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Comparison of Lunar DXA and QCT at the Femoral Neck using Asynchronous Calibration of CT Colonography Exams

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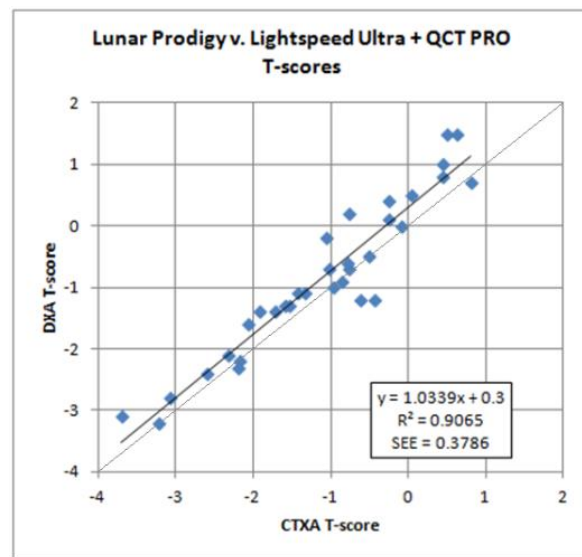
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Introduction: For patients undergoing screening CT colonography (CTC), an opportunity exists for concurrent BMD screening without additional radiation exposure or patient time using Quantitative CT (QCT). Previous studies combining CTC and QCT have focused on the spine. This study investigated the use of DXA-equivalent QCT “CTXA” analysis at the hip obtained using CTC exams.

Methods: Our cohort included 33 female subjects that had a routine CTC using either a GE LightSpeed 16 or GE LightSpeed Ultra, followed by a DXA hip BMD exam using a GE Lunar Prodigy (GE Healthcare, Waukesha, WI) 0-9 months (mean 2.3 months) afterwards. All scans were performed between Jan 2007 and Nov 2008 with BMD reported in T-scores. Subject ages ranged from 49 to 86 years, mean (SD) age 61.3 (10.6) at the time of CTC. Areal BMD in T-scores of the proximal femur was measured from either prone or supine CTC exam using QCT Pro Version 5.0 (Mindways Software, Austin, TX) following standard workflow except that the CT scanners were calibrated by phantoms scanned in Aug 2012, that is, retrospectively of the CTC exam without the subject present.

Results: CTXA BMD measurement and DXA BMD measurement were highly correlated ($R^2 = 0.907$) with a linear relationship of $DXA_BMD = 1.297 * CTXA_BMD + 0.048$. The SEE on the linear fit was 0.053 g/cm². The results for CTXA T-Score measurement and DXA T-Score measurement are below, a linear relationship of $DXA_Tscore = 1.034 * CTXA_Tscore + 0.3$. The SEE on the linear fit was 0.379 T-scores.

Discussion: CTXA and DXA aBMD and T-score measurements showed good correlation despite the approximate four year gap between patient data acquisition and retrospective QCT calibration of the CT scanners.. The SEE of 0.053 g/cm² is comparable with figures in the literature comparing Hologic and Lunar DXA equipment [1]. The observed relationship between CTXA and Lunar DXA BMD estimates matches predictions derived from published cross-calibration relationships relating CTXA BMD estimates to Hologic BMD estimates [2] and then Hologic to Lunar BMD estimates. These equations capture both differences in density calibration standards as well as differences in femoral neck ROI definition. The correlation and consistency with established methods indicates that opportunistic use of CTXA T-scores obtained at the time of CTC can enhance osteoporosis screening.



References:

1. Genant 1994. JBMR 9(10): 1503–14.
2. Khoo 2009. Osteoporosis Int 20(9): 1539–45.