Titanium vs. Cobalt Chromium Tibial Trays: Proximal Tibial Stress-Related Changes

Victoria Oladipo, Elana Gordy, Omar Ahmad, Wayne Gregory Paprosky[1], Scott M Sporer, Brett Russell Levine[2]
[1]Midwest Orthopaedics At RUSH, [2]Rush University Medical Center

INTRODUCTION:
The resultant bone remodeling around total joint implants varies based on mechanical load distribution and the material composition of the components. Due to its rigidity and higher modulus of elasticity, studies suggest that cobalt chromium (CoCr) in total knee arthroplasty (TKA) may increase the likelihood of stress shielding and subsequent mechanical complications when compared to titanium (Ti). Our study aims to evaluate whether tibial alloy composition is associated with radiographic signs of bone reaction and mechanical complications.
METHODS:
Primary TKAs at a single institution from 2011 to 2017 were included in the study and evaluated based on the tibial tray component composition. Demographics and mechanical complications were collected. Radiolucent lines (RLLs) at the bone-cement interface on anteroposterior (AP) and lateral radiographs were observed at 6 weeks postoperatively, then compared to most recent imaging follow up for RLL progression. Two-tailed T-tests and Fishers Exact tests were used for statistical analysis.
RESULTS:
There were a total of 1,793 Ti and 339 CoCr tibial trays. The cohorts did not statistically differ at baseline, with a mean age of 66 ± 9 years, BMI of 32 ±7 kg/m2, follow up of 3 ± 2 years, and a parametric distribution of ASA classification in both cohorts. Progressive RLLs were equally prevalent on both metal alloys in AP tibial images (14% vs. 12%, p= 0.6) or lateral tibial images (8.8% vs. 6.6%, p =0.4). Neither metal alloy had differing rates of progressive osteolysis (1.3% vs. 2.6%, p = 0.09) or aseptic loosening (0.05% vs. 0.29%, p = 0.5).
DISCUSSION AND CONCLUSION:
Although Ti and CoCr tibial trays have different weights and rigidity, they do not seem to result in different clinical outcomes, progressive radiolucent lines, or progressive osteolysis.