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PATHOPHYSIOLOGY OF BIT CONTROL IN THE HORSE

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SUMMARY

The use of one and often two bits, in traditional or *normal* horsemanship, constitutes a welfare problem, a hazard to health, and a handicap to performance.

- The bit method of control is invasive, physiologically contraindicated and counter-productive
- A bit frightens a horse and causes pain, suffering and injury
- It is often responsible for a horse's poor attitude to exercise and the source of over 100 behavioral problems in all types of equitation from dressage (eg., headshaking) to racing (eg., dorsal displacement of the soft palate).
- Horses are happier in a bridle without a bit
- The bit is a common cause of airway obstruction and abnormal inspiratory noise (stridor) at exercise
- If the speed of a racehorse is governed with a bit and rein traction this causes poll flexion, which in turn obstructs the airway and leads to premature fatigue, poor performance, and asphyxia-induced pulmonary edema ("bleeding").
- Measurement of jowl angle is recommended as an indicator of upper airway patency
- A bit triggers digestive tract reflexes, which are physiologically opposed to rapid breathing Horses are being expected to *eat* and *exercise* simultaneously, two activities that are mutually exclusive
- As the bit interferes with breathing and as breathing is coupled with locomotion, the bit also interferes with locomotion
- A horse that leans on the bit loses self-carriage and becomes heavier on the forehand. Its stride becomes shorter and, therefore, slower. In addition, greater stress is placed on the tendons, ligaments, joints and bones of the forelegs. In racing, this factor coupled with premature fatigue from whatever cause, renders breakdowns and fatal accidents more likely
- Resistance to the bit causes rigidity of the neck, which is incompatible with optimum performance. It reduces the effectiveness of some important energy conservation mechanisms. Human athletes need complete freedom of the neck and the horse is no different

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- The horse is an obligatory nose-breather. At exercise, a horse's lips should be sealed and mouth closed so that no air enters the digestive tract. A bit breaks this seal, air enters the oral cavity and elevates the soft palate in the oropharynx (throat)
- "Non-acceptance of the bit" includes problems such as buccal ulcers, wolf tooth sensitivity, pain during eruption of cheek teeth, bone spurs on the bars of the mouth, star fractures of the mandible, lacerations of the lip, tongue and gingiva, open mouth, tongue movement, tongue behind the bit, tongue over the bit, 'swallowing the tongue', 'flipping the palate', headshaking, fighting the bit, chewing on the bit, 'bit between the teeth', veering, boring and pulling
- The safety of rider and horse are imperiled when justifiable resentment of bit-induced pain, leads a horse to take the bit between its teeth and bolt

In the practice of *natural* horsemanship, rider/horse communication without a bit can be painless and free of stress. Painless communication leads to more effective control. In this way, the above problems can be either solved. A new design of bitless bridle, that is neither a hackamore nor a bosal, permits communication through gentle pressure that is distributed around the whole of the horse's head. It facilitates the humane, non-invasive and *natural* approach, and is applicable to both early and advanced schooling.

INTRODUCTION

In the practice of *normal* horsemanship, man has applied his greatest force at one of the most sensitive parts of the horse…its mouth. We have grown so accustomed to the bit method of control that its major physiological disadvantages have passed unrecognized. The bit constitutes an invasive method of control, for a body cavity is violated. Lack of awareness of an alternative has been a factor in the bit's long tenure. The objective of this article is to draw attention to the acceptable alternative of *natural* horsemanship and bitless communication.

The following criticisms of the bit apply particularly to its traditional usage in *normal* horsemanship. In this mode, it is customary to use one or more bits (often of significant weight and considerable severity) to govern a horse's speed by simultaneous traction (often of many pounds psi) on both reins simultaneously. Poll flexion is a significant part of control and bit pressure is often maintained over long periods. In addition, many riders use the reins as an aid to balancing in their seat.

In *natural* horsemanship, effective and painless communication can be achieved non-invasively, without a bit. If a bit is used it should preferably be confined to a snaffle, bit pressure should be transient and limited to 4 oz psi. from one rein at a time; poll flexion should not be achieved by means of a bit, and the rider should have an independent seat[1]. Under these conditions, a bit is less harmful but still contraindicated.

PHYSIOLOGICAL AIRFLOW AT EXERCISE IN THE HORSE AT LIBERTY

The atlanto-occipital joint can be thought of as a *respiratory joint*, as its position governs airflow. Movement of the joint is limited to flexion and extension. Its position correlates with jowl angle; the angle between the horizontal ramus of the mandible and the ventral line of the neck. Full extension of the atlanto-occipital joint corresponds to a jowl angle in the region of 150°, full flexion to about 30° and a neutral position to about 90°.

- *Full extension*. When galloping at liberty and at maximum speed, the horse's head and neck should, I believe, straighten out - like a swan in flight - and the horizontal ramus of the mandible come to lie almost parallel to the ground (Fig 1a and 2a).
- *Full flexion.* This position is unlikely to occur in the wild except transiently, as it is only suitable for quiet breathing. The nasal bone is vertical to the ground and the nasopharynx is maximally obstructed (Fig 1b, 2d and 3c).
- *Neutral.*. The position adopted when at rest with head erect and breathing slowly (Fig 2b,4a), or when walking (Fig 1a: inset).

With the aid of photography, jowl angle is an external and measurable indicator of the patency of the upper airway at exercise. It is a parameter that, in the past, we have overlooked and failed to document.

