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Deciduous Tooth Management

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Take Home Message

Horses shed 24 deciduous teeth and erupt 36-44 permanent teeth between 1 and 6 years of age. This process should be monitored and interceptive care may be necessary to avoid problems with gingivitis and dental malocclusion.

Introduction

Knowledge of eruption times of deciduous and permanent dentition should be second nature to veterinarians working in the equine mouth. The shedding of deciduous teeth is an entirely natural process that generally does not require human intervention to proceed normally. It is not unusual for horsemen to report finding a deciduous tooth or tooth fragment in the feed trough or manure pile. As with other routine prophylactic procedures, however, the use of the horse as a ridden performance animal demands a mouth that is free of any source of possible discomfort. Therefore extraction of “caps” that are felt to be loose or close to exfoliation and causing gingival irritation is common practice when performing routine dental examination and odontoplasty in young horses.1,2 There are times when malerupted permanent teeth occurs which can lead to pathological retention of deciduous teeth.3,4 Interceptive orthodontics is the branch of dentistry that deals with retained deciduous teeth and their associated malocclusions.5

Tooth Eruption

Horses under five years of age have mixed hypsodont dentition. From 12 months to 6 years, equids shed 24 deciduous teeth and erupt 36-44 permanent teeth. Horses have vertically successional teeth, with each deciduous tooth and its underlying permanent tooth residing in the same alveolar crypt. Eruption is the process whereby a developing tooth moves through the supporting bone and into its functional position in the oral cavity, with emergence being the actual appearance of the tooth in the oral cavity. The functional crown will not be in wear for some weeks or months after tooth emergence and will be continually changing throughout the life of the tooth. The mechanisms of eruption of equine dentition have not been studied in detail. However, it is likely that, as in other species, the process is multifactorial with eruptive (from the periodontal ligament), resorptive and hydrostatic forces playing a role.6 The soft tissue layer between the permanent and deciduous tooth contains inflammatory and osteoprogenator cells, cytokines and odontoclasts that remodel the alveolar bone and resorb the apical portion of the deciduous tooth. Deciduous hypsodont crowns wear at approximately 3-7 mm per year. The combined action of resorption of the roots of the deciduous tooth, development and eruption of
the permanent successor and attrition of the clinical crown results in the shedding or exfoliation of a wafer of the deciduous tooth often referred to as a ‘cap’. The deciduous 1st incisors erupt at about 6 days of age, the 2nd incisors at about 6 weeks, and the deciduous 3rd incisors at about 9 months. Deciduous incisors are dome-shaped and smaller than the permanent incisors. They have a flattened root, short crown, and shallow infundibulum on the occlusal surface. The central incisor caps normally shed first (01s) at about 2½ years (30-34 months), the middle incisors (02s) at about 3½ years (40-44 months), and the lateral incisors 03s at about 4½ years (54-60 months). Miniature horses and ponies may not erupt permanent incisors for 6-18 months later than Thoroughbred horses. The eruption times of the deciduous and permanent incisors can be used to help estimate age.7,8

As the permanent incisor erupts, the deciduous tooth root is resorbed. Permanent incisors often erupt palatal or lingual to the deciduous tooth. Therefore, the incisor cap often retains the more labial portion of the root and sometimes displaces slightly rostral in the socket as it is shed.

In foals, the deciduous premolars erupt through the gingiva shortly after birth. The deciduous premolars undergo distinct root formation and have a much shorter reserve crown than the permanent premolars. It is of clinical interest that the clinical or exposed crowns of deciduous premolars resemble those of the permanent teeth. As the juvenile horse matures, the crowns of deciduous premolars wear thin and the roots resorb forming a flat premolar cap as the underlying permanent teeth erupt.

