

Testing the association between bone mineral density and surgical outcomes for TKA patients

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Introduction

- 1/3 of Americans over the age of 50 suffer from osteoporosis or low bone mineral density (BMD) (Wright 2014).
- We observed a lack of bone density screening in our cohort of total knee arthroplasty (TKA) patients (Miller 2019).
- TKA is a surgical procedure which is typically used to counter osteoarthritis within the knee.
- Due to the significantly low amount of screenings for osteoporosis, low BMD goes undetected and untreated in our population.
- We hypothesize that patients with low bone mineral density will experience higher levels of pain and worse symptoms after a total knee arthroplasty surgery.

References

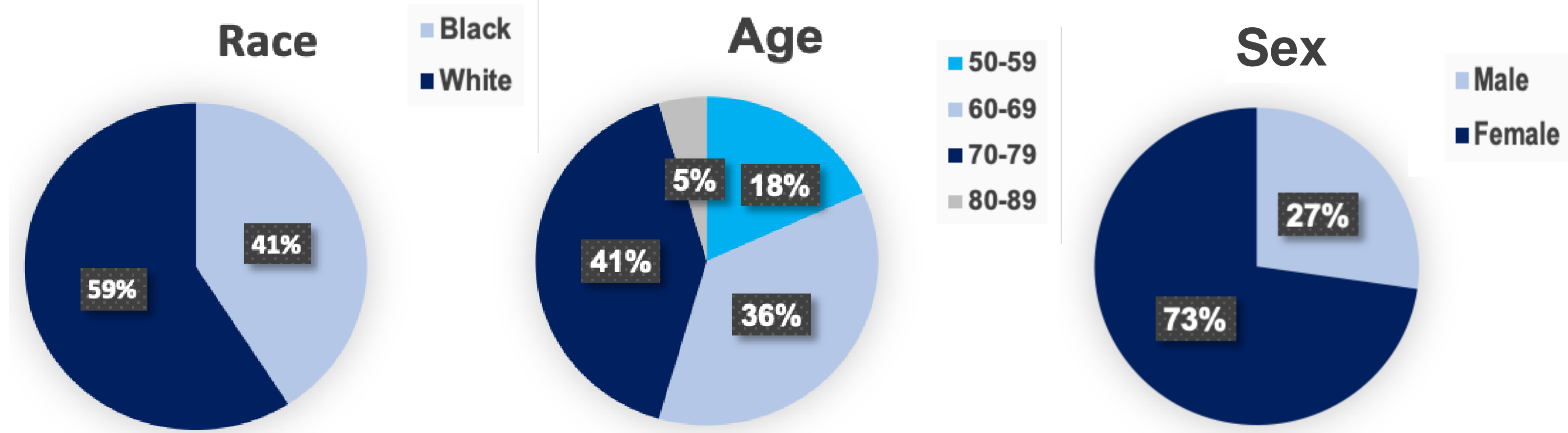
Wright, Nicole C., et al. *Journal of Bone and Mineral Research* 29.11 (2014): 2520-2526.

Miller, Adam M., et al. *Orthopedics* 42.6 (2019): 310-312.

