Proceedings of the 48th British Equine Veterinary Association Congress

BEVA

Sep. 9 – 12, 2009
Birmingham, United Kingdom

Next Congress:

Reprinted in IVIS with the permission of the British Equine Veterinary Association – BEVA
http://www.ivis.org/
15.45–16.00

Refining the transarticular drilling technique to facilitate ankylosis of the distal tarsal joints in horses with bone spavin and establishing surgical performance criteria

**McDonald, S.A., Voûte, L.C. and Lischer, C.J.**
Weipers Centre Equine Hospital, Division of Companion Animal Sciences, Faculty of Veterinary Medicine, University of Glasgow, Bearsden Road, Glasgow G61 1QH, UK.
samcdonald2@yahoo.com

**Aims:** Transarticular drilling is a widely-practiced procedure that facilitates ankylosis of the distal tarsal joints for the treatment of bone spavin. However, there are many variations of the technique and no attempt to modify the procedure has been made. The objectives of the study were to describe a detailed protocol for the procedure and develop an in vivo technique for measuring the amount of articular surface ablated. **Methods:** Three 4.5 mm diameter tracts were drilled across the tarsometatarsal and distal intertarsal joints of 10 isolated equine tarsi: (Tract 1) a 20 mm long tract directed towards MTIV; (Tract 2) a 20 mm tract angled 30° plantar to Tract 1; (Tract 3) a 35 mm tract angled 30° dorsal to Tract 1. Drilling was monitored fluoroscopically. Measurements made from multiplanar reconstructions generated by a C-arm (ZiehmVisionVario-3D C-arm, Ziehm Imaging GmbH) were used to calculate the percentage of articular surface area ablated and the data compared to measurements made from digital photographs of the disarticulated tarsi. **Results:** The mean articular surface area ablated was 298.8 mm² (±21.0) for proximal MTIII and 295.8 mm² (±28.1) for proximal third tarsal bone (T3), corresponding to an average 18.9% (range 14.5–23.8%) and 21.7% (range 15.1–30.9%) ablation of the articular surfaces, respectively. The mean surface area ablated was 1.5% (range 0.0–3.2%) greater for proximal MTIII and 2.1% (range 0.5–4.9%) greater for proximal T3 when measurements were derived from C-arm images. **Conclusions and Practical Significance:** The refined procedure yields consistent and repeatable results regarding the amount of articular surface ablated. Also, multiplanar reconstructions may be a valid intraoperative tool for assessing the proportion of articular surface area destroyed during the procedure. Adoption of this protocol will produce consistent ablation of a known percentage of articular surface area and may enable better evaluation of the factors affecting patient outcome in prospective studies.

16.00–16.15

Mapping the normal thickness and density of the proximal subchondral bone plate of the proximal phalanx in the fit Thoroughbred racehorse

Firth, M.J. and Singer, E.R.
Philip Leverhulme Equine Hospital, Faculty of Veterinary Sciences, University of Liverpool, UK. Xp0u4Q041@liv.ac.uk; e.r.singer@liv.ac.uk

**Aims:** To assess the thickness and density of the proximal subchondral bone (SCB) unit of the proximal phalanx (PP) of the fit Thoroughbred racehorse and to test for a correlation between anatomic measurements and measurements from images acquired by magnetic resonance imaging (MRI), computed tomography (CT) and computed radiography (CR). **Methods:** In 3 frontal sections (dorsal, middle and palmar), the thickness (mm) and density (Hounsfield units) of the SCB of forelimb PP was measured in bones from fit racehorses (n = 16) subjected to euthanasia for reasons unrelated to the musculoskeletal system. Thickness was measured with low field, open magnet MRI, 4-slice helical CT and CR with the measurements compared to corresponding anatomic sections. The density and thickness measurements were taken at 11 standard sites from medial to lateral, for each frontal slice. Pearson’s product moment correlation was used to compare among the anatomic sections and the images acquired. **Results:** A strong correlation (r = 0.791) was found between MRI derived measurements and a good correlation (r = 0.681) between CT measurements and the anatomic specimen measurements, respectively. A poor correlation (r = 0.230) was noted between the anatomic and CR measurements. The SCB thickness pattern varied between the 3 anatomic sections. A fair to poor correlation was found between the SCB thickness and density, with the correlation coefficients for the palmar, middle and dorsal slices being 0.453, 0.353 and 0.199, respectively. **Conclusions and Practical Significance:** The variation in the SCB thickness and density in the dorsopalmar and medial-lateral planes probably reflects the biomechanical loading of this bone during exercise. The correlation between actual and measured SCB thickness on low field MRI indicates that standing MRI could prove useful to monitor changes in thickness over time, sequentially during training. Ultimately, MRI may assist in detection of prefracture pathology. **Acknowledgements:** The Wellcome Trust.