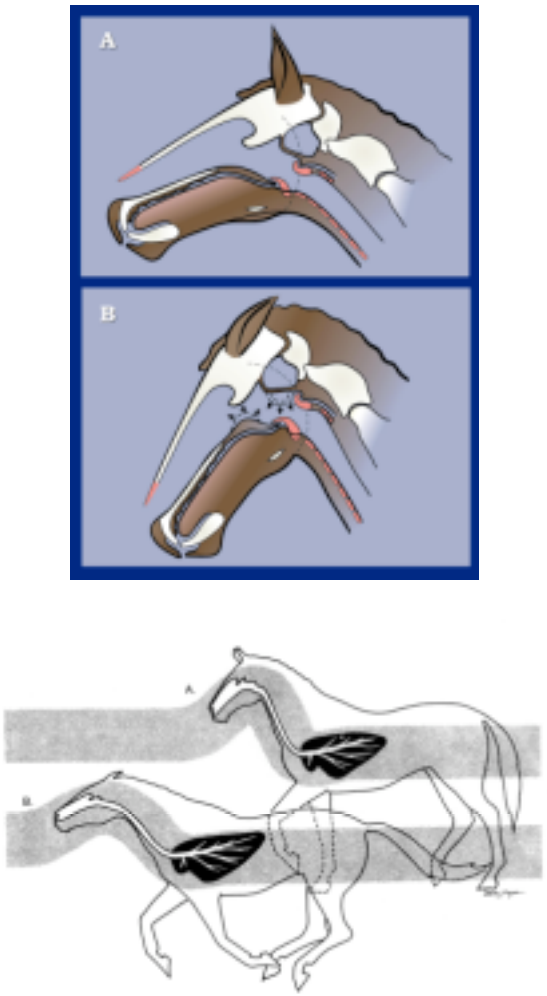
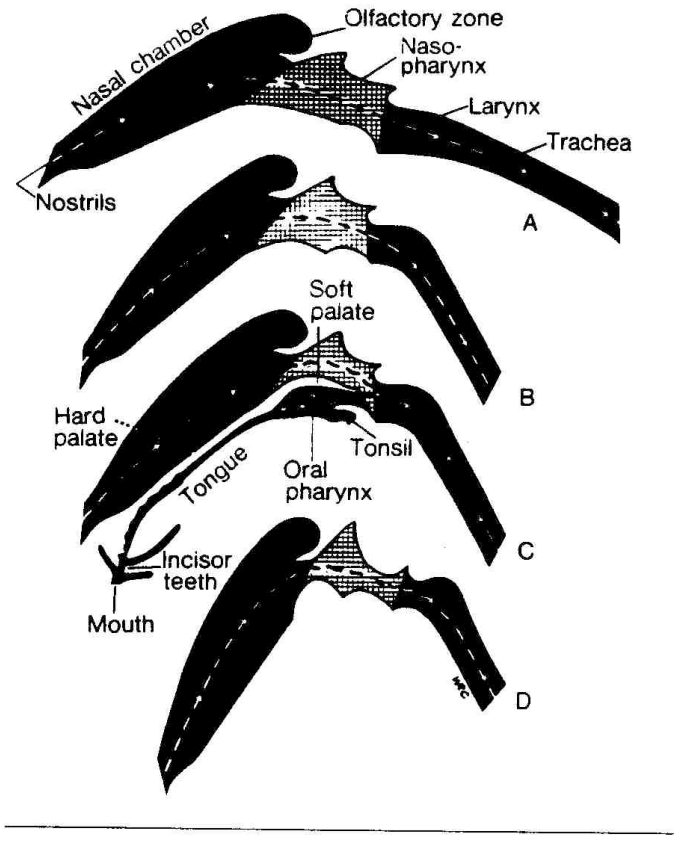


Fig 1. Showing the correlation between patency of the upper airway and the atlanto-occipital joint.
Key: White = bone; red = cartilage; brown = soft tissues

a) ***Full poll extension*** *(jowl angle 140°): The airway is fully patent (Fig 2a corresponds with this diagram). The soft tissue boundaries of the nasopharynx are stretched longitudinally, which helps them resist the otherwise collapsing force of inspiration. Below: Showing the entire airway at rest and its swan-like straightening at exercise*

b) ***Partial poll flexion*** *(jowl angle 70°): The airway is sharply bent and seriously obstructed. The soft tissues of the pharynx further collapse into the airway (see broken lines) during inspiration. This diagram corresponds to Fig 2d. If, as in dressage, the*

horse works with its nasal bone vertical to the ground (Fig 3c: full flexion) or, even worse, behind the vertical ('overbent'), the degree of airway obstruction would be even more severe.



a) ***Full poll extension***: *This airway corresponds to that shown in Fig 1a (jowl angle 140°). The nasopharynx is unobstructed and the area measurement is taken as representing 100%. The soft palate and epiglottis form a nearly level floor to the nasopharynx. The posterior nares are fully patent.*

Neutral position of the poll: *This airway corresponds to that shown in figure 4a (jowl angle 87°). The nasopharyngeal area is 90% of what it is when fully extended. This obstruction, therefore, represents a serious handicap for a racehorse.*

b) ***Neutral position with dorsal displacement of the soft palate***; *The nasopharyngeal area is 43% of potential and is severely obstructed. A bottleneck occurs at the posterior nares and leads to a cascade effect. The abnormally negative pressure on inspiration in the nasopharynx, increases further at every subsequent section of the airway between here and the lungs. In the nasopharynx, the negative pressure can cause the soft palate to rise even further and make contact with the roof of the nasopharynx, plugging the airway completely and causing the horse to choke. In the small airways of the lungs, where the negative pressure is at its most intense, it leads to asphyxia-induced pulmonary edema and so-called 'hemorrhage'.*[4]

c) ***Partial poll flexion***: *This airway corresponds to that shown in Fig 1b (jowl angle 70°). The nasopharyngeal area is 53% and, accordingly, inspiratory resistance is much more than doubled. The diameter of each posterior nares is probably halved. The airway will be at risk for the same problems described under Fig 2c.*

Fig 2. Showing the shape of the upper airway with the atlanto-occipital joint in three different positions (a, b, & d). The diagrams are based on radiographs of the same fully conscious horse with its head in the three basic positions. The nasopharynx is cross-hatched and the squares have been counted in each of the diagrams to measure the percentage reduction in sagittal section area that occurs as full extension is lost. As a measure of the logarithmic increase in airway resistance that accompanies reduction in cross-sectional area, the sagittal section area percentages grossly underestimate the problem but they offer a rough reminder.

a) ***The galloping racehorse****: The angle at the jowl is 87°, close to the neutral position for quiet breathing (see Fig 4a & 2b). The mouth is partially open, the throat latch is creased and the 'set' of the lips is broken The airway is significantly obstructed and the horse is being deprived of oxygen..*

b) ***The show jumper****: The angle at the jowl is 75° and only a little better than the partially flexed position shown in Fig 1b and 2d. The throat latch is considerably creased, the mouth is ajar and the 'set' of the lips is broken. The airway is significantly obstructed and the horse is being deprived of oxygen. Many show jumpers are expected to perform with their polls even more severely flexed.*

c) ***The dressage horse:*** *The angle of the jowl is 33° and the nasal bone is vertical to the ground. The degree of airway obstruction will be several stages greater than that depicted in Fig 1b. Note the multiple creases in the throat latch. Many dressage horses perform in the 'overbent' position, in which the airway obstruction is even more severe.*

Fig 3. Diagrams based on photographs of bitted horses competing in three different activities. In none of the photographs are the reins slack. Considerable traction is being applied to the bars of the mouth in all three examples.