The sequence of eruption of permanent cheek teeth has been widely reported in the literature with emergence times of 1 year for M1 (09s) 2 years for M2 (10s) 2½ years for PM2 (06s), 3 years for PM3 (07s), 3½ years for M3 (11s) and 4 years for PM4 (08s).9

Recent work has shed new light on premolar eruption times in the Thoroughbred horse. In this proposed model, male horses compared to females had a younger age of permanent premolar tooth emergence by 38 days. The 106 and 206 have an older age of emergence by 14 days (age 35.1 months) compared with the corresponding teeth in the lower jaw (306 and 406). The typical 07 permanent tooth emerged about 96 days after the adjacent 06 (age 37.8 months) and the typical permanent 08s emerged at about 264 days later (43.3 months).10

Eruption pseudocysts are bony enlargements that can be observed in juvenile horses on the ventral aspect of the mandible and on the dorsolateral aspect of the maxilla. These pseudocysts normally result from erupting permanent premolars and are most prominent in 3-4 year-old horses. The pseudocysts and associated bony enlargements regress over a 1-2 year period. In general, eruption pseudocysts are not as noticeable on the maxilla because of the overlying soft tissue.

Maleruption

Worn crowns of the deciduous teeth (caps) become loose and subsequently either become displaced or are shed into the mouth. This is often associated with some degree of transient gingivitis and periodontal disease.
In horses with retained deciduous incisors, one or more teeth may fail to shed as the permanent teeth erupt. Incomplete cap shedding with retained tooth fragments can be a chronic source of gingival irritation. Discomfort may occur resulting in clinical signs such as head tossing during eating, rubbing the incisors on fixed objects, quidding, and biting problems. Failure of a deciduous incisor tooth to shed is usually caused by the permanent tooth erupting slightly lingual to the deciduous, resulting in failure of the deciduous root to completely resorb. Permanent incisor teeth may also erupt at strange angles or positions which will also result in retention of the deciduous tooth. A narrow diastema may develop between the retained deciduous and erupted permanent tooth leading to periodontitis. Some cases of retained deciduous incisors may require a radiograph to differentiate this condition from a case of supernumerary permanent teeth.

Premolar caps can appear much like a table with four legs lying over the top of the permanent tooth. These wafer-thin portions of deciduous teeth (caps) can have a variable number of tooth fragments. Chronic gingivitis and periodontal disease can result if these root slivers are broken off and remain in the subgingival space after the cap is shed. The eruption sequence and tooth angulation of permanent molarized dentition predisposes to entrapment by blocking the eruption pathway of teeth in the permanent 07 and 08 column. Delayed shedding of deciduous premolars can predispose to gingivitis and periodontal disease. Gingival irritation secondary to retained, split, or displaced deciduous premolars can be distracting to the training process of a young horse. Additionally, retained deciduous premolars may cause dysmastication, anorexia, and predispose to malocclusion and abnormal crown wear of the permanent teeth.\textsuperscript{1,9} Trapped caps, manifested as bony enlargements or eruption bumps on the ventral mandibular ramus or maxilla rostral to the facial crest, can result from displacement or delay eruption of permanent teeth. These facial bony enlargements are only cosmetic problems in most cases. However, they can become pathological if eruption is severely inhibited or blood-borne bacteria inhabit the inflamed or ischemic dental pulp. This can lead to anachoretic pulpitis and facial swelling with a draining tract on the mandible or maxilla.\textsuperscript{1}

The equine teeth in each arcade are in tight apposition and act as a single grinding unit. It is easy to see how maleruption or displacement of a tooth can result in loss of integrity of an arcade. Typically, the permanent incisors erupt slightly lingual to the deciduous tooth while the permanent premolars usually come in squarely beneath the permanent. This process can be complicated when the eruption pathway of the permanent tooth is malaligned or impeded.

Conditions such as permanent tooth displacement, diastema formation and dental impactions are often attributed to disorders of tooth eruption. This would predispose to abnormal crown wear and periodontal disease.

Despite the lack of evidence based research into the etiology of patterns of malocclusions in the horse, it is common to encounter statements concerning the proposed premature removal of deciduous premolars to prevent dental block and permanent tooth displacement in certain circumstances, particularly in relation to PM4. Some practitioners have expressed concern about early or delayed eruption of permanent teeth playing a role in the formation of certain abnormal
dental wear patterns noted later in life such as wave mouth (i.e. dominant maxillary 10s, lower 08-09 wave, incisor smile or frown).

In some cases, crowding and compression (block) of the erupting permanent tooth may cause an unusually large, warm, painful swelling of the maxilla or mandible. If this should develop, an abnormally erupting or retained deciduous premolar should be suspected. Radiology should be used to evaluate the dental and bone structures associated with large eruption pseudocysts. On radiography, eruption pseudocysts of the mandible appear as smooth-bordered, periapical lucencies with sclerotic margins. It is important to remember that blood borne bacteria may invade inflamed dental tissue associated with eruption pseudocysts resulting in infection of the pulp and the periapical region through a process called anachoresis.

