

# MICROCT CHARACTERIZATION OF SUBCHONDRAL BONE LESIONS IN 5 ISOLATED EQUINE PROXIMAL PHALANGES

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## Purpose

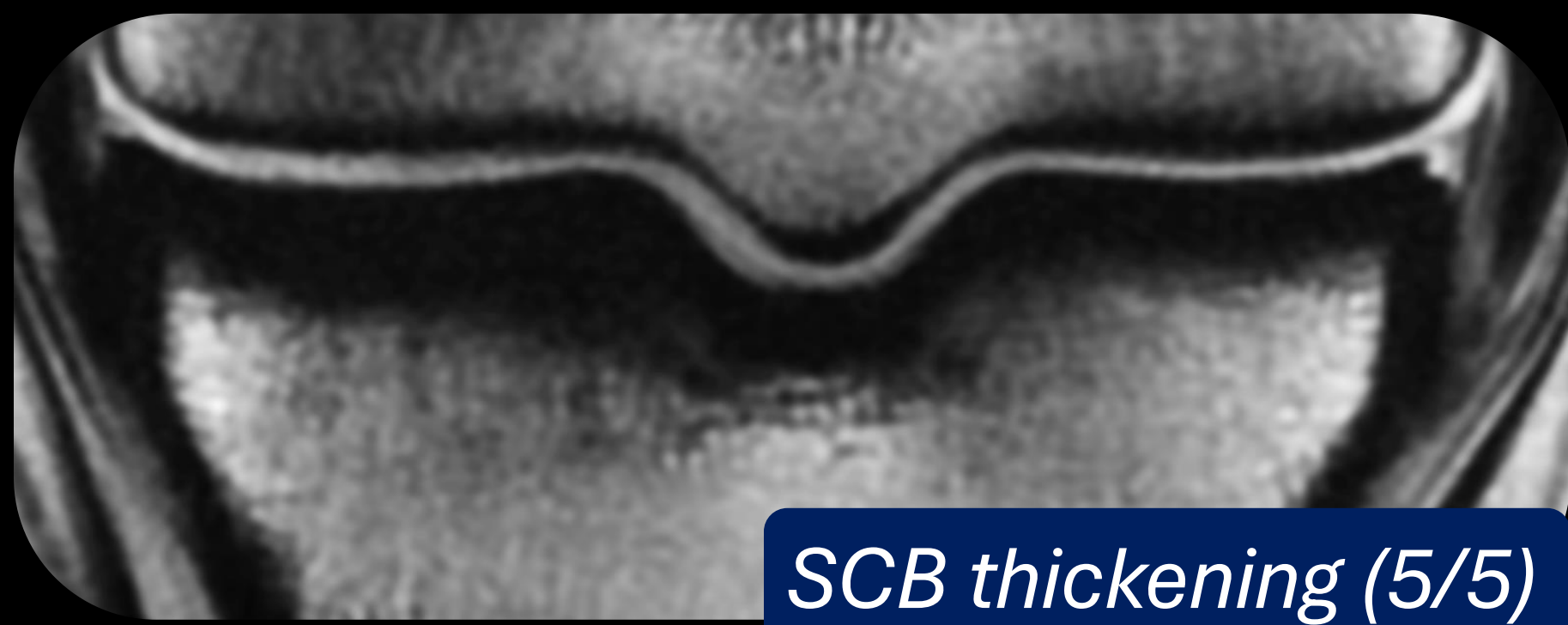
To evaluate the characteristics of subchondral bone (SCB) using micro-computed tomography ( $\mu$ CT) in isolated proximal phalanx (P1) specimens with MRI abnormalities.

