Introduction

Historically, tools for equine dental care consisted of rasps and molar cutters. The law of the instrument represented equine dentistry for over a century. As quoted in Maslow’s Law “I suppose it is tempting, if the only tool you have is a hammer to treat everything as if it were a nail”. Equine dentistry was treated as if reducing elongations of the dental crowns was the most important part of the job. Diagnosing and treating underlying dental disease was seldom addressed usually due to poor understanding of equine dental disease and the lack of good diagnostic aids.

Dental corrective procedures that entail some form of crown odontoplasty have been performed on equine patients for hundreds of years. The term ‘dental floating’ as related to equine dentistry denotes the use of rasp, files, or burrs to perform odontoplasty of sharp points contained on the buccal portion of the upper row of cheek teeth and the lingual side of the lower row of cheek teeth. These sharp areas are thought to traumatize the mucosa of the cheeks and tongue. Performed on a regular basis, odontoplasty corrective procedures have traditionally been part of a horse’s health care program, with very little scientific evidence to support this practice. Odontoplasty procedures are often performed by veterinarians in an attempt to: 1) relieve discomfort associated with oral soft tissue injuries caused by sharp enamel points, 2) reduce dental elongations which place abnormal stress on affected teeth, jaws, and temporomandibular joints thus improving occlusion, 3) improve mastication and digestion of feedstuffs, 4) alleviate stresses and reduce attrition to abnormally worn teeth, and 5) prevent discomfort and improve performance in the horse wearing a bit and bridle.1-10

Historically, equine dentistry has involved numerous procedures including oral examination, and reduction of sharp enamel points. In addition to sharp enamel points, the veterinarian may identify other elongations of the clinical crown involving the hypsodont cheek teeth or incisors. These elongations can place abnormal stress on the affected tooth or teeth and may involve a portion of a tooth (hooks, abnormal transverse ridges), the entire tooth (step, ramp), several teeth (wave), or the entire arcade (shear). Stress forces resulting from overlong teeth can cause the teeth to shift and ultimately lead to rostral or caudal displacement, linguoversion, or buccoversion. The resulting diastema caused from tooth displacement can lead to periodontal disease. It is important to remember that the true pathology associated with elongated teeth in horses often involves a jaw or tooth malocclusion or developmental or acquired pathology to the tooth/teeth and periodontal tissue opposite the elongated dental area. Failure to evaluate and properly address the underlying pathological process may lead to recurrence of elongations and a temporary or unsatisfactory result for the patient. The aim of dental care for the equine patient is
to alleviate pain and preserve the function of the teeth. It is very important for the veterinarian to remember to strive to do no harm to the horse or its teeth when performing odontoplasty procedures.

Clinically, horses which have good proximal contacts between the molar and premolar teeth, and an even pattern of occlusal attrition, are less likely to have periodontal disease, and similarly with the incisor teeth. With good functional occlusion, good dietary management, appropriate biting, good riding habits, and good general health, there should be no need for odontoplasty as part of the management of oral health.

The dynamic nature of the equine hypsodont tooth provides the observant clinician with more information about endodontic health and occlusal status than can be easily gained from observing brachydont dentition. Once the tooth comes into full occlusion, it is not long before the occlusal topography of the molariform teeth reflects both occlusion and pattern of mastication. The pattern of mastication may be influenced by feed substrate, dental pain, musculoskeletal pain, and occlusion. Due to the rostro-caudal shift in mandibular-maxillary relation which is dependent on head position (for example, grazing versus resting), the head position at which most mastication occurs may also influence occlusal topography. While dental stone models and bite registrations are helpful in assessing brachydont occlusion, much can already be determined from observing the pattern of attrition in equids. However, it is important to note that regular generalized odontoplasty is likely to make interpretation of occlusion more difficult (Mesowear patterns).

Occlusion may be influenced by dental factors. Supernumerary teeth, missing teeth, fractured teeth, dysplastic teeth, rotated teeth, persistent deciduous teeth, senile teeth, and tooth size may all affect occlusion. Tooth size is most resistant to genetic change. As a result of breeding selection for small skeletal size, the smallest horse and pony breeds have relatively large teeth, resulting in increased incidence of developmental dental problems. Diseases affecting the supporting structures of teeth, such periodontal disease, Cushings disease, and equine odontoclastic tooth resorption and hypercementosis (EORTH), may also secondarily affect occlusion.

Functional malocclusions may develop as a result of a changed masticatory pattern. The equid may change the pattern of mastication to avoid oral pain, for example dental pain, periodontal pain or orthopedic pain, or in response to substrate characteristics, such as pelleted food. Temporomandibular disease in the equid is rare, and usually associated with trauma. Along with other rare diseases, for example a retrobulbar abscess, these conditions may alter the normal path of the mandibular ramus, either physically or due to pain or both and may also result in a functional malocclusion.

