How to Recognize and Evaluate Periodontal Disease

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1. Introduction

Periodontal disease (PD) infers inflammation and infection involving the periodontium, which is collectively comprised of the gingiva, periodontal ligament, tooth cementum, and alveolar bone.1,2 In equids, PD is a common intraoral finding of variable severity and has been shown to occur at greater frequency with increasing age. Abattoir studies conducted during the last fifty years report an overall prevalence of 13%–60%.1,3,4 This is similar to results reported from more recent surveys of various patient populations showing a prevalence range of 13%–75%.5–9 Earliest stages of PD result in gingivitis without involvement of subgingival tissues; however, as the disease progresses, periodontitis ensues with deeper extension of inflammation and infection into subgingival supporting structures. Histopathological features of equine PD include gingival epithelial ulceration, leukocytic inflammation, gingival hyperplasia, cemental erosion, plaque formation, and bacterial infection.10 The practitioner must be cognizant that periodontal disease manifests in various locations in the equid hypsodont dentition. A very common occurrence of PD occurs due to calculus accumulation on mandibular canine teeth with gingivitis (redness, bleeding) in male horses, similar to PD that which occurs in dogs and cats. At the front of the mouth, gingivitis affecting the incisive region can occur due to local irritation when ingesting noxious plant material in hay or pasture, and focal gingivitis can also be seen in this area of the mouth during incisor eruption. In the back of the mouth, gingivitis is often noted along the cheek teeth arcades during tooth eruption of premolars and shedding of deciduous teeth, and mild gingivitis can also be seen with oral migration of Gastrophilus sp. larvae. The aforementioned conditions are typically limited to the supragingival region and likely cause mild to moderate irritation to the horse. Equine odontoclastic tooth resorption and hypercementosis (EOTRH) is an inflammatory process that results in significant periodontal disease of the incisor teeth, canine teeth, and less commonly the cheek teeth. In these cases, gingivitis, gingival recession, enlargement and distortion of alveolar bone, and gum boils are frequently noted in addition to typical radiographic lesions of EOTRH (tooth resorption lesions, alveolar bone lysis, and hypercementosis). Another painful manifestation of PD in equids occurs if roughage fibers become wedged between adjacent cheek teeth (premolar or molar teeth). Ordinarily tight apposition of the clinical crowns eliminates the possibility of food material entering the interproximal spaces; however, in some equids, a slim gap at the occlusal aspect of the interproximal space that allows entrapment of food material between teeth (the occlusal gap between the teeth is termed a diastema, plural diastemata). Diastemata may be congenital or acquired and in some instances have a sufficient occlusal opening allowing roughage to escape (“open” diastema); however, in some patients, the slim
opening acts as a one way valve to prevent release of the fibrous feedstuffs ("valve" diastema). In this event, roughage fibers are pressed through the occlusal aspect of the diastema during mastication, becoming wedged into deeper portions of the interproximal space, which leads to the pathologic cascade of PD (bacterial fermentation of carbohydrates → acid production → inflammation → necrosis). Untreated, diastemata result in periodontitis, pain, and progressive loss of tooth attachment (Fig. 1).

Potential symptoms of PD noted by animal caretakers are dependent on severity but can include halitosis, slow eating, frequent mouth rinsing, tilting the head when chewing, refusal to bite carrots/hard treats, quidding, or slobbering. In some instances, a patient affected with PD may present for dental procedures without any owner complaints of dental-related issues. As such, a thorough and systematic intraoral examination is necessary for appropriate recognition of PD, as well as radiographic examination to evaluate the teeth and supporting structures. Previous authors have reviewed periodontal anatomy extensively, and there is a growing abundance of research on anatomy and physiology of equine periodontium. In practical terms, the reserve crown and root of the hypsodont tooth are anchored within the alveolus by diffuse subgingival attachment of periodontal ligament along the peripheral cementum of the tooth. These attachments span from the tooth across the periodontal ligament space and attach to the inner surface of the alveolar bone. The alveolar bone encasing the tooth is very compact and forms a subgingival alveolar crest in the interproximal region of the clinical crowns. The intraoral surfaces of the attached gingiva, unattached gingival margin, clinical crowns, and interproximal spaces are visualized in the mouth. The gingival epithelial sulcus depth along the inner surface of the gingival margin is normally measured about 3 mm in depth for incisor teeth and 5 mm for cheek teeth. The inner aspect of the attached gingiva is tightly adhered to the clinical crown and underlying bone, effectively blocking entry of oral contents from the gingival sulcus into the alveolus and periodontal ligament space. Continual eruption of hypsodont teeth is inevitably associated with constant remodeling of the periodontal ligament.