## Methods

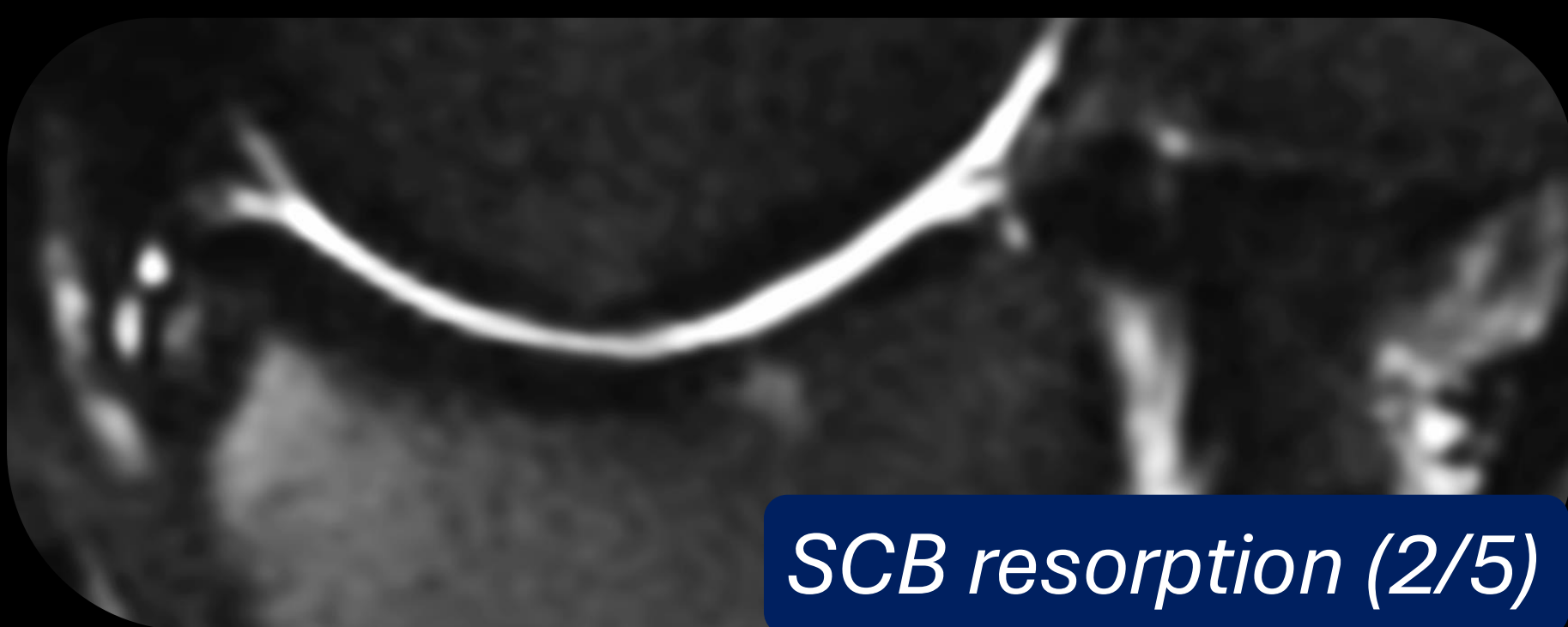
- Five P1 with MRI changes (3 anatomical locations: medial glenoid – MG, lateral glenoid – LG, sagittal groove – SG) → 15 samples



