A preliminary investigation of limb coronal movement range in horses and relationship to pelvic symmetry

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Application: The lateral gait movement of horse's limbs was sensitive to the symmetry correction of pelvic rotation. This may have implications when assessing and improving horse gait and performance.

Introduction: Pelvic asymmetry is often used in objective lameness assessment. Gait analysis often focusses on movement in the sagittal plane, but the coronal plane movement (adduction/abduction) may provide further information. This study investigates coronal range of limb movement in sound horses and any relationship with pelvic axial asymmetry and its correction by chiropractic adjustment. Previous studies support chiropractic method in improving pelvic axial symmetry.

Materials and Methods: 13 sound, healthy riding horses from same yard and routine were acclimatised to wearing boots daily for 1 week. On trial day, triplicate tuber coxae(TC) heights (nearest 0.5cm) were measured from the dorsal aspect to level ground stood square, using a plumb line. Difference between means indicated direction and value of asymmetry relative to symmetry of zero. Pegasus triaxial accelerometer/data logger assessed sagittal and coronal limb movement of metarsal and metacarpal hind and fore limbs at trot, on level ground over 10 strides, before and after receiving manual chiropractic treatment to the pelvis (McTimoney method) by a fully qualified McTimoney animal practitioner and relative to palpation rotation and tilt assessment. From GaitSmart analysis, minimum and maximum angles of metatarsus and metacarpus produced coronal range of motion(CRM) degrees for each limb using average stride data. A smaller CRM indicates a straighter limb movement. Data sets were tested for normality. Statistical analyses included paired T-Test, Pearsons Moment Correlation.

Results: There was a significant TC height discrepancy reduction ($p=0.002$) after treatment. Mean TC height discrepancy was 1.69cm ± 0.99 before and 0.42cm ± 0.61 after treatment. Before treatment 77%(10) of horses had a right ventral pelvic rotation. After treatment 61.5%(8) of horses pelvic height discrepancy was zero.
Before treatment, there was no significant ($p=0.26$) difference between CRM for left hindlimb(12.77+/-2.53) and right hindlimb (13.83+/-3.8). There was no significant ($p=0.26$) difference between left forelimb (16.17+/-6.41) and right forelimb(18.36+/-8.25) CRM.
After treatment, CRM for left hindlimb(10.82+/-2.05) was significantly less ($p=0.03$) than right hind limb(12.98+/-2.84). CRM for right forelimb(15.40+/-7.37) was significantly less ($p=0.005$) than left forelimb(22.22+/-9.73).
Before treatment there was a significant correlation ($p=0.03$) between pelvic TC height asymmetry and left hind CRM. Following chiropractic adjustment there were no associations between TC height asymmetry and CRM of forelimb or hindlimb.
There was no significant ($p>0.05$) difference between saggital ROM of left or right hock, fore and hind cannon before or after treatment.

Conclusions: Correction of pelvic axial asymmetry by chiropractic method has an immediate effect on coronal movement range symmetry of hind and fore limbs that was not associated with saggital ROM. Further study would be required with larger cohorts and effects over time to establish a relationship between pelvic symmetry and coronal movement range.

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