

Treatment of Equine Diastemata¹

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Introduction

Diastemata (singular diastema) are abnormal spaces between teeth. Diastemata can be classified as open or closed (valved).¹ Open diastemata allow food to enter and leave. Closed diastemata allow food to enter but not leave, leading to periodontal disease. Diastemata are generally limited to cheek teeth, but occasionally incisors are affected. Food packed into these spaces leads to fermentation and putrefaction, which results in periodontitis. Pain, hyperemia, and gingival recession can be seen early in the disease process. Treatment at this stage (stage 1 periodontitis) can prevent progression of disease and result in restoration of normal tissue. Treatment options include removal of the trapped food, using a combination of dental picks and water sprays, CCthen instilling antibiotics into the PP, and diastema widening. Diastema widening (or burring) is a technique designed to widen the interproximal spaces between teeth to promote 'cycling' of feed through the space, thus preventing fermentation.²

Periodontal Disease

Periodontal disease (PD) is inflammation of tissue around the tooth and is associated with gingival recession, destruction of periodontal ligament, cemental erosion, and alveolar bone resorption. Tooth loss is the eventual outcome of untreated periodontitis. The incidence of PD is 40 per cent in horses 3 to 5 years old, decreases in horses 5 to 10 years old, and gradually increases to a prevalence of 60 percent in horses 15 years and older.³

Causes of PD include retained deciduous teeth (caps), malerupted (crooked) teeth, exaggerated transverse ridges, prominent cinguli, and malocclusions, such as hooks, ramps, wave- or step-mouth. Idiopathic periodontal pocketing (PP) is not uncommon.

PD is divided into four categories or stages.

Stage 1. Gingivitis with hyperemia and edema (Fig. 1).

Stage 2. Erosion of gingiva between 5 and 10 mm and the presence of periodontal pocketing (PP) (Fig. 2).

Stage 3. Gum loss and pocketing exceeds 1 cm in depth (Fig. 3).

Stage 4. PP exceeds 3 cm, loss of alveolar bone, tooth loosening or loss (Fig 4).



Figure 1. Stage 1 PD. Yearling draft-cross filly with food packed between incisors. Hyperemia of gingiva at interproximal space (IPS). Ulceration of the gingiva between 501/601, 802/801, 801/701,701/702.



Figure 2. Stage 2 PD. Left picture. A 12-year-old Thoroughbred with food material packed at 207/208 IPS. Gingival pocket was 7 to 8 mm deep. Right picture, 15-year-old warmblood, with food packed on palatal side of 208. Gingival erosion with 5-6 mm pocket.

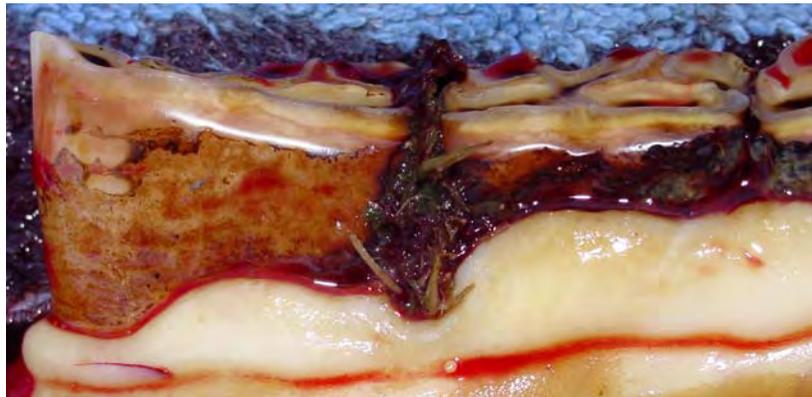


Figure 3. Stage 3 PD in a 25-year-old Quarter horse. Diastema between 306/307. Gingival erosion, cemental erosion, and a periodontal pocket that extended 1 cm below the lowest gingival margin. Both affected teeth were firm.