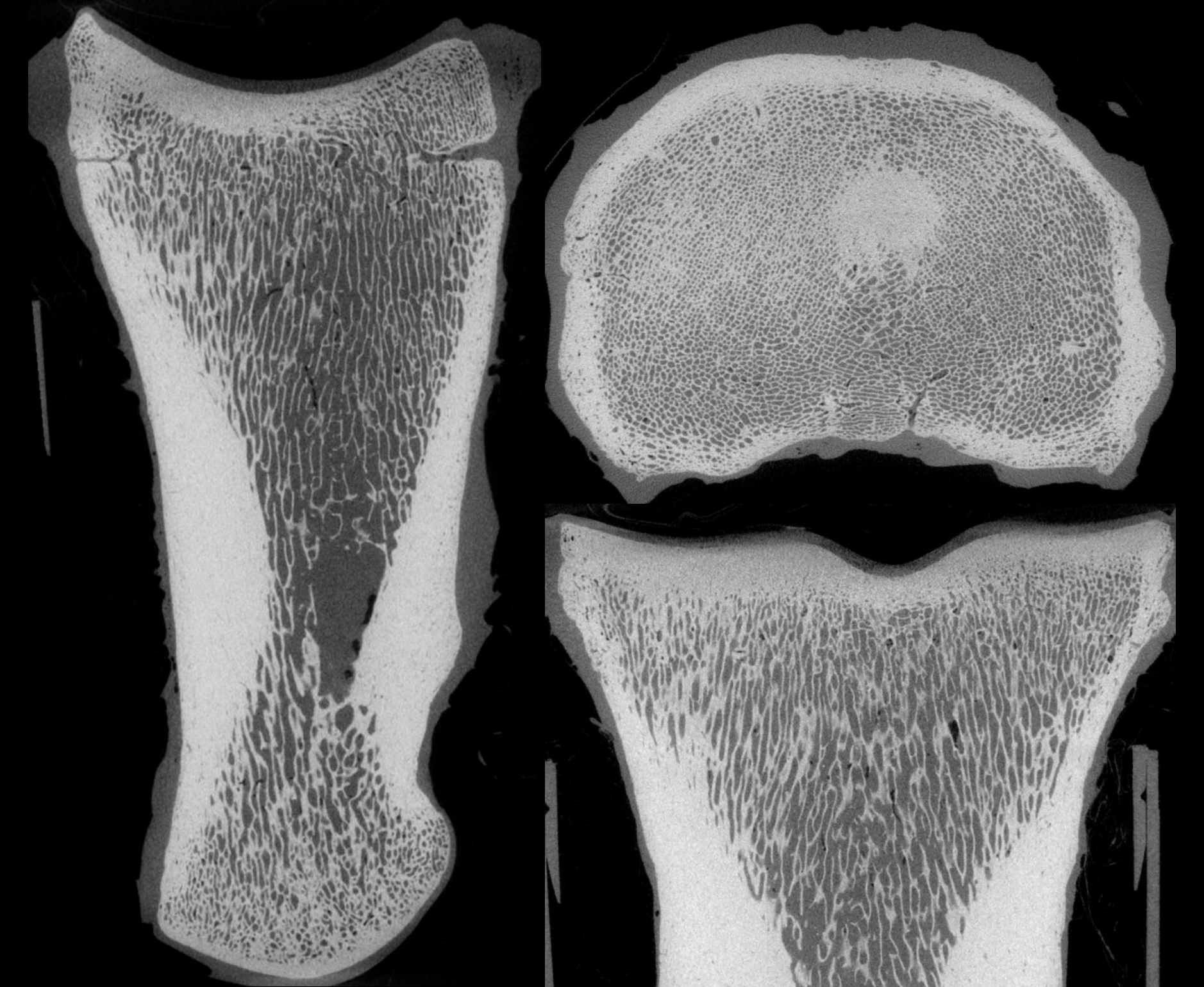
$\mu$ CT examination – 50 $\mu$ m voxel size



SCB thickening (5/5)



SCB resorption (2/5)



