leukemia virus has been demonstrated. Multiple osteochondromas, known also as osteochondromatosis or multiple cartilaginous exostoses, are more common in the cat [11]. Unlike the disease in dogs, horses, and humans, the disease in the cat arises in mature, young adult animals ranging in age from 1.3 years to 8 years. The tumor arises in the perichondnum of flat bones, rather than from long bones. The masses, which appear after skeletal maturity, become larger and increase in number with increasing age of the cat [11]. The enlarging masses produce functional impairment that varies with the sites involved. Gross and histologic examination shows the lesions to be covered by a cap of cartilage and bone; the underlying mass comprises bony trabeculae. Osteochondromatosis in the cat is thought to be viral in origin, with C-type viral particles present within the chondrocytes of these cats [12]. The virus particles are similar to those found in animals with feline leukemia. Malignant transformation of osteochondroma to either chondrosarcoma or osteosarcoma has occasionally been described in older dogs [13] and humans [14]. Whether the tumor arise as De novo chondroblastic osteosarcoma from the peripheral external auditory bone or as a malignant transformation from preexisting osteochondroma is a point of debate and required more molecular and histochemical investigations. In conclusion our results are in direct correlation with Jubb et al. who declared that, chondroblastic osteosarcomas, could arise from malignant mesenchymal cells with a differentiating potentialities to produce both osteoid and chondroid matrices. Immunophenotyping, specially with vimentin, Ki-67 and Osteonectin [15,16] was planned to be applied for confirmation of our results, but the very bad economic situation in Libya at this time was an important obstacle. Moreover Mandal et al. considered that, Biopsy (along with imaging) is mandatory to diagnose osteosarcoma. They added that Osteonectin is a good immunohistochemical marker to differentiate osteosarcoma from its mimics. For prognostication, serum alkaline phosphatase, post chemotherapy tumor necrosis (more than 90%), lack of her [2] expression are good parameters. They also proclaimed that S100 and Ki67 were found to have limited role in diagnosis and prognosis of osteosarcoma.

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