CONTRA-INDICATIONS AND COMPLICATIONS OF BIT CONTROL

These can be described under seven headings, as follows:

1. PHYSIOLOGICAL INCOMPATIBILITY

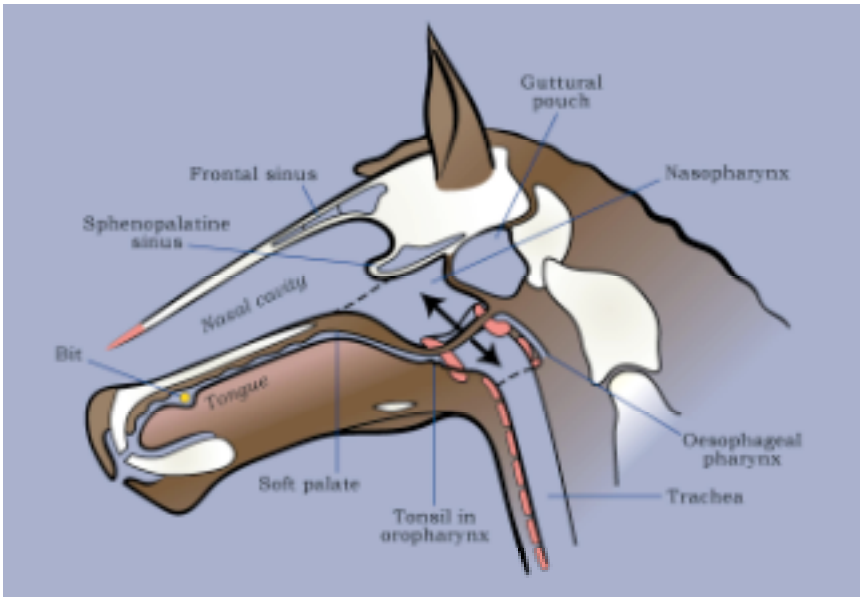
The respiratory and digestive pathways are *anatomically* separated, except at the level of the pharynx. But even here, they should be *physiologically* separated.[8,9] When galloping, the larynx should be fully open and the esophagus fully closed; when swallowing, these positions are reversed (Fig 4). Horses should not be expected to eat and exercise simultaneously.

Yet when a bit is in place, sensory pathways signal the brain to think *eat.* Accordingly, the chewing reflex is invoked and the horse starts lip, tongue and jaw movements. Reflex salivation is also stimulated. Now the horse is saddled and set in motion, which signals the brain to think *exercise*. In this way a physiological conflict is set up between two incompatible functions. During exercise the sympathetic nervous system is dominant, whereas during eating it is the parasympathetic.

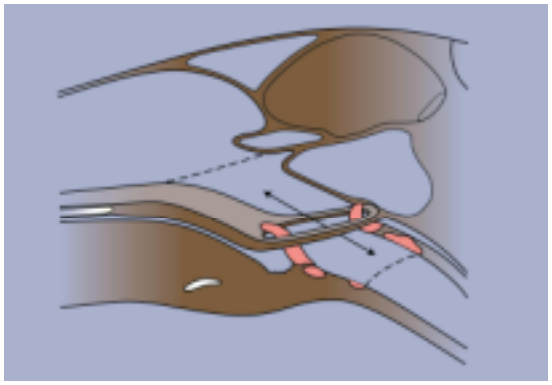
Episodes of dorsal displacement of the soft palate in racehorses are likely to result from this confusion, with a foreign body in the mouth stimulating reflexes that are contraindicated during exercise. Racehorses at the gallop can be seen to swallow, which is not something I would expect to observe in a horse at liberty. The saliva-stimulating

presence of a bit is likely to be responsible. It would also explain the regular occurrence of a swallowing motion as soon as a bitted horse finishes any fast work.[10]

Fig 4. Relationship of soft palate and larynx. At exercise, the larynx should fit tightly into a 'button-hole', the ostium intrapharyngium, in the soft palate. There should be an airtight seal between the two so that no air gets into the digestive tract, i.e., the oropharynx. If it does, then the soft palate rises and starts to vibrate (Fig 8). One way in which the seal can be broken is for a horse to be given fast exercise with its poll in any position other than full extension, something which is particularly likely to occur with normal bit control (Fig 1b). Other ways caused by the bit include the soft palate being dorsally displaced by root of tongue mobility; by gag reflexes triggered by the bit; and by a horse opening its mouth to evade the bit.



*a). **Neutral poll position (jowl angle 87°)**:. Note the position of the bit in relation to the tongue and soft palate. The double-ended arrow indicates the direction of airflow.*



*b). **Full poll extension (jowl angle 150°)**: An enlarged and perspective view of the ideal airway for galloping.*

2. UPPER AIRWAY OBSTRUCTION

In *normal* horsemanship, braking depends on using a bit to flex the poll[2]. But without poll extension, the horse is unable to breathe freely. The governing of speed, therefore, is achieved at the expense of respiration. This restriction varies from mild or moderate poll flexion (e.g., in the rating of a racehorse) to severe poll flexion (e.g., in the collection of a dressage horse). But even mild obstruction of the airway is to be avoided in a racehorse, as it handicaps performance and causes asphyxia-induced pulmonary edema ("bleeding").[2-4, 13] Similarly, the performance of a dressage horse is not facilitated by partial suffocation. The problem of headshaking[5] in dressage horses is most commonly caused by the bit.[6-7]

Although the atlanto-occipital joint is capable of extension to produce a jowl angle of 150° (Fig 4b), I have yet to find an action photograph of a Thoroughbred racehorse with a jowl angle greater than 118° and the average of 29 measurements was 103° (range 87°-118°).