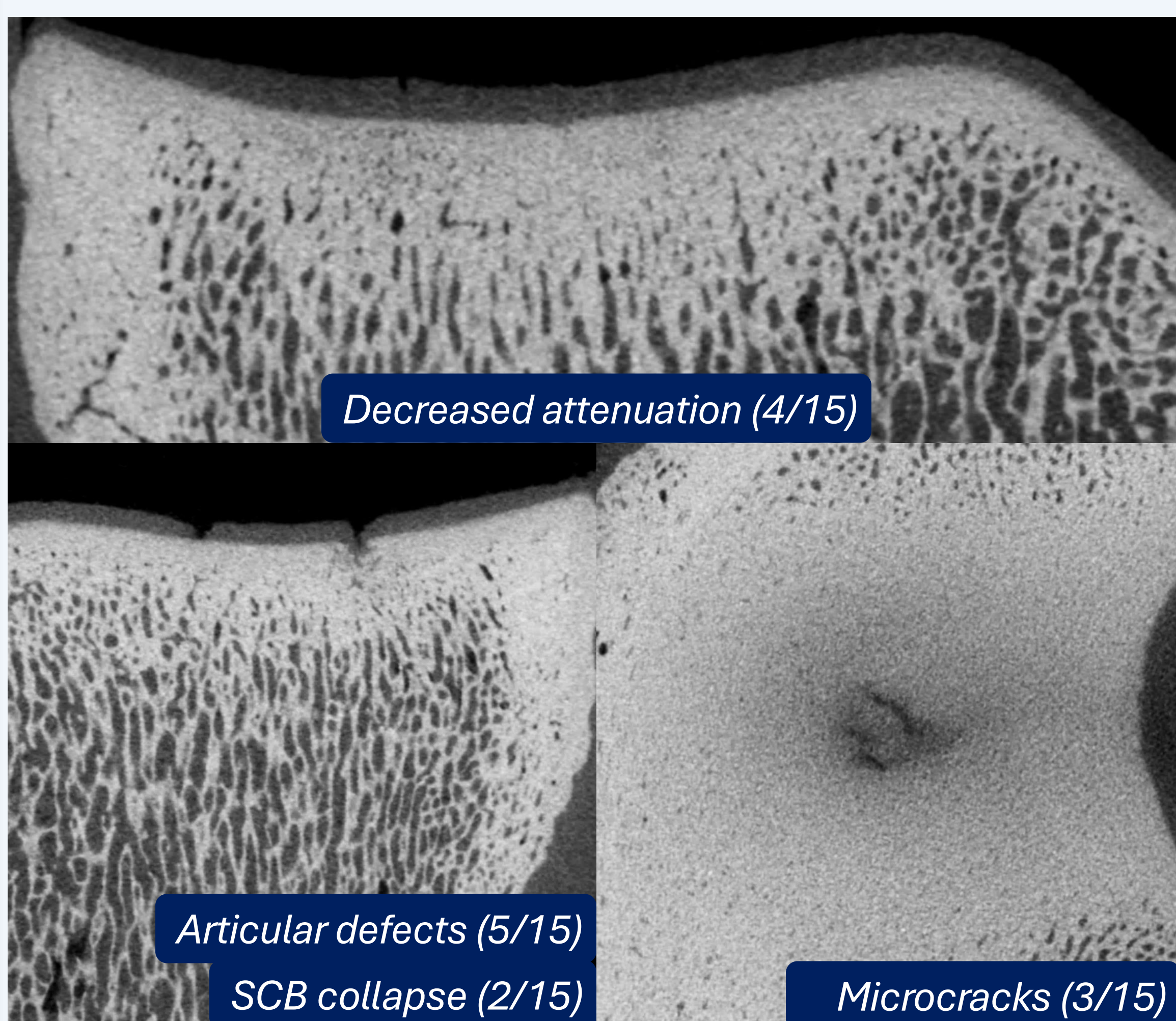
- Description of morphological SCB changes
- Objective trabecular analysis<sup>1</sup> in MG, LG and SG using the **Bone J<sup>2</sup>** plugin of FIJI: degree of anisotropy (DA)\*, trabecular thickness (TbTh), trabecular spacing (TbSp), bone volume (BV) to total volume (TV) fraction (BV/TV).
- Results compared between anatomical locations and samples with or without evidence of SCB abnormality (Student t-test).



