Performance Horse Dentistry: New Concepts in Oral Equilibration

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Importance

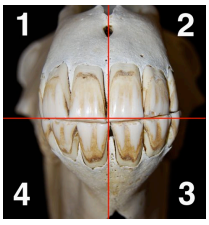
- Equine Dentistry
  - ~10% of equine ambulatory practice
- Traditional view
  - Difficult but necessary task
- Renewed interest
  - Older horse population
  - Good sedatives & improved equipment

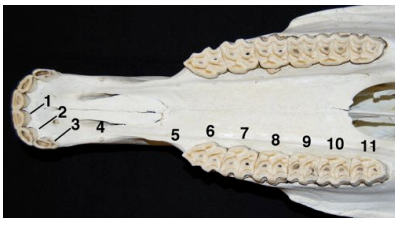
Anatomy

- Equine Teeth
  - Hypsodont (long reserve crown)
- Adult horse
  - 12 Incisors
  - 4 Canines
  - 16 Premolars
  - 12 Molars

36 - 44 teeth

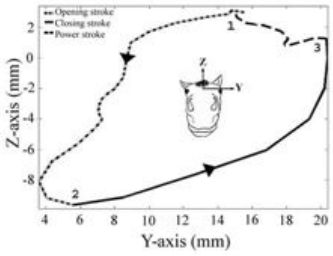
Triadan Nomenclature





Chewing Cycle

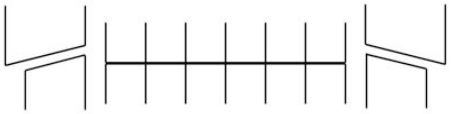
- Opening stroke
  - Fully closed to fully open
- Closing stroke
  - Fully open to most lateral position
- Power stroke
  - Most lateral to fully closed



Adapted from: Bonin et al., AJVR 2006

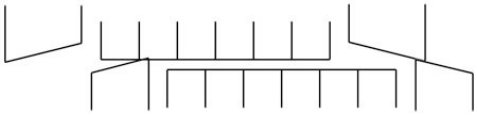
Chewing Cycle

Neutral position



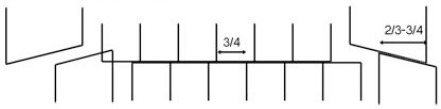
Power Stroke

Power Stroke - beginning



Power Stroke

Power Stroke - end



Key Points

- Maintenance of a normal occlusal pattern requires the entire occlusal surface of the cheek teeth to be worn evenly
- Any portion of arcade that does not contact opposite arcade develops overgrowths

What Are The Most Common Pathologies?

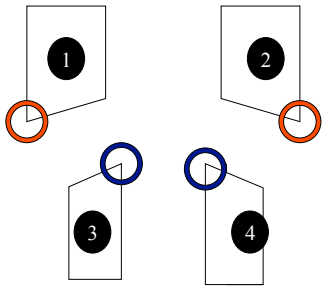
- Sharp points
  - Buccal aspect of upper cheek teeth
  - Lingual aspect of lower cheek teeth
- Cheek teeth malocclusions
  - Isolated malocclusions ('Hooks' & 'Ramps')
  - 'wave' mouth

How Common are Sharp Points?

- Becker (1942) – 1000 nonmilitary horses
  - 99.2% sharp enamel overgrowths
  - 78.8% buccal trauma
- Becker (1945) – 32,000 calvary horses
  - 91.7% enamel overgrowths

Why Do Sharp Points Occur?

- Mandibular dental arcade - straighter & narrower (~30%) vs. maxilla
- Lack of full occlusal contact
- Influenced by:
  - Mandible range of motion
  - Feed material



Feed Material

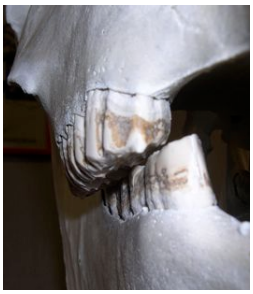
- Lateral excursion (grass> hay> grain)
  - i.e. more occlusal contact with fibrous material vs. grains
- Concentrate diets facilitate formation of sharp points

