Why is 'Rollkur' Wrong? (part two)

Continued observations on the Report of the FEI Veterinary and Dressage Committees' Workshop on 'The use of over-bending ("Rollkur") in FEI Competition,' January 2006.

PART III: RESPIRATORY SYSTEM

Evolution has determined that the lungs of mammals are located in the chest. In the long-necked, long-faced horse, the lungs are at some distance from the nostrils. In addition, because of its unusually long soft palate, the horse cannot breathe through its mouth. It is entirely reliant on nose breathing and it is a running animal that requires huge amounts of oxygen.1 Over-bending obstructs the airway and this in turn causes premature fatigue, partial asphyxia, edema (water logging) of the lungs, and lung hemorrhage (Cook et al 1988, Cook 1993, 1998, 2002,). The frequency with which this cascade of events occurs in the dressage horse is not known but it does occur. In terms of work done and energy needed, a warm-up followed by a dressage performance may not be so different from a six-furlong sprint.

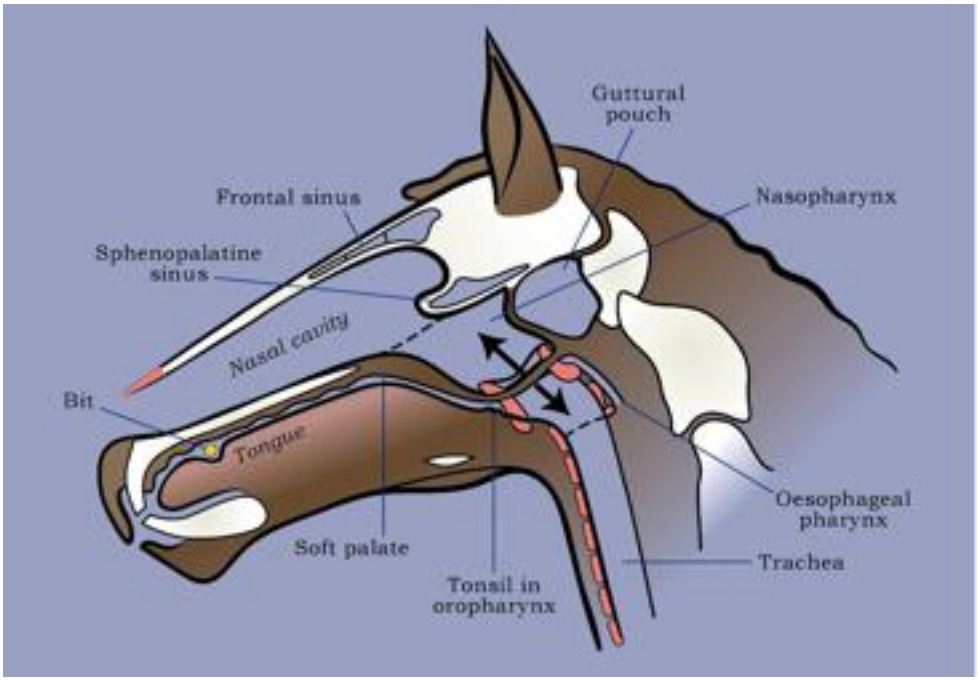


Fig 13. The anatomy of the upper airway in relation to the bit. The top end of the double arrow lies in the respiratory portion of the throat (nasopharynx) and the bottom end in the voice box (larynx). The bit is lying on the tip of the tongue but the root of the tongue stretches back to the tonsillar region in the digestive portion of the throat (oropharynx). Note the long soft palate stretching from the

hard palate back to the roof of the nasopharynx. When the horse is breathing, as opposed to swallowing, the voice box slots through an elastic-sided buttonhole in the soft palate. In this diagram, the breathing/balancing joint at the poll is in the neutral position as for a horse that is standing at rest. The jowl angle (i.e. the angle made by the line of the lower jaw and the front of the neck) is about 90 degrees.

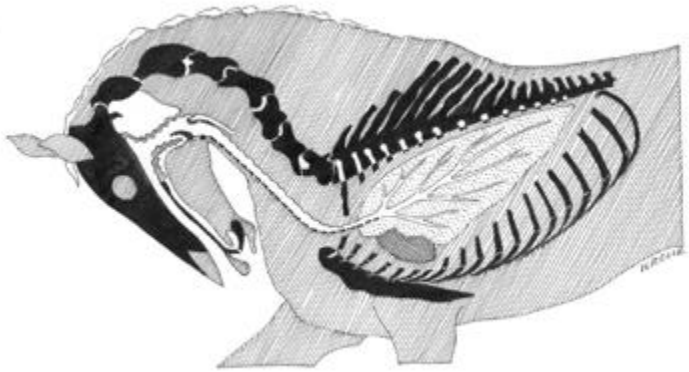


Fig 14: A semi-schematic representation of the over-bent airway (jowl angle 15¼; nasal profile angle 128¼). The head position was traced from the photograph that disgraced the cover of the FEI report. Note the 'U' bend in the airway at the level of the throat and compare this with the unobstructed airway of a horse that is permitted to extend its head and neck for fast exercise (Fig 15a). When over-bent, a horse can neither breathe nor balance properly.
Key: black = bone or cartilage (regions in which the wall of the airway is well supported); hatched = muscle and other soft tissues; wavy line = those unsupported sections of the airway that are especially vulnerable to collapse due to flaccidity when over-bent; cross-hatched = heart; stippled = lung)

To function correctly, the long tube delivering gases to and from the lungs (i.e. the upper and lower airway) has to be aerodynamically efficient. The tube has to resist, in particular, the collapsing force of a negative pressure during inspiration in order to prevent asphyxia. The laws governing the flow of gases along tubes are relevant. Gas flows with least resistance in tubes that are straight, circular in cross-section, and have walls that are rigid enough to resist being collapsed when gases are sucked into a closed chamber (such as the lung). How does the anatomy of the horse provide for these requirements? For deep breathing at exercise

* The head and neck are extended to eliminate bends in the airway as much as possible (Fig 15a). Depending on the exertion but also on the discipline, the degree of extension may vary from a slight extension as for a walk, to moderate extension as for racing (Fig 3b). For dressage, a compromise is reached between the conflicting demands of breathing and balancing. A dressage horse, when ridden without a bridle and communication is by means of a loop at the

base of the neck (a cordo), will choose to hold its head in partial flexion but (except during piaffe) ahead of the vertical.
* The airway is provided with rigid walls or, where flexibility is also a requirement, the airway is stretched longitudinally to provide tension in the walls. Dressage horses have to forego this benefit, even in partial flexion. When over-bent, the airway is close to collapse.
* The nasal passages, throat, windpipe and bronchial tubes are close to circular in cross-section (Fig 16).