The tongue and larynx are both fixed to the hyoid apparatus (Fig 6). Any tongue movement results in laryngeal movement and, at fast exercise, this agitation of the airway would interfere with breathing. Airway obstruction also occurs if the horse evades the bit by drawing the tip of its tongue behind the bit (Fig 7). Some abnormal inspiratory noises at exercise can be eliminated, instantly, by the simple expedient of removing the bit.

The soft palate lies on the root of the tongue. Any movement of the tongue promotes the palate's dorsal displacement (Fig 7)[8]. The soft palate rises during swallowing or coughing and this is perfectly normal but, for unobstructed rapid breathing, it should be firmly depressed (Fig 4)[8].

My assumption is that in the galloping horse, at liberty, the swallowing reflex will, like the salivary and chewing reflex, be in abeyance. If, when at racing speed (respiratory rate 120-140/min), a swallowing reflex is invoked in a horse wearing a bit, the soft palate will rise and be at risk of getting caught-up in the oscillating hurricane blowing through the nasopharynx. Under these conditions, displacement of the soft palate will persist. Dorsal displacement of the soft palate is a normal function of swallowing, not of rapid breathing (Fig 4).

If the racehorse with a bit in its mouth is breathing too fast to swallow, saliva in the pharynx cannot flow into the esophagus because the esophagus is closed. Its only option

[2] The braking method employed in *natural* horsemanship is to disengage the hindquarters by lateral flexion of the neck, using one rein.[1]

is to flow into the larynx. Saliva, as we know, is highly irritant to the laryngeal mucosa and precipitates in us a paroxysm of coughing. In the galloping horse, if cough reflexes are initiated, the soft palate will rise, and a choking attack will follow.[8,9] Alternatively, the irritation may precipitate laryngospasm, which is an even more potent source of suffocation.

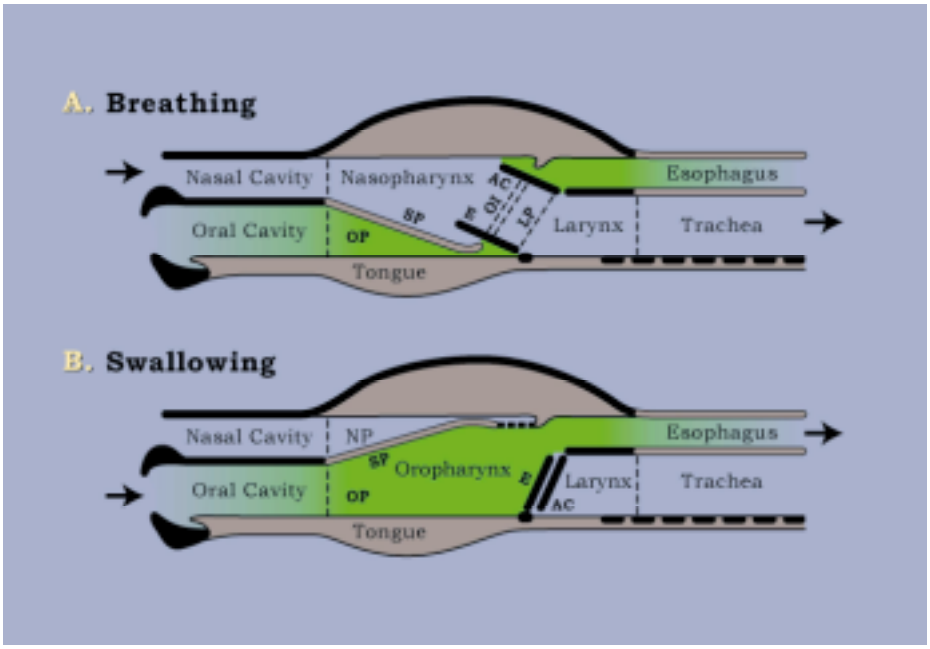


Fig 5. Showing the switching processes needed to change pharyngeal function from exercising to eating. For the sake of clarity, the mouth, oropharynx and esophagus are shown as actual spaces. However, except for those times when they contain food or liquid, these are - in normality - potential spaces only.
Key: OI = ostium intrapharyngium; E = epiglottis; AC = arytenoid cartilages; NP = nasopharynx; OP = oropharynx; L = larynx; SP = soft palate; LP = laryngopharynx; EP = esophageal pharynx

*a**). Exercising**: The soft palate is lowered to seal off the oropharynx and enlarge the nasopharynx. The arytenoid cartilages are raised to close the esophagus and open the larynx. The epiglottis is lowered to form a seal with the soft palate and, more than is apparent in this diagram, to smooth off airflow. The larynx now fits snugly into the button-hole of the soft palate.*

*b). **Eating dry food or swallowing liquids**: The soft palate is raised to close off the nasal cavity and prevent food or water entering. The arytenoid cartilages swing down to open the esophagus and close the larynx, so preventing food or liquid from inundating the lungs. Finally, the epiglottis swings back over the arytenoid cartilages.*