Bonin et al., AJVR 2006; Bonin et al., EVJ 2007

Key Point

- Dentistry is more than just removing sharp enamel points…
- Oral balance is important

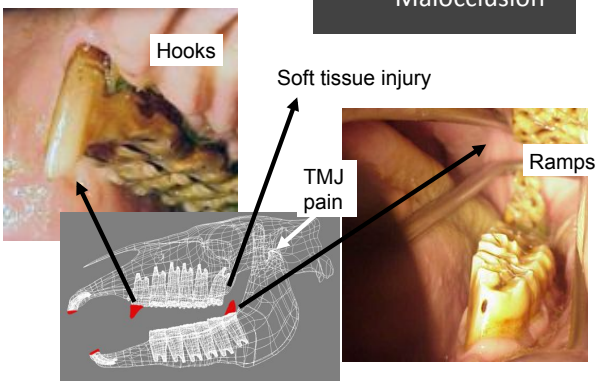
Oral Balance



Oral Imbalance

- Deviation from 'normal' anatomy
- Molars
  - Portion of tooth (hooks, ramps)
  - Entire tooth ('step')
  - Several teeth ('wave')
  - Entire arcade ('shear')
- Incisors
  - Overlong
  - Uneven (diagonal bite)

Malocclusion



Step Mouth

- Single tooth or focal overgrowths
- Individual CT super-eruptions

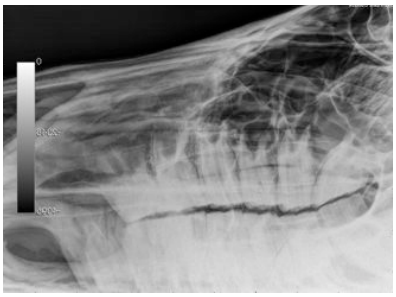
Wave Mouth

Normal

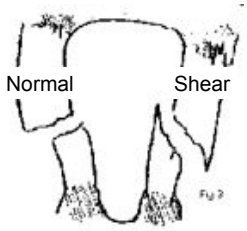
Wave complex

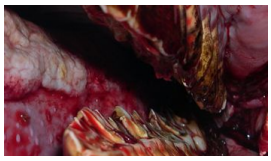
Undulating appearance of the occlusal surface in a rostro-caudal plane

Wave Mouth



Shear Mouth

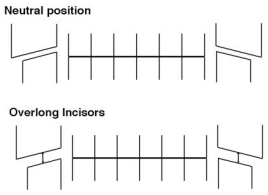




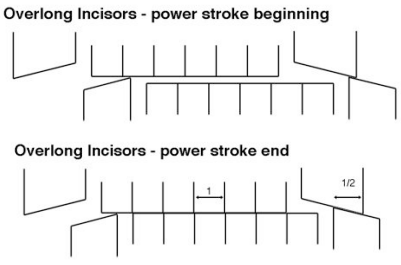
- Excessive angulation of the CT occlusal surface (>30°) in the buccolingual plane

Overlong Incisors

- Large than 'normal' gap between cheek teeth
  - Normal = 2-3 mm
- Decreased molar contact



Overlong Incisors

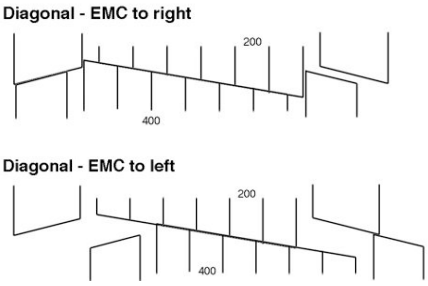


Uneven Incisors

Diagonal Incisor Malocclusion

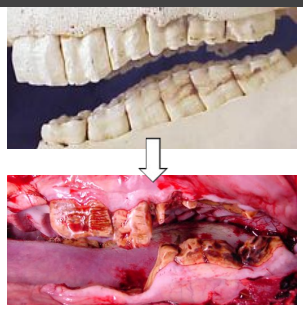
- Diagonally opposite incisors are excessively long
- Plane rotated about horizontal axis
- Mandibular offset

Diagonal Incisor Malocclusion



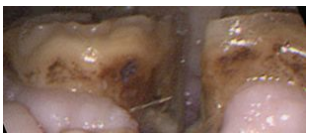
Consequences of Oral Imbalance

- Diastema
- Periodontal disease
- Oral pain
- Weight loss
- GI impaction or choke
- Sinusitis



Diastema

- Abnormal space between teeth
- Valve or open
- Food pocketing
- Periodontal disease



Periodontal Disease

- Restriction of normal side-to-side chewing movements
- Dental overgrowths → mechanical hinderance & gap formation
- Disruption of normal food & saliva circulation → stasis

Dixon P.M., et. al., EVJ 2000

Sinusitis

How Common are Malocclusions?

