Prevalence of Crown Trauma in Free-ranging Maned Wolves (Chrysocyon brachyurus) in Central Brazil

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Introduction
The maned wolf, Chrysocyon brachyurus, is the largest wild canid inhabiting South America. Particular characteristics of this species include its long limbs that enable hunting in tall grass, and solitary, crepuscular, and nocturnal activities (Fig. 1). They are opportunistic generalists in their foraging habits with important dietary components of small animals such as birds, reptiles, rodents, and fruits.1-3

The dentition classification of the maned wolf is anelodont (maximum growth limit of the teeth), brachyodont, and heterodont (anatomically different teeth in the same dentition) with grouped eruptions (the eruption occurs in a lateral, side-by-side pattern).4

There are few studies concerning oral cavity pathology especially in wild free-ranging species.5,6 Most reports available are in captive animals describing a high incidence of oral disease due to trauma and periodontal disease.7 Traumatic injuries usually consist of soft tissue lacerations (oral mucosa, gingiva, or tongue) and crown fracture.8 Frequently, they occur as a consequence of the stress of capture, accidents in play or aggression, and behavioral problems such as chewing cage metal bars, walls, doors, gates, and fencing.7,8,9 Crown fracture is the second most commonly diagnosed dental disease in domestic carnivores.9,10,11 The objective of the present study was to establish the prevalence of crown trauma in free-ranging maned wolves.

Materials and Methods
Nineteen free-ranging maned wolves were captured using metal cage live traps at Emas National Park in central Brazil from April through November 2003 during a long-term study of their ecology, epidemiology, and conservation. Wolves were immobilized with an intramuscular combination of tiletamine/zolazepam (2.98 mg/kg). All animals were weighed and fitted with a radio collar and biological samples were collected for epidemiology, genetic and hormonal assays, and blood, feces, urine, and ectoparasite samples. Physical and oral cavity examinations were performed and individual wolf case logs were established including digital photographic registration (Fig. 2). Wolves were classified according to age as adults or sub-adults (<1-year-old) based on body mass, dentition, and morphological measurements.

Crown trauma was classified according to tooth, location of fracture, type/direction of fracture (transverse/oblique/longitudinal/slab), complicated or uncomplicated fracture, and tooth discoloration indicative of pulpitis.

Results
Nineteen maned wolves (11 males, 8 females) were captured during the study. Seventeen wolves were adults and 2 were sub-adults. All captured wolves were presented in good physical condition and had body weights within normal ranges. Oral cavity examination revealed recent gingival laceration due to trauma during metal cage capture in 3 wolves. There were no signs of recent dental trauma. There was no evidence of oral fistula, abscess, or facial swelling in this study group.

Figure 1
Photograph of a maned wolf (Chrysocyon brachyurus), the largest wild canid inhabiting South America.

Summary:
Nineteen free-ranging maned wolves (Chrysocyon brachyurus) were captured in central Brazil from April through November 2003. Oral cavity examination revealed 34 teeth with crown trauma in twelve animals. Canine teeth were most commonly affected (44.2 %), followed by premolar (29.4 %) and incisor teeth (26.5%). Trauma to maxillary teeth (67.7 %) was more frequent compared with mandibular teeth (32.3 %). The majority of dental fractures were located at the cuspid portion of the crown (56.0 %). Slab fractures were the most frequent type (37.0 %), followed by horizontal (24.0 %), oblique (24.0 %) and longitudinal fractures (15.0 %). Complicated crown fracture (pulp exposure) was diagnosed in 13 (38.2%) of these teeth while pulpitis noted by tooth discoloration was diagnosed in 8 (23.5 %) teeth. J Vet Dent 24(4); 231 - 234, 2007
Thirty-four teeth were diagnosed with crown trauma in twelve (6 males, 6 females) adult animals (63.1%). Although there was an average of 3 (± 2.405) affected teeth per wolf, 1 wolf had 8 fractured teeth (Fig. 3).