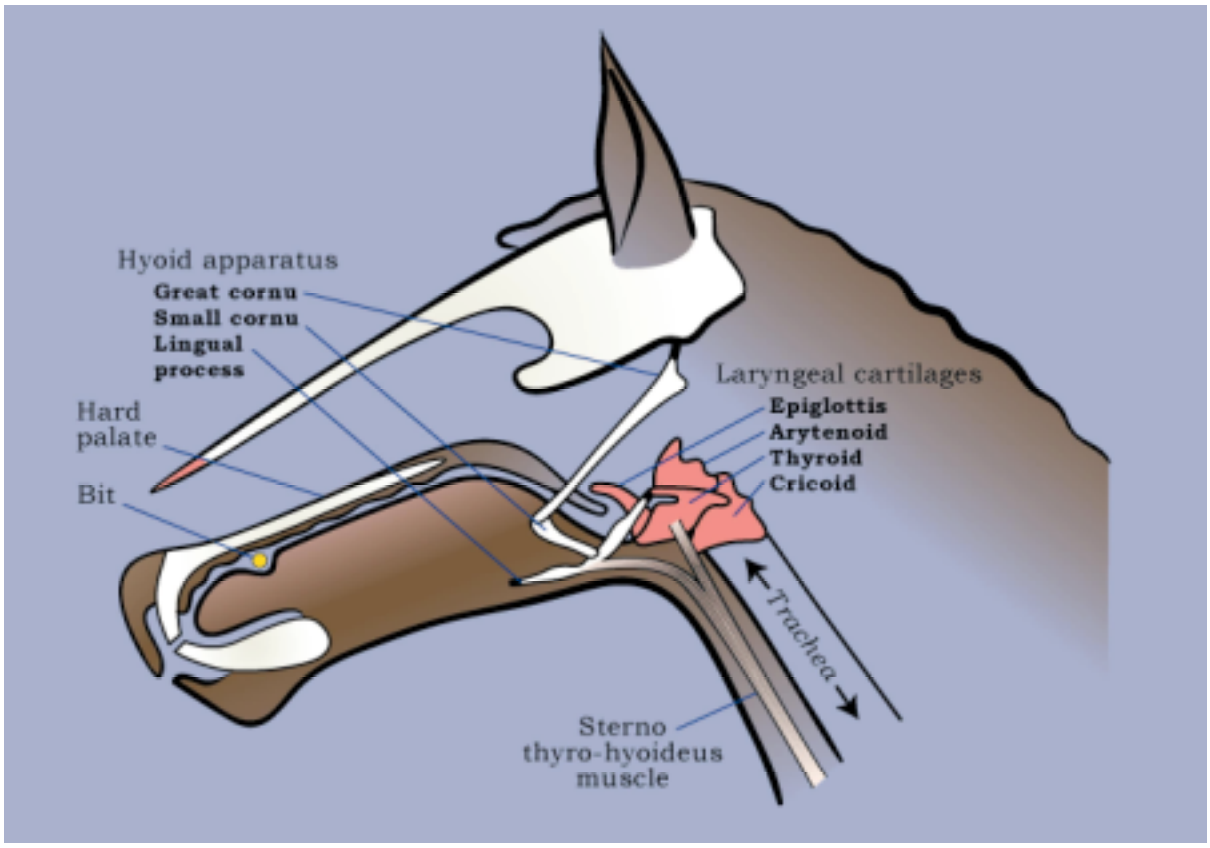


Fig 6. Showing how the larynx and tongue are both suspended from the base of the skull by the hyoid apparatus. As both share a common anchorage, any movement of the tongue caused by the bit is likely to move the larynx, which interferes with breathing.

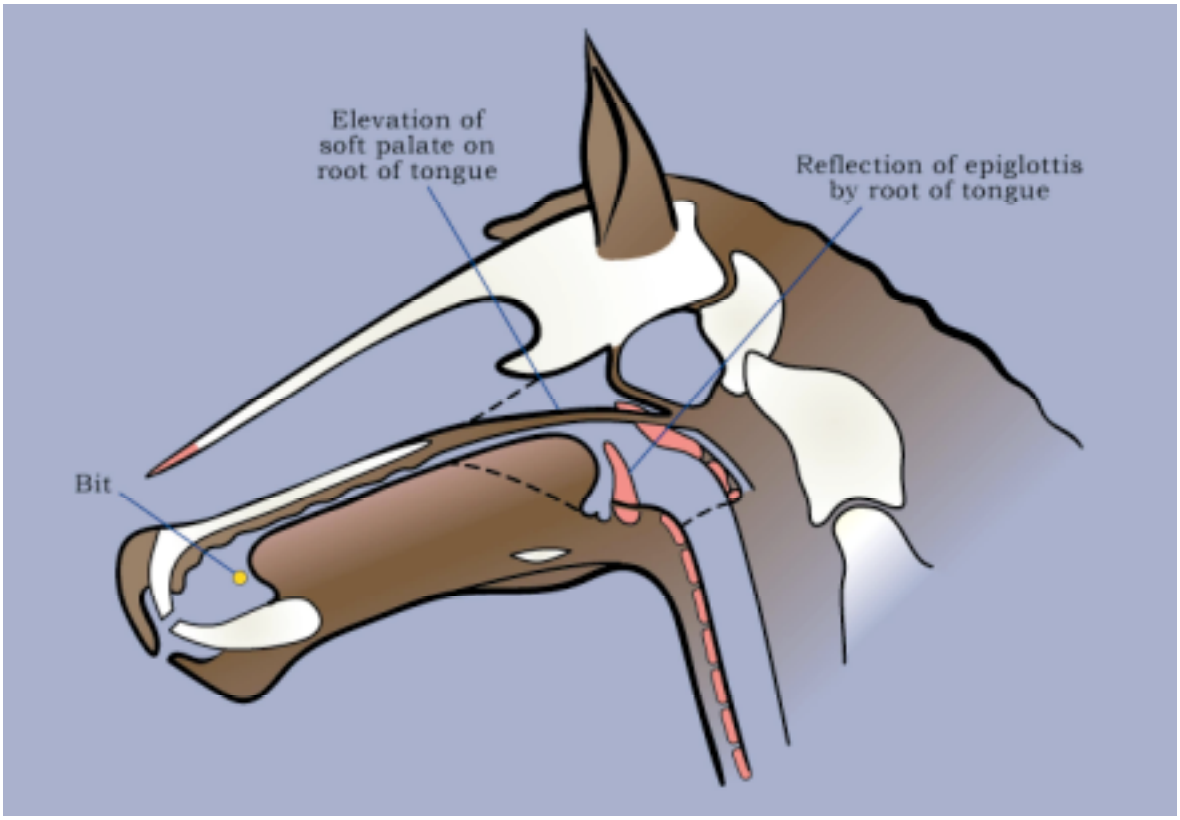


Fig 7. The pathophysiology of "swallowing the tongue". If the tip of the tongue is retracted and comes to lie caudal to the bit, the root of the tongue pushes the soft palate dorsally (obstructing the nasopharynx) and the epiglottis caudally (obstructing the aditus laryngis). The horse chokes-up and partially asphyxiates.