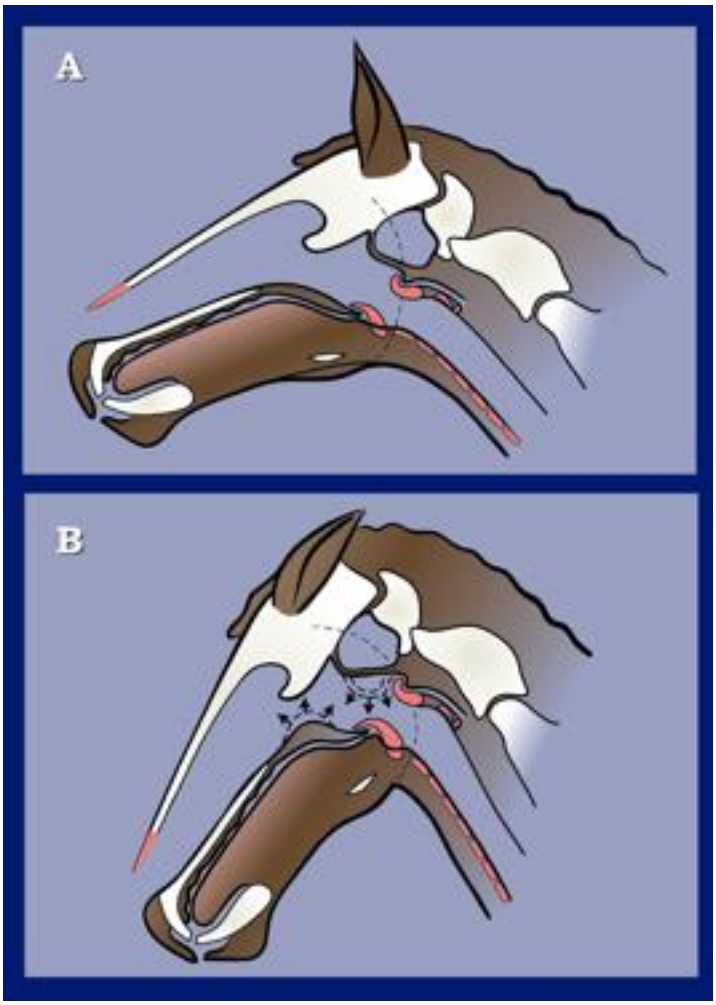


Fig 15: Diagrams based on survey radiographs and fluoroscopy evidence showing the effect on the airway at the throat of even partial poll flexion.
A: Head and neck in moderate extension; airway moderately obstructed during deep breathing at exercise (jowl angle 114¼)
B: Moderate flexion only and nothing like as severe as that produced by over-bending. The jowl angle is 69¼, which is far less than the 45¼ flexion that a dressage horse exhibits when its nasal profile is vertical to the ground. But already, deep breathing at exercise will result in a further narrowing of the airway

at the level of the throat. The ascending arrows indicate the direction of movement of the soft palate, now no longer stretched longitudinally. The descending arrows indicate a similar collapse in the roof of the throat.

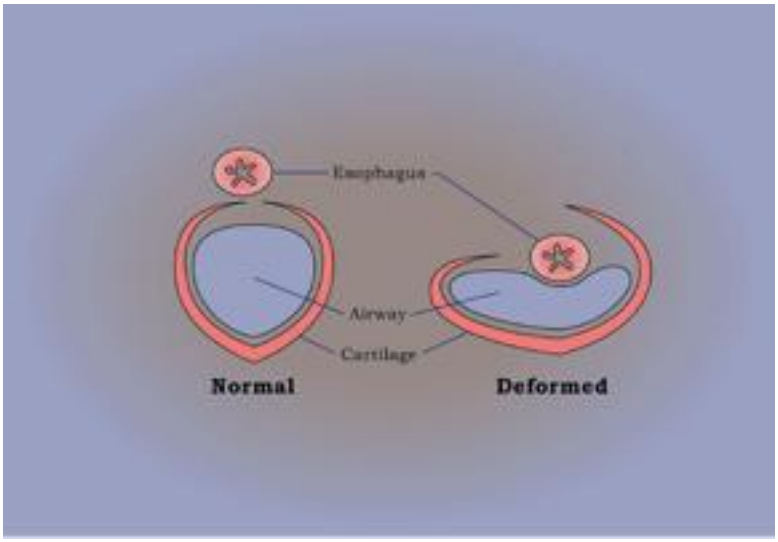


Fig 16. A normal windpipe (trachea), nearly circular in cross-section, compared with a deformed one, in which the airway has become elliptical and further obstructed by intrusion of the esophagus.

The over-bent position during the warm-up has the effect of obstructing the horse's airway at the level of the throat in particular but also at a number of other sites along the airway.

Straightness: Fig 3 Illustrates how the airway for fast exercise tends to be straightened out, like the neck of a swan in flight. But in Fig 14 it can be seen that a 180¼ 'U' bend has been introduced into the system, significantly increasing resistance to airflow, increasing the work of breathing, and generating an increased vacuum pressure in the lungs on inspiration. Over-bending at exercise amounts to partial asphyxia

Rigidity: The nasal airway is supported by bone (Fig 14) and appears at first sight to be immune to collapse (but see later). The soft tissues of the throat, however, are more obviously vulnerable to collapse. Because of the lack of longitudinal stretching, the walls of the throat are limp, like a bicycle tire inner tube with little or no air in it (as indicated by the wavy lines in the diagram).2 The flaccidity will tend to result in the floor of the throat (the soft palate) rising on inspiration and the roof of the throat falling (see also Fig 15b). Note in all the figures that a large air space, the guttural pouch, is present in the horse above the throat. Air on both sides of a thin membrane (such as the one that separates the guttural pouch from the throat) makes the membrane especially sensitive to changing air pressures. The same applies to the soft palate because the bit allows air to get

in to the mouth portion of the throat (oropharynx). This explains yet another mechanism whereby the soft palate might become elevated at exercise, breaking the normally airtight seal between the button-hole in the soft palate and the larynx (Fig 13 & 17). All these mechanisms explain why, when an over-bent horse is breathing deeply, the elevated soft palate will tend to obstruct the airway. Sometimes, the conditions are such that the soft palate will start fluttering in the breeze, like a wet blanket, producing the characteristic gurgling noise of asphyxiation (Cook 2002). But the same obstruction can also cause a roaring noise on inspiration that is indistinguishable from that caused by recurrent laryngeal neuropathy. Most horses suffer an airway obstruction without making any noise at all. Because of this, a judgment on what is acceptable in this respect needs to be made on the visual (i.e. anatomical) evidence, as auditory evidence will only be present in a minority of instances of over-bending.

