

Eruption



Emergence of tooth (either deciduous or permanent) at gum. Considered to be the most accurate of all indicators and is the only indicator used in horses under five years of age. Permanent teeth generally come into wear three to six months after eruption. In this photograph, the left upper central deciduous incisor ("cap") is being pushed off by the underlying permanent. The Eruption Table is shown on page *iv*. A recent publication suggests that shedding of the incisors may have a wider range than conventionally taught and generally incisors may be shed later than reported in the literature.

Length vs. Width of Upper Corner Incisor



The shape of the permanent upper corner incisor has been used recently to categorize a horse's age into one of three groups from five to twenty years of age. Between five and nine years of age this tooth is generally wider than tall. At ages nine to ten the upper corner incisor appears square in most horses and then progresses to taller than wide as age increases.

Shape Changes of the Lower Incisor Table Surfaces



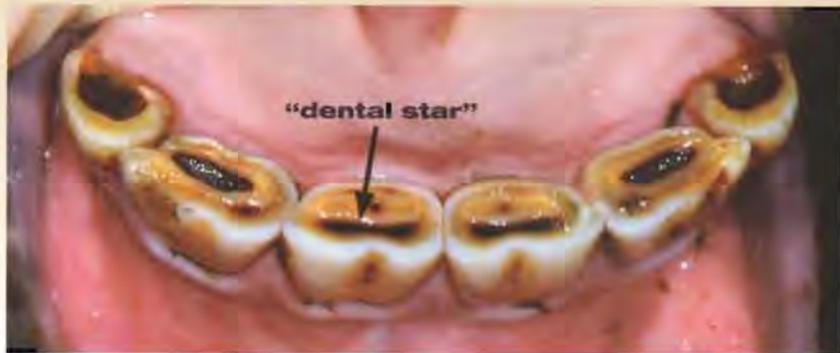
The shape of the table surfaces of the central incisors has traditionally been described as changing from oval to triangular to biangular. Although these shape changes are gradual and somewhat subjective in their assessment they are considered fairly reliable. The oval to round shape is consistent with the age of five to nine. Round to triangular shape is indicative of the age range of 10-15 and triangular to biangular (long in the labiolingual direction) in the 16-20 age range.

Disappearance of the Infundibular "Cups"



The infundibulum is an enamel infolding in the occlusal surface of the equine incisor. The "cup" is the hollow upper segment of this infolding and has a dark brown appearance, especially in horses eating grass. Older references show the disappearance of the cup to occur in I_1 , I_2 & I_3 at six, seven and eight years. Recent studies have found more variability with the I_1 cup disappearing as early as five years. I_3 cups can linger as remnants and not disappear in some individuals until 12-15 years of age. Generally, however, cups are a useful indicator in the five to nine year age range.

Appearance of the Dental Star



The dental star is secondary dentine that occludes the pulp cavity and appears as a yellow brown linear structure on the occlusal surface between the labial edge of the incisor and the "cup." Recent studies on aging suggests the dental star can appear in I_1 at five years, I_2 at six years and I_3 at seven to eight years. With age the dental star becomes oval and then round and moves toward the center of the tooth. The dental star becomes the only structure in the table surface of the centrals at 15-18 years of age.

Disappearance of the Enamel Ring (Mark)



The lower half of the infundibulum that is filled with cement is called the enamel ring or "mark." When the "cup" disappears the remaining enamel ring goes through shape changes similar to the changes in the occlusal surface of the incisors. These shapes change from oval (side to side) to triangular to round and vary a great deal between breeds. In the central incisor the shape of the "mark" changes from oval to round in the five to twelve year age range in most breeds. The disappearance of the "mark" is also highly variable, ranging from 12-18 years from the central incisor followed one to three years later in I_2 and I_3 .

Appearance and Position of Galvayne's Groove



Galvayne's groove is described as a "longitudinal depression on the labial surface of the upper corner incisor." Cementum may remain in part or all of the groove and may or may not have a dark stain. The groove is said to first appear at the gumline at nine to ten years of age and extends the full length of the tooth at eighteen to twenty years of age. The presence of Galvayne's groove is variable and even when present the length in relation to the age of the horse may be inexact.