3. INTERFERENCE WITH GAIT

A cantering horse strides in time with its breathing.[10] As the bit interferes with breathing, it also interferes with striding. Elimination of the bit can do wonders for the gait of a horse. Its stride becomes longer and its forehand lighter. Some of the natural grace of a horse at liberty returns. Just as, in man, the most important part of swimming is breathing so, in the horse, the most important part of running is breathing.

4. SHORTER (SLOWER) STRIDES AND RACETRACK BREAKDOWNS

The point of balance of a standing and riderless horse lies on a vertical line just behind the 13th thoracic vertebra. When the horse is mounted and in motion the point of balance shifts cranially and the horse becomes heavier on the forehand. One or more bits in the mouth further contributes to this imbalance. First, the dead weight of the bits, at the distal extremity of the head, shifts the point of balance cranially. Secondly, because the rider is exerting and often *maintaining* a pressure on the bit, this too adds weight to the

horse's forehand. Thirdly, the horse tends to lean on a bit. As soon as the bit is removed, its foreleg footfall lightens, as can be demonstrated by listening to the soundtrack of a video film.

A horse that is heavy on the forehand has a shorter stride. The show horse develops a 'choppy' action and loses 'self-carriage'. In the performance horse, shorter stride means slower speed. Heavier forehand concussion puts greater stress on the hard and soft tissues of the forelegs. Racehorses are more likely to incur a breakdown.

5. RIGIDITY OF THE NECK AND LOSS OF PROPULSION

Bit control results in many horses 'resisting' or 'fighting' the bit. The degree of resistance varies from mild pulling to shoulder-aching tugging. In addition, many riders use the reins to balance themselves in the saddle. Drivers of harness horses, with lines (reins) that are 8 or 10 feet long have, if they wish, the ability to exert tremendous leverage on the horse's mouth.

Constant drag on the bit must lead to bone ache in the mandible but also to a waste of energy in locking-up the neck muscles. This neck brace effect does not happen in the horse at liberty nor in the Thoroughbred when ridden without a bit. Neither is rigidity of the neck compatible with optimum athletic performance. Years ago, Rooney referred to the fixation of the neck in Standardbreds, caused by overchecks and head poles, which - in turn - he pointed out, results in "irregular breathing."[12] "Try running a few hundred meters" he said "with your neck in a cast." No human athlete could perform well without complete freedom of the neck.

A horse galloping at liberty, uses the normal downward swing of its head and neck under the influence of gravity as an aid to hind limb propulsion, conserving energy by taking advantage of the elastic recoil in the ligamentum nuchae.[11] This phase of the gallop takes place during expiration, when the forelimbs are weight bearing. Rooney continues "…it appears that the more successful racehorses have more movement of the head and neck than others."[11] The gallop style of Secretariat, for example, was remarkable for its unusual degree of head/neck mobility.[11] I recall that Secretariat was also a horse that refused to be rated; hence his 15 length win in the Belmont. Perhaps Secretariat was better than other horses at negating the bit?

A second energy saving device may act on the forelimbs. As the head rises during inspiration, the superficial fascia surrounding the brachiocephalic and omotransversarius muscles will be tensed and this will pull the forelimbs forward and help to overcome the inertia of their momentary immobility at the end of expiration. This mechanism adds further weight to the argument for avoiding restriction of neck movement in the exercising horse.

6. ABNORMAL BEHAVIOR

Non-acceptance of the bit is so common that its many forms have been given colloquial names. Horses are described as 'spitting the bit', getting the 'tongue over the bit', getting the tongue 'behind the bit', 'lolling' the tongue, incessantly moving the tongue, chewing or champing the bit, sucking the bit, 'getting the bit between the teeth', pulling, boring and leaning on the bit, crossing the jaws, opening the mouth, foaming at the mouth, head tossing or head shaking. Some of these items are illustrated in figures 7 - 10. Other behavior modifications relate to many a bitted horse's aversion to exercise and to the gait modifications already described. Evasion of the bit can be the sole cause of inspiratory stridor at exercise, with air turbulence and fremitus in the larynx that is detectable immediately after exercise. Such episodes of 'roaring' can be differentiated from recurrent laryngeal neuropathy by simply exercising the horse again without a bit in its mouth.

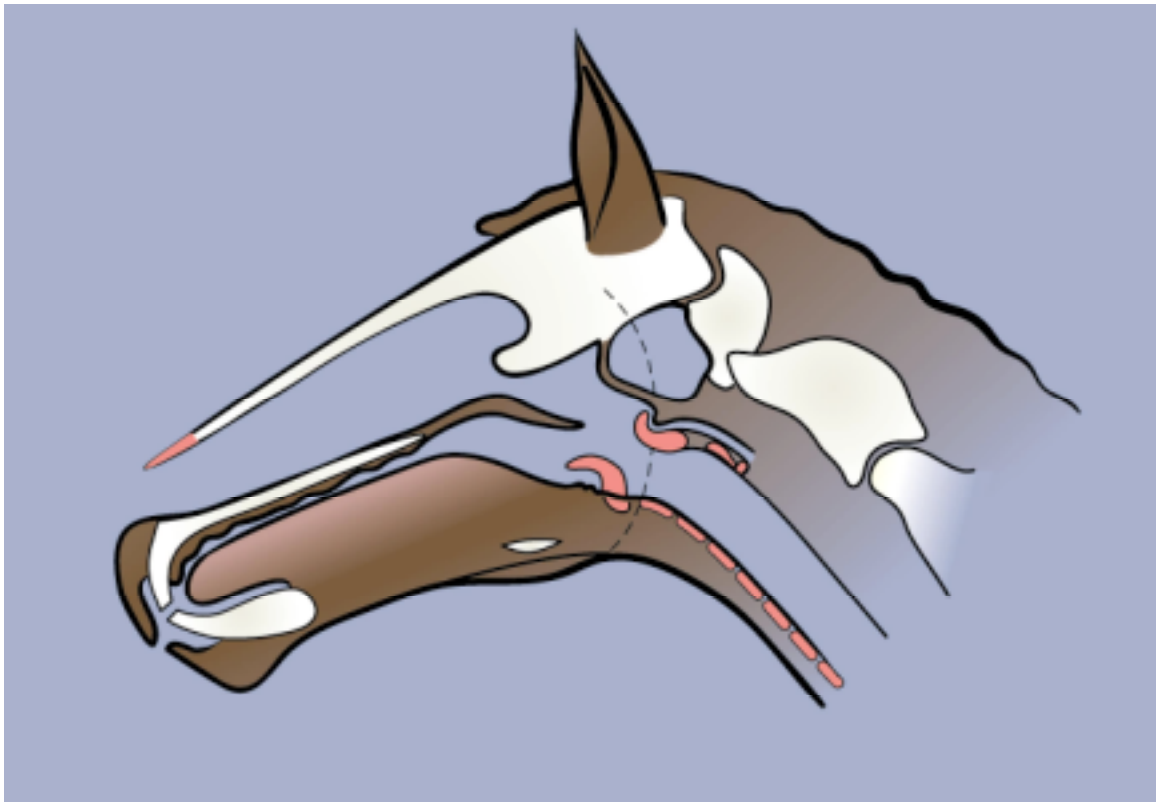
Non-acceptance of the bit negates control. Acute or chronic pain inflicted by the bit, impels a horse to immobilize it by grasping it between the premolars. Once this happens, the rider has no control and the horse may bolt. Shakespeare describes it succinctly