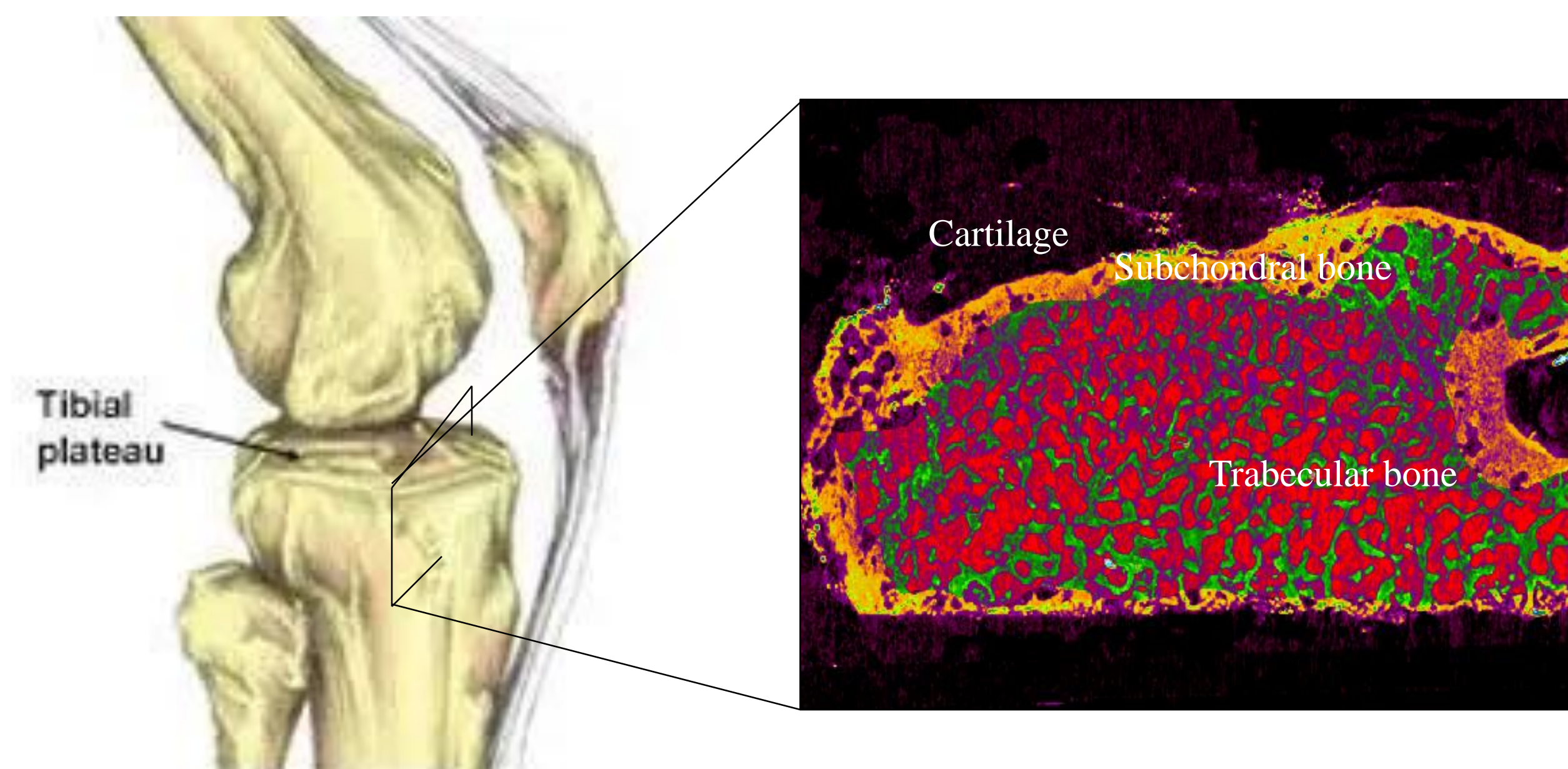
Methods

- We analyzed the correlation between surgical outcomes and BMD on 22 consented osteoarthritis patients undergoing TKA.
- The status of a patient's surgical outcome is determined by the Knee Osteoarthritis Outcome Scores (KOOS) survey. Each patient takes the KOOS survey before (Day 0) and 90 days after their TKA.
- In order to examine the BMD of a patient, their tibial plateau was collected during the total knee arthroplasty surgery. The central region of the tibial plateau was imaged using an ex vivo micro-computed tomography scanner (μ CT).
- The software program, CTAn, was used to analyze the BMD from the CT scans.
- We outlined the regions of interest of the bone scan to include the trabecular bone while excluding the subchondral portion of the tibial plateau.
- BMD mean values were calculated using hydroxyapatite standards, and we used the Pearson's correlation (r) test to evaluate the strength of the correlation between bone mineral density and the patient's KOOS survey sub scores.

