Maxillary Ameloblastic Carcinoma in a Dog

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ABSTRACT

Ameloblastic carcinoma (AC) is a malignant odontogenic epithelial tumor and reported rarely in domestic animals. An 8-year-old, mix breed, male dog presented to Lara Antalya Veterinary Hospital for examination of a mass on the right molar teeth of the maxilla. Oral radiographs did not show clear borders of the mass. Clinically and macroscopically, the mass was painful and had a nodular appearance and was reddish-white in color. Histopathologic examination of the mass revealed irregular shaped broad islands, sheets and nests consisting of neoplastic cells. These cells were immunopositive for carcinoembryonic antigen (CEA), pancytokeratin, Ki-67 and proliferating cell nuclear antigen (PCNA). Based on gross, histopathologic and immunohistochemical findings, the mass was diagnosed as ameloblastic carcinoma.

Keywords: Ameloblastic Carcinoma, Pathology, Immunohistochemistry, Dog, Canine.

INTRODUCTION

Ameloblastic carcinoma (AC) is a malignant odontogenic epithelial tumor and combines the histologic features of the ameloblastoma. It is a rare tumor in humans and an extremely rare entity in domestic animals (1); the tumor has been reported in a horse and two dogs (2, 3, 4). It does not appear in the veterinary tumor classification and has malignant histopathological aspects such as cytologic atypia with or without metastasis (5, 6). Although ameloblastomas are well known and described in the literature, there is a little known about the ameloblastic carcinoma especially in domestic animals (7).

In the present case, the tumor was classified according to the human tumor classification sytem based on histopathologic and immunohistochemical diagnosis. The aim of this report was to describe clinical, gross, microscopic, and immunohistochemical findings of a maxillary ameloblastic carcinoma in a dog.

MATERIALS AND METHODS

A 8-year-old, mix breed, male dog was presented to the Lara Antalya Veterinary Hospital for examination of a tumor mass on the right maxillary region of mouth (Figure 1). The mass had a nodular appearance and was painful. A radiographic examination of the chest did not show any evidence of metastasis. Oral radiographs did not clearly define the borders of the mass. The dog was in a good body condition and the hematological profile was normal. Under general anesthesia, the mass was excised with blunt dissection using cauterization. A 3 cm deep cavity appeared after dissection revealing the alveolar bone of the maxilla. Two of molar teeth were also extracted with the tumor. Severe bleeding of tumor area was observed after dissection which was stemmed using sponges. No adequate healthy gingiva and mucosa was available for suturing. Mouth disinfection was provided by using glycerine-iodine 3% solution (Ulkem Gliserin Iode, Ankara, Turkey) and broad spectrum antibiotics: Cefovecin

8 mg/kg (Convenia, Pfizer Animal Health, Sandwich, Kent, UK) and Enrofloxacin 5 mg/kg (Baytril-K %5, Kansas, USA) for 5 days.

A telephone follow up was made at 4 and 10 months after the surgery and the owner reported that no recurrence had developed.

The tumor was submitted for pathological examination to Mehmet Akif Ersoy University, Veterinary Medicine Faculty, Department of Pathology. The mass was routinely fixed in buffer formalin solution and processed in paraffin-embedded cassettes; 5 µm sections were obtained and stained with hematoxylin and eosin (H&E) for histopathology.

