

Equine Third Metacarpal Bone Assessment by Quantitative Ultrasound and Dual Energy X-Ray Absorptiometry: An Ex vivo Study

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The purpose of this ex vivo study was to analyse two commonly established methods of mechanical bone property assessment for application in horses: Quantitative ultrasound (QUS), which depends on the bone's density and Young's modulus, and dual energy X-ray absorptiometry (DXA), which depends on the areal bone mineral density (BMD). The third metacarpal bone (MC III) of horses was selected as examination region for practical reasons. An interrelationship between QUS- and DXA- values was examined. Both MC III of eleven randomly selected equine cadavers were divided in nine regions of interest (ROI). A multi-site QUS device was used for axial transmission speed of sound (SOS) measurements and DXA device was used for BMD evaluation. Full cortical thickness BMD (FcBMD), overall aspect BMD and 4 mm cortical border slice BMD (4 mmBMD) were evaluated. In addition, each ROI of one MC III was measured 10 times to determine QUS- and DXA- measurement precision. SOS values and BMD values obtained at different aspects of MC III were different ($P < 0.001$). FcBMD and overall BMD obtained at different levels were different ($P < 0.001$). SOS data correlated with FcBMD-, overall BMD- and 4 mmBMD- data at various ROI. FcBMD-, overall BMD- and 4 mmBMD- data were strongly correlated. The intra-operator coefficient of variation was 1.3% for SOS-measurements and ranged between 1.94 and 10.3% for BMD-measurements. Multi-site axial transmission QUS as well as DXA can be used to precisely measure bone characteristics of MC III in horses. However, both techniques do not measure the same bone properties. It is therefore concluded, that QUS and DXA techniques are complementary for application in horses.

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