Deciduous premolar caps that are loose or fractured or ones that fail to shed properly, can irritate a young horse’s mouth. Clinical signs of discomfort include loss of appetite, head shaking and biting and chewing problems.

**Diagnosis and Treatment**

Digital and visual examination of the oral cavity prior to performing any rasping of enamel points will usually detect loose or displaced incisor or premolar caps or cap fragments. The presence of an obvious step in the occlusal plane of any cheek tooth arcade, resulting from whole or subtotal loss of a deciduous premolar, should prompt a closer examination of the corresponding tooth in other arcades. Deciduous premolar caps close to natural exfoliation should: 1) be digitally loose, 2) have partial loss of the crown, or 3) have a palpable demarcation noted on the occlusal and/or palatal aspect of the clinical crown with little or no gingival attachment to the remainder of the cap. Often malodor at the local site accompanies these findings.

Asynchronous eruption of analogously positioned permanent teeth is common in all species. As a general rule in equine practice, if one cap has shed, the cap in the same position on the opposite side of the jaw should be evaluated and, if loose or close to exfoliation, it should be removed. Otherwise the cap should not be extracted.

Retained deciduous incisor teeth may be a source of discomfort or cause dental crowding in the 3-6 year-old horse. Loose incisor caps are easily removed with small extraction forceps after minimal gingival elevation. Retained root or tooth slivers may need to be removed after sedation and local infiltration anesthesia with a root elevator and bone ronguer. Retained and displaced deciduous incisors may appear as a double tooth or arch of teeth. This may make it difficult to differentiate from supernumerary permanent teeth. Close evaluation of the occlusal surface is helpful to separate the newly erupted teeth with deep infundibulae from worn deciduous crowns. Radiographs are helpful in some cases. Uneven eruption of permanent incisors has been reported to be a predisposing factor in incisor malalignment and uneven wear (i.e. smile bite). Premature extraction, bone or dental fracture or deciduous dental avulsion has resulted in maleruption, malformation or failure of eruption of the permanent dentition.9,12
In most cases the retained incisor cap and tooth remnants can easily be removed in the standing sedated horse. Local infiltration anesthesia should be used in most cases. A mental or infraorbital regional nerve block would only be necessary if long root fragments required a bone flap for elevation. A small root elevator and dental forceps is usually sufficient to loosen and extract the deciduous tooth. Root fragments should not be left as these can lead to chronic irritation and pain. Surgical removal through small gingival flap to expose a portion of the root is often less traumatic and may be indicated.

Deciduous premolar caps can safely be extracted when a line of demarcation is visible between the cap and the erupting permanent tooth. Because the crown of deciduous premolar teeth closely resembles the crown of a permanent tooth, it may be difficult to determine whether a premolar cap has been shed. The occlusal surface of newly erupted upper premolar teeth contains two deep infundibular cups. These teeth are usually in various stages of early wear and with close observation can be differentiated from a severely worn deciduous premolar. An open mouth lateral oblique radiograph can be helpful in determining if a cap is present. The premolar caps can be identified on a radiograph as a short, thin slice of tooth situated over the underlying permanent premolar.

The practice of methodically removing deciduous teeth at set ages results in the premature removal in some horses. The fleshy dental sac covering the underlying developing permanent tooth is exposed and quickly destroyed by mastication after the cap is removed. This leads to loss of blood supply to the occlusal aspect of the infundibulum, where active cement deposition may still be occurring. This may result in central infundibular cement hypoplasia and so predispose to the development of infundibular caries later in life.9

In the case of loose premolar caps found on manual examination, extraction is often performed digitally. In other cases, the remaining deciduous crown can be grasped with a cap extraction forceps and an attempt made to roll the cap off, usually in a palatal or lingual direction. Excessive force and multiple attempts should be avoided. If there is insufficient movement when the deciduous crown is grasped and manipulated with the forceps, the tooth should be considered not ready for exfoliation. Extraction should be abandoned in such a case.11

Management of displaced or teeth with blocked eruption secondary to or associated with retained deciduous teeth has been dealt with to a limited extent in the literature.3,4

References and Suggested Reading