Utilizing Cheek Teeth Angle of Occlusion to Determine Length of Incisor Shortening

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A method to determine how much incisors should be shortened in horses when excessive incisor length prohibits proper molar (cheek teeth) occlusion. Author's address: Southwest Virginia Veterinary Service, Rt 1 Box 2, Lebanon, VA 24266. © 2002 AAEP.

1. Introduction
Incisors that are normal in shape and occlusion (Fig. 1), but are too long from lack of usual wear, should be shortened to allow additional (normal) molar (cheek teeth) occlusion. This paper describes a simple, logical method for determining how much incisors should be removed.

2. Normal Cheek Teeth Function
The mandible opens and moves laterally to initiate molar arcade contact for grinding food. Next, the mandible moves medially and the molar arcades remain in contact until the incisors touch. The approximate distance the mandible moves laterally can be divided into percent molar contact and percent incisor contact.

As the percent of the lateral excursion when incisors remain in contact increases, the percent molars are in contact decreases. In some horses, molars remain in contact for such a short distance that the horse is unable to adequately grind food. This percent molar contact has been described as 30% or less.

When cheek teeth erupt, the chewing surface is irregular but essentially flat; the normal occlusal angle is not present. This angle is created by lateral chewing contact and anisognathic relationship of the upper and lower cheek teeth arcades. The normal angle is 10–15°.

The author's preferred method for checking molar occlusion is to start with the mouth in the neutral or

Fig. 1. Normal incisors in resting or neutral position. Incisors are flat and parallel to ground when held at eye level.
resting position and push the mandible laterally until the molars touch. This position represents the last point of molar contact when the horse is chewing as the test is reverse of normal chewing motion.

Next, I push the mandible laterally an additional 1–2 cm while listening for cheek teeth grinding and checking incisor separation.

Distance traveled to molar contact may be measured or simply charted on dental records as a mark on the upper incisor arcade (Fig. 2). Most horses

Fig. 2. Mandible has been moved to the left until the left upper and lower cheek teeth touch. Distance is two thirds of the width of the upper incisor (blue marks). Distance to contact is same for both sides. Center of the mandible is a guide (red arrow).

Fig. 3. A normal 8-yr-old horse, with mandible pushed to both sides to molar contact. A slight difference in distance is normal.

Fig. 4. The horse shown in Fig. 3 at age 15. Distance to molar contact has decreased slightly in 7 yr, but the mandible still has to move slightly further on the left side before the molars touch.

Fig. 5. Yellow lines illustrate the approximate angle on molar arcades. There is slightly more separation on the right side. This is also a normal variation.
will have molar contact by $0.50-1.25$ the width of the upper central incisors $101/201$. The measured distance will vary with age because the width of $101/201$ decreases with age. A 4-yr-old’s $101$ may be $1.9$ cm wide while a 22-yr-old’s $101$ can be $0.9$ cm wide. The author has measured distance to molar contact from $5-1.7$ mm in horses with adequate cheek teeth occlusion.

Fig. 3 shows a normal 8-yr-old horse, with mandible pushed to both sides to molar contact. Fig. 4 shows the same horse at age 15; Fig. 5 shows the same horse as in Fig. 4 with the mandible pushed about $1$ cm further laterally past initial molar contact. This horse is floated annually and has never had incisors shortened. A (imaginary in practice) line (yellow line, Fig. 5) is drawn from the upper incisors, beginning at initial point of molar contact, extending to the center of the mandible. This line represents the occlusal angle of the cheek teeth.

3. Shortening Incisors

The decision to shorten incisors should not be arbitrary or based solely on how far the mandible moves to molar contact. Body condition, chewing ability (dropping grain or quidding), fecal fiber length, and residual molar reserve crown are factors influencing the decision.

When the center of the mandible moves past the center of $102/202$ (Fig. 6) and/or the percent molar occlusion is close to $30\%$ or less, consideration should be given to shortening incisors. The majority of horses will never need their incisors shortened. Horses that do not wear their incisors sufficiently to preserve normal molar occlusion will need incisor shortening only once. Horses requiring incisor shortening are usually over 12 yr of age.

Removing a slight unevenness or bump on the incisors is not considered incisor shortening.

Techniques described for shortening incisors include observing the space between the molar arcades and estimating how much incisor length to remove, followed by cutoff wheel removal of excess incisor. Nippers and forceps have been used, sometimes with adverse consequences. The disadvantages include removing too much incisor and creating a space between the incisor arcades, opening an incisor pulp cavity or fracturing a tooth. Removing $1$ mm at a time and observing the results is a safer method of incisor shortening.

An estimate can quickly be made of how much to shorten incisors. The normal tilt or slope of the molar arcades is $\sim 15^\circ$. This angle is used to estimate incisor shortening. When the mandible is
moved 1 cm lateral to the initial point of molar contact the space between the incisors will vary, in most horses, from 3–5 mm. If the molar table angle is less than 15° the separation will be smaller, if more than 15° the space will be wider.

Figure 7 shows the range of incisor separation per 1 cm lateral excursion past initial molar contact. Horses over 4 yr of age tend to group around the 3–4 mm range. These measurements can be easily made by one person.

The molar table angle represents the hypotenuse (C) (Fig. 8) of a right angle triangle where A and B are the other two sides. Imagine this triangle inserted in the space between resting molar arcades (Fig. 8). The purpose of incisor shortening is to decrease the distance to molar contact (horizontal line B, Fig. 8) by shortening incisor length (vertical line A, Fig. 8).

4. Results
In a true right triangle where $A^2 + B^2 = C^2$ and the angle at the intersection of B and C is 15°, if the length of A is 1, then the length of B is 3.7 (Fig. 9). This relationship is the basis for estimating how much to shorten incisors. Lateral excursion of 1 cm past molar contact should cause the incisors to separate 2.7 mm. (10 mm divided by 3.7 = 2.7, i.e., give line B a value of 1 cm and line A a value of 2.7 mm.) Given the lack of precision of measuring excursion distances, this formula compares well to the measured incisor separation of 3–4 mm per 1 cm lateral excursion past molar contact.

5. Discussion
This trigonometric rule allows practical application to incisor shortening. If the clinician needs to

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**Fig. 8.** Imaginary triangle inserted between resting molar arcades. Line A is incisor height. Line B represents distance to molar contact. The red and yellow lines represent the molar occlusal surfaces in the resting position.

**Fig. 9.** A right triangle where the angle at the intersection of B and C is 15°, $A = 1$, and $B = 3.7$. 
shorten lateral excursion to molar contact by 1 cm, about 3–4 mm needs to be removed from the incisor occlusal surface, not 1 cm. Put another way, for each millimeter incisor length removed, the distance to molar contact will decrease by about 3 mm.

References


