ORAL SQUAMOUS CELL CARCINOMA IN AN AGED CAPTIVE WHITE RHINOCEROS (CERATOTHERIUM SIMUM)


Abstract: A 48-yr-old captive white rhinoceros (Ceratotherium simum) was euthanized due to old age, pododermatitis, and progressive laminitis of the middle toe of the left fore- and hindlimbs. Severe chronic necrotizing periodontitis and dental loss was diagnosed, although food intake prior to death had not decreased. In addition, extensive ulceration of the tongue was noted. Histologically, squamous cell carcinoma of the tongue was diagnosed with chronic severe ulcerative glossitis. Metastatic lesions were not detected. Clinicians should monitor the oral health of aging rhinoceros due to the occult nature of these lesions.

Key words: Ceratotherium simum, rhinoceros, squamous cell carcinoma, tongue, ulceration.

BRIEF COMMUNICATION

A 48-yr-old, wild-caught, female white rhinoceros (Ceratotherium simum) had pododermatitis and progressive laminitis of the middle toe of the left fore- and hindlimbs. The animal was housed at Zoo Duisburg, Germany, for 46 yr and had no significant medical history. Following trauma after an interaction with a younger male rhinoceros, the middle toe of the left forelimb was injured and the animal was non–weight-bearing on the left forelimb. The hoof was injured and inflamed. Palliative care with cooling, disinfectants, and anti-inflammatory drugs was unsuccessful. Due to the advanced age of the animal there was a poor prognosis for full recovery from anesthesia and surgery. As the rhinoceros became weaker and less mobile, it developed pododermatitis of the left hindlimb as well, maybe due to altered weight distribution. The rhinoceros was humanely euthanized.

A necropsy was conducted approximately 6 hr after death. The animal was in good body condition, 1,780 kg. Three teeth were missing from the lower jaw (right M1, left P3, and M1) (Fig. 1). Bilaterally, the second inferior molars were easily removed on manipulation. There was marked dental calculus (Figs. 1, 2). Severe multifocal chronic and necrotizing periodontitis and dental loss were diagnosed. Extensive ulceration of the tongue was noted (Fig. 3). Further macroscopic findings included severe chronic laminitis of the middle toe of the left fore- and hindlimbs with involvement of the bone and mild separation of the nail, mild arthritis of shoulder and knee joints, multiple decubital ulcers, and acute erosive gastritis.

Tissue samples were immersion-fixed in 10% neutral buffered formalin and routinely processed for histology: embedded in paraffin, sectioned at 5 μm, and stained with hematoxylin and eosin. On histologic examination, extensive ulceration of the tongue was confirmed (Fig. 4a). Nests and cords of neoplastic epithelial cells extended into the musculature of the tongue. Cells were closely packed, cuboidal to polygonal, with distinct cell borders and moderate amounts of homogenous eosinophilic cytoplasm. Nuclei were round to oval, centrally located, with variably stippled hyperchromatic chromatin and single prominent nucleoli. Marked anisokaryosis, anisocytosis, and keratin pearl formation were visible (Fig. 4b). Mitotic rate was low (0–1 per 10 high-power fields). Neutrophils and macrophages, with lesser plasma cells, were associated with the lesion. Squamous cell carcinoma of the tongue was diagnosed. Neoplastic cells stained intensely with pan-cytokeratin (Mouse anti-cytokeratin, ABC method, clone AB-1 [AE1/AE3], MS-343-P, Thermo Scientific, Fremont, CA, 94538, USA) (Fig. 4 c). Papilloma virus-DNA was not detected by polymerase chain reaction in DNA-extracts prepared from formalin fixed and paraffin embedded material of the tumor. (QIAamp DNA...
Individual rhinoceros species show anatomic adaptations to their specialized diets. The white rhinoceros is classified as a grazing species in contrast to the black rhinoceros (*Diceros bicornis*), which is a browsing species. *Ceratotherium simum* has higher crowned teeth with flat grinding occlusal surfaces of the upper molars, closely packed shearing blades, and more cementum. The white rhinoceros has more-pronounced lateral jaw movement, longer relative premolar rows, and reduced blade sharpness.\(^9\) Due to the extensive wear in this case, the occlusal surface was ground down, three teeth were missing, and two were easily removed (Figs. 1, 2). There was marked dental calculus, a lesion which has been previously described in an aged white rhinoceros.\(^1\) In the rhinoceros described in this study, severe multifocal chronic and necrotizing periodontitis and squamous cell carcinoma of the tongue were seen, though feeding behavior, body condition, and fecal production had been unchanged.

There are a few reports of squamous cell carcinoma in rhinoceros: white rhinoceros at the skin and uterus; black rhinoceros at the pharynx; and greater Asian one-horned rhinoceros (*Rhinoceros unicornis*) at the horn base.\(^{3,6,8}\) The malignant characteristics of squamous cell carcinoma include anaplasia, aggressive local invasion with tissue lysis, and occasional metastatic potential.
Ultraviolet light exposure is associated with development of some skin cancers. Genetic factors, immunosuppression, viral infections, chemical agents, and chronic inflammation have also been linked to the pathogenesis of squamous carcinoma.3 In domestic species, squamous cell carcinomas are common in dogs, cats, horses, cattle, sheep, and goats.2,3,4 Papillomavirus-induced tumors can undergo malignant transformation, e.g., invasive squamous cell carcinomas.7

Oral squamous cell carcinoma was reported once in a C. simum with stridor due to oropharyngeal infiltration and metastasis.11 Oral squamous cell carcinoma has been reported in other perissodactyls, the Malayan tapir (Tapirus indicus), and horses (Equus sp.).2,3 No specific etiology for the lingual squamous cell carcinoma of this rhinoceros was identified and the course of development remains unknown. Papillomavirus has been detected as a cause of canine oral squamous cell carcinoma, but no papilloma virus was detected by PCR in this rhinoceros.10 Nevertheless, a negative PCR is generally less significant than a positive one. Trauma followed by chronic inflammation was described in squamous cell carcinoma at the base of the horn of an Indian rhinoceros (Rhinoceros unicornis).8 This is the first report of a squamous cell carcinoma of the tongue in a southern white rhinoceros, though dental problems are not uncommon in aged individuals. Oral health of rhinoceros should be monitored regardless of good body condition and feed intake.

LITERATURE CITED


Received for publication 5 October 2015