Impact of Bone Quality on Postoperative Outcomes in Postmenopausal Women Undergoing Total Knee Arthroplasty

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ABSTRACT

BACKGROUND: Total Knee Arthroplasty (TKA) improves pain, function, and quality of life in patients with advanced osteoarthritis. Bone mineral density (BMD) may influence postoperative recovery, particularly in postmenopausal women at risk for osteopenia and osteoporosis. This study evaluated the association between preoperative BMD and patient-reported outcomes (PROs) following TKA.

METHODS: In this single-center retrospective cohort study, 61 postmenopausal women undergoing primary TKA (2018-2024) were categorized as normal BMD (T-score ≥ -1.0, n=48) or low BMD (T-score < -1.0, n=13) based on preoperative DEXA scans. KOOS subscales, including Symptoms, Pain, Activities of Daily Living (ADL), and Quality of Life (QOL), were assessed preoperatively and at 2 weeks, 3 months, and 6 months postoperatively. Longitudinal analyses employed repeated measures ANCOVA adjusted for baseline KOOS, age, BMI, race, Kellgren-Lawrence grade, and insurance status.

RESULTS: Of 61 patients, 48 had normal BMD and 13 had low BMD; 20 received osteoporosis treatment preoperative. Patients with low BMD had significantly lower KOOS scores across all domains through 6 months (Symptoms 45.4 vs. 67.0; Pain 48.6 vs. 65.7; ADL 54.7 vs 69.6; QOL 21.0 vs. 43.1; all $p \leq 0.003$), despite similar baseline scores. Both groups improved over time ($p \leq 0.009$) with parallel recovery trajectories (BMD x time $p \geq 0.074$). Heterogenous medication exposure precluded definitive conclusions regarding pharmacotherapy effects.

CONCLUSIONS: Preoperative low BMD identifies postmenopausal women at risk for inferior early PROs following TKA, with clinically meaningful differences of 15-22 KOOS points. Routine preoperative bone health assessment may guide perioperative counseling and risk-stratified management. Prospective studies are needed to determine whether targeted osteoporosis pharmacotherapy can mitigate these outcome disparities.