16.15–16.30

Quantitative motor unit action potential analysis in two paraspinal muscles in sound adult Warmblood horses

Wijnberg, I.D., †Graubner, C., Back, W. and †Gerber, V.*
Department of Equine Sciences, Faculty of Veterinary Medicine, Utrecht University, The Netherlands; and †Equine Clinic, Vetsuisse Faculty, University of Berne, Switzerland.
Claudia.graubner@knp.unibe.ch

**Aims:** To determine normative data on quantitative motor unit...
action potential (MUP) analysis of the paraspinal muscles serratus ventralis and brachiocephalicus and to investigate differences between muscles and/or localisations. Methods: Seven adult (mean ± s.d. age 9.5 ± 2.3 years, height 1.64 ± 0.45 cm, and rectal temperature 37.6 ± 0.3°C) normal Dutch Warmblood horses without clinical neurological signs and radiographic abnormalities of the cervical column underwent quantitative MUP analysis. In each muscle 6 segments were measured. Segments were defined by palpation of the transverse processes of the cervical vertebrae and represent the area between 2 respective vertebrae. Commercial EMG equipment (Viking Quest) was used. Measurements were performed according to formerly published methods. ANOVA with post hoc testing according to Bonferroni on LN transformed data was used SPPS 15.0 to analyse the data. Results: No significant differences (P<0.80–1.00) existed in mean duration, amplitude, number of phases, area or size index among the 6 segments in either muscle; only the number of polyphasic (>3.0 phases) MUPS was higher (P<0.03) in the segment between the 3rd and 4th vertebrae in the serratus ventralis muscle. The mean amplitude, number of phases and size index were significantly higher in the serratus ventralis muscle (P<0.05). 95% CI intervals for serratus ventralis and brachiocephalicus muscle were for amplitude (488–551 μV and 412–483 μV), duration (4.3–4.6 ms and 4.3–4.7 ms), and number of phases (2.9–3.0 and 2.7–2.8). The mean number of polyphasic MUPS was maximally 1.7. Complex MUPS (>5 turns) was absent. Conclusions and Practical Relevance: The establishment of normative data for these muscles allows objective quantitative EMG examination of paraspinal muscles in patients with suspected cervical neurogenic disorders. Muscle differences but not segmental differences should be taken into account. Acknowledgements: Department of Companion Animal Sciences, Division Diagnostic Imaging, Faculty of Veterinary Medicine, Utrecht University.

16.30–16.45
Blood culture medium enrichment importantly optimises synovial fluid culture in horses: A comparison of different culture techniques

Dumoulin, M., Pille, F., Oosterlinck, M., Haesebrouck, F., Gasthuys F. and Martens, A.
Department of Surgery and Anaesthesiology of Domestic Animals, Faculty of Veterinary Medicine, Ghent University, Belgium. michele.dumoulin@UGent.be

Aims: To compare the efficiency of different culture techniques for isolation of microorganisms from equine synovial fluid (SF). Methods: Between February 2007 and October 2008, SF specimens were collected from all horses admitted to the Ghent University teaching hospital that were clinically diagnosed with synovial sepsis. Negative control samples were obtained from horses with aseptic synovial disorders. SF samples were cultured in parallel by: 1) direct agar culture (DA); 2) agar culture after lysis-centrifugation pretreatment (LC); 3) conventional enrichment (CE); 4) combined LC/CE; or 5) blood culture medium enrichment using an automated system (BACTEC 9000 series, Becton Dickinson). Results: A total of 90 synovial fluid samples obtained from 82 horses were included in the study together with 40 negative control samples. The lowest isolation rates were observed for DA (21 positive samples). LC pretreatment and/or CE resulted in a slightly higher but not significantly different isolation rate (23–25 positive samples). The best culture result was achieved by blood culture medium enrichment (BACTEC). Of 90 samples, 71 (79%) were culture-positive. This was significantly higher (P<0.05) compared to all other methods and BACTEC enrichment never failed to recover microorganisms that were identified by other methods. All control samples were culture negative by the 5 different techniques. For the majority of samples containing isolates recoverable without enrichment, culture results after BACTEC enrichment were available on the same day as for agar culture with or without LC (19/23 samples). In contrast, conventional enrichment most of the times postponed recovery by at least one day (20/23 samples). Conclusions and Practical Significance: Blood culture medium enrichment is superior to other techniques for isolation of bacteria from SF of horses. The use of an automated system allows enrichment without importantly postponing recovery of microorganisms.

