

Study on the Association of Proximodistal Patellar Position and Canine Gait

Abstract of PhD Thesis

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Motion analysis is used to analyse the mechanical function of humans or animals in motion. However, it has not yet been widely applied in clinical practice in the veterinary field. One of the most common orthopaedic diseases in small animals is medial patellar luxation (MPL). Patella alta, a condition in which the patella is displaced proximal to the trochlea, has been suggested to be associated with MPL. There has been no motion analysis of MPL or patella alta performed in dogs to date, and it is unclear whether dogs display crouch gait associated with these conditions, as in humans. This study aimed to evaluate the effect of the proximodistal patellar position on the gait of dogs.

In the first study using radiographic images, it was shown that the maximum stifle joint extension angle was greater in small dogs with MPL than in healthy dogs, with consequent proximal displacement of the patella. The effects of the hip and stifle joint angles on the quadriceps muscle length/femoral length ratio (QML/FL) and patellar ligament length/patellar length ratio (PLL/PL) were then examined. It was shown that the PLL/PL did not change with joint angles, whereas the QML/FL decreased with hip joint flexion and stifle joint extension. These results indicate the possibility of functional patella alta, a condition in which the patella displaces more proximally than normal over the femoral trochlea due to stifle joint hyperextension, even with the proximodistal position of the patella relative to the stifle joint angle being normal. Such conditions might be associated with MPL in small dogs.

An inverse dynamics analysis was performed on healthy dogs during trotting to calculate the angular alterations in the stance phase as well as the associated joint moments and joint power. Based on these angular alterations in healthy dogs and dogs with MPL, we examined the association between the movement of the stifle joint during

trotting and image examination values related to patella alta. As the PLL/PL increased or the patellar position during hyperextension became more proximal, both the maximum angle of flexion and extension of the stifle joint in the stance phase significantly decreased. It was suggested that the crouch gait, which is equivalent to the one reported for patella alta in humans, is also present in dogs. Finally, gait analysis was performed in dogs wearing an orthosis that limits the range of motion of the stifle joint to investigate how the degree of restriction affects the ground reaction force. The alteration in the ground reaction force varied with the degree of restriction on the range of motion of the stifle joint. These alterations could increase the load on some joints.

In this study, it was concluded that functional patella alta may be present in small dogs with MPL, possibly in association with crouch gait and these gait changes could result in load changes other than stifle joint.