The voice box (larynx) is supported with cartilage. But the word 'box' is misleading as the larynx is a valve that opens and shuts for either breathing or swallowing, so it is extremely mobile. Even a healthy valve might partially collapse because of the increased suction forces generated by over-bending. But there is another problem. Large horses, of the type that are so commonly trained for dressage these days, are especially likely to suffer from a neurological disease that results in the left side of the larynx becoming weak or even totally paralyzed. The likely presence of this disease (recurrent laryngeal neuropathy or laryngeal hemiplegia) renders the larynx especially vulnerable to collapse in an over-bent horse. The more severely affected horses will make a roaring sound on inspiration but the absence of any noise does not mean that the airway is clear of obstruction (Cook 1981a, 1988).

Circularity: The above changes spoil the circularity in cross-section of the parts affected but the windpipe (trachea) has its own special vulnerability to collapse in this respect. The walls of the windpipe are supported by 'C'-shaped cartilages that, under the stress of abnormally strong suction pressures, become flattened. Repeated stress results in permanent deformation. The result is that the cross-sectional shape changes from circular to elliptical (Fig 16). A post-mortem survey of cadavers that I conducted some years ago tells me that deformity of the windpipe ('scabbard trachea') is extremely common. The region most often deformed is at the entrance to the chest, at the level of the first rib (hence the narrowing depicted in Fig 14 at this level) but long stretches of the windpipe in the neck are also commonly deformed. Bunching of the neck muscles in the over-bent position could be a causal factor, as could pressure against the neck vertebrae, the abnormally high suction forces on inspiration, and the shortened neck leading to telescoping of the windpipe. For aerodynamic reasons, these suction forces become stronger the further the distance from the point of the obstruction. So with a primary obstruction at the level of the throat, suction pressures increase the closer one gets to the tail end of the lung. This explains the tracheal collapse at the entrance to the chest. It also explains why, when horse 'bleed' from the lungs, the 'hemorrhage' (heavily blood-stained edema

fluid) is always most severe at the tail end of the lung (Fig 19). Over-bent dressage horses will, like racehorses, develop pulmonary edema and 'bleed.' The incidence of 'bleeding' in dressage horses has not been documented because endoscopic surveys have never been carried out. I predict that the incidence in over-bent horses could be high.

The familiar adage about the strength of a chain being its weakest link applies to airflow. Resistance to the flow of gases along tubes is determined by the narrowest section of the tube, the bottleneck. Resistance to flow increases logarithmically in relation to a reduction in the tube's diameter. Halving the diameter increases resistance by a factor of four (Cook 1989).

Other causes of throat problems

From the above causes of obstruction, the airway at the throat will be crimped like a badly bent straw, partially suffocating the over-bent horse at a time when it is being required to work hard at the walk, trot and canter. But the asphyxia is yet further compounded if the horse tries to evade the bit and draws its tongue behind or over the bit (Cook 1999a). This results in a backward and upward shift of the root of the tongue, which in turn elevates the soft palate (Fig 17). Elevation and even dorsal displacement of the soft palate (DDSP) from its normal position accounts for the gurgling/roaring noises that some of these over-bent horses make during the warm-up, when they are required to work hard with their chin on their chest (Fig 14)

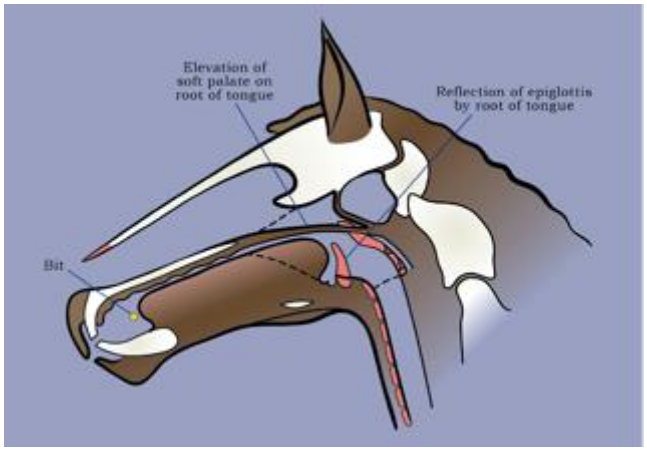


Fig 17. Retraction of the tip of the tongue (evasion of the bit) can result in the root of the tongue bulging backwards and upwards (i.e. beyond its normal limits as indicated by the broken line) and elevating or even dorsally displacing the soft palate (DDSP). Serious airway obstruction follows and the horse is said to have 'swallowed its tongue.' The bit contacts bone at the bars of the mouth.

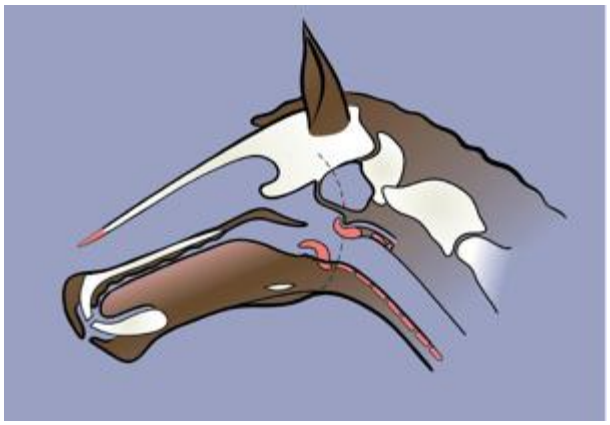


Fig 18. The mouth is not gaping but the seal of the lips is broken (as it is by a bit) and this is enough to admit air into the mouth. From there it rises into the throat, where it lifts the soft palate on a balloon of air. Obstruction of the airway follows from either simple elevation of the soft palate or, as in the diagram, elevation and dorsal displacement of the soft palate (DDSP).