- Clinical cases 42% (44/104)
  - Age range 3-34 yrs; median 10 (Dixon et al., 2000)
- Post mortem studies (Wafa et al., 1988)
  - Abnormalities of wear
    - 17.2% overall incidence
    - 47.5% in horses over 20 years
  - Most cases had accompanying periodontal disease

Brosnahan et. al. 2003. JAVMA Demographic and clinical characteristics of geriatric horses: 467 cases

How Often Do We Look?

- Geriatric horses (20-29 yrs) (Brosnahan et al., 2003)
  - Presented for other medical reasons
  - 8% (37/467) had a dental examination
  - 50% had a wave mouth
- Associations
  - Severe CT arcade disorders & choke, large colon impactions, maldigestion of whole-grain cereals

Brosnahan et. al. 2003. JAVMA Demographic and clinical characteristics of geriatric horses: 467 cases

What Are The Signs of Malocclusions?

- Quidding – 70%
- Weight loss – 38.6%
- Bitting problems / abnormal head carriage – 31.8%
- Halitosis – 18.2%
- Periodontal disease – 72.7%
- No clinical signs – 11.4%
- **Clinical signs only develop when problem is severe**

Dixon et al., 2000

How Do Malocclusions Occur?

- Etiology largely unknown in majority of cases
- Hypothesis
  - Disharmony in rates of eruption & attrition
- Overlong tooth
  - Decreased attrition or increased rate of eruption, or both
- Short tooth
  - Excessive attrition or decreased eruption, or ankylosis of alveolar bone & PDL

Vicious Cycle

- Exaggerated attrition & eruption
  - Forces of a magnitude greater than normal
  - Focused on specific arcade segments
- Dental interlock
  - Vicious cycle of ever increasing forces that can not resolve without outside intervention

How Do We Correct Malocclusions?

- Economically & technically feasible procedures & materials do not yet exist for rebuilding the excessively worn tooth to a normal occlusal level
- An overlong tooth is easily addressed via routine occlusal equilibration

Goal of Correcting Malocclusions

- Return of full even occlusion
- Normal mastication range of motion
- Benefits
  - Exaggerated rates of eruption are reduced
  - Normal range of motion → forces spread more evenly across arcade

Principles of Treatment

- Remove sharp points
  - Upper - buccal
  - Lower – lingual
- Balance the mouth
  - Reduce the tall tooth / teeth
- Take specific teeth out of occlusion
  - Unopposed tooth erupts 2-4 x faster

Easley J. In: Corrective Dental Procedures; Equine Dentistry. 2005

Oral Examination

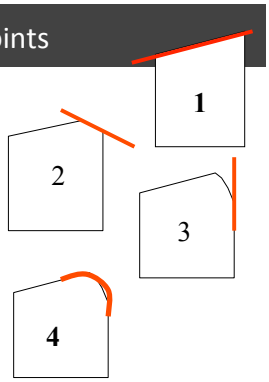



Dental Prophylaxis

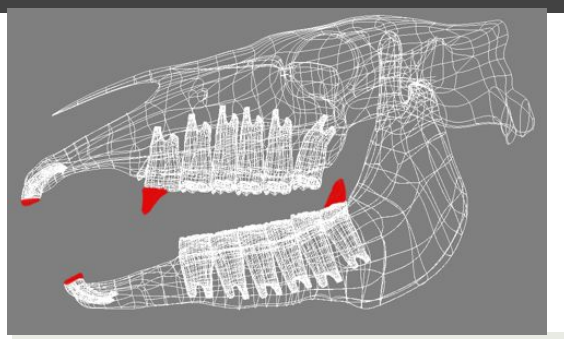
- Removal of sharp enamel points
  - Swedish study – bit in mouth → higher rate of ulceration
- Enamel projections
  - Hooks, beaks and excessive transverse ridges