Immunohistochemical (IHC) examination was performed using the routine streptavidin-biotin peroxidase method with primary antibody against Pancytokeratin [Mouse Monoclonal Pancytokeratin Antibody, Abbiotec, Cat. No. 251788, San Diego, CA, USA, 1:100 dilution]; Vimentin (Mouse Monoclonal Vimentin Antibody, Abbiotec, Cat. No. 251809, San Diego, CA, USA, 1:100 dilution); Carcinoembryonic antigen (CEA) (CEA Antibody, Abbiotec, Cat. No. 250598, San Diego, CA, USA, 1:200 dilution); Ki67 (Rabbit Polyclonal Ki-67 Antibody, Abbiotec, Cat. No. 250733, San Diego, CA, USA, 1:100 dilution); Proliferating cell nuclear antigen (PCNA) (Rabbit Polyclonal PCNA Antibody, Abbiotec, Cat. No. 250812, San Diego, CA, USA, 1:100 dilution); Smooth muscle actin (SMA) (Mouse Monoclonal SMA, Abbiotec, Cat. No. 251813, San Diego, CA, USA, 1:200 dilution); S100 (Mouse Monoclonal S-100 Antibody, Abbiotec, Cat. No. 251795, San Diego, CA, USA; 1:100 dilution). The reaction product was visualized by DAB [3, 3'-diaminobenzidine chromogen (Zymed, South San Francisco, CA, USA)) and counterstained with Harris' hematoxylin.

RESULTS

The tumor mass was localized in the region of the right molar teeth of the maxilla and measured 4 × 3.2 × 1 cm and weighed 18.3 grams. It was reddish-white in color and firm in consistency. The cut surface of the tumor was homogeneous and also reddish-white in color.

Histopathological findings revealed irregular shaped broad islands with a variable appearance with poorly cellular collagenic tissue sheets and nests consisting of neoplastic cell proliferations with ameloblastic differentiation. These cells were markedly pleomorphic, oval to round shaped with large, irregular, hyperchromatic nuclei, prominent nucleoli with moderate eosinophilic cytoplasm. Some tumor cells had multiple nucleoli. Mitotic figures were common and 4-6 mitotic figures were seen per high power field in the mitotically active areas of the tumor (Figure 2). In some fields of the tumor, epithelial proliferations in cords were dispersed into the adjacent fibrous tissue. In addition, necrosis was observed in some areas of the tumor.

Immunohistochemically, the neoplastic cells were positive for CEA (Figure 3), pancytokeratin (Figure 4), Ki-67

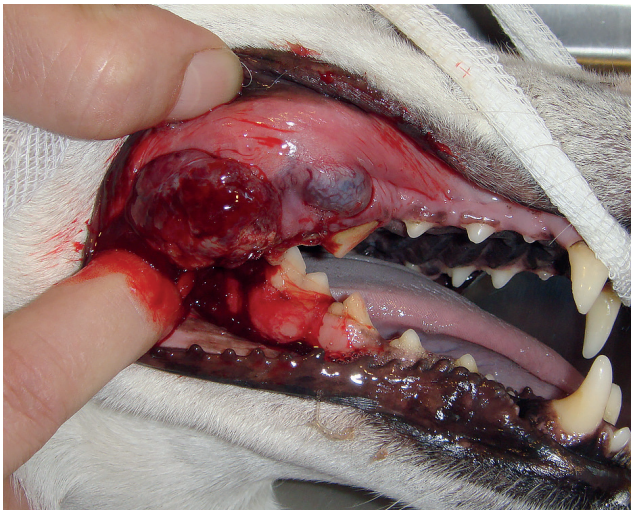

Figure 1: Appearance of gingival mass on the right maxillary region of the mouth.

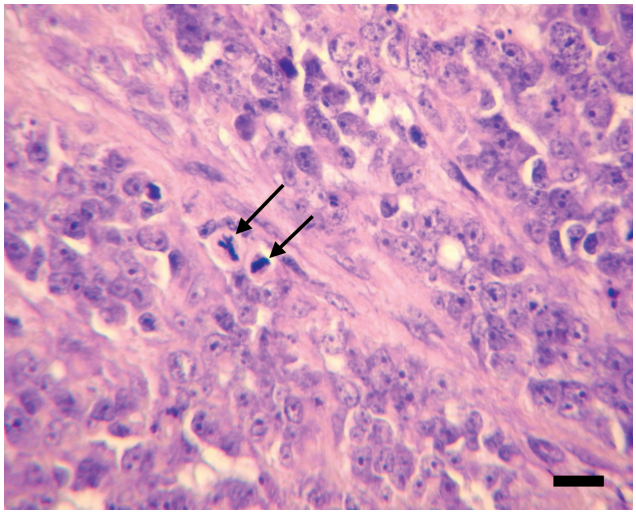

Figure 2: Ameloblastic carcinoma. Marked pleomorphism of the neoplastic cells and mitotic figures (arrows). HE, bar = 30 µm.

and PCNA but negative for SMA, vimentin and S100. These positive cells were homogeneously distributed throughout the tumor area.

