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

Audrey Ulfers[1], Erik Piedy[1], Matthew Bratton[1], Thuc Truong[1], Amy Bronstone[2], Claudia Leonardi[3], Vinod Dasa[2]

1. Louisiana State University School of Medicine
2. LSUHSC Department of Orthopedics
3. LSUHSC Community Health Science and Policy, School of Public Health

Introduction

Total Knee Arthroplasty (TKA) reliably improves pain, function, and quality of life for patients with advanced osteoarthritis. However, outcomes may be influenced by patient-specific factors, including bone health. Postmenopausal women are particularly vulnerable to osteopenia and osteoporosis, which may impair bone quality, jeopardize implant fixation, and limit recovery. While bone mineral density (BMD) is a well-established predictor of fracture risk, its role in shaping patient-reported outcomes (PROs) after TKA remains underexplored. This study investigates the association between preoperative BMD and postoperative outcomes in postmenopausal women undergoing primary TKA.

Methods

- Single-center, single provider retrospective cohort from 2018-2024
- 61 postmenopausal women undergoing primary TKA
- Groups: Normal BMD (T-score ≥ -1.0, n=48) vs. Low BMD (T-score < -1.0, n=13)
- Outcomes: KOOS subscales (Symptoms, Pain, Activities of Daily Living, Quality of Life) at preoperative, 2 weeks, 3 months, and 6 months postoperatively
- Analysis completed using repeated measures ANCOVA adjusted for baseline KOOS, age, BMI, race, Kellgren-Lawrence grade, insurance

KOOS Pain Trends

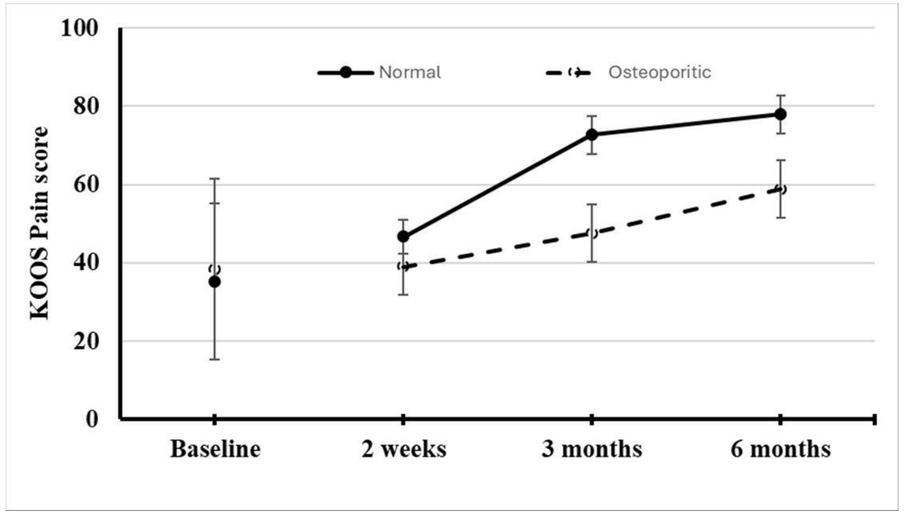

Figure 2: Knee Injury and Osteoarthritis Outcome Score (KOOS) Pain means score at baseline (± SD) and within six months (2 weeks, 3 and 6 months; ± SEM) post-TKA by bone quality status.

KOOS Symptoms Trends

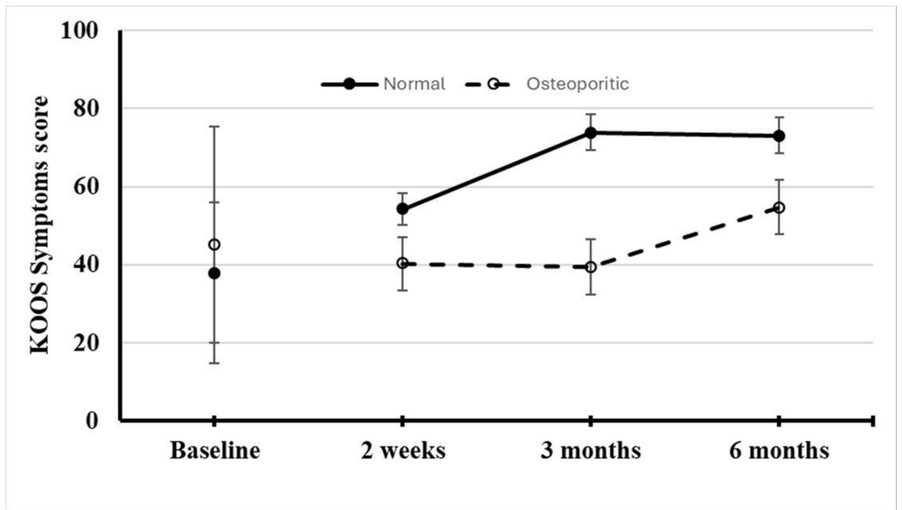

Figure 1: Knee Injury and Osteoarthritis Outcome Score (KOOS) Symptoms means score at baseline (± SD) and within six months (2 weeks, 3 and 6 months; ± SEM) post TKA by bone quality status.

KOOS Impact on BMD and Time

Item	Bone quality status		Effects		
	Normal (n=48)	Low BMD (n=13)	BMD	Time (T)	BMD x T
KOOS, LSM (SEM)[1]					
Symptoms	68.4 (2.0)	46.5 (3.7)	<0.0001	0.002	0.072
Pain	67.1 (2.4)	47.8 (4.6)	0.001	<0.0001	0.109
ADL	70.4 (2.3)	54.3 (4.4)	0.002	<0.0001	0.138
QOL	49.2 (2.7)	26.3 (5.1)	0.001	0.001	0.353
KOOS, LSM (SEM)[2]					
Symptoms	67.0 (3.5)	45.4 (4.9)	<0.0001	0.009	0.082
Pain	65.7 (4.0)	48.6 (6.1)	0.003	<0.0001	0.074
ADL	69.6 (4.1)	54.7 (6.1)	0.001	<0.0001	0.113
QOL	43.1 (4.5)	21.0 (6.6)	0.001	0.003	0.311

Table 1: Knee Injury and Osteoarthritis Outcome Score (KOOS) subscales within six months (2 weeks, 3 and 6 months) post-TKA by bone quality status.

Conclusions

Those with low preoperative BMD (n=13) reported significantly worse outcomes across all KOOS domains compared to women with normal BMD (n=48), with clinically meaningful differences of 15–22 points in symptoms, pain, ADL, and quality of life (all $p \leq 0.003$). Both groups improved over time with parallel recovery trajectories, but low BMD patients consistently remained at a disadvantage. These results highlight preoperative bone health as an important determinant of early recovery and support routine BMD assessment to guide counseling and risk-stratified care. Future prospective studies should evaluate whether osteoporosis pharmacotherapy can mitigate these disparities.