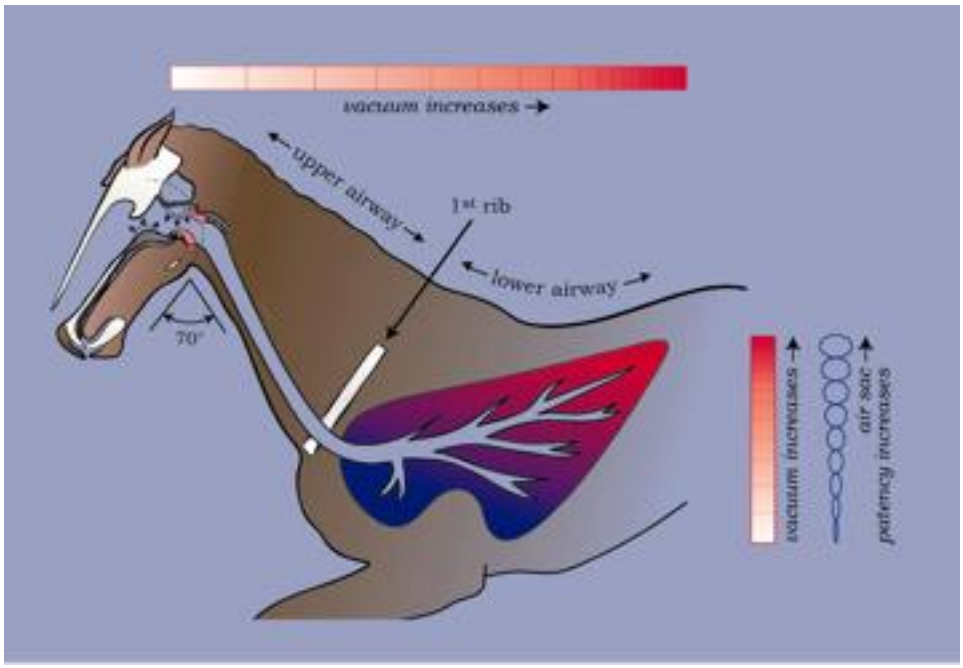


Fig 19. Showing how any obstruction of the upper airway (in this case by moderate poll flexion) explains why lungs 'bleed' (i.e. develop pulmonary edema) because of the increased suction pressures that develop in the lungs during labored inspiration.

PART IV: NERVOUS SYSTEM, BEHAVIOUR, MUSCULOSKELETAL & CARDIOVASCULAR SYSTEMS

NERVOUS SYSTEM AND BEHAVIOR

Bits cause over 100 behavioral signs of pain and fear. They can be classified under the five main headings of fright, flight, fight, freeze and facial neuralgia. These signs are manifested anatomically in sites from head to hoof. As pain affects the brain it seems appropriate to classify behavioral responses under the nervous system. My research into the effect of bits on the horse has highlighted the degree to which even the standard use of a bit frightens a horse, rendering it nervous, apprehensive & inclined to spook (Cook 2003, Cook & Strasser 2003)3. The over-bending use of a bit exacerbates the terror. Though, in general, the horse has evolved a survival strategy of non-disclosure of pain, this policy does not apply to certain pains. Abdominal pain (colic) is one exception and mouth pain is another.

As the FEI Code of Conduct, Article 1b, on Training Methods includes the statement that a horse "must not be subjected to any training methods which are abusive or cause fear..." this statement alone provides a clear directive to the FEI Dressage Committee that, without question, the practice of over-bending should be prohibited. It cannot escape the committee members' notice that the same conclusion could well be applied to any use of the bit. The regular use of a bit is potentially abusive. Its employment for over-bending is simply a particularly pernicious example of abuse. Acute pain frightens horses but severe and constant pain also produces other psychological effects. Pain can induce major character changes. Acute pain may induce flight in some horses and fight in others, i.e. running away or aggression. Chronic pain may induce an attitude of defeat, hopelessness and a loss of interest in life. Over-bending produces all these effects.

Extrapolation from human experience is no longer frowned upon as it used to be. In the absence of any other way to assess subjective feelings, an anthropomorphic approach is regarded as reasonable. This being so, if anyone wishes to get a feeling for how a horse might feel when exercised in the chin on chest position, they have only to trot a hundred yards with their own heads in this position. For a closer simulation, do this on all fours, put a bridoon in your mouth and ask a friend to lean their weight on the reins

This is not the place to list the 100 behavioral signs of pain caused by the bit, or the 40 different bit-induced diseases that can follow. But the list is available online at here. A few of the signs are potentially fatal to horse and rider, such as rearing, bucking and bolting, but all are harmful to a horse's welfare, an impediment to performance, a reason why horses in pain cannot listen and learn, and a barrier to the attainment of that horse-and-rider harmony which is the goal of horsemanship. A horse's ability to balance (to 'collect') is dependent on its nervous system and, as already remarked upon, an over-bent horse is unbalanced. Over-bending interferes in this way with both the nervous and the musculo-skeletal systems.

In the 'Digestive System' section, I drew attention to a neurological disease caused by the bit, i.e. trigeminal neuralgia (Fig 20). In my experience, this is by far the most common cause of the headshaking syndrome (Fig 21). In the past, this has been a disease of unknown cause and, therefore, unsatisfactory treatment. Happily, most instances of the problem now respond to removal of the bit.

