

Are Patients with Metal Allergies at Higher Risk of Poor PROMs after Total Knee Arthroplasty? A Comparative Study

Mitchell F Kennedy, Sophie Antonioli, Farouk J Khury, Anzar Sarfraz, Ran Schwarzkopf, Vinay Aggarwal, Anna Cohen-Rosenblum, Claudette Malvina Lajam

INTRODUCTION:

Metal hypersensitivity has been associated with persistent pain and swelling following total knee arthroplasty (TKA). However, the effect of allergies—including but not limited to metal allergies—on patient-reported outcome measures (PROMs) after TKA remains unclear. This study aimed to compare the impact of metal and non-metal allergies on PROMs following TKA.

METHODS:

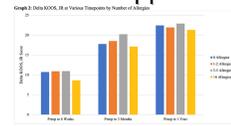
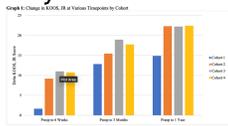
A retrospective chart review of patients who underwent primary, elective TKA at a single academic institution was performed. Patients were excluded if they did not have a preoperative and at least one postoperative Knee Injury and Osteoarthritis Outcome Score for Joint Replacement (KOOS, JR). Patients were separated into cohorts based on the presence of self-reported allergies: cohort 1 (metal allergies only, N=32), cohort 2 (metal and non-metal allergies, N=64), cohort 3 (non-metal allergies, N=2,106), and cohort 4 (no allergies, N=2,734). Baseline demographics and KOOS, JR at preoperative, 6-weeks, 3-months, and 1-year postoperative timepoints were reviewed.

RESULTS:

Patients in the allergy cohorts were more likely to be female ($P<0.001$) and had higher rates of depression/anxiety ($P<0.001$) and autoimmune disease ($P<0.001$) compared to the no allergy cohort. At 6 weeks postoperatively, cohort 1 had significantly lower KOOS, JR scores (47.2) compared to cohorts 2 (56.5; $P=0.027$), 3 (54.7; $P=0.017$), and 4 (55.7; $P=0.004$). Change in KOOS, JR from preoperative to 6 weeks was significantly lower in cohort 1 compared to cohorts 3 ($P=0.032$) and 4 ($P=0.040$), though these differences were no longer significant at later timepoints. No significant differences in KOOS, JR were observed between the cohorts at 3-months or 1-year.

DISCUSSION AND CONCLUSION:

Patients with metal allergies demonstrated significantly lower KOOS, JR scores at 6-weeks post-TKA compared to those with non-metal or no allergies, though these differences resolved by later timepoints. Long-term functional outcomes were comparable across all groups. These findings suggest that while metal allergies may impact early postoperative recovery, they do not appear to affect long-term patient reported outcomes.



Characteristic	Cohort 1	Cohort 2	Cohort 3	Cohort 4	P Value
Age (mean [range])	62.8 (51-78)	62.2 (51-78)	62.1 (51-78)	62.1 (51-78)	0.88
Female (%)	81.3	78.1	75.2	75.2	0.001
Male (%)	18.7	21.9	24.8	24.8	
Body Mass Index (mean [range])	27.2 (18.4-41.4)	27.1 (18.4-41.4)	27.1 (18.4-41.4)	27.1 (18.4-41.4)	0.98
Smoking Status (%)					
Never	21.9	21.9	21.9	21.9	0.98
Former	40.6	40.6	40.6	40.6	
Current	37.5	37.5	37.5	37.5	
Autoimmune Disease (%)	43.8	43.8	43.8	43.8	0.001
Yes	43.8	43.8	43.8	43.8	
No	56.2	56.2	56.2	56.2	
Depression or Anxiety (%)	19.3	19.3	19.3	19.3	0.001
Yes	19.3	19.3	19.3	19.3	
No	80.7	80.7	80.7	80.7	
TKA Indication (%)					
OA	26.9	26.9	26.9	26.9	0.001
R/O	73.1	73.1	73.1	73.1	

Timepoint	Cohort 1	Cohort 2	Cohort 3	Cohort 4	P Value
Preop	55.0	55.0	55.0	55.0	0.98
6 Week	47.2	56.5	54.7	55.7	0.004
3 Month	54.7	55.0	55.0	55.0	0.98
1 Year	55.7	55.0	55.0	55.0	0.98
Preop to 6 Week	-7.8	-8.5	-0.3	-0.7	0.027

Comparison	P Value	95% CI
Preop		
Cohort 1 vs. Cohort 2	0.963	-10.20, 6.56
Cohort 1 vs. Cohort 3	0.490	-3.17, 10.94
Cohort 1 vs. Cohort 4	0.005	-6.26, 9.21
Cohort 2 vs. Cohort 3	0.025	0.47, 10.23
Cohort 2 vs. Cohort 4	0.155	-0.92, 9.09
Cohort 3 vs. Cohort 4	0.008	-2.57, -0.27
6 Week		
Cohort 1 vs. Cohort 2	0.027	-17.88, -0.73
Cohort 1 vs. Cohort 3	0.017	-13.07, -0.97
Cohort 1 vs. Cohort 4	0.004	-14.97, -1.98
Cohort 2 vs. Cohort 3	0.840	-3.86, -2.55
Cohort 2 vs. Cohort 4	0.061	-4.86, -0.33
Cohort 3 vs. Cohort 4	0.125	-2.18, 0.17
3 Month		
Cohort 1 vs. Cohort 2	0.338	-10.07, 4.03
Cohort 1 vs. Cohort 3	0.032	-18.11, -0.56
Cohort 1 vs. Cohort 4	0.040	-17.81, -0.29
Cohort 2 vs. Cohort 3	0.930	-9.52, 5.88
Cohort 2 vs. Cohort 4	0.956	-0.22, 6.15
Cohort 3 vs. Cohort 4	0.067	-1.30, 1.87

KOOS, JR, Knee Injury and Osteoarthritis Outcome Score for Joint Replacement; Preop, preoperative; A, Delta; CI, confidence interval.