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NEOPLASTIC DISEASE

Oral Papillary Squamous Cell Carcinoma in Twelve Dogs

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Summary

Papillary squamous cell carcinoma (PSCC) is a distinct histological subtype of oral squamous cell carcinoma (SCC), described in both dogs and man. In dogs, PSCC has long been considered a malignant oral tumour of very young animals, but it has recently been reported to occur in adult dogs as well. The aim of this study was to describe the major clinicopathological characteristics of canine oral PSCC (COPSCC). Twelve dogs diagnosed with COPSCC were included in this retrospective study (1990–2012). The majority (75%) of the dogs were >6 years of age (median age 9 years). All tumours were derived from the gingiva of dentate jaws, with 66.7% affecting the rostral aspects of the jaws. The gross appearance of the lesions varied, with one having an intraosseous component only. The majority (91.7%) of the tumours were advanced lesions (T2 and T3), but no local or distant metastases were noted. Microscopically, two patterns were seen: (1) invasion of bone forming a cup-shaped indentation in the bone or a deeply cavitating cyst within the bone (cavitating pattern), (2) histologically malignant growth, but lack of apparent bone invasion (non-cavitating pattern). The microscopical appearance corresponded to imaging findings in a majority of cases, with cavitating forms presenting with a cyst-like pattern of bone loss or an expansile mass on imaging and non-cavitating forms showing an infiltrative pattern of bone destruction on imaging. These features suggest two distinct biological behaviours of COPSCC.

Keywords: dog; oral papillary squamous cell carcinoma

Introduction

Squamous cell carcinoma (SCC) is the second most common oral tumour in dogs (Todoroff and Brodey, 1979; Liptak and Withrow, 2007). SCC is an invasive oral epithelial tumour with several histological subtypes that include papillary SCC (PSCC) (Ogilvie *et al*., 1988; Stapleton and Barrus, 1996; Head *et al*., 2003; Barnes *et al*., 2005; Liptak and Withrow, 2007; Cushing *et al*., 2010; Nemec *et al*., 2012). Oral PSCC exhibits a predominantly papillary growth pattern, with thin fibrovascular stalks covered by neoplastic basaloid cells with a low mitotic index and localized neoplastic invasion into the adjacent stroma or subepithelium. The neoplastic squamous epithelium may develop a normal maturation sequence, with atypia observed in some areas. Keratinization is usually minimal (Ogilvie *et al*., 1988; Barnes *et al*., 2005; Nemec *et al*., 2012).

PSCC has long been considered a malignant oral tumour of very young dogs (Ogilvie *et al*., 1988; Stapleton and Barrus, 1996), but it has been reported recently to occur also in adult and old dogs (Nemec *et al*., 2012). Data on this form of PSCC are scarce and so the aim of this study was to describe the major clinicopathological characteristics of canine oral PSCC (COPSCC).

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Materials and Methods

Selection Criteria

The database and pathology reports from the Department of Pathology, Microbiology and Immunology, School of Veterinary Medicine, University of California, Davis, from 1990 to 2012, were searched, using the following keywords: canine, oral cavity and SCC.

Medical Records Review

Case selection and medical records review were performed as previously described (Nemec *et al.*, 2012). Briefly, dogs with oral PSCC (selected on the basis of histological assessment from all cases of SCC) that received no prior treatment were included in the study. Breed, age, sex, weight, gross appearance of the visible tumour, tumour location in the oral cavity and data on clinical staging were recorded. Dental radiographs and computed tomography (CT) images, where available, were reviewed. As previously described (Evans and Shofer, 1988; Fiani *et al.*, 2011; Nemec *et al.*, 2012), for classification of tumour location, the oral cavity was divided topographically into the rostral aspect of the maxilla and the mandible (from the level of the first incisor tooth to the level of the second premolar tooth), the caudal aspect of maxilla and mandible (the dentate region caudal to the second premolar tooth), the tongue and the mucosa of the oral cavity and oropharynx, excluding the tonsils. Lesions involving both the gingiva and the hard palate or floor of the mouth were considered to originate from the dentate jaws (Todoroff and Brodey, 1979). Clinical staging data included tumour size (T), examination of the regional lymph nodes for gross evidence of pathology (N) and three-view thoracic radiographs (Arzi and Verstraete, 2012).

Histological Evaluation

Sections (5 μm) from formalin-fixed and paraffin wax-embedded tissues were stained with haematoxylin and eosin (HE) and assessed by a veterinary pathologist (BGM) and a human oral and maxillofacial pathologist (RCJ). Nine excisional and, where not available, incisional ($n = 3$) biopsy specimens were reviewed. Excisional biopsy samples were considered to be those samples that were surgically obtained with an attempt to obtain clean surgical margins or those that were obtained at the time of the gross necropsy examination. In cases of incisional biopsy, at least three (and up to 12) pieces of tissue, at least 5 mm (and up to 15 mm) in diameter were available for examination. Cases of carcinoma *in situ* were excluded.

Statistical Analysis

Exact chi-square tests were used to compare distributions of age, sex and breed (each specific breed as well as pooled purebred versus crossbred) in the study population with those of the hospital population during the period investigated. For comparisons of age, five age groups were created: <1 year, 1 to <5 years, 5 to <10 years, 10 to <15 years and ≥15 years. $P < 0.05$ was considered significant.

Results

Population

Twelve cases of COPSCC were diagnosed in 22 years. All dogs, except for one, were purebred (three Labrador retrievers and one each Shetland sheepdog, Akita, golden retriever, English setter, Husky, English springer spaniel, American cocker spaniel and West Highland white terrier). Three dogs were younger than 1 year and all others were older than 6 years (median 9 years). There were two entire females, one entire male, five neutered females and four neutered males. Dogs ranged in body weight from 10 to 46.3 kg (median 28.8 kg).

The distribution of dogs presented with oral PSCC did not differ significantly from that of the hospital population by age or sex. The distribution of breeds among the dogs with oral PSCC differed significantly ($P < 0.0001$) from the hospital population, with English springer spaniel, Shetland sheepdog, Akita, Husky, English setter and West Highland white terrier overrepresented. However, only one dog in each of these breeds was diagnosed with SCC and therefore no conclusions could be made regarding breed predisposition, despite calculated statistical significance.

Anatomical Location and Gross Appearance

All tumours were derived from the gingiva of dentate jaws. In four cases the lesion occurred on the rostral mandible, four involved the rostral maxilla, three the caudal maxilla and the caudal mandible was involved in one case. Grossly, four tumours were described as papillomatous, four as ulceroproliferative, two as proliferative, one as verrucous and one tumour had an intraosseous component only, but demonstrated a papillomatous architecture within the osseous tissue. In one case, the disease started with increased tooth mobility without any noticeable oral soft tissue component. Later, after tooth extraction, a proliferative mass was noted on the gingiva in the area of the missing tooth. Another case presented with a large bony swelling of the mandible and only a small papillomatous mass at the right mandibular second and third incisor teeth (Figs. 1

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