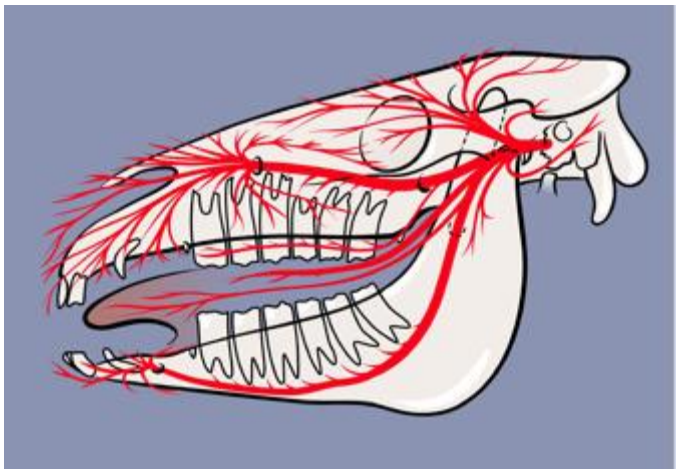


Fig 20: The muzzle and mouth regions constitute a highly sensitive tactile receptor. All the many signs of the headshaking syndrome are consistent with direct or referred pain being transmitted by the bit to one or more of the three major branches of the trigeminal nerve (from bottom to top, the mandibular, maxillary and ophthalmic branches)

Fig 21: Head tossing, open mouth, fear and pain [Photo credit: Lydia Nevzorova]

Mention has already been made of the part that another neurological disease, recurrent laryngeal neuropathy (RLN), plays in the over-bending story. RLN is, in my opinion an inherited disease and some evidence of the disease, in varying degrees, is present in nearly 100% of horses, as opposed to ponies (Cook 1988)

MUSCULO-SKELETAL SYSTEM

As described under the 'digestive system,' the bit's role in over-bending depends largely on its effect on bone. Bone spurs on the bars of the mouth testify to this effect.

Over-bending has also been incriminated as the cause of bone spurs (exostoses) on the back of the skull, where the nuchal ligament inserts (Weiler 2006). Prolonged pressure on the curb rein during 20-30 minutes of warm-up will have applied considerable pressure to the poll and may well cause discomfort in this region, especially if nearby bone spur formation is active. Mention has already been made of the pain that a tight noseband causes on the bridge of the nose...think of the pain we experience, when swimming, from wearing badly fitting goggles. A cranked noseband, popular with over-bending proponents, has the additional effect of causing pain at the poll. As seen in profile, a horse's head is wedge-shaped. A tight noseband will tend to creep in the direction of the muzzle and, in so doing, will tense the cheek pieces.

Signs of a musculoskeletal effect of the bit include those of a painful neck and tense spine. For example, a horse may exhibit a disinclination to stand still, a stiff gait, a short stride, occasional stumbling and a general loss of rhythm. A flashing tail and poor transitions may occur and/or a horse might exhibit a

tendency to buck or rush. The signs are similar to and sometimes mistaken for equine protozoal myeloencaphalitis but 'bridle lameness' is a simpler explanation and one that is easier to test for and treat.

Effect on stride and respiratory synchrony

At the trot and canter, a horse at liberty strides in synchrony with its breathing; one stride/one breath (Cook 1965). The existence of this rhythm explains that poetry of motion aspired to by all dressage riders. Unfortunately, the presence of one or more bits in a horse's mouth, interferes with a horse's breathing and, therefore, its striding too. The result is that the normal respiratory/locomotor coupling often breaks down and the 'fluid' rhythm of the gait is lost.

Proponents of over-bending defend their method on the grounds that it supples and relaxes the neck. The premise is unsupported by the evidence. Nature's way to relax the neck is to allow it to stretch. Grazing is the best way to relax a horse's neck (Fig 22)

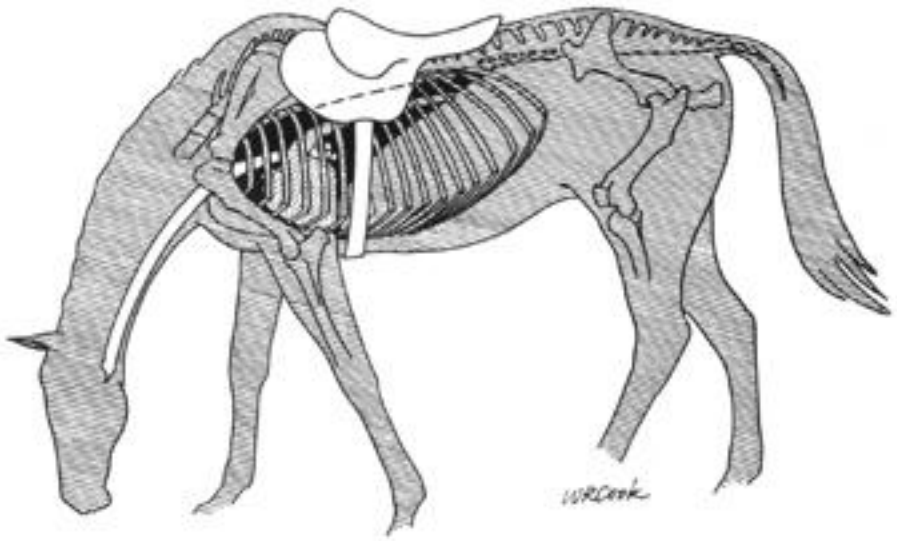


Fig 22. Showing how the neck relaxes and reaches its maximum length when the horse is grazing. It also illustrates the benefits of the head down position ('Dr. Green') for the drainage of abnormal lung fluids such as excess mucous and bloodstained edema fluid.

The FEI report focused exclusively on the possible effect of over-bending on the neck but made no mention of the fact that freedom of the neck is essential for any athlete, human or animal. No human athlete could balance or perform well

with her neck in a plaster cast. Over-bending not only fixes the horse's neck as in a cast but fixes it in such a position as to virtually ensure a maximum impediment to performance. A horse so handicapped cannot balance, breathe or see properly and, as though this was not enough, is also frightened and in pain.

CARDIOVASCULAR SYSTEM

Extreme over-bending may well result in partial obstruction of the jugular veins in the neck. The horse, unlike some other mammals, only has one jugular vein on each side of the neck. This predisposes it to venous congestion of the head if one vein becomes blocked. Walls of veins are easily compressed by pressure from outside, whereas walls of arteries are more rigid and are not affected. Over-bending of the head and telescoping of the neck could compress the jugular veins but leave the carotid arteries pumping. Under these conditions, the nasal mucosa would become engorged and, because the horse is an obligate nose-breather, the nasal airway would be severely compromised. After 20 minutes of over-bending, horses should be examined for this defect. I have no evidence that such an effect occurs but I predict the possibility on physiological grounds. It is of interest that one of the features that are commented on in horses that have been over-bent for long periods is the way that the superficial veins of the head become engorged and prominent.