Figure 4. Stage 4 PD. Left photograph. A 25+- year-old, breed unknown. Tooth 208 primarily was affected. Pocket extended dorsally 2-3 cm. Minimal periodontal ligament attachment was left. The tooth was easily moved with fingers and should be extracted. **Right photograph.** A 28-year-old Saddlebred. Diastema between 106/107 was 4-5 mm wide. 107 was loose and had almost no gingival or ligamental attachment and was extracted. The low portions of the tooth visible at 106/7 and 107/8 IPS suggested that the cause of periodontal disease was overwear by opposing teeth the opposite arcade.

Horses with early PD may be asymptomatic. Signs of advanced PD include dysmastication, weight-loss, halitosis, and quidding. Intermittent halitosis is frequently the owner's only complaint.

Diagnosis of PD

A good history and a thorough oral examination are required to determine the extent of PD. Good illumination and an intra-oral mirror are recommended. The clinician should always wear latex or nitrile gloves while working in the equine oral cavity. Horses should be sedated for examination because horses with early PD may react aggressively when pockets are explored. The location, stage, depth, and estimated duration of PD should be documented. Diastema formation may begin lingually (palatally) or buccally, usually with a small PP trapping food at the interproximal space (IPS) (Fig. 2, left photo). Small pockets may be difficult to locate visually, but digital examination of the gingiva and all IPS's can expose PD transferring the odor to the glove, which can then be sniffed by the examiner.

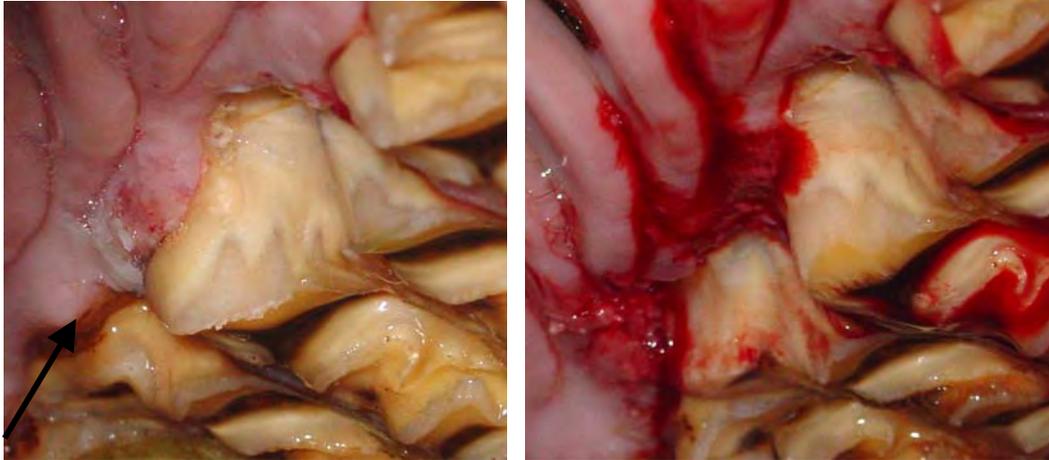


Figure 5. [Same horse as in Fig 2, right photo.] Left photograph. Palatal side of 208 was burred smooth. After cleaning the region, a small PP (5-6mm) was seen at 208/209 IPS. Notice the slight discoloration of gingiva at the IPS (arrow). Right photograph. Pocket was abraded with an 8-mm diameter oval burr on a Powerfloat®. This horse had no malocclusions. Abraded gingiva healed and reattached in 1 to 3 weeks. This type of contouring cannot be done with hand floats.

