

## **Visual Assessment of Patient Motion in HR-PQCT Relates to Error in Morphological Parameters**

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*In vivo* high-resolution peripheral quantitative computed-tomography (HR-pQCT) provides three-dimensional (3D) images of bone architecture utilized for investigating bone related disease and treatment. From these 3D images, morphological parameters are calculated to assess bone architecture and bone quality. Despite careful patient restraining, patient motion in HR-pQCT occurs and affects image quality producing streaking artifacts and blurring. The effects of degraded image quality due to patient motion, as perceived by the operator, on the morphological parameters are, however, unknown. Two fresh human cadaver forearms, representing a 'young bone' and 'old bone' were scanned at the wrist (Xtreme CT, Scanco Medical AG). Using these two images, patient motion was simulated (Matlab) with different intensities. A total of 121 simulated images were manually graded for motion severity by an experienced operator, and morphological parameters (BV/TV, Tb.Th, Tb.Sp, Tb.N and Ct.Th) were calculated according to the standard patient protocol. For all simulations, the percent error was calculated for each parameter with respect to the motion-free image. The results indicate that density measurements (BV/TV) are less affected by motion than structural parameters (Tb.Th, Tb.Sp, Tb.N and Ct.Th). It was also observed that an increase in perceived motion is associated with an increase in Tb.N, a decrease in Ct.Th/Tb.Th/Tb.Sp, and a decrease in BV/TV at higher levels of motion. Better understanding of the effect of perceived motion in the quality of the morphological parameters will allow informed decision-making in studies employing HR-pQCT.