A venous congestion of the lungs may be part of the 'bleeding' story (asphyxia-induced pulmonary edema or, as it is still called, exercise-induced pulmonary hemorrhage). An increased negative pressure in the pleural space on inspiration, due to airway obstruction, would increase the flow of venous blood into the lungs and a waterlogging pulmonary edema might follow. Whether or not this is an additional mechanism causing pulmonary edema, apart from the negative airway pressure mechanism already described, there is no doubt that pulmonary edema occurs (Cook et al 1988, Cook 1999c, Boden et al 2005)

Pulmonary edema in man causes acute chest pain and is accompanied by a sensation akin to drowning. These are subjective sensations in man that cannot be documented or quantified, even by necropsy. We cannot be sure that horses feel the same but it is reasonable to suspect that they do.

The above overview of bodily systems is incomplete but long enough to give a sense of the havoc that one or two small rods of metal in the mouth can cause.4 One might add, for example, that though a horse's eyes still function, its useful field of vision is severely limited during extreme over-bending. Photographs of over-bent horses show them trying to roll their eyes upwards, revealing the white of their eyes at six o'clock.

PART V: EFFECT ON PERFORMANCE

The collective effects of all the above are manifested in the warm-up ring when the over-bending may be extreme but also in the arena when the degree of poll flexion is less. A horse that has been subjected to prolonged over-bending in the warm-up ring is likely, because of the above, to enter the arena in a lathered-up state of high anxiety, generated by a mixture of fear, pain and exhaustion. How is it that such a practice could have achieved popularity? Presumably there must be some advantages, otherwise experienced riders would not continue the practice. The disadvantages have already been described, so let's consider a cost/benefit analysis of this rather bizarre situation in order to better understand how over-bending could possibly thrive as a training technique.

Advantages of over-bending, as perceived by proponents and judges:

1. A tired horse may be easier for the rider to handle. Some of the 'air' will have been let out of its 'tires' and the horse might not be such a handful.
2. Some horses, perhaps those of a more phlegmatic temperament, react to pain by 'giving-in.' Horses become 'defeated' and submissive to the point of apathy and hopeless resignation, no longer seeming to care what happens to them. This is the state that Dr. Andrew McLean refers to in the FEI report as "learned helplessness," a state that results from failure to release pressure (see paragraph 2.3 of the FEI report)
3. Other horses, of a more spirited temperament, react to pain by developing a heightened sense of emergency. The discharge of adrenaline caused by a combination of pain and asphyxia at exercise generates a drama and tension in their behavior. Perhaps this is the 'WOW' factor, the 'electricity,' that judges mistakenly interpret as desirable and meriting bonus points.
4. Some riders believe that by over-bending a horse and putting it under 'pressure' during the warm-up phase that this provides for a sense of 'release' in the arena that is beneficial to performance
5. The hypersensitized mouth may enable riders to use less force when giving rein aids. The mere hint of an increased pain level from a squeeze of the fingers could be enough to prompt an immediate response. This facilitates virtually imperceptible rein aids; something else that the judges are scoring. The analogy has already been drawn between the practice of soring the mouth in the dressage horse and soring the shin in the Tennessee Walking Horse.
6. Prolonged over-bending during warm-up may prevent a horse from being too 'forward' during the test. Perhaps imperceptible rein pressure will keep a horse's head vertical or even behind the vertical and give an impression of collection that deceives the eye of a judge, even though this is being achieved by bit pressure rather than by seat and legs.
7. Generous salivation. Judges and riders have been taught for generations that salivation is a sign of 'acceptance of the bit.' In fact, this is incorrect but as over-bending tends to increase the amount of slobbering, such horses may be awarded bonus points (Cook 2001 a & b). Physiologically, a horse that is eating and breathing quietly will be salivating generously but because it is eating and mixing the saliva with grass, no saliva will escape from the lips. When breathing

deeply, at exercise, a horse at liberty will have a relatively dry mouth and sealed lips. It is only the presence of one or more foreign bodies in the mouth of a ridden horse, breaking the seal of the lips and stimulating salivation that accounts for the unnatural slobbering.

8. Chewing on the bit. Once again, it is the received wisdom that constant chewing signifies 'acceptance of the bit' and that this is something deserving bonus points. In fact, it is a sign of pain and discomfort, and a cause of dental erosion. Just as over-bending increases pain and discomfort, so too will it increase the euphemistically named 'playing with the bit' and this, in turn, might be mistaken for a virtue and scored accordingly.

9. Dr. Andrew Higgins, Chairman of the Welfare Sub-Committee, in his committee's preliminary report, observes that as over-bending and other training methods "continue to be used by the top medal winning riders and their trainers, the conclusion is inevitable that their use must help to produce a performance that the judges wish to see." I have added the emphasis to the end of that quote, as I believe that if judges reward features that do not promote the welfare interests of the horse, then judging standards need to be revised.

10. A bit in a horse's mouth makes it so easy for the rider to bend, let alone over-bend her horse. This provides a superficial semblance of 'collection' and self-carriage that, if not spotted by the judges and recognized as false collection, allows the competitor to gain unjustified bonus points.

11. If a horse's head is firmly flexed by bit pressure it will not be able to take an interest in its surroundings and no penalty points will be earned during a test on account of a horse exhibiting distraction, such as by turning its head sideways or raising it high for a moment. Similarly, if an over-bent horse is wearing a crank noseband, as many are, such a horse will be less likely to be penalized for opening its mouth.

12. It has been suggested that judges are being selected, by show administrators and competitors who are proponents of over-bending, for their known acceptance of the practice. If this is the case, judges who would penalize such welfare abuse are being sidelined and are no longer invited to officiate. Judging panels could in this way be stacked in favor of over-bending and the practice perpetuated.

13. The long-term effects of over-bending are, by definition, delayed and will not be recognized in a dressage test. Perceived short-term advantages may, therefore, be thought worth the risk by competitors, even though such horses may have to be retired prematurely because of long-term injury. An analogy could be drawn with the manufacturer who benefits by selling a product at an attractive face value but who is not penalized for the cost of cleaning up the toxic waste that is the by-product of the manufacturing process. Bits are weapons of horse destruction.

