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Bone mineral density around the knee joint: Correlation with central bone mineral density and associated factors

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Introduction: The aims of this study were to 1) assess the bone mineral density (BMD) around the knee joint, 2) determine the correlation between central and knee BMDs, and 3) investigate the factors associated with BMD around the knee joint in patients with knee osteoarthritis (OA).

Methodology: This cross-sectional study included 122 patients who underwent total knee arthroplasty (TKA). Central and knee dual-energy X-ray absorptiometry (Fig. 1) was performed preoperatively. BMD at six regions of interest (ROIs) around the knee joint were measured (Fig. 2), and their correlations with central BMD were determined using Spearman's correlation analysis. Lower limb alignment, severity of OA, body mass index (BMI), preoperative functional and pain scores were assessed to elucidate the factors associated with knee BMD using linear regression analysis.

Results: Around the knee joint, BMD was the lowest at the distal femoral metaphysis and lateral tibial condyle. Knee BMD was significantly correlated with central BMD (Table). However, the correlation coefficients varied by the ROI. Additionally, multivariate analysis revealed different associations with respect to the regions around the knee joint. Varus alignment of the lower limb was associated with increased BMD of the medial condyles and decreased BMD of lateral condyles. High grade OA was a protective factor; it was associated with increased BMD at the lateral condyles of the femur and tibia. Higher BMI was an independent protective factor in all ROIs around the knee joint except the lateral femoral condyles. Lower functional level was not associated with decreased BMD, whereas a higher pain score was significantly associated with lower BMD at the proximal tibial metaphysis.

Conclusions: Knee BMD was significantly correlated with central BMD. However, the correlations varied with the regions around the knee joint probably due to their independent association with the alignment of the lower limb, severity of OA, BMI, and preoperative pain level.

Correlation Coefficient Between Bone Mineral Density of Proximal Femur and Bone Mineral Density Around the Knee Joint

Region of interest	Proximal femur		
	Neck	Trochanter	Shaft
Distal femoral metaphysis	0.579*	0.591*	0.533*
Medial femoral condyle	0.340*	0.301*	0.224*
Lateral femoral condyle	0.397*	0.432*	0.270*
Medial tibial condyle	0.477*	0.551*	0.396*
Lateral tibial condyle	0.453*	0.409*	0.333*
Proximal tibial metaphysis	0.586*	0.630*	0.602*



Fig. 1. Dual-energy X-ray absorptiometry was performed with the patella facing upward with the position of the knee maintained using supportive devices. (A) anteroposterior view. (B) lateral view.

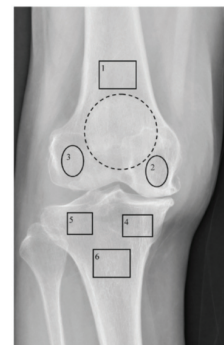


Fig. 2. Diagram demonstrating 6 areas of bone mineral density measurement around the knee. 1, distal femoral metaphysis; 2, medial femoral condyle; 3, lateral femoral condyle; 4, medial tibial condyle; 5, lateral tibial condyle; 6, proximal tibial metaphysis.

Biography

Chan Yoon has his expertise in knee arthroplasty and arthroscopy. He has finished residency at Seoul National University Hospital, department of orthopaedic surgery, and specialized in knee arthroplasty and arthroscopy during his fellowship at Seoul Metropolitan Government Boramae Medical Center. He is currently working as a orthopaedic surgical staff at Seoul BumIn Hospital. He has special interest in total knee arthroplasty.

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