The relationship between fetlock joint dorsiflexion and flexor tendon moment arms variations

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Introduction: To calculate flexor tendon forces on the basis of inverse dynamic analysis, flexor tendon moment arms need to be determinated in the equine distal forelimb. Moment arm of deep digital flexor tendon (*d*DDF) and of superficial digital flexor tendon (*d*SDF) have been recognised to vary during the fetlock joint dorsiflexion, however little distal forelimb model has taken into account *d*SDF and *d*DDF variations. This study describes a method to determinate the relationship between the fetlock joint dorsiflexion and the flexor moment arms variations.

Methods: Eleven forelimbs of eleven horses (~500 Kg) were collected, transversally cut below the shoulder joint, frozen and cut into a sagittal plane until above the fetlock joint. Considering the forelimb pulley model (Meershoek *et al.* AJVR 2001; 62 1585-1593), in the segment based coordinate system, for the fetlock joint the pulley centers of the DDF and SDF tendons were determined directly from the section. For the fetlock radius-pulley experiments, forelimbs were thawed overnight, fixed to an immobilizing support and attached to a hoist that dorsiflexed the fetlock joint. For the fetlock dorsal angle (θ) 180° to 150°, the *d*DDF and the *d*SDF were measured directly from the section. For each tendon all of these data were fitted using a polynomial regression model (OriginPro8) and the relationships between θ and the radius pulley variation (Δd) was described assuming that Δd was zero at θ equal to 180°.

Results : When the fetlock dorsiflexion increased, *d*DDF and *d*SDF decreased ($\Delta d_{DDF}(150)$= -6.1 mm; $\Delta d_{SDF}(150)$= -5.2 mm) according to the following equations: $\Delta d_{DDF}(\theta) = -0.24923 \times \theta^1 + 0.00139 \times \theta^2$ (R^2=0.89867) ; $\Delta d_{SDF}(\theta) = -0.21494 \times \theta^1 + 0.0012 \times \theta^2$ (R^2=0.91504).

Conclusions : A distal forelimb pulley model with variable *d*DDF and *d*SDF has been performed. It could become an important tool for use in inverse dynamic procedures.