The localization of the tumor mass, the high mitotic activity, pleomorphism of the cells, infiltrative characteristics of the tumor, presence of necrosis and immunohistochemical findings supported the diagnosis of an ameloblastic carcinoma.

DISCUSSION

In humans ameloblastic carcinoma is a rare odontogenic tumor in comparison to its benign counterpart (1). In animals it is a very rare tumor which has been reported to the best of our knowledge in two dogs and a horse (2, 3, 4). The most common tumor site is the mandible, but cases of maxillary ameloblastic carcinoma have also been rarely reported in humans (8, 9, 10, 11). In animals the maxillary location was reported in a horse and a dog while a mandibular location was reported in another dog (2, 3, 4). In this case the tumor presented at a maxillary location.

Histologic classification of World Health Organization (WHO) for odontogenic tumors was updated in 2005 and the terminology of malignant ameloblastoma was changed to ameloblastic carcinoma (5). Evidence of ameloblastic carcinoma was cited as cytologic atypia with or without metastasis. It should not be difficult to distinguish ameloblastic carcinoma from ameloblastoma on routine microscopic examination owing to the cytologic atypia in ameloblastic carcinoma (12). In addition, ameloblastic carcinoma is destructive, grows rapidly, and invades neighboring tissues (2,13,14).

In this case, marked cytologic atypia with ameloblastic differentiation was seen without evidence of metastasis. Due to the cytologic atypia, this tumor was diagnosed as ameloblastic carcinoma instead of ameloblastoma. In addition the high mitotic index, local aggressive invasion of tumor and necrosis in some areas supported the diagnosis of ameloblastic carcinoma.

The most common area of distant metastasis of this tumor is the lung, but metastasis to the skull and regional lymph nodes has also been reported (7, 15). In the present case, the dog had no evidence of metastasis at the time of diagnosis.

An important feature of malignancy is increased mitotic index in ameloblastic carcinoma (3, 4, 12). In a case report, mitotic figures were determined 5 to 6 per high magnification (4). In this case, 4-6 mitotic figures were seen per high power field and this finding was evaluated as an important feature of malignancy.

The tumor in the present case was tentatively diagnosed based on the histologic characteristics of malignancy. The diagnosis of AC was confirmed by immunohistochemistry. In order to determine the origin of the tumor cells, CEA was used as primary antibody. CEA is an important tumor marker for some carcinomas and demonstrates selective epithelial expression (16). CEA positivity is used to determine the aggressiveness of tumors showing squamous differentiation

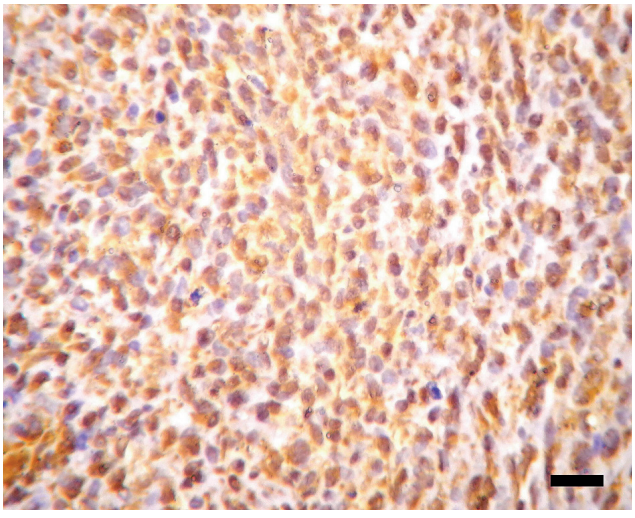

Figure 3: Ameloblastic carcinoma. Strong positive immunohistochemical labeling for CEA stain in tumor cells. ABC method, Harris hematoxylin counterstain, bar = 30 µm.