A Class 1 Malocclusion (neutroclusion) occurs in horses with normal jaw lengths and teeth in their normal mesiodistal location. Abnormalities of cheek tooth wear are frequently seen and often described as waves, steps, hooks, and ramps. While these types of occlusal abnormalities have not been previously classified as a type of malocclusion, their description as a Class 1 Malocclusion is justified and lends credence to the idea that occlusal adjustment is an
orthodontic procedure. Similarly, abnormal incisor wear, given the descriptive terms smile, diagonal, stepped or irregular, and frown can be considered another type of Class 1 Malocclusion.

A malpositioned tooth, in the horse with normal jaw lengths, is another type of Class 1 Malocclusion. Rotations, crowding, displacements, and versions (tilting) are seen in both the incisor and cheek teeth, with the highest incidence in the miniature horse. An overjet is a facial projection of the maxillary incisors, while an overbite is the vertical overlap of the maxillary incisors over the mandibular incisors. The overbite (parrot mouth), is most commonly seen in the Class 2 Malocclusion in which the mandible is short relative to the maxilla. The maxillary incisor overbite or overjet may be accompanied by abnormalities in cheek tooth wear such as hooks on the rostral maxillary and caudal mandibular cheek teeth. Normal cheek tooth occlusion is often observed with these incisor malocclusions. The Class 3 Malocclusion, in which the mandible is of greater length than the maxilla-incisive bones, is most commonly seen in the miniature horse. Mandibular incisor overjet or overbite may occur in the absence of cheek teeth abnormalities, but is most commonly associated with ramped mandibular 1st cheek teeth (306, 406).

Malocclusions in the equid often result in secondary effects, such as soft tissue interference, diastema formation, feed enlargement to some or all of the masticatory muscles initially through inflammation alone, but later also through hyperplasia; it may also lead to disuse atrophy of some masticatory muscles. Clinically, a common effect of masseter muscle enlargement is medial displacement of the buccal mucosa increasing soft tissue interference predominantly with the maxillary molar teeth. At the occlusal level, the cingula (from mesial to distal: parastyle, mesostyle, and metastyle) create pressure points in the buccal mucosa. How the buccal mucosa responds varies depending on severity of insult, time, and other pre-existing conditions (such as Cushing’s disease which affects among other things, collagen synthesis and immune function). If the integrity of the mucosa is not overwhelmed, a reactive/protective response such as hyperkeratosis results. If the integrity of the mucosa is overwhelmed, tissue necrosis occurs resulting in ulceration of the mucosal and submucosal layers. Recognizing which process is present is important for diagnostic, prognostic, and treatment reasons.

If the primary cause can be treated or managed, then many of the secondary and tertiary problems may self-correct. The resolve of secondary and tertiary problems can be a good indicator that the primary cause has been correctly diagnosed and treated. Initially, symptomatic treatment, such as analgesia, may also be indicated. Where treatment of a malocclusion is indicated, selective odontoplasty may be used to alter occlusal forces. Management of the malocclusion may also include changes in diet, feeding regimes, bitting and other tack, riding/driving habits, and on-going management of occlusal forces. Malocclusions of the molariform teeth more commonly require treatment compared to the incisor teeth.

The type of orthodontics described in this paper may best fall in the category of interceptive orthodontics. Interceptive orthodontics is performed during the formative and eruptive period of dentition. Due to the extended period of eruption of the equid hypsodont tooth, this period extends for most of the animal’s life. Classical orthodontics use devices/appliances to apply
forces to the crown and then retain them in their new position to prevent relapse. Appliances may be active or passive, fixed or removable, and provide continuous or intermittent forces. Orthodontic forces have been categorized into intrusive, extrusive, tipping, rotational, and translational. Movement of a tooth employs more than one type of force – restriction to one type of force is not regarded as clinically possible. The orthodontic forces described hereon utilize the occlusal forces provided during mastication with the predominant type of orthodontic force generated usually being tipping. The occlusal forces of mastication can be reduced on a portion of the occlusal surface to effect orthodontic movement. The process appears a slower one compared to orthodontics affected with a device in humans and small animals. However, no retainer period is necessary. It is also likely to be a more physiologic than pathologic process, but further investigation is required. Risks associated with human orthodontic treatments include: enamel damage, root resorption, periodontal damage, temporomandibular disorders, tooth devitalization, treatment failure, and relapse. Of these, treatment failure and relapse are the most likely risks in clinical equid cases utilizing the described process. Utilizing occlusal forces to move teeth is not well covered in the literature. It has been suggested as a possible method to address teeth, which undergo pathological tooth movement in humans. Another area of the literature which touches on the subject, is the removal of occlusal interferences during the post-orthodontic movement retainment period to try and prevent relapse.12

**General Approach to Occlusal Adjustment Procedures**

Two approaches to performing dental corrective procedures have become standard over the past few years. Both involve examination and dental corrections carried out in a standing, sedated equine patient. In rare cases, general anesthesia may be required to thoroughly examine and treat dental problems. The less involved type of standing restraint has been described as ‘performing dentistry by feel’ (non-visual). This type of dentistry is performed with the horse’s head at the level of the operator’s waist or chest. This requires minimal sedation and works well for most horses with relatively normal dental occlusion needing only odontoplasty of sharp points of the cheek teeth. The horse’s head can be periodically elevated and the oral cavity visually evaluated during the procedure.11-14 The second method commonly employed is ‘visual dentistry’.15 Working in the horse’s mouth visually requires the patient to be well restrained and more heavily sedated. The animal’s head must be elevated and supported at a height that allows visualization of the mouth while the veterinarian maintains a comfortable ergonomic body position.16 Visual dentistry allows for a more thorough dental examination and precise correction of dental abnormalities. Both methods have their place in practice but visual dentistry has many advantages over dentistry by feel, especially in horses with severe wear abnormalities or other dental pathology. Working with dental instruments, including power equipment, requires strength, dexterity, and mastery of technique. The visual method allows better access to the mouth and lowers the learning curve on the use of equipment.

