Saddle Fitting for the Thinking Rider

Part 1

by

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Saddle Fitting for the Thinking Rider—Part 1

In this article we look at both the theory and practice of saddle fitting for all kinds of equestrian sport. Theory, so that we can understand enough to ask the "why" questions and analyse saddle fit. Then practice, to gather information to enable us to take action and make changes if necessary.

First I want to make one point. Very often, a rider having problems with his or her horse will think, or be told, that the problems are associated with the way they ride. My view is that you should start looking for a solution **by not blaming yourself first**. Often it is the case that the way the rider sits on the horse is simply the way the saddle determines, and not in a way which makes it possible to unite the horse and rider in optimum balance. Trying to achieve a natural, balanced riding position, if the saddle is blocking your efforts and those of your horse, is difficult and not at all rewarding. Once you have eliminated every other cause and are sure your saddle allows you to sit in a light, balanced position even when you are tired, then it is time to look at the quality of your riding.

I have broken the subject down into three topics. We start with the horse, for we must clearly understand how the saddle affects him. Then we look at horse and saddle together, and finally we investigate balance and harmony in motion, taking in horse, saddle and rider, and ending with some considerations for competitive riding. At the end of each topic we will look at practical ways in which we as riders can assess saddle fit and take an active part in improving it.

THE HORSE

There are four basic questions we might ask, the answers to which should start us thinking about how the saddle and horse interact:

1. What is the maximum available surface area, on the back of the horse, upon which a rider's weight can be applied without causing discomfort and/or damage to the horse?
2. What is the maximum pressure which can be applied to the horse's back?
3. How does a horse move, and how can we be sure that the horse's movement is not restricted by a saddle?
4. How does a horse hold a rider up and how might this affect movement?

1. Available area for a saddle

To answer the first question we must look at the structure of the horse.

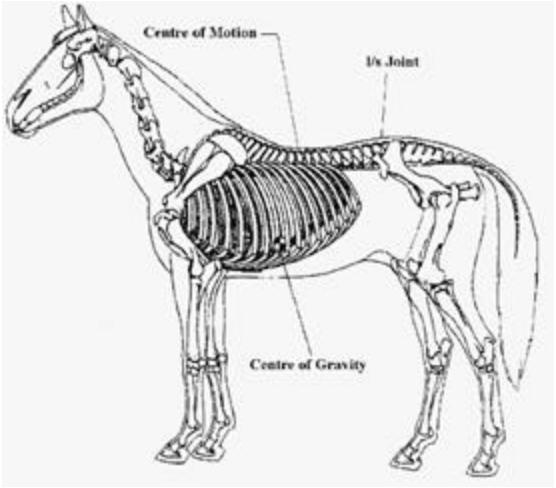

Figure 1

The strongest structure is the rib cage and in particular those ribs which are attached to both the spine and the sternum (ribs 1 to 8). The floating ribs (ribs 9 to 18) are not as strong as they are nominally 'free' at the lower end and are used in the action of breathing. Because the ribs form a cylinder they offer structural strength both along and across the back. The shoulders and the associated muscles cover most of ribs 1 to 8 and must be unrestricted if the horse is to move well. The outer muscle covering the rest of the ribs is thin but very wide and will not be restricted by the parallel contact of flat and comfortable saddle panels. Once beyond the last (18th) rib the strength provided by the rib cage is lost; furthermore this lumbar region is the one with most side to side movement, when the horse is in motion.

From these observations we can determine the largest load bearing area on the back, which leaves the horse free to move and breathe. To do this an imaginary line can be traced over the back, as illustrated in Figure 2, tracing the available saddle contact area. This amounts to about 1sq ft on either side of the horse (2sq ft in total) and does not vary markedly with breed and size (14 hands upward).

