Can saddle fitters reliably and repeatably locate the most caudal thoracic dorsal spinous process?

Francesca Bradley and Kathryn Nankervis, Performance in Equestrian Sport Group, Hartpury University Centre, Hartpury, Glos. GL19 3BE

Correspondence e-mail: kathryn.nankervis@hartpury.ac.uk

Introduction: A correctly fitting saddle is important for the welfare and performance of the horse. It is often recommended that the saddle tree should not extend beyond the top of the last rib (i.e. caudal to the 18th thoracic vertebra) (Dyson et al. 2015). Fitting both the horse and rider can be a problem with larger riders (Dyson et al. 2015) and anecdotal reports claim that many horses are fitted with saddles that extend into the lumbar region of the back (Society of Master Saddle Fitting Consultants, pers comm). Prior to investigating the extent to which this practice occurs, and indeed, whether or not it has any bearing on horse comfort or performance, it is necessary to establish whether saddle fitters can identify the most caudal thoracic vertebra. The aim of this study was therefore to determine whether saddle fitters can reliably and repeatably locate the dorsal spinous process (DSP) of the 18th thoracic vertebra (T18).

Method: Part 1: Reliability: Three saddle fitters (SF) took part in the study. SF1 was a Master Saddle Fitting Consultant (MSFC), SF2 was both a member of the Society of Master Saddlers (SMS) and a MSFC, and SF3 was a member of the SMS. SF3 found T18 by following the last rib up to the thoracic spinous process, whilst SF1 and 2 also counted 6 DSPs cranially from the lumbosacral junction. Radiography was used to locate the DSP of T18 in seven horses (bodyweight 543kg ± 40k; body condition score 4.6 ± 0.6 (Henneke et al. 1983)). Following radiography, the location of T18 (T18vet) was marked at the skin surface with a circular, self adhesive marker (19 mm diameter). A second marker of the same type was placed in a random location on the lumbar spine and the distance between this marker and T18vet was measured using a flexible ruler (Perfect Saddle Fit, bettersaddles.co.uk) and following the spinal curve to give 'T18distance'. T18vet was then removed and the SFs were asked in turn to locate the DSP of T18 using their normal palpation technique and to mark it with a self adhesive marker. Each SF was allowed up to 15 minutes per horse. They worked in isolation and were blinded to T18vet and to each other's measurements. The difference between the T18distances given by each SF and the vet were calculated. A negative value corresponded to the SF identifying T18 as being caudal to T18vet and a positive value corresponding to the SF identifying T18 as being cranial to T18vet. Intraclass correlation coefficients (ICCs) were used to determine the level of agreement and the level of consistency between SFs and vet. **Part 2: Repeatability:** Each SF located T18 in a further 3 horses on two occasions approximately 30 minutes apart, generating two T18distance measurements for each horse per SF and 9 measurements on each occasion (3SF x 3 horses). These horses (a Shire Cross, an Irish Sports Horse and a Welsh pony) were currently ridden in saddles of different widths; wide, medium, and narrow, respectively. The T18distance measurements on occasion 1 and 2 were compared using a Wilcoxon Signed Rank Test ($P<0.05$).

All statistical analyses were carried out in SPSS version 24.0. Ethical approval was obtained from the Hartpury College Research Ethics Committee.

Results: SF1 and SF2 placed their markers cranial to T18vet in 6/7 horses, a mean of 4.3 cm (± 4.1 and ± 4.0 respectively) (cranial) to T18vet. SF3 placed their marker caudal to T18vet in 5/7 horses, with a mean difference of -0.1 cm (± 3.6) (caudal) to T18vet. Agreement between all SFs and the vet was 'poor', (using a scale where <0.4 = 'poor'; 0.4-0.75 = 'fair to good' and >0.75 = excellent (Fleiss, 1971)) with agreement between SF1 and vet of 0.360, between SF2 and vet of 0.354, and between SF3 and vet of 0.223. Consistency between vet and SF1 and

2 was classed as ‘fair’ at 0.523 and 0.522 respectively, however consistency between vet and SF3 was ‘poor’ at 0.177. Repeatability measures showed that in all but one instance all SFs placed the T18 marker within 2.0 cm of each other (apart from SF1 on the Shire cross) and there was no significant difference between T18distance between the two occasions (P=0.725).

Discussion: Saddle fitters were not able to identify T18 reliably, as the intraclass correlation coefficients were deemed to be ‘poor’. However, SF1 and SF2, who used the method of palpating forward from the lumbosacral junction showed greater consistency between their placement and T18vet than SF3. SF3 used the method of following the curvature of the last rib to locate T18, and whilst the mean difference between their placement and T18vet was low, the consistency with the vet was lower than that of SF1 and SF2. As SF1 and SF2 were consistent in placing their marker in front of T18; their method could be improved by counting 5 dorsal spinous processes in front of the lumbosacral junction, as presumably the last lumbar DSP is too deep to be palpable. All 3 SF were repeatable to within 2.0 cm (i.e. likely to be within one DSP) on all but the widest, and tallest horse. This horse may have been more difficult to palpate either because of the large paravertebral muscle mass and/or because SF1 was less likely to be ‘above’ this horse when placing their marker.

SF3 did not consider the position of T18 at all in their normal daily practice; arguing that as long as the saddle panels did not extend beyond the last rib, it should not compromise the movement and comfort of the back. This is an extremely valid point regarding the weight bearing area under the saddle; but this study highlighted large variability in rib curvature between our 7 horses. In horses with greater rib curvature; fitting the saddle panels to a point vertically upwards from the last rib would place the weight bearing portion of the saddle on the lumbar vertebrae.

Conclusion: This study has shown that current methods do not allow saddle fitters to reliably palpate the DSP of T18. The results suggest that counting forward 5 DSPs from the lumbosacral joint would be more reliable than attempting to follow the curvature of the last rib, and less likely to lead to a saddle being fitted that extends into the lumbar spine. Both the length of the thoracic spine and the curvature of the rib should be taken into account when fitting a saddle to a horse. Further work is needed to investigate the relationship between the length of the saddle in relation to the thoracolumbar junction and the impact of this relationship on the comfort and performance of the horse.

Acknowledgements: Thank you to the British Horse Foundation and the saddle fitters for their generous support of this study. Special thanks also to Dr Sue Dyson for her advice and input.

References:

Dyson, S., Carson, S. and Fisher, M., 2015. Saddle fitting, recognising an ill-fitting saddle and the consequences of an ill-fitting saddle to horse and rider. *Equine Veterinary Education*, *27*(10), pp.533-543.

Egenvall, A., Byström, A., Weishaupt, M.A. and Roepstorff, L., 2013. Horse-rider interaction. *Equine locomotion. 2nd ed. Philadelphia: Saunders Elsevier*, pp.341-368.

Fleiss, J.L., 1971. Measuring nominal scale agreement among many raters. *Psychological bulletin*, *76*(5), p.378.

Henneke, D.R., Potter, G.D., Kreider, J.L. and Yeates, B.F., 1983. Relationship between condition score, physical measurements and body fat percentage in mares. *Equine veterinary journal*, *15*(4), pp.371-372.