Changes in Direction of Upper and Lower Incisor Arcades



This indicator may only be useful in comparing a young horse to a very old horse. In profile the upper and lower arcades of a young horse are very close to a straight line (180°) from gum of the upper arcade to the occlusal surfaces and down to the gumline of the lower arcade. As aging occurs this angle becomes more acute (near 120° or less) and usually is significantly noticeable around twenty years of age. The lower arcade generally takes up the most oblique position first.

Upper Corner Incisor Hook



Historically the “hook” that is sometimes visible on the caudal border of the upper corner incisor was thought to occur at the age of seven years and again at 11-13 years. This hook represents a lack of wear on the caudal aspect of the upper tooth by the opposing lower incisor. The most reasonable explanation of the wide age range and highly inconsistent presence of this indicator is the changing obliquity of the incisors (see direction changes of incisors indicator). The inconsistent presence of this indicator dictate that it be considered too unreliable to be useful in aging.

Section II

Ages One Week to Twenty Years

Birth to Two Weeks



The deciduous central incisors (I_1) have erupted; the gum (gingiva) covers the other incisors. Viewed from in front, the labial border of the centrals is visible in both jaws. The dental table (masticatory or occlusal surface) shows the labial (anterior border) of the central incisors.

Four to Six Weeks



Viewed from in front, the deciduous centrals (I_1) are in contact, the lower with the upper (superior with the inferior). The labial surface of the crown presents delicate vertical ridges and grooves. The intermediates (I_2) have emerged through the gums. The dental tables of the centrals are in wear and show a definite cup in this individual. The intermediates are emerging through the gum with the labial edge showing the most exposure.

Six to Ten Months



Viewed from in front, the central (I_1) and intermediate deciduous incisors (I_2) are in contact and the crown of each is fully exposed. In profile, the corner incisors (I_3) have emerged from the gums but are not in contact. The dental tables of the centrals and intermediates show wear; the cup is shallower in the centrals than in the intermediates in this individual.

One Year



Viewed from in front, all deciduous incisors are visible, the crown of the centrals and intermediates is fully exposed. In profile, the upper and lower corner incisors are partially or completely in contact (depending on the time of year). The dental tables of the centrals show considerable wear. The dental star is seen usually in the centrals and intermediates as a dark or yellowish-brown transverse line in the dentin on the labial side of the infundibulum.

Two Years



Viewed from in front, the central incisors are free from the gum and the neck may be visible (depending on time of year). In profile, the corners are in full wear. The dental tables of the lower incisors are smooth, the intermediates show decided wear and the corners are in full wear. The dental star is clearly visible in the lower centrals and intermediates.

Three Years



Viewed from in front, the four permanent central incisors are seen in full wear. They appear more solid, have vertical ridges and grooves and are larger than adjacent deciduous teeth. In profile, the deciduous intermediate may be inactive or show signs of being shed (depending on the time of year). The dental table of each central incisor has a deep cup and the borders of these teeth are sharp. The lower intermediates are deciduous in this individual and are smooth. The lower corners (deciduous) have little central enamel.

Four Years



Viewed from in front, the permanent upper central and intermediate incisors are in contact with corresponding lower teeth. The jaws have acquired so much width for the centrals and intermediates that the deciduous corners can scarcely be seen. In profile, the corners (deciduous) appear small and may show signs of shedding (depending on the time of year). The dental tables of the centrals (permanent) show wear but their cups are deep. The intermediates are permanent and are in wear.

Five Years



Permanent dentition is complete; all teeth are in wear. In profile the upper corner incisor is rectangular in shape (long side horizontal). The dental tables of the centrals and intermediates are wide transversely and show wear. Their cups are readily visible and completely encircled by the central enamel. The dental star is present labial to the cup on the centrals. The corners are beginning to wear at their labial border.