2. Material and Methods

- Sedation
- Dental halter or headstand
- Bright source of light
- Dental speculum
- Cheek retractor
- Dental mirror or oral endoscope
- Periodontal probe
- Dental scaler
- Pressurized oral irrigation instrument
- Right-angle periodontal forceps
- Radiographic instrumentation

Oral examination procedures are detailed in a different manuscript of this session. To evaluate the periodontium, all components of the dentition are examined to detect the presence of any of the following conditions of the oral cavity: abnormal tooth mobility, calculus, gingivitis, gingival recession, halitosis, enlarged juga, gum boils, periodontal pocketing, or diastemata. For complete evaluation, the veterinarian will need to visualize all gingival tissues associated with the lingual and labial aspects of the clinical crowns of the incisors, canine teeth, and cheek teeth. During this process gentle retraction of the lips, cheeks, or tongue is very helpful for visualization. Minimal instrumentation is required.

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<th>Table 1. Index of Tooth Mobility Modified for Equine Dentistry</th>
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<tr>
<td><strong>Normal</strong></td>
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<tr>
<td><strong>Mild</strong></td>
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<tr>
<td><strong>Moderate</strong></td>
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<tr>
<td><strong>Severe</strong></td>
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<th>Table 2. Stages of Periodontal Disease</th>
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<tr>
<td><strong>0 Normal:</strong></td>
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<tr>
<td><strong>1 Gingivitis:</strong></td>
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<tr>
<td><strong>2 Early PD:</strong></td>
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<td><strong>3 Moderate PD:</strong></td>
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<td><strong>4 Advanced PD:</strong></td>
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to accomplish the exam at the front of the mouth; however, complete evaluation of the periodontal structures of the cheek teeth is not possible without the use of a dental speculum, bright light, and dental mirror (or endoscope). Tooth mobility is assessed by attempting to wiggle the affected tooth with finger pressure or with the aid of a rigid dental scaler, and the movement can be estimated in millimeters to assign a Mobility Index \(^{13}\) (Table 1). Advanced PD is present in any tooth that is mobile > 3 mm and/or is depressible into the alveolus. Areas of the gingival margin that appear to be affected by bleeding, gingival recession, calculus, or roughage entrapment warrant further inspection. Entrapped roughage must be removed from periodontal pockets or interproximal spaces using high pressure irrigation and periodontal forceps. Removal of roughage allows visual assessment of the degree of gingivitis/gingival recession and allows probing. The periodontal probe is used to measure depth by sliding the tip alongside the tooth within the gingival sulcus. If a periodontal pocket is present, the probe will slide deeper within the sulcus in an apical direction alongside the tooth. \(^{16}\) Staging of PD helps define the extent of pathological change that is present. \(^{24}\) PD is progressive, meaning that gingivitis, gingival recession, probing depth, and tooth mobility will worsen without treatment. In general terms, PD Stage 1 (PD1) is comprised of gingivitis/bleeding without attachment loss, while cases with PD2, PD3, or PD4 are characterized by progressive worsening of gingivitis and gingival recession, increased sulcular probing depth, tooth mobility, and alveolar bone loss (attachment loss). The stage of PD present is ascertained via clinical examination and radiography. Dental radiographic techniques are covered by a different manuscript in this session and have been described extensively. \(^{25–27}\) In cases of PD, radiographs allow the veterinarian to observe the degree of bone loss involving the interproximal alveolar crest and alveolar margin in addition to other changes that may be present including sclerosis, widening of the periodontal ligament space, blunting of the tooth apices, and lytic changes of subgingival crown and roots. \(^{13}\) Radiographic findings are then correlated with clinical findings to determine the overall severity of attachment loss and stage of PD (Table 2). Intraoral images provide excellent detail of alveolar bone of the incisor teeth and mandibular canine teeth. Due to inherent superimposition of skull structures that occurs with extraoral radiography of cheek teeth, the author typically acquires an occlusal oblique with the mouth held open by a speculum to evaluate the crestal bone and clinical crowns and an apical oblique view to evaluate the alveolar bone margin, PDL space, and apices (Figs. 2 and 3). Computed tomography eliminates superimposition and provides exquisite detail of teeth and alveolar bone (Fig. 4).

### 3. Results and Discussion

Periodontal disease is a common affliction of equids. Using the techniques described here, the
veterinarian performing a complete oral examination in a properly sedated patient can effectively evaluate irregularities of the periodontal tissues. For PD affecting the cheek teeth, a dental mirror or endoscope is requisite for recognition. The use of high-pressure irrigation and periodontal instruments to remove entrapped roughage improves visualization of affected areas and allows detailed inspection of the gingiva for probing. In addition to clinical examination, radiography helps detect the degree of bone loss and other changes that help determine severity of PD and appropriate treatment planning.

Acknowledgments

Declaration of Ethics

The Author has adhered to the Principles of Veterinary Medical Ethics of the AVMA.

Conflict of Interest

The Author has no conflicts of interest.

References

24. Definitions of stage, grade, index. AVDC Nomenclature. https://avdc.org/avdc-nomenclature/