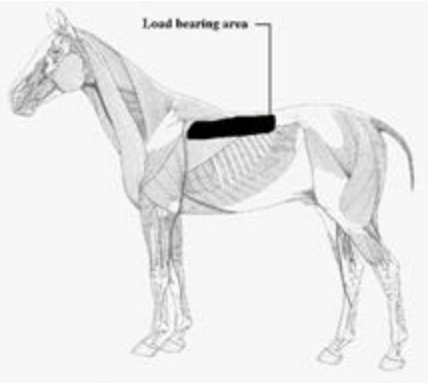

Figure 2

2. Pressure and blood flow

When pressure is applied to the skin and muscles of animals, including humans, there are two typical effects. The most familiar is the bruise, which comes out because small blood vessels, called capillaries, are ruptured from a sharp blow. The other effect occurs when the blood flow is stopped in the capillaries from constant, unrelieved pressure. If there is no flow for long enough, then the capillaries cannot reopen, resulting in the death of the surrounding cells through lack of oxygen. If the vessels are able to reopen, then a swelling will normally be seen, as there is a surge of blood and fluid into the affected area to resupply oxygen and remove waste products.

Studies show that at a surface pressure greater than 1.5 psi (pounds per square inch) the heart can no longer pump blood into the skin capillaries. If this condition lasts for too long (1 to 2 hours) the capillaries will not reopen when the pressure is removed, and localised cell death occurs. When this happens under the saddle we find swellings, sores, white hairs and tenderness. We therefore want to reduce the pressure from the

saddle as far as possible, and to achieve this the greatest area of contact between saddle and horse should be the aim.

3. Moving under the saddle

Free flowing movement in the horse is the essence of our sport. For this to happen the connection between the poll and the croup must not be blocked - and yet, right in the middle of this connection we place the saddle.

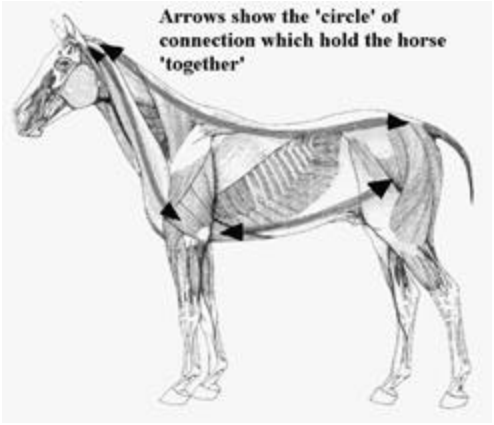

Figure 3

Looking at figure 3 we can see that a large muscle connects the front leg to the poll - so, what stops the head coming down, when this muscle is contracted, rather than the leg moving forward? The answer is the tendons and muscles of the back, eventually connected to the pelvis, and via the abdominal muscles to the rib cage and sternum. That same neck muscle links through the shoulder joint with the shoulder blade, which is held in position by the trapezius muscle on the side of the withers and the neck. Saddles often block the shoulder blade and restrict the function of the trapezius muscle. If this is the case, how can the front legs, poll, back, pelvis and hind legs work in unison at all paces?

4. Carrying the rider

Contrary to illustrations often seen the big muscles in the back do not act like part of a suspension bridge holding up the spine. It is the tummy muscles, connected to the underside of the pelvis, which do that. For the back to be up, the back muscles must stretch. It is when the back muscles are tense or hurt when stretched, which cause the hollow back, high head and trailing hind legs.

Most of the horse's spine is quite rigid, except for the joint between the last lumbar and first sacral vertebra (l/s joint), see figure 1. This joint has movement of 10-20 degrees vertically, while the rest of the vertebral joints can only move 2-5 degrees. The abdominal muscles, pulling on the pelvis, rotate it on the l/s joint, lifting the back and bringing the hind legs well under the body, thus making the horse better engaged. This permits the big muscles of the hind legs to have the best effect in moving the horse forward into a straight spine, and light forehand.

Practical application

With a basic understanding of how the horse works it is possible to make observations and checks, which will help to assess just how your horse is moving, and whether any problems may be due to the saddle. This is not a sure fire guide with all the answers, but it helps build a picture from which a conclusion can be drawn and action planned. Observations and checks are listed as single items for clarity, but try and build a picture from what is discovered.