Tell et. al., Vet J 2008

Removal Of Sharp Points

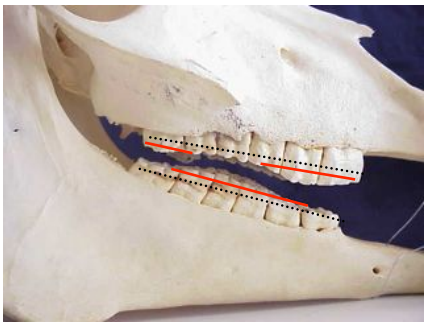


Malocclusion example - 'Parrot Mouth'



Parrot Mouth

Malocclusion example - Wave Mouth Correction



Wave Mouth Correction Process

Do We Need to Reduce Incisors?

- How much cheek teeth occlusal reduction was performed?
- What is the cheek teeth gap & excursion to molar contact
- Should return to 'normal' for that horse (i.e. what you started with)

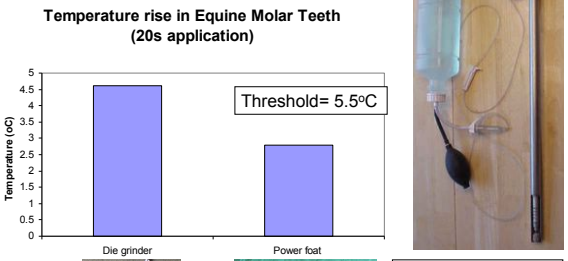
Do We Need To Treat Periodontal Disease?

- Following wave mouth correction, in most instances periodontal disease resolves
  - Strengthening of periodontal ligament → tightening of tooth
- How much PDL is involved?
  - Severe cases may necessitate CT extraction

Instrumentation

- Hand floats
  - Tungsten chip
  - Carbide
- Power equipment
  - Reciprocating blades
  - Rotating diamond wheels

Heat Production



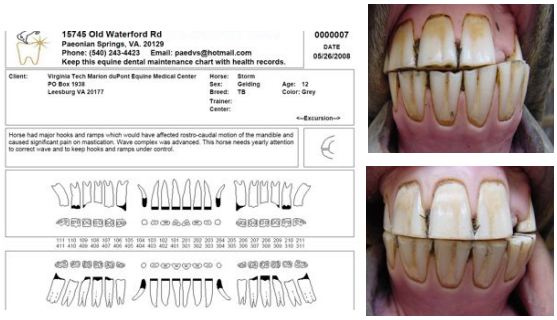
Water Cooling =
No °C change

Wilson et. al., AVJ 2005

How Can We Prevent Malocclusions?

- Young horses (1-5 years)
  - 6-8 months
- Middle aged (6-15 years)
  - 12 months
- Geriatric (16+ years)
  - 6-12 months
- Cost of prevention is less than corrective procedures!!

Dental Records



Evidence Based Equine Dentistry

- **Does prophylactic dentistry improve performance?**
  - Wileweki et. al., - improved athletic performance and responsiveness to the bit in 20 horses post dental floating
  - Carmalt et. al., - no improved performance (dressage)
- Rostro-caudal movement of mandible is improved

Wileweki KA et. al., Equine Practice 1999 21, 16; Carmalt et. al., J. Vet. Dent 23(4) 2007

Evidence Based Equine Dentistry

- **Does prophylactic dentistry affect weight loss or gain?**
  - Gatta et. al., demonstrated a positive influence of corrected teeth on digestibility
  - Ralston et. al., - no effect

Gatta D., et. al., In: Proceedings 14th Symposium Equine Nutrition and Physiology Society 1995
Ralston S.L., et. al., EVJ 2001;33(4):390-3

Malocclusions Eventually Cause Problems

Conclusions

- Regular prophylactic dental care
  - Performed throughout life will prevent problems from occurring
  - Spare older patients from oral pain & promote better quality of life
- Dentistry is more than floating!!

Questions

Acknowledgements:

Tony Basile CEqDT

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