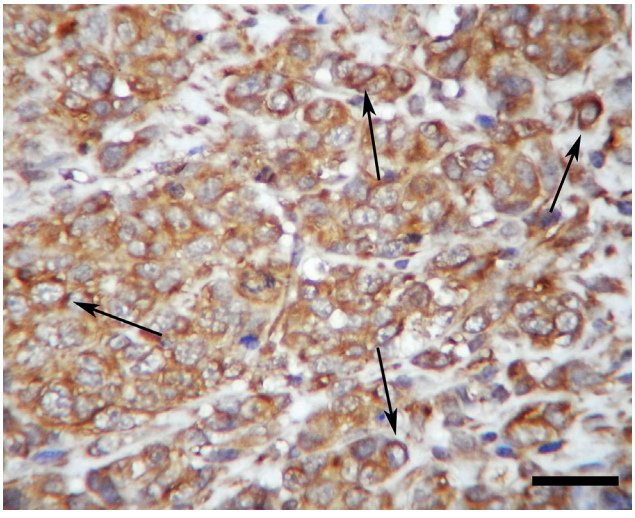

Figure 4: Ameloblastic carcinoma. Positive immunoreactions of the tumor cells with pancytokeratin (arrows). ABC method, Harris hematoxylin counterstain, bar= 30 µm.

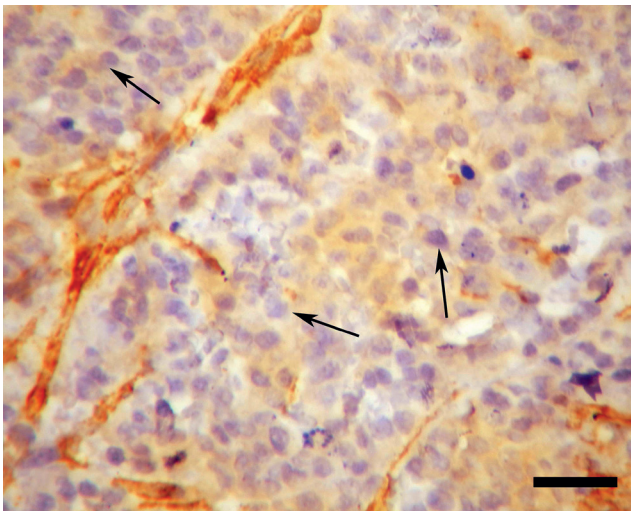

Figure 5: Ameloblastic carcinoma. Negative immunoreaction of the tumor cells with vimentin antibody (arrows). ABC method, Harris hematoxylin counterstain, bar= 30 μm.

including cases of ameloblastoma, odontogenic carcinoma, and squamous carcinoma (17). In the present case, tumor cells stained for CEA with strong positivity revealing the epithelial origin and aggressiveness of the tumor.

The vimentin negativity is generally use for ameloblastic origin of tumors but cytokeratin positivity in this tumor is controversial. While some authors reported positivity, other authors reported negative staining by cytokeratin (18). In this case, vimentin negativity revealed its ameloblastic origin and pancytokeratin positivity revealed its epithelial origin of the tumor cells. Ki-67 and PCNA activity of the present case supported malignancy of the tumor; SMA negativity showed non-muscle origin of the tumor cells; S100 negativity ruled out the melanocytic origin of the tumor.

This report regarding an rare ameloblastic carcinoma in the dog is of importance as a contribution for the differential diagnosis of tumors in the oral cavity of domestic animals.

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