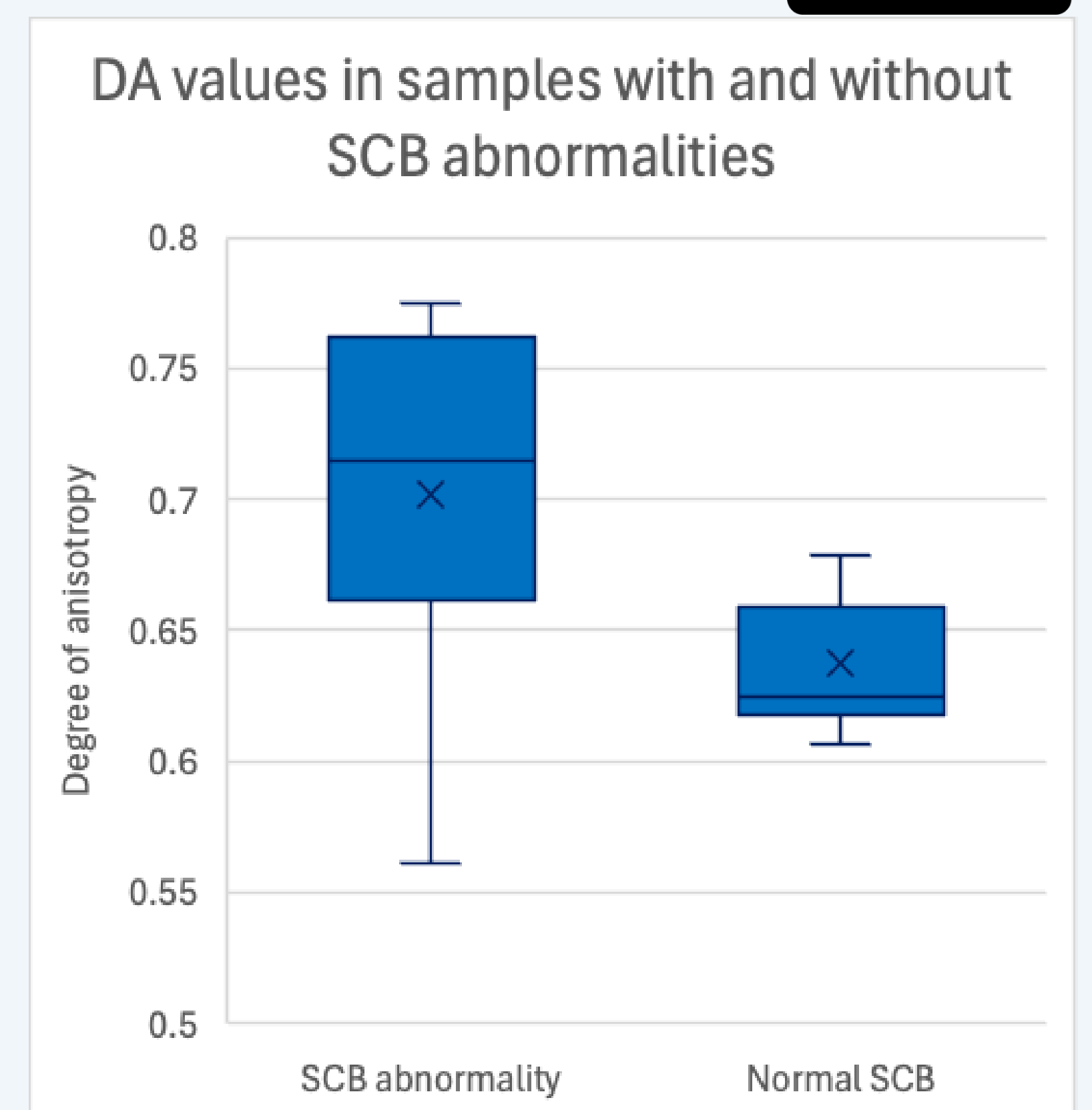
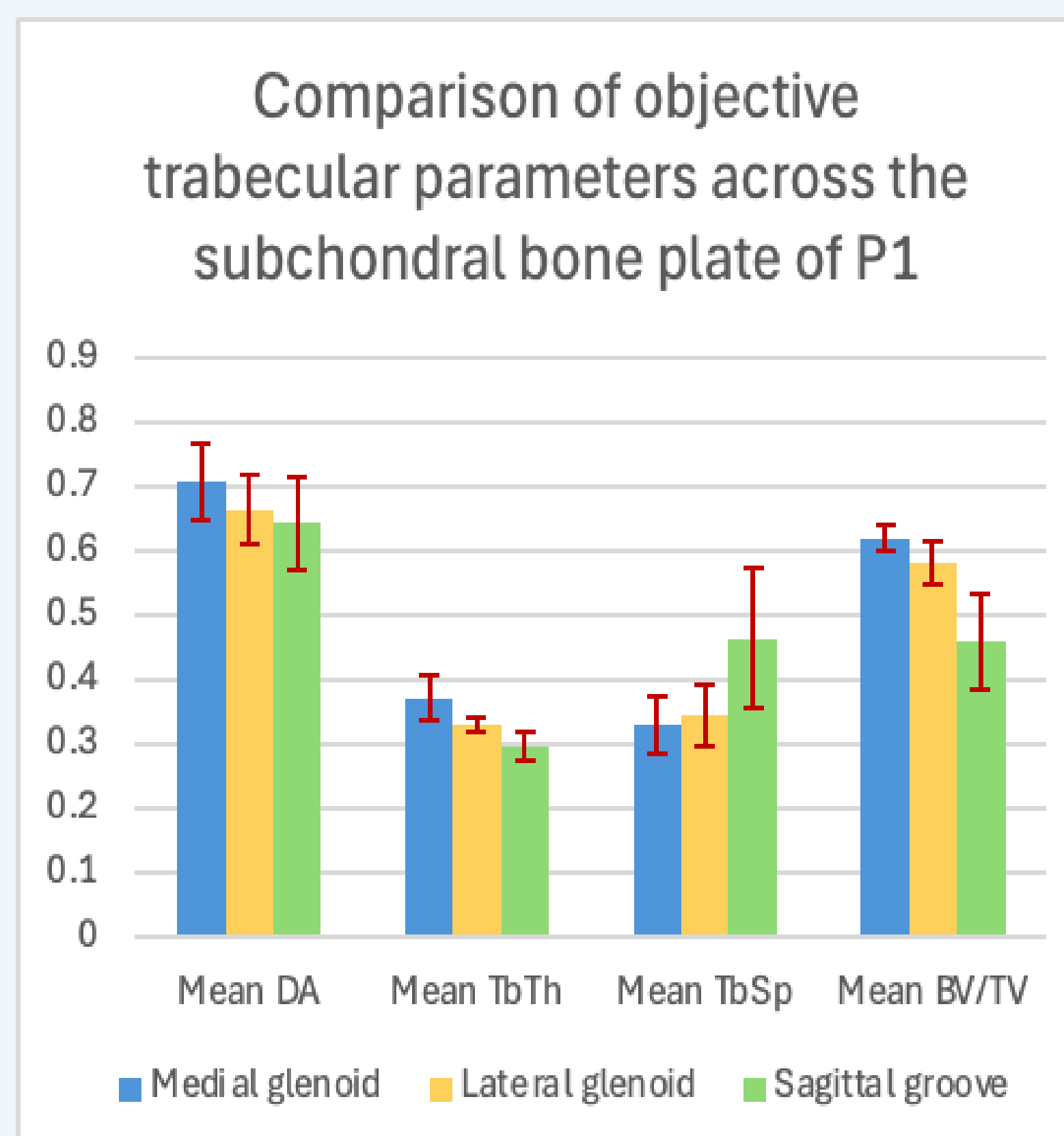
\* **What is the degree of anisotropy (DA) in trabecular bone?**  
Quantification of trabecular directional alignment. Bone J uses the Mean Intercept Length method, casting vectors through a sample to measure intercept lengths between solid and void regions. These vectors form a point cloud, and the best-fit ellipsoid's properties determine DA, ranging from 0 (isotropic) to 1 (anisotropic).

