Force plate gait analysis

Summary / Zusammenfassung

Force plate gait analysis provides objective data on limb function and is more and more used worldwide to evaluate outcome after surgical or medical treatment of orthopedic conditions. Unfortunately, comparison between different studies is difficult, because of differences in data acquisition and patient material. Important factors influencing the measured ground reaction forces are gait and velocity, body weight, conformation, and other variables.

One study evaluated and compared the sensitivity and accuracy of force plate gait analysis in dogs with a low-grade hindlimb lameness (K. Voss, J. Imhof, S. Kaestner, P.M. Montavon, published in Vet Comp Orthop Traumatol). Nineteen normal and 41 dogs with low-grade hind limb lameness were included in the study. Each dog was both walked and trotted over the force plate in a defined velocity on the same day. The dogs were randomly assigned in 2 groups, one walking first, one trotting first. Peak vertical forces and impulses were expressed as % of body weight and a symmetry index between the affected and non-affected hind limb was calculated. The symmetry index of peak vertical forces measured walk and trot were compared to clinical gait examination, using Cohen's kappa coefficient and ROC-analysis. The trotting gait was found to be significantly more accurate in detecting low-grade hindlimb lameness in dogs, compared to the walking gait.

Another study was conducted to evaluate correlations of body weight, morphology, and different breeds with vertical ground reaction forces in normal dogs at trotting velocity (K. Voss, L. Galeandro, M. Haessig, P.M. Montavon, submitted to Vet Surg). One hundred and twenty-nine dogs between 15 and 65 kg body weight, including 19 different breeds, have been measured. Results showed that body weight, morphometric parameters, dog breed, and sex have significant influences on peak vertical forces and impulses of both the hindlimbs and forelimbs. The results of the study should help to obtain normal values for different dog sizes and breeds to be able to compare results of future studies.

In a clinical study, outcome after treatment of dogs with cranial cruciate ligament deficient stifles with tibial tuberosity advancement was evaluated using force plate gait analysis (K. Voss, D. Damur, T. Guerrero, M. Hässig, P.M. Montavon, published in Vet Comp Orthop Traumatol). Force plate gait analysis was performed prior to surgery, and 6 months after surgery. Mean peak vertical forces of the affected hind limb was 32%BW prior to surgery, and 64%BW at follow-up examination, which compares favorable to other techniques. 64%BW represents a limb function, which is approximately 90% of normal. This compares favorable to other techniques for cranial cruciate ligament disease. In addition we are about to evaluate correlation of functional results as measured on force plate gait analysis with radiographic presence and increase in osteoarthritic changes in the stifle joint.

A clinical study has been started to evaluate and compare long-term function of forelimbs after partial carpal and pancarpal arthrodesis (A. Andreoni, K. Voss). Preliminary results indicate that a similar vertical limb loading can be expected after both techniques, but that pancarpal arthrodesis results in minor changes of craniocaudal forces compared to partial carpal arthrodesis and to normal dogs. This study was conducted in collaboration with Dr. Vannini, Regensdorf, and Dr. Rytz, Vetsuisse Faculty University of Bern.

Publications / Publikationen

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Dogs, lameness, kinetics, force plate, gait analysis

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