

Oncology Corner Le coin de l'oncologie

Radiation therapy of canine nontonsillar squamous cell carcinoma

Candace K. Grier, Monique N. Mayer

Squamous cell carcinoma (SCC) is the 2nd most common oral malignant tumor in dogs (1). Common presenting signs include facial swelling, oral discharge, excessive drooling, dysphagia, halitosis, and pain on opening the mouth (2). Clinically, these carcinomas may vary in appearance from a mass-like proliferation to a region of ulceration that frequently involves bone (Figure 1). Prior to making the treatment decision, it is recommended that a large, wedge or core, incisional biopsy be taken to obtain a histological diagnosis. Prognosis of squamous cell carcinoma is dependent on the location of the tumor within the oral cavity. Oral SCCs are categorized into 2 groups: tonsillar or nontonsillar. Tonsillar SCC is reported to be highly metastatic, with frequent local tumor recurrence following surgical or radiation treatment (3,4). Fifty percent to 78% of oral SCCs arise from the nontonsillar region (4). The metastatic rate for nontonsillar SCC is quite low; therefore, achieving local tumor control is considered the most important factor. Regional lymph node metastasis and pulmonary metastasis are reported in up to 10% and 3% to 36% of dogs, respectively (2). There is no reported sex or breed predisposition for canine nontonsillar SCC.

Despite a reported low metastatic rate, full staging is required prior to treatment recommendation for nontonsillar SCC. Oral tumors in dogs are staged according to the World Health Organization (WHO) classification system. The stage is determined by primary tumor extent (T), regional lymph node status (N), and the absence or presence of distant metastasis (M) (Table 1) (6). Full staging workup includes regional radiography, computed tomography (CT) or magnetic resonance (MR) imaging, a complete blood (cell) count (CBC), serum chemical evaluation, urinalysis, thoracic radiography, abdominal ultrasonography, and an aspirate or biopsy of the regional lymph nodes. Computed tomography or MR imaging is required prior to making a treatment recommendation in order to determine the primary tumor extent. The ipsilateral and contralateral mandibular lymph nodes drain the oral cavity and its associated structures, making bilateral sampling essential to complete the staging process (7).

Local tumor control may be achieved by using surgery, radiation therapy, or a combination of surgery and radiation. A local



Figure 1. An ulcerative canine squamous cell carcinoma located at the angle of the jaw.

recurrence rate of 8% (2/24 dogs) was reported following the removal of mandibular SCCs with a minimum of 1 cm margins based on radiographic or gross observation (8). Removal of maxillary SCC with 1 cm margins from grossly or radiographically observed tumor borders resulted in a local recurrence rate of 29% (2/7 dogs) (9). To maximize the probability of removing all cancer cells, surgical margins of at least 2 cm are recommended for SCC in the dog (2). Full-course radiation therapy is indicated, if surgery is not feasible because of tumor size or location, and if surgical margins are incomplete. Full-course radiation therapy is also recommended, if surgery is declined in an attempt to maintain function or cosmesis. Due to the low metastatic potential of nontonsillar SCC, chemotherapy is not routinely recommended after surgery or radiation therapy.

Thirty-nine dogs with nontonsillar squamous cell carcinoma treated with full-course radiation therapy had an overall median progression-free survival time of 36 mo (5). Local tumor

Department of Small Animal Clinical Sciences, Western College of Veterinary Medicine, University of Saskatchewan, 52 Campus Drive, Saskatoon, Saskatchewan S7N 5B4.

