Introduction

The age at which an animal is classified as geriatric can be based on chronological, physiological or functional age. Physiological age differs between horses and depends on their use, genetic and environmental factors. Geriatric horses and ponies make up an increasing percentage of the equine population and there is some evidence the more aged horses are being presented for veterinary treatment. (Brosnahan and Paradis 2003). A UK study showed horse >15 years represented 29% of the equine population (Ireland, Clegg et al. 2011). The prevalence of disease conditions has also been reported to increase with age and a high prevalence of disease in apparently healthy horses has been identified at veterinary examination (Chandler and Meller 2001). At least one dental abnormality was detected in 95.4% of horse over 15 years, with a large proportion of horses having generalized dental abnormalities (Ireland et al. 2012). In this study only 25% of horses with dental abnormalities on examination were reported by the owner to have a dental problem which supports previous USA studies showing dental disease in geriatric horses was almost always diagnosed during veterinary evaluation of another health problem for which the horse was being seen (Brosnahan and Paradis 2003). Geriatric horses have a higher incidence of generalized health issues such as; pituitary dysfunction, laminitis, arthritis, gastrointestinal disease, heart murmurs, respiratory disease and tumors. This text will review anatomic changes and some of the more common dental pathology seen in older horses.

Older horse dentition

The change in normal equine dental anatomy with age results in dental disease that is specific to the geriatric equine. In addition, the culmination of dental disease throughout the life of the horse often results in advanced dental disease in older horses. The approach to treatment of specific dental disease conditions have to be adapted for older horses to compensate for the reduction in reserve crown and occlusal enamel. Ensuring oral comfort and maximizing masticatory ability are the mainstays of geriatric dental treatment. Recognition of dental disease common to older horses will ensure that the correct treatment can be applied. Furthermore, older patients often require long-term management changes, such as dietary modification, to manage dental disease effectively.
The natural ageing process of equine teeth contributes to the majority of dental disease observed in geriatric equids. Central to the ageing changes seen in equine teeth are that they are hypsodont and have a finite crown length. Various factors such as management and type of diet may also contribute to the rate at which teeth are worn and this may accelerate age related changes. Horses that have been fed a coarse forage based diet with lots of silicates, may increase the amount of wear on the teeth.

The decrease in enamel thickness and enamel infolding further apically in teeth means less enamel is exposed on the occlusal surface as the teeth wear down. This results in teeth that are not able to resist wear as effectively and the rate of attrition increases. As a result of the teeth narrowing apically, aged horses will have less tooth surface area, less tooth angulation and the compression forces in each cheek teeth row are unable to maintain close interdental contact between teeth. This may result in multiple diastemata developing along a cheek teeth row, termed ‘senile diastemata’.

A recent detailed biomechanical study determined that in older horses, mandibular cheek teeth became more curved rostro-caudally, but did not change their dental positions. In contrast the maxillary cheek teeth did not become more curved, but did have an increase in mesio-occlusal angle i.e. changed their dental position. As this changes the occlusal contact between maxillary and mandibular cheek teeth, it may contribute to changes in wear pattern observed in geriatric horses. Incisors also decrease in length with age and the contact angle between the maxillary and mandibular incisors become more acute. If this change of angle is not equal on both upper and lower jaws, it may adversely affect the normal wearing of the occlusal surfaces.

**Dental Disease in Older Horses**

Geriatric horses often have the culmination of dental disease that accrued throughout their lives. Due to the ageing process, dental disease such as worn teeth, periodontal disease and diastemata are very common in older horses. A study in a large population of donkeys, clearly showed a significant increase in the prevalence of dental disease as the animals aged. In particular there was a significant increase in dental disease in the 15 – 20 year old age range (du Toit, Burden and Dixon 2009). Incisor disease is commonly diagnosed in older horses and can be a source of chronic pain.