Disadvantages of over-bending, though these are not necessarily recognized as disadvantages by either proponents or judges. In fact some of the behavioral signs of pain and fear are interpreted incorrectly and are mistaken by judges as virtues. Other disadvantages, being long-term effects, do not surface in a performance and are overlooked.

1. The over-bending method is an extreme form of an already existing method of training that is itself a potentially abusive method, i.e., the bit method. (Cook 2003a-d, Cook & Strasser 2003).
2. The degree of head and neck flexion required, even for short periods, can cause pain in the mouth, jaw, teeth, head, neck, back, feet. legs and lungs.
3. Profuse sweating is a common sign of pain. Other signs of pain and fear include:
4. A wildness of expression in the eye
5. Constant headshaking
6. Inability to stand still
7. Inattention
8. Poor transitions
9. Lack of impulsion
10. Imbalance
11. The need for constant half-halts in order to rebalance a horse that only loses its balance because of the mandatory bits.
12. Protrusion of the tongue. It is a paradox that this problem for which the rider is penalized would not occur if the bit was not mandatory
13. Bucking
14. Rearing
15. Bolting

In addition to the above examples, there are the remaining behavioral signs of pain from the list of one hundred or more possible signs. These are commonly associated with even the standard use of a bit, let alone its use in over-bending (Cook & Strasser 2003). The majority of these signs are evident during exercise, so there is really no excuse for them being overlooked. Judges have a responsibility to study the signs and become aware that these are signs of a horse in pain or a state of fear. At present, when a horse evinces these signs, they may well be interpreted as 'drama' and gain the rider bonus points. Other harmful effects of over-bending may not be discernible during a warm-up or performance and only become apparent in the long-term. In this respect, such 'disadvantages' are not documented by judges.

'Over-bending,' whether applied briefly or for more prolonged periods, places horses under serious "pressure" (both psychologically and physically) and clearly contravenes the primary objective of the FEI that the welfare of the horse is paramount.

It is noticeable that the disadvantages of over-bending are the same disadvantages, though exacerbated, as those of the bit method of training. Being virtually the same behavioral signs as the more orthodox trained and bitted horse, the signs may not be recognized by the rider as having anything to do with the bit or over-bending. The behavioral signs are such old and familiar signs and my research explaining their true origin so comparatively recent, that many riders and judges have not yet recognized them as being caused by the equally familiar

and long-established bit. Instead, the bit-induced behavioral signs that are not mistaken for virtues are attributed to other causes and are often unfairly blamed on the horse's attitude or its alleged bad character. Accordingly, they are 'treated' with a host of repressive measures, none of which are effective as the real cause of the problem has not been recognized and removed...the only proper foundation for a successful treatment. It is not until a rider removes the bitted bridle and replaces it with a painless bridle that they recognize, in hindsight, what pain the bit has been causing all these years.

As this is often the case, the advantages of over-bending, under the present system of judging, may be thought by the rider to be justified, as the many disadvantages have not been correctly attributed to the practice of over-bending and are not being weighed in the balance. The full disadvantages of over-bending will only become recognized if the double bridle is no longer mandated as the only bridle allowed and a more recently available, painless method of communication is permitted (Figs 23, 24).

PART VI: RECOMMENDATIONS

Revision of Guidelines for Judges and Stewards

As the FEI is responsible for the welfare of horses throughout a competition, it is recommended that stewards should oversee the warm-up as judges oversee the performance. It is unacceptable to have different standards for these two phases, i.e. to condone cruelty during the warm-up and penalize it during the performance. As over-bending has been shown to be cruel, it is recommended that use of this method in the warm-up ring should be grounds for disqualification.

The question now arises, what are the physiologically acceptable headsets for both the warm-up and the performance. My proposal is that judges and stewards should be guided by the natural collection headsets that a horse willingly adopts when not being artificially constrained by bit or bridle. It is generally agreed that the finest horsemen use the least amount of hand and communicate largely with seat, legs, balance and breathing. So let's look for our evidence on guideline standards to those horses that have been trained to perform the classical dressage movements without bit or bridle. In the last few years we are fortunate to have a number of good examples to follow, e.g., Mario Luraschi in France, Silke Vallentin in Germany and Alexander Nevzorov in Russia. These are the people who can teach us what is physiologically acceptable to the horse. The following guidelines on headsets during natural collection are based on my observations of the two films published by Nevzorov (2003 and 2006) which demonstrate the natural headsets that a horse willingly, calmly and gracefully adopts when ridden haute ecole without a bridle. I might add that Nevzorov's

horses show not a trace of 'drama,' 'expression' or 'brilliance' and neither do they sweat profusely or slobber at the mouth. They simply do willingly and without coercion what is asked of them and they joy in the doing. This is exactly what the FEI guidelines are wishing to promote...a horse that is "calm, supple, loose and flexible, but also confident, attentive, and keen."

In these films, one can observe Nevzorov ride several different horses with a neck cordo and no bridle, at paces from the Spanish walk to the extended trot. A large range of haute ecole movements are demonstrated, including airs above the ground. Throughout these astonishing performances, except during a piaffe, the head is ahead of the vertical. The position of the breathing/balancing joint varies from the neutral position to just ahead of the vertical. Only in the piaffe, when the horse is trotting-on-the-spot, are these horse's heads slightly behind the vertical. It seems that, in the absence of forward momentum, the need to balance ('collect') requires the greatest degree of poll flexion. But even then, the flexion nowhere approaches the over-bent position of maximum flexion.

Currently, the FEI guidelines for dressage require that horses should be "on the bit." The phrase is an unfortunate one for a couple of reasons. First it implies that dressage training cannot be achieved without a bit, which is patently incorrect. It is only 'impossible' from an administrative point of view, as a bit is a prerequisite for all FEI sponsored dressage competitions. In fact, for advanced dressage, the current rules require not one bit but two, together with a curb chain. In case, anyone should try to compete with dummy bits in their horse's mouth, the rules have recently been amended to require that all bits must be attached to reins. Yet, as most elegantly and compellingly demonstrated by Nevzorov and others, humane and graceful performances of dressage can be achieved in the absence of a bit, the absence of a bridle, and even the absence of a rider. So why do the FEI rules require one or more bits as a matter of necessity? The question is especially appropriate in view of the advance in equitation made possible by the introduction, in the last eight years, of a painless/cross-under bitless bridle and the compelling evidence that the bit method of communication is cruel. Accordingly, it is recommended that the FEI rules and regulations be updated to eliminate the phrase 'on the bit'. It would be better to use the phrase 'on the aids' as this allows for a comment about contact yet without mandating a cruel method of contact. Such a change would also overcome a semantic obstacle to advance when it is proposed, quite correctly, that a horse can be 'on the aids' even when a bit is not present. At the moment, use of the phrase 'on the bit' represents an unnecessary and illogical obstacle to a reform of the equipment rules to permit riders the option of using the more humane cross-under bitless method of communication.