Address all correspondence and reprint requests to Dr. Candace K. Grier; e-mail: candace.grier@usask.ca

Table 1. Clinical TNM stage of canine tumors of the oral cavity

T — Primary tumor	
T _{is}	Preinvasive carcinoma (carcinoma in situ)
T ₀	No evidence of tumor
T ₁	Tumor < 2 cm maximum diameter
	T _{1a} without bone invasion
	T _{1b} with bone invasion
T ₂	Tumor 2 cm to 4 cm maximum diameter
	T _{2a} without bone invasion
	T _{2b} with bone invasion
T ₃	Tumor > 4 cm maximum diameter
	T _{3a} without bone invasion
	T _{3b} with bone invasion
N — Regional Lymph Nodes (RLN)*	
N ₀	No evidence of RLN involvement
N ₁	Moveable ipsilateral nodes
	N _{1a} nodes not considered to contain growth**
	N _{1b} nodes considered to contain growth**
N ₂	Movable contralateral or bilateral nodes
	N _{2a} nodes not considered to contain growth**
	N _{2b} nodes considered to contain growth**
N ₃	Fixed nodes
M — Distant Metastasis	
M ₀	No evidence of distant metastasis
M ₁	Distant metastasis (including distant nodes) detected

*The RLN are the cervical, submandibular, and parotid nodes

** (-) — histologically negative, (+) — histologically positive

recurrence was a more common cause of 1st treatment failure (6/39 dogs) than regional metastasis to lymph nodes (1/39) or distant metastasis (4/39). Stage T1 (< 2 cm diameter), T2 (2 to 4 cm diameter), and T3 (> 4 cm diameter) patients had a progression-free, 1-year, survival rate of 89%, 83%, and 41%, respectively. A 3-year progression-free survival rate of 74%, 53%, and 27%, was reported for the WHO-tumor stages, T1, T2, and T3, respectively. Progression-free survival is defined as the time between completing radiation therapy and local recurrence, distant or regional metastases, or death unrelated to the tumor. World Health Organization tumor stage (size of the primary tumor) was the only significant prognostic variable for dogs with SCC in this study (5). Because dogs with smaller tumors had longer survival times after treatment, early diagnosis and treatment of tumors is important.

A 1996 study (10), reported a median disease-free interval and survival was recorded as 12 and 14 mo, respectively, in 14 dogs that received full-course radiation therapy as the primary treatment modality. The median disease-free interval was 16 mo in dogs 9 y or less, and 7 mo in dogs older than 9 y. With the exception of patient age, there were no statistically significant prognostic factors. The authors believed that their lack of prognostic indicators may have been due to the small number of patients.

Dogs referred to the Western College of Veterinary Medicine radiation oncology service may require a computerized 3-dimensional plan prior to being given full-course radiation therapy, depending on tumor location and normal tissues in the treatment field. Computerized plans are created from a CT scan performed by the radiation oncology service prior to starting treatment. Patients not requiring a computer based plan start



Figure 2. Acute effects of the oral cavity in the patient in Figure 1, 16 d after the start of radiation treatment, with mucositis and edema in the treatment field.



Figure 3. Same patient, 21 d after the start of radiation treatment, with fibrinous mucositis of the oral mucosa and the portion of the tongue within the treatment field.

1–2 d after their initial evaluation by the radiation oncology service. The number of treatments involved varies; however, most patients require 18–20 treatments. These treatments are given daily Monday through Friday over a 3.5- to 4-wk period, on an outpatient basis.

Acute radiation side-effects are limited to the treated site and occur in rapidly dividing cells, such as skin and oral mucosa. Side-effects usually last 3–4 wk and are at their worst towards the end of treatment and during the first 1–2 wk posttreatment.

This temporary discomfort is managed with a combination of medications, such as nonsteroidal anti-inflammatory drugs, tramadol, and fentanyl patches. With treatment of oral tumors, acute side effects generally involve the lining of the mouth and the skin. During the 2nd wk of treatment, a mucositis develops, which is often most severe towards the end of radiation treatment (Figures 2, 3). Acute radiation skin effects appear during the 3rd wk of treatment and generally include alopecia, and dry and moist desquamation (11). Skin effects are usually at their worst during the first 2 wk postradiation treatment, and the affected tissues must be protected from self trauma. Acute radiation side-effects are usually completely healed 4 wk post-radiation treatment.

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