16.45–17.00
Comparison of dorsoventral displacement of the pelvis in straight and circular motion

Walker, A.M., °Leutton, J. and °Pfau, T.
Department of Veterinary Basic Sciences, Structure and Motion Lab, and °Department of Veterinary Clinical Sciences, Royal Veterinary College, Hattfield, Hertsfordshire AL9 7TA, UK. amwalker@rvc.ac.uk

Aims: Compare the differences in dorsoventral displacement of the pelvis between straight and circular trotting, and determine if horses exhibit sidedness: a preference for one rein over the other. Methods: Inertial sensors were attached to os sacrum and both tuber coxae of 14 horses while trotting in a straight line and on the lunge (left and right reins). Vertical displacement amplitudes during 2 phases of each stride were calculated for both conditions and an amplitude ratio calculated. Results: Nine horses were included in the analysis (showed symmetrical displacement of the os sacrum during straight line locomotion). Displacement amplitude ratio of the os sacrum was larger during circular motion compared to straight, showing both phases of each stride are no longer symmetrical. Asymmetric vertical displacement of the tuber coxae is normal for straight line locomotion. During circular motion this asymmetry is reduced with the majority of horses exhibiting greater amplitude in their os sacrum and inside tuber coxae during the swing phase of the outside leg. A third of the horses showed altered displacement ratios between movements on the right and left rein, suggesting that horses exhibit sidedness. Conclusions and Practical Significance: Horses exhibiting symmetrical pelvic displacements on the straight can show different amounts of asymmetry when trotted on the left compared to the right rein. Therefore interpretation of asymmetries seen on a circle must be approached with caution as it could be indicative of low grade lameness or simply a difference in strength or suppleness between sides of the body.

17.00–17.15
Characterising temporal phase relationships between cyclical limb movements in equine locomotion using inertial sensors
The medial extension of the APJ towards the vertebral canal length of the vertebra caudal to the joint (r = -0.591, P = 0.000). This varied significantly between locations (C2C3, C3C4, C4C5, C5C6, C6C7). A flexion of the neck resulted in minor changes to the shape of the APJ but did not result in the medial extension encroaching any closer to the spinal cord. Conclusions and Practical Significance: From this study, it appears that the main factor of spinal cord compression associated with APJ pathology is not the joint effusion, but the hypertrophy of the surrounding structures, although an effusion may exert pressure on the surrounding structures and thus be a contributor. The direction of the APJ into the vertebral canal found in this study was dorsomedially, suggesting that oblique myelographic views would be recommended for the diagnosis of spinal cord compression when pathology of the APJ is implicated.

A comparison of suspensory ligament biomechanics in the front and hindlimbs of horses
Smith, M., Pfau, T., Ferrari, M. and Weller, R.
Department of Veterinary Clinical Sciences, The Royal Veterinary College, UK. rweller@rvc.ac.uk

Aim: Suspensory ligament (SL) injuries are a common cause of lameness in horses, with injuries in the hindlimb offering a poorer prognosis for full return to work. The objectives of this study was to investigate differences in strain, in situ stiffness, cross-sectional area (CSA), and length in the front and hindlimb SL. Methods: The structural properties of the suspensory ligament of 14 equine cadaver legs were determined using a hydraulic loading machine and direct dimensional analysis. Morphometric measurements of the SL were performed using freehand 3D ultrasonography. Length was determined by measuring the SL from origin to insertion after dissection. Results: Strain (P<0.005), in situ stiffness (P<0.001), and cross-sectional area (P<0.0001) were all found to be significantly higher in the forelimb SL compared to the hindlimb. The SL in the hindlimb is significantly longer than in the front limb (P<0.005). Strain in the forelimb SL (P<0.05) and in situ stiffness in the hindlimb SL (P = 0.005) varies significantly between horses. CSA of both the front (P = 0.002) and hindlimb (P<0.0001) SL varies significantly between horses. Conclusions and Practical Significance: The smaller cross-sectional area and lower stiffness of the hindlimb SL suggest that under the same load, it may sustain higher stress than the forelimb SL, despite the lower strains. This may be a potential cause for the higher frequency and poorer prognosis of injuries to the hindlimb compared to the frontlimb SL. Acknowledgements: The Horseracing Betting Levy Board

The 3D anatomy of the cervical articular process joint in the horse and its role in spinal cord compression
Claridge, H.A.H., and Weller, R.
Department of Veterinary Clinical Sciences, The Royal Veterinary College, UK. hclaridge@rvc.ac.uk