"The iron bit he crushes 'tween his teeth,
Controlling what he was controlled with."

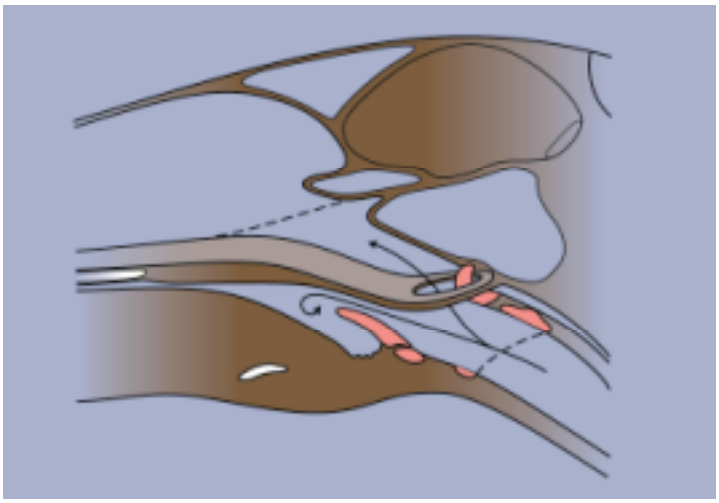
In recent years, tongue movement and the ensuing dorsal displacement of the soft palate has led, in Thoroughbred and Standardbred racing in the USA, to the almost routine practice of tongue-tying and the addition of yet another invasive foreign body in the mouth. Unlike Thoroughbreds, the majority of Standardbreds race with *two* bits in their mouth, a snaffle or curb and an overcheck bit. This and other reasons already mentioned may well explain why dorsal displacement of the soft palate is so common in Standardbreds.

Upper airway obstruction, from whatever cause, is - in my experience - an etiological factor to be considered in the occurrence of racetrack breakdowns, choking up, "bleeding" and sudden death. In view of this, the bit must take its share of responsibility for these phenomena, alongside the other more familiar causes such as recurrent laryngeal neuropathy.[13]

Fig 8. Companion figure to Fig 4, showing the turbulent airflow that results when the soft palate becomes dorsally displaced.



a). The arrows in Fig.8b below indicate how, once the palate is raised, air enters the oropharynx at each expiration. This maintains the problem until such time as the horse can slow up and swallow



b). An enlarged view of the throat in Fig8 (a), showing the soft palate button-hole in perspective.

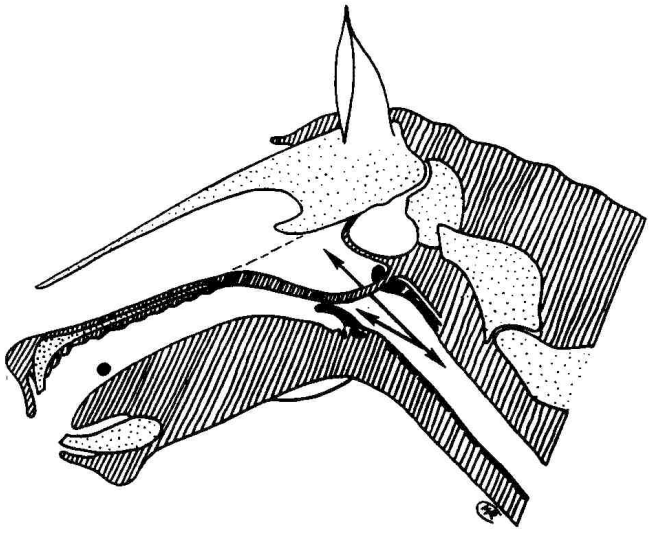


Fig 9. Showing how dorsal displacement of the soft palate may occur when a horse opens its mouth in response to bit traction, allowing air to enter the oropharynx.

Fig 10. Showing the dorsiflexion and ventroflexion of the neck described as head tossing or head shaking.

7. ORAL AND DENTAL PROBLEMS

The horse is an obligatory nose-breathing animal. At exercise, its lips should be sealed and mouth closed, to prevent air entering the oropharynx and causing soft palate displacement. Bit control breaks this 'set' of the lips and often opens the mouth.

The mouthpiece of a bit lies on the tongue and diastema of the mandible, and the various rings and shanks lie in contact with the delicate commissures of the lips. The bit, therefore, is lying directly above the mental foramen and the terminal branches of the mandibular nerve and in contact with the exquisitely sensitive lips of an animal that, left to its own devices, is fastidious about what it puts in its mouth. In the past, I have not been able to put forward any convincing explanation for the cause of headshaking in the horse, and even less have I been able to suggest any satisfactory treatment.[5] But, from studying the effect of the new bitless bridle (see below), I now recognize that the bit is at least one cause of headshaking and almost certainly the most common.. Some horses stop headshaking immediately the bit is removed.[6] Headshaking may be a sign of trigeminal neuralgia brought on by the persistent pressure of the bit. In man, "the fifth nerve is often the seat of neuralgia"[14] In the horse, local and referred pain in the mandibular branch

of the nerve and referred pain in the maxillary and ophthalmic branches could well explain why some headshaking horses rub their faces on anything handy and why some headshakers get comfort from the pressure of a fly net over their muzzle, or even from a maxillary (infraorbital) neurectomy. It will be simple enough, in time, to put this hypothesis to the test on a large number of headshakers.