Treatment

Horses with Stage 1 or 2 PD respond well to mild abrasion of the pocket and correction of malocclusion. Gauze wrapped around a finger usually provides sufficient abrasion. Abrasion should stimulate gingival hemorrhage. The pocket should be flushed clean with water from a hose or with dilute chlorhexidine solution administered using a pump-up hand sprayer. Periodontal pockets at IPSs should be smoothed and beveled slightly (odontoplasty) to prevent channeling of food back into the pocket (Figs. 5 and 6). A small gap or crevice (1-2mm) may exist at the IPS. The crevice usually does not penetrate far into the IPS, and smoothing out the crevice stops feed from filling this defect. Apply powered metronidazole tablets to the PP after abrasion and odontoplasty is completed. An antiseptic solution that can be used for lavage by the owner is 10 mL of 2% chlorhexidine gluconate in 1 gallon of water.⁴ Chlorhexidine at this concentration causes minimal oral irritation.

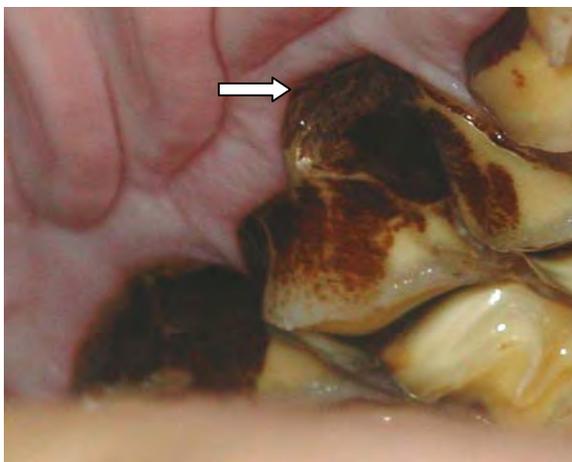


Figure 6. Same horse as in Figure 5 six months after treatment. Gingiva had healed, and 1mm of newly erupted tooth was visible below the gingiva (white arrow). The only treatment was abrasion, odontoplasty, and a single application of metronidazole.



Figure 7. Small PP on the palatal side of 108. The normal angle of the tooth edge has been removed, and the gingiva has been abraded. This was done using a solid carbide wheel on a Powerfloat®, but similar results can be achieved with careful use of hand floats. The angle created reduces chance of food repacking into the PP.

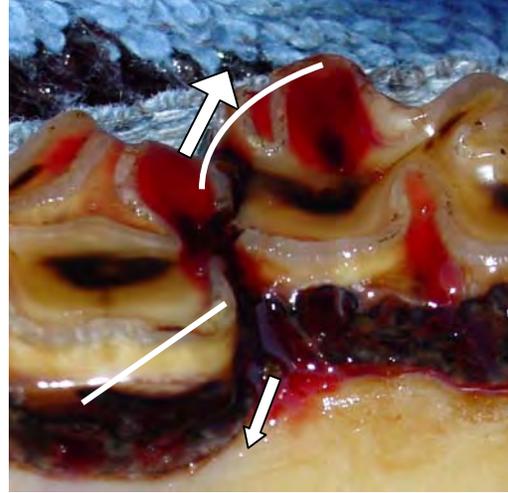


Figure 8. Occlusal view of 308/309 in a 25-year-old Quarter horse. Distal end of 308 deviated slightly buccally, and mesial end of 309 deviated slightly lingually (arrows), causing feed to collect in the IPS on each side of the teeth. The portion of protruding tooth was sloped back from the gingiva to the level of the adjacent tooth (white lines).

Flat contouring a tooth is difficult using hand floats, but it can be accomplished using a short (1-inch) solid carbide blade. Short strokes flatten the buccal or lingual (or palatal) side of the teeth in the affected region for a distance of 3 cm or less, depending on the skill of the operator. The gingiva is abraded slightly (Fig. 7). A scalloped area is impossible to contour using hand floats.

Eruption of cheek teeth that are rotated or offset to the saggital plane of the arcade creates divots at the IPS that may collect food (Fig 8). Food entrapment may be temporary or permanent. Odor from the crevice reveals if PD is present. Regardless, the part of the tooth that is diverging from the arcade should be smoothed and rounded to forestall PD development or progression.