Observations when ridden:

- position of head - high and tense
- straggling hind legs and dipped back
- three beat trot - ridden and trotted up
- reluctant to canter - always on the same lead leg
  reluctant to move freely down hill

Other observations:

- dragging rear toes so that they wear flat
- shoe wear - more on front feet than hind
- saddle shaped back, with hollows behind shoulders
- poorly developed upper neck (neck part of trapezius or wither muscle)
- white hairs following part (often a triangle on the withers) or all of the shape of saddle panel
- thin, poorly developed back muscles, giving a triangular rather than rounded shape across the back
- horse dropping its back significantly when rider mounts
- non-specific lameness

Checks to carry out on your horse:

- press hard on the back with two fingers, but not finger nails, over all the area the saddle touches (but say hello first by rubbing and smoothing the back with the hands). If you get a response leave that area alone for a while and come back to it. Tenderness normally shows a consistent reaction - the best guide is usually the ears, eyes and tension in the neck - attempt to take the horse's character into account.
- feel for hard skin and scabs under the hair, especially at the withers and front of the saddle - can the hair be pulled out in lumps with scabby skin on the end?
- feel and look for swellings, especially after a ride

  feel the lower neck muscle, on either side - is the muscle tight - does the horse back away when the muscle is gently squeezed between thumb and fingers?

I have encountered all the above when looking at saddle fitting problems. In mild cases it may only be one thing, in others, several symptoms will show up. A change in saddle fit and remedial treatment for neck, back and muscles usually will return everything to normal. If the problem rests with the saddle you can repeatedly spend any amount of money on back treatment, but fixing the saddle will fix the problem.

If you have any doubts get a friend to observe and check, ask a vet and/or back specialist to look and comment. There may well be other causes for the symptoms, not at all related to saddle fitting. The business of problem solving with horses is one of elimination, as the horse can only react to what we do - trial and observation is the only way we have of asking questions of the horse.

THE HORSE AND SADDLE

Having established that there is about 2 sq. ft. (1858 sq cm) of usable surface on the back of the horse on which to put a saddle, we must now consider how this can best be used.

To fully utilise this area and minimise pressure the whole of the saddle panel must come into even contact with the whole area in figure 2, with the rider in the saddle on the horse. Provided the rider is in the middle (see next topic) of the saddle, the rider's weight will now be evenly distributed on the back throughout any activity.

If all the 2 sq. ft. (1858 sq cm) of usable area on the back of the horse are used to take a saddle, and an average rider weighs 11 stone (70kg), a pressure of 0.5psi (0.035 kg/sq cm) will be applied, going up to 1psi if half the area is used, and so on, provided contact is uniform over that whole area. If any part of the panel protrudes downwards and touches the back before the rest, then that part will always exert greater pressure and this may result in discomfort, with some of the symptom discussed above. Remembering that the crucial pressure limit is 1.5 psi (.105 kg/sq cm), it is clear that there is some leeway in just how much of the panel touches the back of the horse, provided it has even contact.

You can use the table below to estimate the sort of pressure being applied to your horse's back. The column under 2 sq. ft (1858 sq cm) shows the best possible result while that under 0.5 sq. ft. (464 sq cm) shows the worst, unfortunately many saddles have panel contact areas of less than 1 sq. ft. (929 sq cm) so it can be easily seen that horses are often ridden in the 1.5 psi (.0105 kg/sq cm) danger region, even with light weight riders!

Pressure applied to the horse's back for different panel contact areas and total rider/saddle weights in pounds per square inch and kilograms per			
Rider weight Stone(Kg) / pounds	Area of panel in contact with the horse's back		
	2 sq. ft. (1858 sq. cm)	1 sq. ft. (929 sq. cm)	0.5 sq.ft. (464 sq. cm)
8(50) /112	0.39(.027)	0.78(.054)	1.56(.108)
9(57) /126	0.44(.031)	0.88(.061)	1.75(.123)
10(63) /140	0.49(.034)	0.97(.068)	1.94(.136)
11(69) /154	0.53(.037)	1.07(.074)	2.14(.149)
12(75) /168	0.58(.040)	1.16(.081)	2.33(.162)
13(82) /182	0.63(.044)	1.26(.088)	2.53(.177)

A saddle should therefore have a contact area of not less than 1 sq. ft. (929 sq cm), all of it in even contact with the back of the horse within the confines of the area in figure 2. For long distance and endurance riding you should aim for a greater area of contact than the minimum square foot, as you are usually in the saddle more than 2 hours, the critical time after which damage can occur from prolonged constant pressure.

In utilising this area alone we do not, however, get a saddle which will stay in place and not move from side to side. To stabilise the saddle the contact area must extend up the withers, using them to give lateral stability without applying the rider's weight there. If weight is applied at the withers, which is soft muscle tissue, the saddle will, over time, sink into the withers and block the shoulder movement.