The mainstay of dental treatment in older horses is aimed at ensuring oral comfort and maximizing masticatory ability. The short remaining reserve crown limits dental crown reduction treatment in geriatric horses. This is especially so if prophylactic dental care has not been maintained throughout the horse’s life. Trying to achieve major changes in the cheek teeth row occlusal profile will be more detrimental to the patient at an advanced age.

Diastema is defined as a detectable interdental or interproximal space between adjacent teeth and is the most common dental condition predisposing the horse to periodontal disease. Not all diastemata should be considered problematic. Only when the diastema contributes to the stagnation of feed material and leads to the development of secondary periodontal disease, should it be considered clinically significant. The stagnation and fermentation of feed material causes a secondary anaerobic bacterial infection to develop at the gingival margin. As infection progresses, inflammatory mediators cause stretching and inflammation of the periodontal ligament. This can be very painful and lead to a
loss of attachment at the gingival-cemental junction. Left unchecked, this periodontitis can lead to gingival recession with spread of infection into the sinuses and other adjacent osseous structures.

Diastema can be congenital or develop secondary to other pathology. This condition is under-diagnosed in clinical practice due to lack of awareness of the seriousness of the condition and poor dental examination techniques. Modern dental examination techniques require utilizing both digital palpation and visual inspection of the oral cavity. Proper patient restraint, a mouth speculum, bright light source, dental mirror and/oral endoscope are required to inspect all the dental surfaces. Radiographs should be performed to assess the width and depth of the diastema and extent of horizontal and vertical bone loss within the periodontal pocket. Through the use of intra-oral or open mouth oblique extra-oral radiographs, the veterinarian is able to properly assess the number, depth, and severity of the diastemata; develop a treatment plan; and monitor progression (Barakzai and Dixon 2003, Baratt 2013). Treatment methods consist of dietary modification, diastema cleaning and packing, reducing occlusal pressure from opposing teeth, orthodontic treatment with odontoplasty, widening interdental spaces or tooth extraction. Diastemata diagnosed early and managed properly can prevent the progression of periodontal disease and allow affected horses to preserve their dentition into old age (Walker et. al. 2012, Bettiol and Dixon 2011, Easley and Odenweller 2016).

Equine odontoclastic tooth resorption and hypercementosis (EOTRH) is a painful, progressive condition that can affect the canine and incisor teeth in older horses. A current update on pathology, clinical findings, radiographic signs, and possible causes/associations will be discussed. Currently, extraction of severely involved teeth is the only tested treatment option available. Extraction techniques for canine and incisor teeth will be discussed.

An emerging pathology involving tooth resorption and hypercementosis has been recognized within the equine population. Tooth resorption itself is not new, and it is found in commonly studied species. The cause and pathophysiology of equine tooth resorption are still under investigation and demonstrating some distinct differences from the disease seen in other species, namely hypercementosis or invasive irregular cementum. The condition was first described in 2004 as a periopathogenic disease involving the incisor and canine teeth of the horse, and in 2006, a study formally recognized cemental hyperplasia and hypoplasia associated with the disease. In 2007 and 2008 tooth resorption was described as a major component of this pathology, and the disease was termed equine odontoclastic tooth resorption and hypercementosis (EOTRH).

Tooth resorption and hypercementosis affect both the incisors and canine teeth of the horses typically greater than 15 years of age. Recently, a small number of anecdotal reports of resorption and irregular cementum involving premolars have been confirmed by histopathology. The disease is characterized by internal and external resorption of dental structures sometimes associated with excessive production of irregular cementum on the exterior and interior of the tooth. The apical 1/3 to 1/2 of the tooth is commonly affected. The disease tends to start along the lingual/palatal aspect of the tooth with expansion in a mesial and distal direction. As the disease progresses, the pulp, dentin, periodontal ligament, and alveolar bone become inflamed and infected leading to reduced structural support for the
teeth, degradation of gingiva, increased incisor angle, fistula formation, tooth fracture, and pain.