Six Years



Viewed from in front, the jaws present the same features as at 5 years. The upper centrals are either larger or of a similar size to the intermediates. In profile, the upper corner is still wider than tall and may show a small hook, especially if no overbite is present. The incisive angle is at its least acute angle (approaches 180°). The dental tables of the lower centrals are usually smooth and not as wide transversely as at 5 years (tend to be oval). The surface of the intermediates may still show a cup (or remnant thereof) while the corners should have well defined cups that are in full wear. Dental stars are present in both centrals and intermediates in this individual. The enamel rings in the centrals are oval in shape.

Seven Years



From in front no significant change is evident from the six-year-old mouth. The corner incisor on profile should still be wider than tall but may be approaching square. The dental tables of the centrals appear oval, while the enamel ring is somewhat triangular in this individual. The "white spot" in the dental star is visible. The intermediates show some cup present (usually worn down to enamel ring at this age). The surface of the corner shows a well defined cup that may take several years to completely disappear. The disappearance of the cups in the six- and seven-year-old examples demonstrate the normal variability between horses.

Eight Years



There is still no significant change in the front view from the previous two years. In profile, the upper corner may now begin to appear somewhat square. The lower dental tables are smooth and all cups will be gone (although remnants may remain, especially on the corners). Due to natural variation no differences in the dental stars or enamel rings may occur from the previous age.

Nine Years



Viewed from in front the upper centrals will still be similar in size to larger than the adjacent intermediates. In profile, the upper corners will usually be somewhat square. The gum line (area where tooth emerges from gum) will start to lose its straight appearance and begin to drop down where Galvayne's groove will appear. The dental tables of the centrals are now round with the enamel rings triangular. All lowers in this individual show a dental star, with the centrals and intermediates having a "white spot" in the middle of the star. The corners show remnants of a cup in this individual.

Ten Years



No change has occurred in the front view of the incisors. The upper corner on profile will be square and likely will show evidence of the beginning of Galvayne's groove. The dental tables of the centrals remain round while the dental star is shorter in length and appears to be moving more central in the tooth. This individual shows remnants of cups in all lower incisors at this age (could be attributed to a naturally occurring deeper cup).

Eleven Years



No obvious changes from the front view should occur at this age. In profile, the upper corner is still somewhat square or slightly taller than wide. The gum/tooth margin should show a v-effect where Galvayne's groove has started (see section on indicators). This individual has a distinct hook on the posterior ventral aspect of this tooth (also see indicators). The dental tables of the lower centrals are round. The central enamel of each lower incisor forms a small ring close to the lingual border; the dental stars are narrower transversely and near the center of the dental table.

Twelve Years



This individual's centrals appear slightly shorter than the adjacent intermediates when viewed from in front. In profile, the upper corner should be slightly taller than wide and have evidence of a Galvayne's groove at its apex. The dental tables of the centrals should be round to triangular. The central enamel may be disappearing and the dental star is seen as a darker stained area of secondary dentine near the center of the tooth.

Thirteen Years



Viewed from in front, the appearance is similar to that of 12 years. Many individuals at this age begin to exhibit a shrinking of the size of the upper centrals as compared to the intermediates. In profile, the upper corner is definitely taller than wide with a Galvayne's groove extending approximately $\frac{1}{3}$ down from the apex (see indicators for accuracy). The dental tables of the lower centrals resemble a triangle in shape. The central enamel should be disappearing from the centrals. The dental star is similar to age 12. Remnants of cups are still evident in the corners of this individual.

Fourteen Years



Changes in all views become gradual and more variable as horses age through the next five to seven years which affects accuracy negatively. From in front the upper centrals usually are now shorter. In profile, the upper corner may resemble age 13 but should be slightly taller and may have a Galvayne's groove that is near halfway down the labial surface. The dental tables may be unchanged from age 13. This individual appears to have remnants of cups in all six lower incisors.

Fifteen Years



Viewed from in front all the lower incisors may appear shorter than the uppers. The upper centrals will usually be smaller but not yet half the height of the intermediates. In profile, the upper corner is taller-than-wide with a Galvayne's groove that is somewhere near halfway down the tooth (variable). The shape of the dental tables of the lower central incisors should have a triangular appearance. The intermediates are round to triangular and the dental star is taking a central position in the lower central incisor.