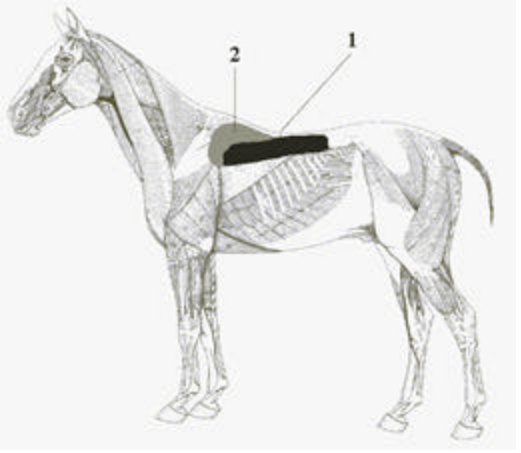

Figure 4

To completely eliminate damage to the wither area and maintain free shoulder movement the contact area can be extended over the rear of the shoulder blade. This contact must be very flexible and give, without hindering the shoulder or applying the rider's weight. Figure 4 indicates the revised contact area, after taking stability and freedom of movement into account by combining the load bearing area (1) and stability area (2).

Practical checks with saddle and horse:

- *Does the saddle contact the whole of the back?*

A common problem is that the saddle touches front and rear, with a hollow under the middle of the panel. The horse may be sore both front and back, with hard skin and temporary lumps after rides and white hairs.

To check for this fault place the saddle on the horse's back in the usual place (correct place is another question!), do not girth up. While holding the saddle on the back with one hand, slide the fingers of the other hand under the sweat flap and up to the panel, checking for places where the fingers easily slip between back and panel. If they do, then that side of the saddle has bridging contact with the back. Now check the other side in the same way.

It is sometimes thought that the horse, if he is going properly, will round up into this space. If, however, we consider that the back near the withers has almost no flexibility, it is difficult to see how it can round to fill the space. In fact most "rounding up" comes from the l/s joint at the rear of the horse and is combined with a lowering of the haunches and the hind legs stepping farther under the body.

A saddle that bridges the back needs to be altered. If you have a flocked saddle, have the flocking adjusted to fill the space, with the horse present so that the saddle can be fine-tuned to your horse - do not send it away for reflocking! For flat panel saddles, readjust the panel settings to give the correct contact. If you cannot do this yourself, ask the manufacturer or agent to come out and do the adjustments for you. With both types of panels it makes sense to test ride the alterations to check that all is satisfactory.

How large is the area of panel that contacts the back of the horse?

This is a difficult one without an accurate measuring system. To give an idea of the minimum area place two sheets of A4 paper side by side (or open up a magazine). There should be the equivalent to the area of an A4 sheet contacting the horses back on each side. Now look at the panels of your saddle and consider the following:

> *How hard/soft are they? - the harder the flocking the less it will give and the smaller will be the contact area.*

How rounded are they? - round panels against a back rounded in the opposite direction give a smaller area of contact?

How narrow are they? - narrow panels tend to be more rounded, so give a smaller contact area.

Am I getting as close to an A4 page of contact on both panels? - if not the only solution is a new saddle.

- ***Does the saddle block the shoulders?***

This tends to depend on two factors: the size of the shoulders and the extent of the hollow in the withers. With this in mind consider the following:

With the saddle placed on the horse in the usual place, how much space is there between the back of the shoulder blade and the panel? - touching perhaps?

Is it obvious that the saddle does not move forward because it is stopped by the shoulder?

Does walking down hill seem stilted and difficult?

Does the walk generally seem stilted and stiff?

Any of these **may** indicate a blocking of the shoulder to varying degrees, which will have the knock-on effect of reducing engagement and the power the horse can deliver with the hind legs, through the circle of connection shown in Figure 3.

- ***Does the saddle lift at the back in trot?***

This indicates that the saddle is not adjusted correctly at the front.

This simple statement hides a minefield of problems! It could be that the flocking has just compressed, or alternatively the horse's wither has shrunk away, or both. Should it be decided that only the flocking has compressed, then have it adjusted **with the horse present** and ride to test the result.

If the withers have hollows, to narrow the saddle will only make matters worse in the long term, although it will stop the rocking short term. In addition, letting the saddle fill this hollow in the withers cannot possibly help the trapezius muscles to recover, fill out and do their proper job. It is hard to say where to go from here, but lunging and free schooling on a frequent basis will help, as the muscle can build without the rider's weight pressing on it. It might also be worthwhile giving consideration to the use of a flat panel saddle.