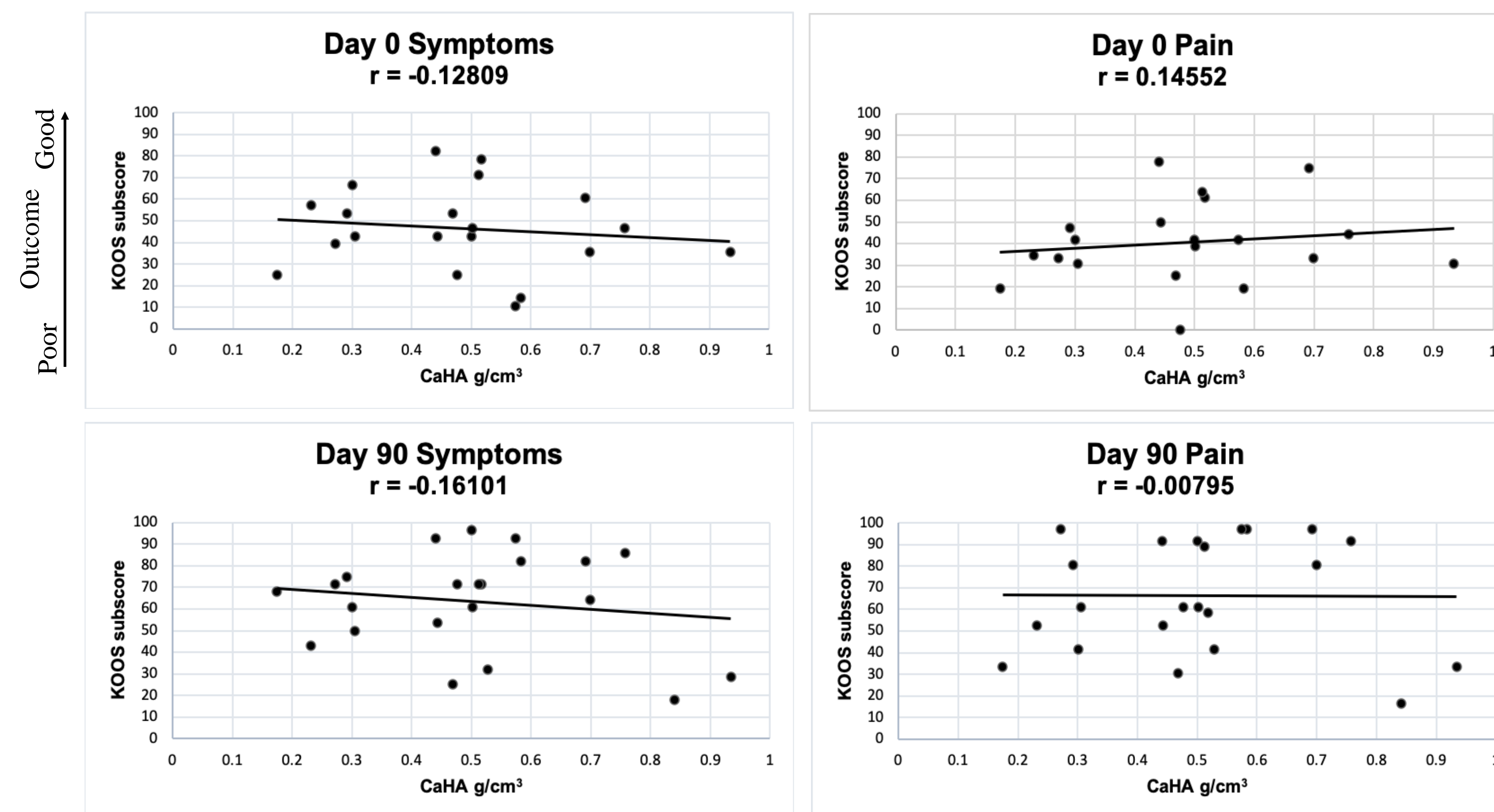
Patient Demographics



Tibial Plateau and BMD Scans



Results



Based on the data which was evaluated between the patient's BMD and their KOOS survey sub scores we must reject our hypothesis. There is no indication from the Pearson's correlation test (r) that bone mineral density prior to surgery is associated with patient reported outcomes at 90 days post surgery. A high KOOS score refers to the patient enduring low levels of pain and a low KOOS score refers to the patient enduring high levels of pain.

Patient Selection

Of the 250 patients in our database only 80 qualified for analysis in this study based on the following criteria:

1. Patients had more than 50 μ L of blood collected during TKA for subsequent bone turnover analysis
2. Patients returned 90 days after surgery for follow-up KOOS survey
3. The patient must have been diagnosed with osteoarthritis (OA), no patient could have rheumatoid arthritis (RA).

From these 80 patients, 22 patients were randomly selected for this specific study.

Limitations and Improvements

Limitations

- Our study did not include whether a patient was prescribed anti-pain medication before or after TKA surgery which could affect patient reported pain values.
- We did not control for patients who may have been on treatments, such as bisphosphonates, for osteoporosis which would affect the bone mineral density values.

Improvements

- To correct for both of the above limitations, a future study would limit patient selection to only patients known to not be currently taking bone-modifying medications and would report prescribed pain medications in the analysis.

Conclusion

- Previous work by our group identified a positive correlation between bone mineral density and patient reported pain when analyzing only female patients.
- This project was designed with random patient selection from a repository of existing tissues, including female and male patients in our analysis, and raises future questions if TKA outcomes are sex-linked.
- Because bone mineral density is modifiable prior to surgery, knowing if a patient's bone mineral density can affect total knee replacement outcomes helps us determine the necessity of BMD screening for all patients.