

Characterization of Normal Bone in the Equine Distal Limb with Effective Atomic Number and Electron Density Determined with Single-Source Dual Energy and Detector-Based Spectral Computed Tomography

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Products

Dual-Energy Computed Tomography (DECT) for subchondral and trabecular bone analysis.

Hospital / Authors

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Clinical Background

Subchondral bone diseases are prevalent in horses, affecting performance and requiring advanced imaging for evaluation. DECT enables detailed characterization of bone properties, such as effective atomic number (EAN) and electron density (ED), aiding in the understanding of exercise-related changes and disease processes.

Aim of Study

To determine baseline EAN and ED values for normal subchondral and trabecular bone in the equine distal limb using single-source dual-energy CT (SSDECT) and detector-based spectral CT (DBSCT), and to compare findings between technologies.

Cohort Study

DECT scans were performed on 37 equine cadaver limbs, examining 16 zones of subchondral and trabecular bone across distal limb bones. EAN and ED values were recorded to establish reference data and analyze variability.

Results

- **Bone Property Variations EAN and ED lower in trabecular bone** compared to subchondral bone showing **DECT's sensitivity** in identifying **density differences**
- **Technological Comparison SSDECT higher EAN lower ED** values than **DBSCT** highlighting **vendor specific applications**
- **Age Related Adaptation Palmar/plantar fetlock zones increased EAN** with **exercise related remodeling**
- **Regional Difference Navicular and distal PHD compared to proximal regions** on comparative imaging **capabilities**

Summary

- **DECT offers unmatched detail** for bone characterization, surpassing conventional imaging methods.
- **EAN and ED variations highlight exercise-induced adaptations**, aiding in tracking bone health over time.
- **Inter-vendor differences emphasize the need for standardization**, ensuring consistent and reliable data across platforms.
- **Promising applications in subchondral disease monitoring**, supporting advancements in equine orthopedic research and clinical care.