Stage 3 PD

Horses with Stage 3 PD require more extensive odontoplasty. Migration of food material deep into the IPS creates gingival, cemental, and periodontal ligament destruction. The diastema may be present from the occlusal surface to below the recessed gingiva, or PD may be confined to a tract through the IPS (Fig. 9).



Figure 9. Diastema at 208/209 IPS. Food was packed completely through the IPS. The occlusal surfaces of the teeth at the IPS were in contact.



Figure 10. Diastema at 306/307. The smallest cone burr is creating a V-shaped groove. The burr was inserted from the buccal side of the occlusal surface and rotated side to side while being pushing lingually. The burr is 6 mm at its base, and it extends just to the receding gingiva.

Food should be removed with a thin dental pick, a long-handled alligator forceps, and water flushes. The Powerfloat®⁵ is the instrument of choice for widening the diastema. Operated at ½-speed (2000 rpm), excess heat produced is minimal. The tooth should be flushed with water after 20 to 30 seconds of burring. Thirty seconds is usually enough time to burr through an IPS. The burring procedure is easily learned, and the burs can be used for other odontoplasty techniques.

Three burs are used to completely groove the diastema: a narrow cone, a slightly larger cone and a cylinder.

- If the occlusal surfaces are touching the small cone is inserted into the IPS at the gingiva, which is usually the widest portion of the defect.
- The cone is inserted from the palatal side when opening a diastema on the maxillary cheek teeth and buccal side when opening a diastema on mandibular cheek teeth.
- The point of the cone is rotated toward the occlusal surface, using the Powerfloat®⁶ at one-half speed.
- After the point of the cone has burred up through the occlusal surface, reposition the cone. Insert the cone from the occlusal surface with the point toward the apex of the tooth. The base of the cone will be resting on the occlusal surface.
- The burr is pushed toward the ungrooved side of the IPS, while being rocked back and forth, until it exits the other side of the IPS.



Figure 11. Picture at the left shows the groove created using the small cone. Picture at the right shows the groove created using the large cone. The groove can be burred without removing the feed.

- The burr is slid back and forth in the IPS until the groove is as wide and deep as the burr (Fig. 11).
- Establishing a groove across the IPS with the small cone requires the most time and care.
- Next, the large cone is inserted into the grooved IPS at the occlusal surface, and the procedure is repeated.
- Lastly, the cylinder burr is inserted into the IPS to create a uniform, 6-mm wide channel across the IPS. The 6-mm channel allows food to cycle in and out of the IPS (Fig. 12). The gingiva heals in 1 to 2 weeks (Fig. 13).



Figure 12. The finished gap is 6 mm wide. Tooth-to-tooth contact is present at the bottom of sulcus, preventing the exposed crowns from migrating to close the gap.



Figure 13. A 26-year-old pony with PD. The left photograph was taken immediately after burring IPSs 106/7 and 107/8. This photograph shows the typical amount of bleeding. Right photograph was taken 2 months after treatment. The mouth was flushed daily for 7 days with dilute chlorhexidine solution after burring. Signs of PD, quidding and halitosis, shown by this horse resolved within 4 days.

Post Burring Treatment

After the grooved IPS is flushed repeatedly, it is packed with metronidazole paste or a paste made from trimethoprim-sulfa tablets. The owner is instructed to flush the horse's buccal pouch once or twice daily for 7 to 10 days with a dilute solution of chlorhexidine, using an inexpensive garden pump-up sprayer with a plastic wand.

Stage 4 PD

Horses with Stage 4 PD are not good candidates for diastema burring. The loosening of the tooth in the alveolus from destruction of the periodontal ligament and bone resorption make extraction the best treatment. Opening the IPS by burring when Stage 4 PD is present usually fails to resolve the PD, and extraction of the affected teeth becomes necessary.