Aims: This study describes the 3D anatomy of the equine cervical articular process joint (APJ) in relation to the spinal cord, and to assess whether an effusion of the APJ could contribute to cause spinal cord compression. Methods: Six cadaver necks (C1–C7) of clinically normal horses were used in this study. Computed tomography scans were performed on the APJ of C2–C7 after injection of a negative contrast agent to maximum distension. The resulting images were semi-automatically segmented using greyscale thresholding and polygonal surface meshing. The resulting 3D reconstructions were used to measure joint volume and assess distance to the spinal cord. Results: Joint volume varied significantly between locations (C2C3, C3C4, C4C5, C5C6, C6C7) (P = 0.000) and was found to be inversely related to the length of the vertebra caudal to the joint (r = -0.591, P = 0.000). The medial extension of the APJ towards the vertebral canal showed no significant variation between location (P = 0.104) and did not appear to extend into the spinal canal at any point. Flexion of the neck resulted in minor changes to the shape of the APJ but did not result in the medial extension encroaching any closer to the spinal cord. Conclusions and Practical Significance: From this study, it appears that the main factor of spinal cord compression associated with APJ pathology is not the joint effusion, but the hypertrophy of the surrounding structures, although an effusion may exert pressure on the surrounding structures and thus be a contributor. The direction of the APJ into the vertebral canal found in this study was dorsomedially, suggesting that oblique myelographic views would be recommended for the diagnosis of spinal cord compression when pathology of the APJ is implicated.

Quantitative motor unit action potential analysis of the serratus muscle in 28 Warmbloods suspected of cervical lesions
Wijnberg, I.D., † Graubner, C., † Gerber, V. and Back, W.
Department of Equine Sciences, Faculty of Veterinary Medicine, Utrecht University, The Netherlands; and † Equine Clinic, Vetsuisse Faculty, University of Berne, Switzerland. I.D.Wijnberg@uu.nl

Aim: The structural properties of the cervical articular process joint (APJ) in relation to the spinal cord, and to assess whether an effusion of the APJ could contribute to cause spinal cord compression. Methods: Six cadaver necks (C1–C7) of clinically normal horses were used in this study. Computed tomography scans were performed on the APJ of C2–C7 after injection of a negative contrast agent to maximum distension. The resulting images were semi-automatically segmented using greyscale thresholding and polygonal surface meshing. The resulting 3D reconstructions were used to measure joint volume and assess distance to the spinal cord. Results: Joint volume varied significantly between locations (C2C3, C3C4, C4C5, C5C6, C6C7) (P = 0.000) and was found to be inversely related to the length of the vertebra caudal to the joint (r = -0.591, P = 0.000). The medial extension of the APJ towards the vertebral canal showed no significant variation between location (P = 0.104) and did not appear to extend into the spinal canal at any point. Flexion of the neck resulted in minor changes to the shape of the APJ but did not result in the medial extension encroaching any closer to the spinal cord. Conclusions and Practical Significance: From this study, it appears that the main factor of spinal cord compression associated with APJ pathology is not the joint effusion, but the hypertrophy of the surrounding structures, although an effusion may exert pressure on the surrounding structures and thus be a contributor. The direction of the APJ into the vertebral canal found in this study was dorsomedially, suggesting that oblique myelographic views would be recommended for the diagnosis of spinal cord compression when pathology of the APJ is implicated.
**Aims:** to determine if quantitative motor unit action potential (MUP) analysis of the ventral serratus muscle can provide evidence for, or localise cervical neurogenic abnormalities. **Methods:** Semi quantitative MUP analysis, measured in the segments of the ventral serratus muscle in 28 adult Dutch Warmblood horses suspected of cervical disorders (mean ± s.d. age 8.4 ± 4.7 years, group 1), were compared to the normative data obtained from 7 adult (age 9.5 ± 2.3 years) healthy and sound breed-matched horses with normal neurological examination findings and without radiographic abnormalities of the cervical column (group 2). Also, with data of 23 neurological patients showing no evidence of cervical abnormalities in a cervical segment on semiquantitative EMG (age 7.3 ± 3.9 years, group 3). The muscle was divided into segments based on anatomical position of the transverse process. Measurements were made according to formerly published methods. ANOVA with post hoc testing according to Bonferroni on LN transformed data was used (SPSS 15.0) to compare the 3 above mentioned groups. **Results:** The mean amplitude (617 µV), duration (7.9 ms) and number of phases (3.2) in group 1 were significantly (P<0.0001) higher than those of healthy controls (group 2) (520 µV, 4.5 ms and 3.0, respectively) and group 3 (404 µV, 5.3 ms and 3.0, respectively). MUP analysis of group 3 differed not significantly from the healthy controls (group 2). Localisations judged as abnormal did predict radiological evidence of arthrosis if present. **Conclusions and Practical Relevance:** Objective quantitative MUP analysis contributes to the understanding and interpretation of neurological signs. It helps to localise a potential site suspected of pathology and can be useful in determining the extent of damage of the paraspinal nerves. **Acknowledgements:** Department of Companion Animal Sciences, Division Diagnostic Imaging, Faculty of Veterinary Medicine, Utrecht University.