Effect of Age, Anatomic Site and Soft Tissue on Quantitative Ultrasound

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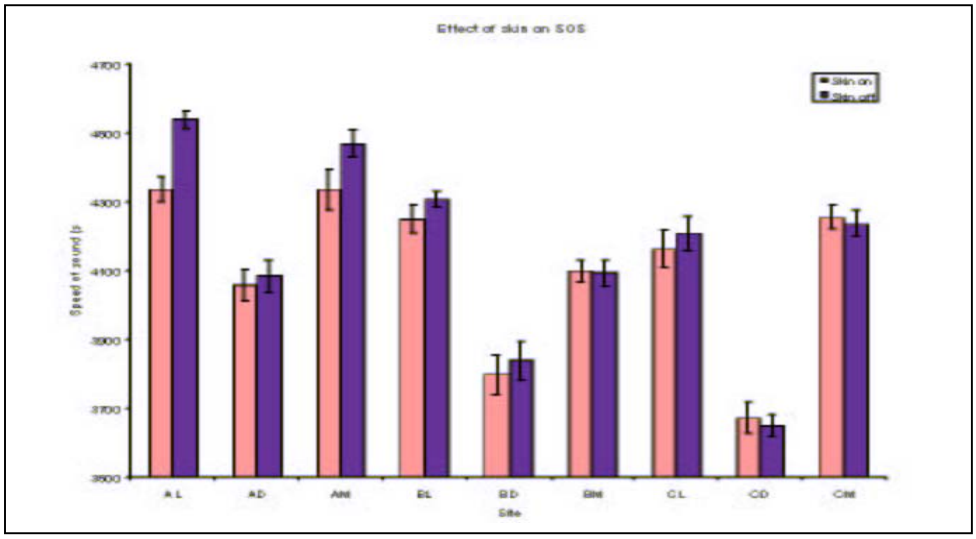
Non-adaptive bone remodeling results in focal loss of bone mineral and architecture and stress fractures in the dorsolateral cortex of racehorses. We used 20 metacarpi (ex vivo) from 10 horses aged 2-20 years and a quantitative ultrasound (QUS) device (Sunlight Technologies, Rehovot, Israel) to see if regional variations in speed of sound could be found. Two operators recorded QUS at nine sites (medial, dorsal and lateral sites at proximal middle and distal locations) in each metacarpus. Measurements were repeated twice and the skin was then removed and the measurements repeated. A linear regression model was created with the speed of sound modeled against: side (left vs right), skin (on vs off), sex, age, and site. Medial and lateral sites at the proximal locations were more difficult to record because this curved surface gave poor probe contact. There were significant effects of the interaction of age and sex ($p<.0005$) and age and site ($p<.000003$). There was a significant effect of the interaction between skin coverage and site ($p<.02$) due to the variability introduced by the medial and lateral proximal sites. When these two proximal locations (sites AL & AM in graph) were removed from the data set, there was no longer a significant effect of skin on the speed of sound ($p= 0.32$). The speed of sound increased most with age at the mid-dorsal location. Age has the possibility of being confounded by training status. The relationship between the effect of training and specific sites should be examined by following cohorts of horses through training. We concluded that QUS may be useful clinical tool for assessing the equine metacarpus in the sites where non-adaptive bone remodeling is most likely to occur, i.e. the middle and distal metacarpus. This QUS device appears to subtract the effect of soft tissue coverage in sites where the probe can make reasonable contact. We hope that QUS can be used to screen large groups of young horses for subclinical stress fractures.



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