- ***What about girths and girthing?***

The girth can only secure the saddle in one place, namely where the horse has the narrowest circumference. Therefore the girth will slide back or forward (most common) until that point is found. The ideal place for the horse to have this narrowest circumference would be directly below the middle of the saddle. We could then girth up in the middle and get even girth pressure over the back - but the horse did not evolve to our design. Because of the way the horse is made the girth holds the back of the saddle down by rotating the saddle on a point forward of the girth's attachment to the saddle, that is the withers, which only works effectively if the panels are set correctly as discussed above.

To check your girthing arrangement place the saddle on the horse in the usual place, attach the girth to one side, and let it hang down. Stand back and hunker down, looking to see if the girth and the upward dip ("girth groove") on the sternum line up. If they do this is great, the saddle is unlikely to move. If the girth groove is in front of the girth then use the front two girth straps, if behind use the rear two.

Point and balancing straps (angled from the rear of the saddle) should be avoided if at all possible. Point straps help if nothing else can be done for a horse which has a girth grove next to the elbows. The disadvantage is that they pull directly on the saddle points and may block the shoulder and increase the pressure at this point on the withers. Always use an elasticated girth with point straps to provide some give. The balancing straps help with a narrow-ribbed horse, where the saddle slides back. However, the pull is both forward and down. In pulling forward the balancing strap may, again, cause blocking of the shoulder.

- ***And then the gullet?***

A wide gullet over the spine behind the withers is essential, and should be at least three to four fingers wide.

At the wither, it becomes a little more complicated, as this part of the back provides stability for the saddle. A very wide gullet over the withers makes the saddle laterally unstable (slipping to the side when the rider leans down to reach a gate), whereas a narrow gullet, especially if combined with a narrow panel, compresses and damages the wither muscle, but gives good stability.

Therefore make sure that the panel of the saddle is at its widest over the wither, so that the weight can be transferred to the ribs below the wither, yet with the panel just contacting the wither itself to give reasonable lateral stability.

- ***Can numnahs help?***

Numnahs which absorb sweat and transfer it to the outside of the numnah are ideal as they help to cool the horse's back. Certain types of knitted materials and real wool on a knitted backing are good at this.

Numnahs to fix a saddle problem are usually not effective. They may do as a very temporary stop-gap. The real answer will lie in getting the saddle fit correct.

HORSE, SADDLE AND RIDER IN BALANCE

To ride with no tension and minimal stress you must be in balance with your horse at all times. In beginning to think about balance in riding we must remember that the horse has its own system of balanced locomotion. The rider's objective is to minimise any disturbance to this natural balance. Figure 1 shows the horse's skeleton with the centre of gravity when standing in a normal relaxed position. You will notice it is forward of the centre of the horse's body, as the weight of the big and heavy head is forward of the front legs.

Horses, when moving forward move their centre of gravity to match the pace, and the rider must move her centre of gravity to stay in balance. Walking or running is a controlled fall forwards; the centre of gravity is pushed forward over the supporting legs and the farther out it is pushed the quicker the legs will have to move to stop the fall. Human sprinters seem to be almost falling over, and with race horses the neck is stretched out and the jockey gets as far forward as possible. In both examples they are trying to go as fast as possible, with the centre of gravity moved as far forward as possible, short of catastrophe. In contrast we can think of the dressage horse and rider, where the centre of gravity is kept within the area covered by the supporting legs to give poise and grace in movement. For long distance riding think of the long distance runner, centre of gravity just out in front, to keep a relaxed, energy conserving pace, for mile after mile.

If we look again at Figure 1 you will note that on a vertical line half way between the legs of the horse is the centre of motion (it's the place that moves the least when cantering, so if you can sit there you get the best ride). To illustrate the relationship between the centre of gravity and the centre of motion consider the horse described as being 'on the fore-hand'. It has moved its centre of gravity forward of the centre of motion to a place inappropriate for the pace, far enough for trotting say, when in fact it is only walking, so it seems heavy on its front legs. At the other extreme, when the dressage horse is asked to do piaffe it has to be so collected that the centres of gravity and motion coincide.

