Subchondral bone density distribution of the canine talus

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Introduction
The articular cartilage and the underlying subchondral bone, supporting the cartilage, form a functional unit and pathological conditions like osteochondrosis (OC) cannot be seen as a condition of only the cartilage (Duncan et al., 1987; Ebel et al., 2010; Madry et al., 2010). Furthermore, subchondral bone density is influenced by joint biomechanics and limb function, a feature known as Wolff's law. The subchondral bone density in joints depends on joint loading and reflects the loading history of the joint (Pauwels, 1965; Eckstein et al., 1997; Müller-Gerbl et al., 1990; Müller-Gerbl et al., 1992). Subchondral bone density can be evaluated using computer tomographic osteoabsorptiometry (CTOAM).

Methods and materials
Computer tomographic (CT) images (4 slice helical CT scanner Lightspeed Qx/i, General Electric Medical Systems, Milwaukee, WI). were acquired from the tarsal joints of 17 Labrador Retrievers (34 joints). Five dogs were 8 months old, twelve were 24 months old. The CT parameters were 120 kVp and 300 mAs. Contiguous, 1,25 mm collimated, transverse images were obtained, using a soft tissue reconstruction algorithm.
The CTOAM workflow was completed using commercially available computer software (Analyze, Mayo Clinics) and a standardized grid to quantify and describe the density maxima.

Results
The subchondral bone density distribution was very similar between left and right tali and between different dogs. Two distinct density maxima were seen in all joints, one proximally on the medial talar ridge and one distally on the lateral talar ridge. In young dogs (8 months) the overall density was lower, but the density distribution was similar.

Discussion and conclusions
Using CTOAM, regional density variation in the subchondral bone can be visualised in the canine talus. In Labrador Retrievers, a consistent distribution, with two separate density maxima, was found. A significant increase in density in the elbow has been reported in older dogs (Dickomeit et al., 2011), similar to our findings in the talus. The strength of CTOAM in biomechanical research is its ability to show the morphological effects of forces acting on the joint (Müller-Gerbl et al., 1992).