Sixteen Years



From in front, this individual's lower incisors are smaller than the uppers and have a significant space between each tooth (aging change). In profile the incisive angle should begin to drift toward a less than 180° angle. As the upper corner becomes taller it may appear narrower (front to back) with increasing age. Galvayne's groove is highly variable but should extend past the mid-point of the corner. The surface of all lower dental tables will generally lack color except for the centrally located dental star. The dental star gradually replaces the enamel ring from central to corner incisor.

Seventeen Years



Viewed from in front, the upper centrals are definitely shorter than the intermediates. In profile, the upper corner is taller than wide and Galvayne's groove (if evident) should extend about $\frac{3}{4}$ of the way down the tooth. The dental tables of the lower centrals and intermediates should appear triangular to biangular (see Indicators section). Each dental star is round and near the center of the tooth. Teeth may begin to appear more widely spaced (not evident on this individual).

Eighteen Years



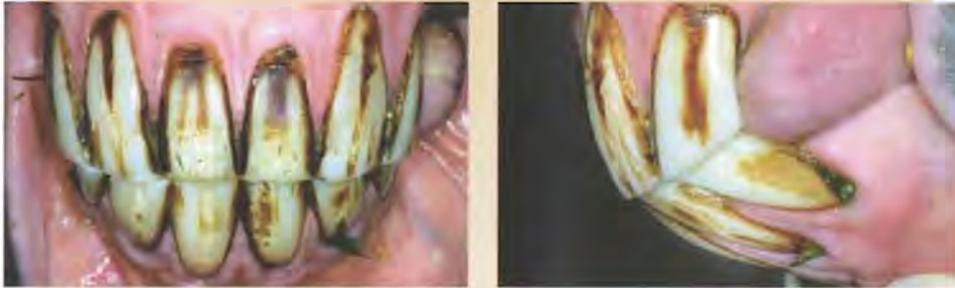
Changes in all indicators in the ages 15 to 20 will be gradual causing age estimation to be less accurate than in ages under ten. Viewed from in front, the upper centrals are smaller than the adjacent intermediates. In profile, the upper corner is tall with a Galvayne's groove that is past half-way and approaching the table surface. The dental tables are similar to the 17-year-old (usually exhibit minimal color) and show a single centrally located dental star.

Nineteen Years



The front and profile views will be similar to the 18-year-old. The most useful changes in the indicators may be in Galvayne's groove and the shape of the dental tables. The groove should extend nearly the full length of the corner tooth (may or may not have color). The dental tables of the centrals will no longer appear triangular but will have a more biangular (long lingual to labial) shape.

Twenty Years



Viewed from in front, the upper centrals should be obviously smaller than the intermediates. In profile, the upper corner tooth is tall with a Galvayne's groove extending the full length of the tooth. The incisive angle will be much less than 180° (see Indicators section). The dental tables of the lower incisors will have little or no color and the centrals will be oval to biangular in shape (labial to lingual). A single round shaped dental star will occupy the center of the tooth.

Glossary of Terms

Cup – The dark or dark-brown to black cavity in the infundibulum surrounded by enamel ring.

Deciduous Teeth – Temporary, fetal, milk or baby teeth. They are characterized primarily by their smaller size, constricted neck, and shallow cup.

Dental Star – The darker dentin that fills the pulp cavity as the tooth wears. It is dark yellow to yellowish-brown.

Dental Table – The table, masticatory or occlusal surface.

Eruption – Pertains to the period when a tooth breaks through the gum.

Galvayne's Groove – The longitudinal depression on the labial surface of the upper corner (I_3) incisor. The cementum remains in the groove as a dark line; the rest of the surface is worn to expose the white enamel.

Incisor Teeth – Starting at the midline incisors are designated as centrals (I_1), intermediates (I_2) and corners (I_3).

Infundibulum – The deep invagination of enamel which is filled with a variable amount of cement. Commonly referred to as the "cup."

Labial Surface – Surface toward the lips.

Lingual Surface – Surface toward the tongue.

Permanent Teeth – Second dentition or adult teeth.