## Results

### Morphological SCB changes



### Objective trabecular analysis



- Mean values for DA, TbTh and BV/TV highest in MG and lowest in SG (>> TbSp)
- DA higher adjacent to SCB abnormalities compared to normal SCB plate ( $p < 0.05$ ).

## Discussion/Conclusion

The values for TbTh, TbSp, and BV/TV indicate that sclerosis tend to develop medially in the equine P1 and is mainly characterized by trabecular thickening. The consistently highest DA in the trabecular bone adjacent to the MG and to SCB abnormalities suggests a continuum between bone adaptation and SCB lesions development. This contrasts with human literature, where DA tends to decrease in regions of sclerosis associated with osteoarthritis<sup>1</sup>, supporting the hypothesis of overload arthropathy in horses rather than a primary degenerative condition.

References: 1. Koria L, Farndon M, Jones E, Mengoni M, Brockett C. Changes in subchondral bone morphology with osteoarthritis in the ankle. PLoS One. 2024 Jun 18;19(6):e0290914. doi: 10.1371/journal.pone.0290914. 2. Doube, M., Klosowski, M. M., Arganda-Carreras, I., Cordelières, F. P., Dougherty, R. P., Jackson, J. S., Schmid, B., Hutchinson, J. R., and Shefelbine, S. J. (2010). BoneJ: Free and extensible bone image analysis in ImageJ. Bone, 47(6):1076–1079.