Periodontal inflammation is reported as a possible initiating trigger for tooth resorption, and it is suspected that chronic inflammatory mediators, particularly PGE2, an inflammatory factor that plays a primary role in the stimulation of osteoclasts, perpetuate the resorptive process. Osteoclastic activity has been shown to be influenced by several hormones and cytokines as well. A reparative reaction involves fibroblasts, odontoblasts and cementoblasts invading spaces between the osteoclasts to produce a cementum-like tissue to fill the dental defects. Depending on individual animal and tooth reaction, the balance between resorption and cementum deposition can vary resulting in the variety of stages seen sometimes in one mouth.

Histopathology of resorptive lesions and proliferative cementum has demonstrated abnormal location and activity of osteoclasts, odontoclasts, and cementoblasts. Osteoclasts in normal dentition typically reside against the bone surface occupying shallow hollowed-out depressions they have created called Howship’s lacunae. Histopathologic examinations of resorptive lesions revealed osteoclasts and odontoclasts residing in very large, atypical lacunae within bone, cementum, enamel and dentin. The term hypercementosis has been used in pathology reports to describe hyperplasia of normal cemental tissue and proliferation of irregular cementum, and this nondescript use of the word has led to some question regarding the true nature of cemental change reported in the past. Research into improved recognition and classification of the different forms of equine hypercementosis may help further reveal the nature of its association with tooth resorption and importance as a possible primary pathology.

Tooth resorption in general is a painful disease, and the level of pain appears to intensify with the severity of the lesions. A common initial sign of incisor pain reported by owners is a reduced ability/desire to grasp apples and carrots. Other signs of pain include sensitivity to bitting, head shaking, ptyalism, resistance to turning during work, shyness about the head, periodic inappetance, weight loss and decreased use of incisors for grasping and grazing. Some horses become incredibly adept at
grasping feed with the lips, sliding it past the incisors and moving it into the mouth through the “bar” region. Watching how a horse eats hay prior to an oral exam is a good way to gauge the animal’s discomfort and stage of disease. Some horses that are in the earlier stages of disease, or with primarily hypercementosis may show no apparent signs of discomfort; however, level of pain can be a subjective assessment and difficult to evaluate in the horse. Oral exam can be quite challenging because patients are resistant to manipulation of the lips and pressure on affected teeth. Placement and opening of an oral speculum can elicit alert and possibly dangerous behavior even under heavy sedation due to pain. Oral exam findings can include enlarged mandibular lymph nodes, decreased incisor angle not appropriate for age, prominent juga, loss of dental papillae, gingival and mucogingival fistulas, severe regional inflammation, purulent drainage, calculus and feed accumulation, missing teeth, hyperplastic gingiva, gingival recession, bulbous enlargement of dental structures, tooth mobility, and supragingival regions of dental resorption. Resorptive lesions in older horses can be found under excessive tartar deposition on the mandibular (more common) and maxillary canine teeth. Exposing these lesions after removal of tartar will cause discomfort for the horse. The practitioner should be prepared to address these problems.

Evaluating tooth resorption and hypercementosis necessitates intraoral radiographs of both the incisors and canines to properly formulate a treatment plan. Radiographic findings typically include varying levels of dental resorption and hypercementosis, loss of the periodontal ligament space, disruption of alveolar and regional cancellous bone, osteomyelitis, and tooth fracture. A radiographic classification system for tooth resorption based on location was found to be useful in categorizing the type of resorptive lesions present in dogs. The system radiographically evaluated lesions for 7 types of resorption which included external surface resorption, external replacement resorption, external inflammatory resorption, external cervical root surface resorption, internal surface resorption, internal replacement resorption and internal inflammatory resorption. In this recent study, all types of resorption were evident in the dog except for internal replacement resorption.
Treatment planning will depend heavily on clinical examination, radiographic findings and the patient’s level of pain. Horses with mild subgingival resorption and no regional osteitis or alveolitis can be monitored with oral exam and radiographs as the pace of disease progression varies between teeth and individuals. It is not uncommon to see radiographically a variety of disease stages ranging from normal to severe throughout the incisors and canines. Once supragingival lesions, alveolitis, osteomyelitis, tooth fractures and extensive resorption of the reserve crown and root are detectable radiographically, extraction is recommended. Moderate to severe cases require staged or complete extraction of the affected incisor and canine teeth to alleviate infection and pain caused by this disease. Incisor extraction can be accomplished in two ways depending on the nature and severity of the pathology associated with the tooth/teeth. Singular incisor extraction by elevation and avulsion can be accomplished simply in mild to moderately affected teeth. In cases of multiple incisor and canine tooth extraction with severe disease, a surgical approach is necessary to allow for complete removal of dental material, visualization of tooth and diseased structures, debrideent and closure. In addition, a surgical approach increases the surgeon’s ability to deal with complicated extractions where reserve crowns and roots have fractured due to initial trauma and resorption.