Bit pressure causes contusion of the gums, laceration of the tongue and lips, bone spurs on the bars of the mouth, and star fractures of the diastema.

A bit also lies close to any wolf teeth that are present under the gum or just erupting through the gum at a point in front of the first cheek tooth. Pain is caused if the bit clashes up against or rolls over these vestigial teeth. The cheek pieces of a snaffle and curb bridle press the buccal mucosa against the sharp enamel edges of the upper cheek teeth. Buccal ulceration is common. There is also the problem of relying on a method of control that requires a bit in the mouth of an animal whose permanent dentition is erupting between the ages of two and five. Thoroughbred racehorses are at the height of their careers during this teething period.

If one asks a Thoroughbred or Standardbred trainer what percentage of horses in their barn do they expect at any one time to have mouth problems of one sort or another, the answer ranges from 20 to 60%.

CONCLUSION

A bit is an unyielding foreign body in a sensitive body cavity and is capable of causing pain, injury, disease and even death. A bit in the mouth of an exercising horse is physiologically contraindicated and, from the rider's point of view, counter-productive. The wonder is that all horses do not resent the bit. It is possible, however, that we may not be recognizing signs of bit discomfort in many horses. Much improvement in performance might be gained, even in a horse that is thought to be untroubled by the bit, by its removal. This step can certainly be an enormous relief, for example, to the headshaking horse[6].

It takes a little study to realize that simply removing a piece of metal from a horse's mouth provides more effective and safer control; helps the horse to breathe and move better; and improves its whole attitude to work. Horses prefer bridles "with a bit missing".[14]

Riders and drivers need to be aware of the constraint that a bit places on the horse's natural functions. The less horsemen depart from what is natural, the less will they generate man-made problems for the horse and themselves. As a horse can be more safely controlled without a bit and as this brings benefits to both horse and rider, these are compelling reasons to re-evaluate the bit's time-honored place in equitation.[6] Competition

regulations for some sports that currently make use of a bit obligatory will, it is hoped, be modified in future.

As has been convincingly demonstrated in recent years, the bitless option is available by adopting the methods of *natural* horsemanship for all stages of schooling.[1] For the more refined control needed at the stage of advanced schooling, even the natural horseman currently resorts to the use of a snaffle bit[1]. This last step can now be avoided because refined control can be effectively provided by the recent introduction of a fundamentally new design of bitless bridle.[3] This is neither a mechanical hackamore nor a bosal, both of which rely for their effect, as does the bit, on pain and poll flexion. Instead the new bridle works by painless pressure distributes over the skin of the whole of the head. (Fig 11). It permits humane, effective, and non-invasive control without interfering with respiration or locomotion[6,7].

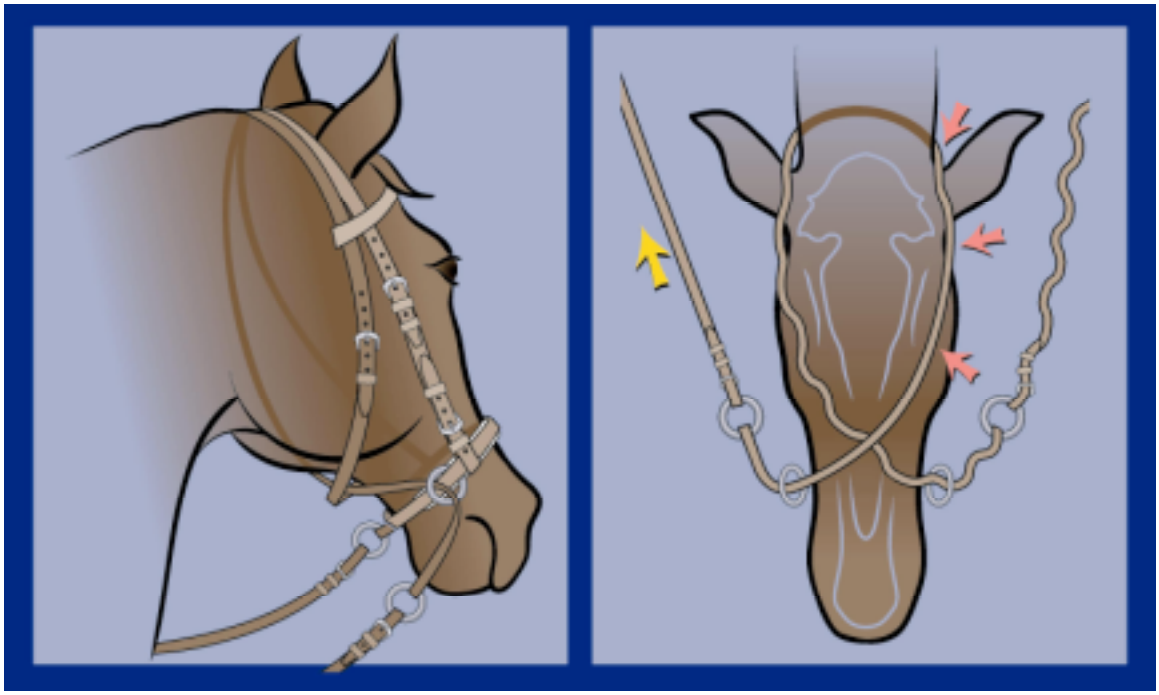


Fig 11. The design of the new cross-under design of bitless bridle. The diagram on the right is a ventral view of the head and shows how, with transient traction on one rein(yellow arrow), gentle and painless pressure can be applied to the bridge of nose, chin, cheek and pol, in decreasing order of pressure (red arrows). This bridle pushes, non-invasively and painlessly, on the skin of the whole of the head, whereas a bit pulls, invasively and painfully, on the mouth.

Acknowledgments

[3] 'Bitless Bridle 2000': ELG Inc., 206, Birch Run Road, Chestertown MD 21620

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