The prevalence of crown trauma was recorded according to location, type, and direction of fracture was recorded (Tables 1-3, Figs. 4 and 5). Crown trauma injuries occurred in 23 maxillary teeth (67.7%) and 11 mandibular teeth (32.3%). Carnassial teeth were fractured in 3 cases (8.8%). There were 13 complicated crown fractures (38.2%), and 8 discolorated teeth (23.5%). Missing teeth were noted in 8 of the 19 maned wolves captured (range = 1 to 9 missing teeth; average = 3.5). Two wolves had gingival overgrowth and inflammation at the maxillary incisive region, where most of the incisor teeth were missing (Fig. 6).

Discussion

Oral trauma, especially tooth fracture, is considered to occur frequently in wild captive animals. However, there have been few studies about the prevalence of oral cavity diseases in free-ranging species, including the maned wolf. The incidence of tooth fracture and attrition in wild captive felides (Panthera onca and Puma concolor) has been reported to be high, but the same oral injuries in free-ranging felids were not observed. Most of the literature attributes crown fracture to be secondary to trauma associated with a captive environment. The present study observed a high prevalence of tooth injury in free-ranging animals (63.1%), which occurred during natural functions and habits of the maned wolf.

Capture of prey (predation), food processing (biting, tearing, lacerating, chewing, gnawing), fighting, intimidation, offspring transport, and hair coat cleaning are the most important natural functions of wild carnivore teeth. These functions influence the type of dentition of the animal. Carnivores have teeth adapted for subduing prey and tearing flesh (canine teeth) with wide mouth openings and laterally stable temporomandibular joints that allow higher occlusive forces to engage part of the prey and shear off soft tissue and bones (carnassial and molar teeth). The major functions of the incisor teeth are biting, gnawing, and hygiene. Actually, the maned wolf is an omnivore adapting to a carnivore-omnivore diet, with opportunistic feeding behavior. Food processing and predatory habits that influence tooth wear and trauma may be different due to this grinding function, especially for incisor teeth.

The diet of the maned-wolf in Emas National Park is composed...
of animal (42.0 %) and vegetal (58.0 %) sources,3 especially the pampas deer (*Ozotoceros bezoarticus*) and armadillo (*Dasypus septemcinctus*, *Euphractus sexcinctus* and *Cabassous unicinctus*). Apprehension and mastication of these foods may be responsible for the prevalence of tooth fractures diagnosed in the present study. Also, tooth morphology and anatomical characteristics may predispose certain teeth to injury.10 The canine tooth is the most prominent and vulnerable tooth to injury in carnivores.

Hard objects in the environment are most often responsible for tooth trauma in domestic carnivores.7 In a study that evaluated tooth fractures in 139 dogs, fractures of the incisor and canine teeth occurred in predominantly large breeds, especially in working breeds. Trauma was caused by games (catching thrown objects, such as stones and tree branches), training, and behavioral problems. Younger dogs (< 4-years-old) were over represented suggesting that age and stage of tooth development may be factors in crown trauma.11 In the present study all animals with tooth trauma were classified as adult (> 1-year-old), with older wolves over represented.

The inability to perform dental radiography in the captured wolves of this study was based on the field conditions of the study. Portable dental radiography was not available. This deficiency may...
have resulted in an under representation of oral pathology including tooth trauma. Dental radiographs would have aided in the diagnosis of oligodontia, tooth fracture with retained roots, root fracture, periodontal disease, endodontic disease, and neoplasia.8

**Table 2**

Prevalence of tooth fractures based on location. Crown fractures were characterized as coronal, medial, and cervical.

<table>
<thead>
<tr>
<th>Location of Fracture</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cervical</td>
<td>15%</td>
</tr>
<tr>
<td>Root</td>
<td>3%</td>
</tr>
<tr>
<td>Coronal</td>
<td>56%</td>
</tr>
<tr>
<td>Medial</td>
<td>26%</td>
</tr>
</tbody>
</table>

**Table 3**

Prevalence of tooth fractures based on type and direction of fracture.

<table>
<thead>
<tr>
<th>Location of Fracture</th>
<th>Slab</th>
<th>Transverse</th>
<th>Longitudinal</th>
<th>Oblique</th>
</tr>
</thead>
<tbody>
<tr>
<td>Percentage</td>
<td>37%</td>
<td>24%</td>
<td>15%</td>
<td>3%</td>
</tr>
</tbody>
</table>

**Figure 6**

Photograph showing missing incisor teeth with overgrowth and ulceration of the gingiva.

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