Periodontal disease is commonly present with EOTRH. The cause of EOTRH has not yet been determined, but it is clear that the loss of dental and regional structure resulting from EOTRH opens the door for severe periodontal infection. The inflammation resulting from periodontal disease causes further degradation of both hard and soft periodontal structures. Treatment of periodontal disease will not stop EOTRH, but it will break the negative feedback cycle between EOTRH and periodontal disease temporarily. In the early stages of EOTRH where loss of the dental papillae and periodontium lead to regional feed accumulation, both veterinarian and owner can work together to keep the incisors and canines debris free. Daily tooth brushing and oral irrigation and frequent professional periodontal therapy (every 3-6 months) should be initiated. Antibiotic therapy can also be used to temporarily decrease the build-up of periodontopathogenic bacteria and regional infection. As EOTRH progresses, visual examination, radiographic findings and the patient’s signs of pain will determine when both owner and veterinarian need to consider extractions. Splinting of mobile teeth severely affected by periodontal disease and/or EOTRH is not recommended as it creates even more surface area for debris entrapment and unnecessarily extends the period the animal will be in pain.

The removal of all or most of the incisors can lead to extrusion of the tongue beyond the labial margin. The tongue appears to protrude most when horses are at rest, but there is tremendous variation between individuals. Tongue protrusion can be a problem for horses in show where this is considered a violation, but horses appear to suffer no physical or mental trauma as a result of this complication.

**EOTRH Extractions**

Tooth resorption associated with EOTRH is well documented to be associated with the canine and incisor teeth. Therefore, in cases of EOTRH, radiographs of both the incisors and canines should be taken. Severe cases of EOTRH require staged or complete extraction of the affected incisor and canine teeth to alleviate infection and pain caused by this disease. Resorptive lesions in older horses can be
found under excessive calculus deposition on the mandibular and maxillary canine teeth. Exposing these lesions after removal of calculus will cause discomfort for the horse, and the practitioner should be prepared to address the problem either through extraction under primary care or referral to an equine veterinary dental specialist. In severe cases of EOTRH requiring extraction of all incisors, owners will need extensive pre-surgical counseling regarding the surgery, post-operative care, nutrition, possible complications), and anticipated outcome. It is also recommended that horses requiring extraction of all incisors be referred to a veterinary dentist or surgeon experienced in this procedure as retrieval of all infected dental material and extraction of severely resorbed teeth can be technically challenging.

Horses with severe EOTRH display little discomfort after extraction of all incisors. Post-operative pain is controlled with non-steroidal anti-inflammatory medication and an antibiotic is given 7-10 days to prevent infection. Horses with no incisors are able to eat hay, and many owners and veterinarians report that these horses can graze by grasping forage with the lips and pulling. Although it is impressive that these horses can graze, it should be assumed that they cannot maintain themselves on pasture alone until proven otherwise. Therefore, owners will need to be aware that supplementation with hay, hay stretchers, senior feed or similar additives will be necessary for pasture horses. Once healed, horses will be able to return to full work, and many owners report improved disposition and increased energy.

References


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