THE UNIVERSITY of EDINBURGH
Royal (Dick) School of Veterinary Studies

EVDI ANNUAL CONGRESS

COMPARISON OF MANUFACTURER-PRESCRIBED AND PATIENT-CENTRIC CT-TABLE HEIGHTS FOR COMPUTED TOMOGRAPHIC BONE MINERAL DENSITY ASSESSMENT

Riccardo Rossi, Yi-Lin Tan, Sumari Dancer, Tobias Schwarz
University of Edinburgh, Royal (Dick) School of Veterinary Studies, EH25 9RG, UK
Email: Riccardo.rossi@ed.ac.uk

Introduction:

Computed tomographic bone mineral density evaluation (CT-BMD) is an application for human bone health assessment, set up for a lumbar vertebra in a dorsally recumbent human and using a BMD calibration phantom.[1] The CT-table height is standardized when using this application, so that the isocenter of the gantry is centered on a level equidistant to the BMD phantom and the vertebral body of an average human being to minimize measurement errors. CT-BMD has been applied successfully in dogs[2] and has been adapted for the canine head in ventral recumbency (Figure 1).[3] With this canine head positioning, the manufacturer-prescribed table height value often does not project the gantry isocenter to a location equidistant to the BMD phantom and calvarium. The question is: Does this matter?

Purpose of this study was to investigate, whether CT table height influences BMD calculation for canine head CT-BMD. Our hypothesis was that changes in table height within the range applied to accommodate canine head positioning do not significantly affect BMD value calculation.

Methods:

Fifty clinical canine head CT studies in which the height was adjusted to the isocentre of the head were reviewed for the selected table height and body weight. The table height value range was quintiled. The sixth value was the manufacturer-prescribed value (125mm, Siemens Definition AS 64-slice CT scanner). Five canine cadaver heads of dogs with known body weight were imaged with the previously established protocol[1] using all six table heights (Fig. 2). One-way ANOVA with Geisser-Greenhouse correction and Holm-Sidak's multiple comparisons test were used for statistical analysis.

Results:

Statistical analysis showed a significant difference between values obtained from manufacturer-prescribed (125mm) and patient centric table-height protocols and therefore our hypothesis was rejected.

Discussion:

Our results show that the height of the CT-table significantly influences the CT-BMD value calculation. Within the scan-field-of-view of any CT scanner, the most accurate measurement of X-ray beam attenuation is in the isocentre of the gantry, as this is the location in which the most complete dataset was acquired, and which has minimal artifact magnitude.

In conclusion, CT table height should be adjusted to a level equidistant to the centre of the canine head and the BMD phantom.

Fig. 1: CT-BMD Set up for the canine head. The BMD phantom is positioned underneath the head or with table (see inset).

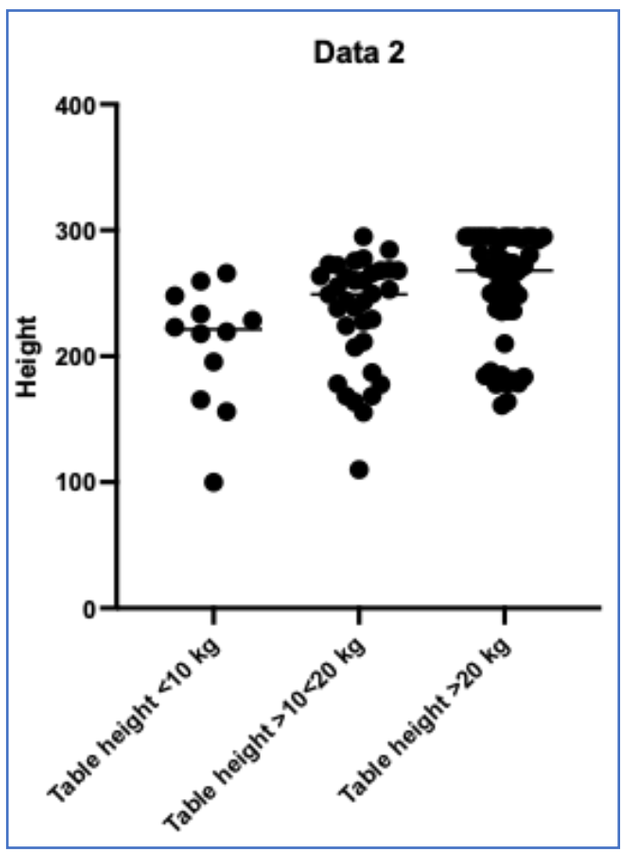

Fig.3: Table height values of the 50 canine heads classified for body weight. 100, 223, 249, 268, 295mm were establish as heights.

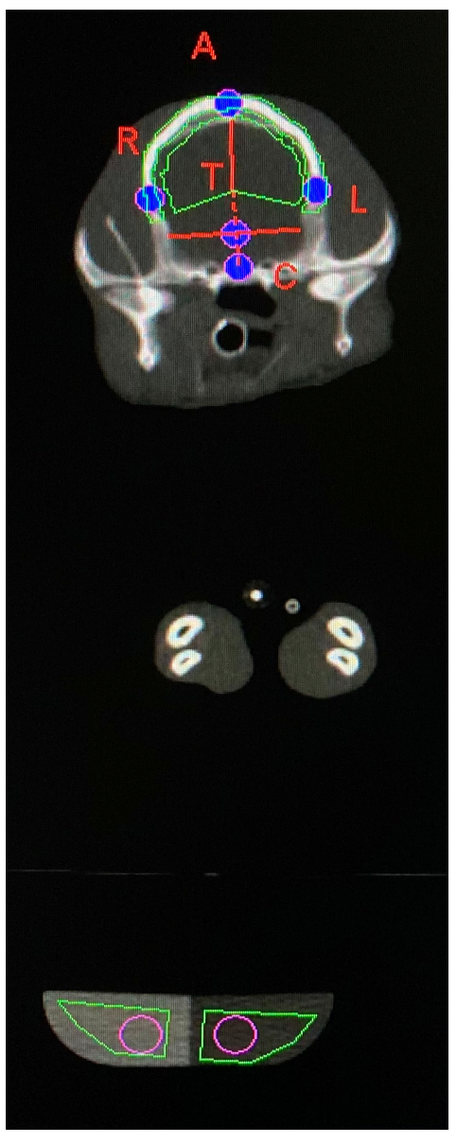

Fig. 2: CT image of a canine cadaver head and BMD phantom used for CT-BMD evaluation.

References:

1. Aggarwal V, Maslen C, Abel RL, Bhattacharya P, Bromiley PA, Clark EM, Compston JE, Crabtree N, Gregory JS, Kariki EP, Harvey NC, Ward KA, Poole KES. Opportunistic diagnosis of osteoporosis, fragile bone strength and vertebral fractures from routine CT scans; a review of approved technology systems and pathways to implementation. Ther Adv Musculoskelet Dis. 2021 Jul 10.
2. Lee D, Lee Y, Choi W, Chang J, Kang JH, Na KJ, Chang DW. Quantitative CT assessment of bone mineral density in dogs with hyperadrenocorticism. J Vet Sci. 2015;16(4):531-42.
3. Woods G, Israeliantz Gunz N, Handel I, Liuti T, Mellanby RJ, Schwarz T. Computed Tomography Osteodensitometry for Assessment of Bone Mineral Density of the Canine Head-Preliminary Results. Animals (Basel). 2021 May 14;11(5):1413.