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## MAXILLARY SINUS FRACTURE IN A BLACK RHINOCEROS (*Diceros bicornis*): DIAGNOSTIC IMAGING AND COMPUTED TOMOGRAPHY REFERENCES

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### Abstract

A 4-yr-old male black rhinoceros (*Diceros bicornis*) was transported to Busch Gardens, Tampa, Florida (BGT) in the fall of 1999. The transit was reported as unremarkable and the animal appeared calm in the crate. Immediately following release from the crate the animal charged into the framework of a steel door designed to contain a bull elephant. Significant epistaxis developed from the right nares but the rhinoceros appeared relatively unscathed. Several days later the rhinoceros was given access to a yard fenced by steel rails. It immediately rushed outside, hit a corner, and dropped to its carpus. At this point the epistaxis continued and the rhinoceros appeared to have difficulty breathing, with a prominent respiratory stridor. This animal had been reported as being fairly tractable and after a day allowed closer examination. The right nares was completely obstructed and at times the rhinoceros exhibited open mouth breathing, with extreme exercise intolerance. Analgesics, anti-inflammatories, and antibiotics were initiated. Within 7 days of arrival the rhinoceros was calm enough to obtain blood samples from the medial carpal vein. A mild anemia (29%) and increased white blood cell count (15,000/ml) were noted. Because of the predisposition of compromised black rhinoceroses to develop *Aspergillus* pneumonia,<sup>3</sup> a course of itraconazole (Sporanox, Janssen Pharmaceutica N.V., Beerse, Belgium) at 10 mg/kg s.i.d. p.o. was initiated and continued for 60 days. Body weight for all medications was estimated at 1000 kg. By the third week, an unrestrained radiograph of the pre-maxilla area revealed a fractured right pre-maxilla bone. Antibiotics were changed from 30 mg/kg s.i.d. p.o. trimethoprim-sulfadiazine (Uniprim, Macleod Pharmaceutical Inc., Ft. Collins, CO 80525 USA) for 7 days to 2.5 mg/kg b.i.d. p.o. enrofloxacin (Baytril, Bayer Corp., Shawnee Mission, KS 66201 USA) for 12 days to 10 mg/kg b.i.d. p.o. tetracycline (Butler Co., Columbus, OH 43228 USA) based on deep nasal cultures obtained with guarded equine culturettes. Eleven days after initiating itraconazole therapy the rhinoceros developed severe, serosanguinous, fibrinous cutaneous ulcers. None of these lesions were seen over any pressure points and most were located on the animal's dorsum. Cytology revealed a predominately eosinophilic response. Based upon appearance and timing of the itraconazole, these lesions were not initially believed to be those classically associated with superficial necrolytic dermatopathy<sup>2</sup> and were thought to be a drug reaction. Three days after discontinuing the itraconazole these lesions resolved. At 60 days it was decided to immobilize the rhinoceros for an extensive diagnostic workup. Computed tomography (CT) images of a black rhinoceros skull were obtained to study in preparation for the workup. Premedication consisted of 40 mg detomidine (Dormosedan, Orion Corporation, Espoo, Finland) and 20 mg butorphanol (Torbugesic, Ft. Dodge Animal Health, Ft. Dodge, IA 50501 USA) followed by 2 mg etorphine (M99-Ten, Wildlife Pharmaceuticals, Inc., Ft. Collins, CO 80524 USA) all i.m. by hand syringe. A 28-mm endotracheal tube was placed via a 1.7-m flexible colonoscope. This was facilitated by 0.25 mg etorphine and 300 mg xylazine (Xylazine-100, Ben Venue Laboratories, Inc., Bedford, OH

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44146 USA) given i.v. Isoflurane (IsoFlo, Abbott Laboratories, North Chicago, IL 60064 USA) was maintained at 2-3% with an oxygen flow rate of 10 L/min. The animal was maintained on a 20-L ventilator with assisted respiration at 10 breaths/min for the 3-hr procedure. Lateral radiographs showed an area of bony resorption that corresponded to previous fracture of the right pre-maxilla. An endoscope was passed fairly easily along the dorsal meatus of the left nasal passageway back to the soft palate and larynx. All around the larynx but excluding it was a great deal of slightly raised pink-to-red mucosal blisters. Attempts to pass the endoscope within the right nares met with resistance. At 25-30 cm from the nares an eroded area on the dorsolateral bony wall was present, and when touched, a 3-cm elliptic piece of bone was dislodged and then recovered. Deeper passage was accomplished but the scope needed to be manipulated dorsally at the 30-35 cm point compared to the left nares where the lumen appeared smaller in diameter. Biopsies of one of the blisters and the recovered bone were submitted for histopathology. The rhinoceros recovered without incident and was normal by the end of the day. It was concluded by the combination of diagnostics performed in reference to the CT images that a sinus fracture with communication to the right nasal passage had occurred, with compression of the nasal passageway. Histopathology of the bone fragment suggested an *Actinomyces* sp. infection based on the presence of sulfur granules.

Diseases and traumatic events to the maxillary sinus, paranasal sinus, and nasal passages are not uncommon in black rhinoceroses. Temperament, unfamiliar surroundings, and a predisposition to epistaxis are all underlying factors in the causes of such problems. Diagnostics and therapies have been as diverse as endoscopy and cryosurgery<sup>1</sup> to sinus percussion and supportive care (D. Blythe and D. Grobler, pers. comm.). Outcomes have been diverse, ranging from full recoveries to fatalities. The maxilla of the black rhinoceros, and presumably other rhinoceros species, is perhaps one of the most complex anatomic structures a veterinary clinician may face. Some diagnostic imaging may be possible in conditioned captive animals, but sedation and often general anesthesia must be utilized to thoroughly evaluate and treat problems in this area. Combinations of imaging modalities may be used to help localize a lesion and help focus appropriate therapy. Reference material for the anatomy may be hard to come by. Museum quality skulls are not generally available to section but may allow for radiographic references. Standing films are difficult and unless a lesion is obvious, may be frustrating. CT images are likely impractical in a living rhinoceros but images from the skull provide excellent detail for diagnostics and will be invaluable if surgical intervention is attempted.

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#### LITERATURE CITED

1. Miller, E. D. and R. E. Junge. 1998. Treatment of a nasal ulcer in a black rhinoceros (*Diceros bicornis*) using cryosurgery. Proc. Am. Assoc. Zoo Vet./Am. Assoc. Wildl. Vet. Joint Conf. Pp. 213-215.
2. Munson, L., J.W. Koerler, J.E. Wilkinson, and R.E. Miller. 1998. Vesicular and ulcerative dermatopathy resembling superficial necrolytic dermatitis in captive black rhinoceroses (*Diceros bicornis*). Vet. Pathol. 35:31-42.
3. Weber, M. and E.R. Miller. 1996. Fungal pneumonia in black rhinoceros (*Diceros bicornis*). Proc. Am. Assoc. Zoo Vet. Pp. 34-36.