Sedation and Nerve Blocks

Adequate sedation is essential to minimize soft tissue damage when opening the diastema with a burr. Done correctly, minimal bleeding is encountered (Fig. 13). The author uses detomidine at .01 to .02 mg/kg and butorphanol at .01 to .02 mg/kg for a 500 kg horse administered together as an initial dose. Butorphanol decreases head motion without exacerbating the ataxia caused by detomidine. Nerve blocks are usually not needed but should be considered if the horse is fractious. A local anesthetic agent can be applied to the gingiva instead of administering a nerve block. A dangerously fractious horse may need to be anesthetized.

Case Studies

Table 1 shows horses treated by diastema burring and the results of treatment. The 7-year-old Appaloosa gelding had PD caused by malerupted 310 and 410 teeth. The horse was initially treated by reshaping the deviated teeth to prevent food entrapment in the IPS and by daily flushing of the buccal space by the owner. Healing did not occur until the diastema at 10/11 IPS was burred open.

Age	Breed	Sex	Position	No. Diastema	Signs	Results
17	Arab	F	107/8 207/8	2	none	sold
27	QH	G	208/9 308/9	2	quidding	resolved
29	QH	F	106/7 110/11 206/7 207/8 210/11 310/11 409/10 410/11	8	weight loss, quidding, odor	resolved resolved
25	chin pony*	F	106/7/8 110/11 208/9 410/11	5	quidding, odor	resolved
7	App	G	310/11 410/11	2	WT loss, quidding	resolved
25	QH	G	108/9	1	slow eating	resolved
22	TB	F	209/10	1	quidding, resists bit	resolved
11	QH	G	108/9 208/9	2	weight. loss, quidding	resolved
24	QH	G	108/9	1	quidding	resolved
26	QH	F	206/7	1	odor	resolved
26	Pony	G	407/8	1	odor	resolved
14	WB**	G	408/10	1	quidding, odor	resolved
25	ASB	G	109/10 409/10	2	quidding, odor	resolved

Table 1. Details of horses treated by burring of diastemata affected by PD. *Chincoteague pony. **PD resulted after 409 was extracted 4 years earlier, causing 408 and 410 to migrate together, trapping food.

Precautions

Exposing a pulpal horn during diastema burring is possible, but unlikely. Cheek teeth in the maxillary arcades have 3 pulp canals, and those in the mandibular arcades have 2 (except for the 6 and 11 teeth, which may have three canals) The pulps divide into 5 or 6 pulp horns as they extend toward the crown. Opening a horn could expose a pulp canal to contamination, causing septic pulpitis.

To date, I have not experienced any complications that could be associated with burring into a pulp horn. A study to determine the distance between the pulp horns and the rostral and caudal tooth edges suggested that entering a pulp horn during burring of a diastema is not likely.⁶ In this study, the distance between the pulp horns and the tooth's surface of

all the cheek teeth of 13 horses (1440 pulps) ranged from 3.51 mm to 19.71 mm (mean, 7.11 mm). Five horses, aged 5, 11, 13, 16-18, and 22 years old, had no detectable pulp in the crown above the alveolar bone of any cheek tooth. The location of the pulp cavity in the teeth of these 5 horses was indefinable, or only a pulp remnant. All pulp horns of three horses, aged 4, 7, and 11, were patent. The distance between 10 pulps (0.0069%) and the tooth's surface was 3 and 4 mm. Sixty seven pulps (4.65%) were 4 to 5 mm from the tooth's surface, and 19 of these pulps were only remnants. Fifty-three of the pulp horns (out of 77 total (68.83%)) that were between 3 to 5 mm from the tooth's surface were on the caudal end of the tooth. This suggests that slight caudal pressure should be applied while burring so that slightly more tooth material is removed from the mesial surface of the distal tooth.

Of the 1440 pulps measured, 94.65% were 5mm or more from the tooth's surface or were completely absent. Also, the frequent finding of crowns, with portions fractured off to the level of alveolar bone, that have no pulpal disease suggests that septic pulpitis is unlikely to be caused by burring diastemata.

The most frequent sequel of diastema burring is dysmastication for several days after burring, but I have observed dysmastication in only two of approximately 35 horses that I have performed the procedure on.

References

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