Practical checks with horse, saddle and rider

Here are some steps you can take to optimise the saddle fitting so you have the best chance of riding in balance?

1. *First find the centre of the saddle by measuring from the pommel to the cantle, halve the distance and find the point on the seat directly below that measurement. When you put the saddle on the horse the centre of the saddle should be placed over the centre of motion of the horse, between ribs 12 and 15 (count back from the 18th rib).*
2. *The centre of the saddle is also where your seat bones should be placed. Your weight is then equally distributed over the front and rear of the saddle. For this to happen when you are seated on the horse and in the saddle, the saddle centre must be the lowest point of the seat. With the saddle in its usual place on the horse but not girthed, lift the rear of the saddle. As you lift, is a point reached where the seat seems level? If this is so, then the saddle in its normal position is sitting you at the back. Doing the same check, but lifting the ungirthed saddle from the pommel end, will reveal if the saddle in its normal position sits you forward.*

3. *To correct a saddle that tips forward or back it is often necessary to make adjustments to the flocking or flat panels. As before, only have this done with the horse present and test ride the result, doing slight changes until you are satisfied.*
4. *If all of the above is correct your centre of gravity should be placed over the horse's centre of gravity, see figure 5. But what about the shoulder-hip -heel (SHH) alignment?*

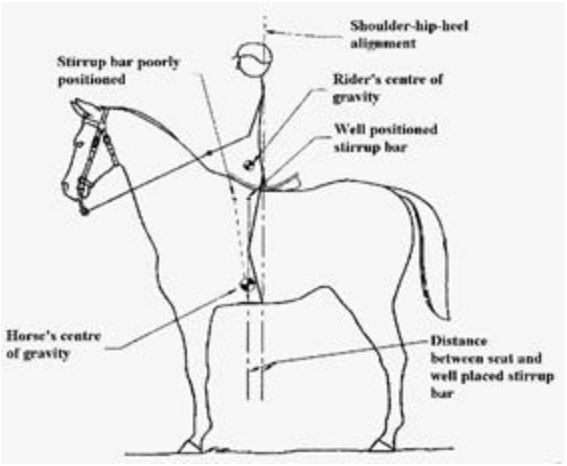

Figure 5

5. *To sit SHH without a struggle the distance from the centre of the seat to the centre of the stirrup bar should be the same as the distance from your heel to the ball of your foot as shown in figure 5. If the stirrup bar is placed too far forward the rider is not in a relaxed SHH position, as the leg has to be physically held back. When rising to the trot the legs swing forward on the stirrup leather pendulum and the sense of balance is lost. On the other hand if the leathers hang straight down from the stirrup bar to the ball of the feet we can rise in the trot without the leg swing. In addition sitting becomes gentler and more controlled, as the thigh muscles stay in closer contact with the saddle.*

6. *The problem here is that every rider has different sized feet, so the shoulder-hip-heel alignment, in relation to the stirrups, is different for each person. To overcome this difficulty it is a good idea to have adjustable stirrup bars as shown in figure 6 fitted to the saddle.*
7. *Then, having found the centre of your saddle, centred the saddle on the horse and yourself in the saddle, the stirrup bar can be adjusted to give a perpendicular leather to the ball of your foot.*

Figure 6

Getting these points right, i.e. fine tuning your saddle, will mean that you will tire less, and even when you do get tired the design and placing of your saddle naturally puts you in the most balanced and least energy consuming riding position. Changing your riding position to a more 'classical', 'centred' or 'balanced' seat often does not come easy, as old habits die hard. There can be a feeling of being unsafe and out of balance, as your body recalibrates its joint angles and muscle tensions to suit the new position. However, once the body learning is done the full benefits become apparent.

COMPETITION TIPS

- Get the saddle fitting right before the season starts.
- If problems develop, stop competing, solve the problems and start again.

- With long distance and endurance riding vet gates, and at crew stops if you have time, remove the saddle allowing the capillary blood flow to recover.

- If problems (swellings, sores, tenderness) arise during competition, retire.

- Girth up only just tight enough to keep the saddle in place.

- Use wicking numnahs, which help to cool the back.

Perhaps some of the above seems to go against the competitive spirit, but we owe it first to the horse, bound by our will and not free to do as he pleases, then to ourselves and finally to the sport to ensure that enjoyment, comfort and welfare have pride of place.

Free'n'Easy Dressage Special

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