THE QUANTITATIVE ASSESSMENT OF PHOTODENSITY OF THE THIRD CARPAL BONE IN THE HORSE.

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ABSTRACT

The purpose of this study was to determine if a method of non-invasive bone mineral analysis could be adapted to quantitatively assess photodensity in the third carpal bone of the horse. The technique chosen was radiographic absorptiometry, which determines bone mineral density from a radiograph that includes a control (usually a wedge) of known photodensity. When taken correctly the tangential view of the distal row of carpal bones allows visualisation of the dorsal aspect of the third carpal bone, without superimposition of overlying structures. The method is technically demanding, because the angle at which the x-ray beam penetrates the third carpal bone can not be exactly replicated in a clinical situation, as it is affected by the x-ray beam angle and the limb flexion angle. To utilise radioabsorptiometry in the tangential view, assessment of the effect of variation in x-ray beam angle was required.

Fourteen isolated distal rows of carpal bones were radiographed varying the x-ray beam angle in 5° increments over 15° from the base angles of 60° and 90°. The radiographs were digitised and processed to determine the photodensity of specific regions of interest in terms of millimetres of aluminium, using the wedge as reference. The results indicated that small variations in x-ray beam angle significantly affect photodensity.

Quantitative assessment of the photodensity of the fourth carpal bone showed changes associated with exercise, similar to those in the third carpal bone. Changing the size of the region of interest when x-ray beam angle was varied by 30° did not affect photodensity of the region of interest. Although conversion from photodensity to bone mineral density was not possible within this project, the findings supported other authors who have studied bone mineral density of the third carpal bone.

There are two tangential views of the distal row of carpal bones. The two methods affect the radiographic image differently because the magnification and distortion changes are different in each, and this precluded accurate comparison. Therefore, it was impossible to determine which method would more accurately assess the photodensity of the third carpal bone.

The study concluded that quantitative assessment of photodensity of the third carpal bone using either tangential view was clinically inapplicable at this time, because of the significant effect of very small changes in angle on photodensity. This is unfortunate, because the current practice of visual subjective assessment of photodensity of the third carpal bone remains unsatisfactory, in particular the differentiation between grades of sclerosis.