Dental corrective procedures such as floating teeth were once considered fairly innocuous. With the development of better quality and more efficient equipment to perform odontoplasty procedures, dental correction can be overdone and have severe detrimental effects on the patient.13 Rasping teeth has been shown to amputate odontoblast processes, leave deep grooves
in the surface of the dentin and/or chip the enamel surface and peripheral cement. Motorized
dental tools can remove large amounts of dental tissue and create heat; this increases the risk of
thermal damage to the odontoblasts contained in the pulp horns. It has recently been speculated
that horses may suffer dental pain after corrective procedures. A fine-toothed burr or dental
rasp used with light intermittent cutting strokes causes less damage in reduction. An efficient
water cooling system and frequently cleaning the burrs may reduce the chance of thermal injury
to the dentin and pulp.

**Odontoplasty of Sharp Dental Points**

In veterinary medicine the concept of prophylaxis, that is, the ability to use a practice that will
prevent the development of subsequent serious disease, is the foundation of any health
maintenance program. Dental prophylaxis or prevention (i.e. the examination of the oral cavity
and the use of corrective procedures to arrest disease processes before clinical signs are seen),
has been reaffirmed as an important part of a patient’s health care program. In equine veterinary
practice, dental prophylaxis involves the use of files and burrs to perform odontoplasty of sharp
points on the buccal aspects of the upper and lingual edges of the lower cheek teeth in order to
provide more comfortable mastication and bitting for the horse.

Floating may be the initial dental procedure performed in order to make the mouth more
comfortable when using a full mouth speculum to perform the oral examination and other dental
procedures. Hand floating by feel with minimal sedation has been well described. Many
practitioners use power tools in routine floating. Since each type of motorized dental equipment
requires varied techniques, it is recommended that one work closely with practitioners who have
experience with the specific instruments being used. Manufacturer recommendations on the use
of particular power driven instruments should be followed very closely. Equine dental floating
should be approached in a sequential fashion. A full set of hand floating instruments is needed to
reach the various areas of the mouth.

**Indirect Evaluation of Cheek Teeth Occlusion**

With the speculum removed, the veterinarian evaluates the movement of the mandible in the
sedated horse in order to assess components of the horse’s chewing apparatus. A simple method
of assessing cheek teeth occlusion involves raising and supporting the horse’s head, then sliding
the mandible to the left and right while retracting the ipsilateral cheek for viewing. As the
examiner slides the mandible laterally, the lower row of cheek teeth normally comes in contact
with the upper row of cheek teeth. Using this technique the veterinarian can feel and/or visualize
areas that may interfere with mastication (i.e., an overlong tooth or protuberance). If necessary,
the speculum is reinserted and additional odontoplasty is carried out, followed by re-evaluation
of cheek teeth occlusion to ensure the procedure has been successful. In some instances,
radiographic examination of the area may be indicated before additional odontoplasty
procedures. Rucker determined a method to evaluate cheek teeth occlusion by measuring the
distance that the mandible can be slid to the left or right until the cheek teeth come into occlusion
(‘Excursion to Molar Contact Distance, or EMC distance’). Measurement of EMC distance has
been used in calculations involving masticatory function.
If there is excessive excursion to molar contact, then conservative incisor crown reduction can be performed. Some diagonal incisor malocclusions have recently been shown to have accompanying deformation of the incisive bone. It is not necessary and potentially deleterious (inadvertent pulp exposure) to perform occlusal adjustments of these cases in an effort to recreate a level bite. Recent work by German scientists have shown a wide discrepancy in occlusal angles of equine incisor teeth.

Summary

Dental examination and dental prophylaxis performed on a regular basis are procedures that are advocated by veterinarians as important components of an overall horse health care program. Careful and complete oral examination is critical in the diagnosis of dental pathology and the planning of dental corrective procedures. It is important for veterinarian to be knowledgeable and possess the proper equipment to facilitate the examination and procedures. This should include a bright light source, head support apparatus, and dental speculum. The patient should receive adequate analgesia/sedation in order to reduce the occurrence of undesirable or difficult behavior during the procedures. The veterinarian should remember to keep observers at a safe distance while work is performed. High quality manual instruments and motorized dental floats are readily available for managing sharp dental points and dental elongations. An important concept to keep in mind when addressing abnormalities of occlusion of the dental arcades is to perform procedures that will allow normal mastication.

References and Suggested Reading


