Hard Palate Depth in Horses

Oral Health Charting in Koalas

Bilateral Dentigerous Cysts in a Dog

Extraction of Maxillary Molar Teeth in the Dog

Commissurotomy for Extractions in a Dwarf Miniature Pony

Practical Application of the Total Mouth Periodontal Score System
**Introduction**

The performance horse often represents the bulk of the equine veterinarian’s case load. The smallest issues of discomfort must be addressed in order for the performance horse to compete at the top level. Trainers and riders may complain of subtle lameness, decreased performance, or behavioral problems. These issues are often attributed to proximal suspensory disease, hock pain, ill-fitting saddles, or sacro-iliac disease; and more recently, dental disease.

Although routine dental care is commonplace, and dental disease relating to the teeth is now more often addressed in veterinary medicine, the remaining oral cavity is often ignored. It has been stated that: “the use of a bit and the manner in which it is a adjusted within the horse’s oral cavity have implications not only in the performance arena but also for equine welfare.”

The horse is controlled and balanced through pressure exerted by the rider’s legs on the horse’s side and hands on the horse’s mouth. The pressure from the rider’s hands is transferred to the horse through the reins, bridle and bit. The bit places pressure on the horse’s tongue, bars of the mandible, hard palate, the poll, the commissures of the mouth and side of the cheeks. It has been written that “the tongue and the hard palate are the most sensitive and the most responsive to subtle rein pressure.”

Bits have been associated with severe tongue lacerations and periostitis of the bars of the mandible. Although damage to the palate due to bitting has not yet been documented, recent papers have discussed the importance of the palate in bitting. Unfortunately, radiography cannot completely show the relationship of the bit to the hard palate as the oral mucosa is not clearly represented. Molds of the hard palate in 50 horses were taken and measurements showed significant variations. However, this method of measurement would not be practical for the owner or equine practitioner. Another study documented the position of six different bits in the oral cavity of eight horses. It was noted that the “differences between bits in shape and orientation of the mouthpiece affect the proximity of the bit to the palate and cheek teeth.” This study focuses on the depth of the equine hard palate in order to establish a normal reference range for palate depth and its association with age, sex, and breed of the horse.

**Materials and Methods**

An oral examination was performed on 52 horses. The horses were sedated with butorphanol tartrate (0.01 mg/kg), detomidine hydrochloride (0.01mg/kg), and xylazine (0.1mg/kg) intravenously. A Conrad speculum was placed on the horses and their heads were placed on a head stand. The depth of the palate was measured using a newly designed device. The device was placed in the mouth just rostral to the right (106) and left (206)
maxillary second premolar teeth and the center sliding piece was pushed up until the tip just touched the hard palate mucosa (Fig 1). The horses’ sedation was then reversed with 400 to 800-mg of tolazoline hydrochloride intravenously. The age, sex, and breed were recorded for each horse.

Palate measurements were compared to age, sex, and breed using multiple statistical analyses. A whisker box plot was used to compare sex and breed to the hard palate depth. Palate measurements were then compared to age, sex, and breed using multiple statistical analyses. Palate measurements were compared between the following breeds: Quarterhorses (QH), Thoroughbreds (TB) and Other (grouping all other breeds) using an analysis of variance (ANOVA). Furthermore, palate measurements were compared between female and male (gelding and one stallion) using a student’s t-test. Lastly, a linear regression was used to test for a relationship between age and palate measurements. A P value of < 0.05 was considered statistically significant for all tests.

Results

Palate measurements ranged from 0.5 to 2.7-cm (Fig. 2). The ages of the horses ranged from three years to 29-years (Fig. 3). There was no correlation between palate measurement and both breed and sex (Fig. 4). There was no association between palate depth and age (Fig. 5). Overall, all statistical tests resulted in P values > 0.05 indicating that the palate measurements did not correlate with age, sex, or breed in the 52 horses evaluated. However, reference ranges were established based on the measurement data (Fig. 6).

Discussion

The results reveal that there is a large range of palate depths in horses. Using the 52 horses in this study, a normal reference range was established for palate depth. These reference ranges can be used by veterinarians to aid in bit selection for their patients. Palate measurement may be added to routine dental evaluations in order...
to establish if the horse may be predisposed to bitting problems because of a “high” or “low” hard palate.

Although the research shows that palate depth varies greatly between horses, it is not yet possible to conclude that palate depth is associated with behavioral problems or decreased performance in the horse. Furthermore, although two horses may have similar oral anatomy and use the same bit, they may not react similarly to the bit’s effects since each horse likely has different pain tolerance. It does, however, encourage further research to determine if palate depth is involved in these problems and palate depth should play a role in selecting a bit for the performance horse. Unfortunately, radiography cannot completely show the relationship of the bit to the hard palate as the oral mucosa is not clearly represented.6

The device created and used in the study reported here could easily be used in the live horse with the aid of only a speculum. However, sedation is necessary in most horses necessitating the assistance of a veterinarian.

In conclusion, since the range of palate measurements is not associated with any age, sex or breed of horse, measurement of each individual horse is required. The results of this study underscore the need for a thorough oral examination in all equine patients especially when abnormalities attributed to bitting are suspected. The established normal reference ranges can be used by veterinarians to aid in bit selection for their patients. Palate measurement may be added to routine oral evaluations in order to establish if the horse may be predisposed to bitting problems due to a “high” or “low” palate; or may be used to select the ideal bit for each horse’s unique oral anatomy.

The device created and used in the study reported here could easily be used in the live horse with the aid of only a speculum. However, sedation is necessary in most horses necessitating the assistance of a veterinarian.

In conclusion, since the range of palate measurements is not associated with any age, sex or breed of horse, measurement of each individual horse is required. The results of this study underscore the need for a thorough oral examination in all equine patients especially when abnormalities attributed to bitting are suspected. The established normal reference ranges can be used by veterinarians to aid in bit selection for their patients. Palate measurement may be added to routine oral evaluations in order to establish if the horse may be predisposed to bitting problems due to a “high” or “low” palate; or may be used to select the ideal bit for each horse’s unique oral anatomy.

**Author Information**

From the University of Georgia Field Services and Theriogenology, 1303 Brightwood Drive, Savannah, GA, 31406; and, the University of Georgia Veterinary Teaching Hospital (Lowder), Department of Large Animal Medicine, 501 DW Brooks Drive, Athens, GA, 30605.

Email: rparsonsgay@gmail.com

**Acknowledgements**

The authors wish to thank Michael Flint Buchanan MEd, MFA; Roy D. Berghaus DVM, PhD, MS, BS; Diana Hartle MLS; Deborah Keys, PhD for their assistance with this study.

**References**