Secondly, it seems that the phrase "on the bit" is being incorrectly interpreted by FEI dressage judges as meaning that the nasal profile of the horse should be on the vertical or even behind the vertical. As a result, horses whose headsets lie between the neutral position and the vertical are currently penalized by many

judges. Yet the evidence shows that this is the range of head positions that the horse itself tells us is physiological for these particular movements. Accordingly, it is recommended that judges be reminded of the definition of 'on the bit' that is written into the FEI Guidelines. I quote: "In all his work even at the halt, the horse must be 'on the bit.' A horse is said to be 'on the bit' when the neck is more or less raised and arched according to the stage of training and the extension or collection of the pace, and he accepts the bridle (emphasis added) with a light and soft contact and submissiveness throughout.5 The head should remain in a steady position, as a rule slightly in front of the vertical, with a supple poll as the highest point of the neck, and no resistance should be offered to the rider." Sadly, it seems that many judges have tended to score horses on the assumption that any position ahead of the vertical is synonymous with 'above the bit.' In fact, as the definitions of head position at the top of this article make clear, a horse remains 'flexed' and can be perfectly well 'collected' at any position of the head in front of the vertical, as long as the nasal angle profile is above 53¼ &/or the jowl angle is less than 90¼. Once again, this is confirmed by the beautifully balanced ('collected') horses trained by Nevzorov without a bridle.

I am not aware of the reasons why the FEI adopted the phrase 'on the bit' in preference to the previous phrase 'ahead of the vertical. Perhaps knowledge of the history of this change would help me to understand the logic behind the change.

Along with the acceptance by judges of a different set of criteria regarding head position during both warm-up and performance, revised guidelines should make clear that bonus points can no longer be awarded for such features as 'spookiness', 'playing with the bit,' and excess salivation. A ruling to disallow crank nosebands would also be a welfare advance.

Aside from the need to comply with competition regulations, a rider's preference for a bitted bridle over a cross-under bitless bridle represents the triumph of faith over reason.6 A rider's faith that a bit is an acceptable and effective way to control a horse is incompatible with reason derived from an awareness of the horse's inborn responses to pain.

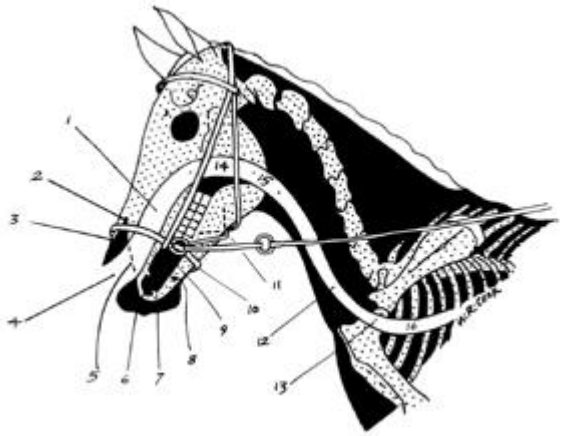
Some advantages to the horse, to the competitor and to the FEI that would flow from of a rule change to permit the cross-under bitless bridle.

* Competitors who opt to use the painless method of communication should expect to pick up bonus points for enhanced welfare
* 'Wild' eyes, 'spookiness,' profuse salivation, excessive sweating, tension and other signs of pain and fear would be absent
* Horses would be happier, calmer, more relaxed and in harmony with their riders
* Gaping mouths and protruding tongues would be eliminated
* Performance would be improved
* The likelihood of accidents would be reduced

* Bitless competitors would automatically be immune to penalties for over-bending. With such a method of communication it is virtually impossible to over-bend a horse. Any such attempt would also be blatantly obvious to the judges.
* Collection and self-carriage would be apparent and easy to judge, as false collection is impossible. Judges would have no need to differentiate between true and false collection as the latter would be as impractical to attempt as over-bending
* FEI sponsored competitions would be seen to be promoting the welfare of the horse
* To sum up, a horse without a bit is like a mouse without a cell phone. Bits are not only unnecessary but also inhumane and a serious impediment to performance.

Fig 23. The cross-under design of bitless bridle is painless, compatible with the physiology of exercise, provides comprehensive communication for all disciplines and enhances the welfare of horse and rider. Tension and release on one rein (yellow arrow) steers a horse by nudging the opposite half of the head (red arrows). Tension and release on both reins, signals slow or stop by gently hugging the whole of the head.

A 



B

Fig 24.
A. Showing the crossunder design of bitless bridle. The head and neck of this standing horse is slightly flexed (jowl angle 67¡ and nasal profile 74¡)
B. Showing the internal anatomy of the above photograph and how the cross-under bitless bridle is fitted so that the noseband is supported by the peak of the nasal bone. Though the noseband is placed lower on the head than a bitted bridle it is in no danger of obstructing the nostrils.
Key: Black = soft tissue: stippled = bone:
1 = nasal airway: 2 = premaxillary notch: 3 = false nostril: 4 = nostril: 5 = edge of premaxilla: 6 = closed mouth: 7 = Lower incisor teeth: 8 = mental foramen: 9 = bars of the mouth: 10 = chinstrap: 11 = crossunder straps 12 = trachea: 13 = thoracic inlet at level of first rib: 14 = nasopharynx: 15 = larynx

The cross-under bitless bridle is to the bitted bridle what the safety razor is to the open razor. It serves its purpose admirably and it is easy to use correctly. The risk/benefit equation is hugely in favor of the cross-under bitless (safety) method. Not only will it not leave a 'customer' raw, bleeding, and apprehensive of ever being 'shaved' again but also neither does it expose the customer (or the user) to the hazard of sudden death. The user does not need to be a master barber-surgeon to use it safely and it complies with the Hippocratic oath ... 'at least do no harm.'

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