

# Does the presence of contralateral and ipsilateral total hip and knee joint arthroplasty increase the risk of periprosthetic fractures?

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**INTRODUCTION:** A continuous increase in volume of total hip arthroplasty (THA) and total knee arthroplasty (TKA) is anticipated in the United States. As the population receiving total joint arthroplasty (TJA) expands, the incidence of multiple TJAs within one patient occurs more frequently. The incidence of complications such as periprosthetic fracture (PF) and the need for revision will subsequently rise. It has been suggested by previous studies that TJA accelerates age-related bone loss in the contralateral limb, suggesting arthroplasty influences the skeleton at distant sites in a negative manner. Furthermore, the risk for periprosthetic fracture in the ipsilateral limb remains largely unknown. The aim of this study is to compare the risk of periprosthetic fracture between patients with a single TJA and 3 different patient groups: 1) those with only an additional contralateral total joint arthroplasty (TJA) for TKA as well as THA, 2) those with only an additional ipsilateral total joint arthroplasty (TJA) for TKA as well as THA, and 3) those with additional total joint arthroplasty (TJA) in both contralateral and ipsilateral limb for TKA as well as THA.

**METHODS:** A retrospective review was performed on 1618 consecutive patients that underwent revision TJA. Patient demographics including type of primary hip and knee prostheses, data on prior TJA, and revision surgery were recorded alongside clinical outcomes such as PF, readmission and re-revision rates. Multiple subgroup analyses were performed on a TJA in the contralateral, ipsilateral, and both contra- and ipsilateral limbs for TKA as well as THA. Significant differences between the cohorts were established using Pearson Chi-Square Test for dichotomous variables and Student's t-test for continuous variables.

**RESULTS:** This study included a total of 513 patients who underwent revision TKA (382 patients with only a single TKA, 106 patients that also have a contralateral TJA, 8 patients that also have an ipsilateral TJA, and 17 that have both an ipsilateral and contralateral TJA), and 1105 patients who underwent revision THA (810 patients with only a single THA, 212 patients that also have a contralateral TJA, 32 patients that also have an ipsilateral TJA, and 51 that have both a contra- and ipsilateral TJA). The cohorts were matched with respect to patient demographics, except for age ( $p<0.016$ ), American Society of Anesthesiologists (ASA) ( $p<0.001$ ), drug use ( $p=0.001$ ), and diabetes mellitus ( $p=0.049$ ) (Table 1). When compared to the control group, patients with both a contra- and ipsilateral joint replacement in the TKA as well as the THA group showed a significantly higher risk of periprosthetic fracture ( $p<0.001$ ). Patients with both a contra- and ipsilateral joint replacement in the THA group showed significantly increased 30, 60, and 90 day readmission rates ( $p=0.045$ ;  $p=0.007$ ;  $p<0.001$ ). Patients with both a contra- and ipsilateral joint replacement in the TKA group showed significantly higher re-revision for infection, loosening, and fracture ( $p<0.001$ ) (Table 1). Length of stay was significantly longer ( $p=0.019$ ) for patients with an ipsilateral joint replacement in the THA group (Table 1).

**DISCUSSION:** In an era of amplification of TJA in the population, this study is the first to describe the potential biomechanical relation between multiple TJA and contralateral and ipsilateral periprosthetic fracture for both TKA as well as THA. The findings of this study demonstrate that a contralateral joint replacement has no effect on outcomes including fracture risk. However, patients in the THA group who also have an ipsilateral TJA demonstrated an increased risk of re-revision for infection, loosening, and fracture. Patients with both a contra- and ipsilateral TJA showed significantly increased readmission and re-revision rates for infection, loosening, and fracture. Furthermore, an increased fracture risk was observed for patients in the TKA as well as the THA group with contralateral and ipsilateral TJA, suggesting that multiple TJAs increase the burden on the musculoskeletal system that may lead to an increased fracture risk and higher complication rate.

**SIGNIFICANCE/CLINICAL RELEVANCE:** This study demonstrates that a contralateral joint replacement is not associated with inferior patient outcomes, while the presence of ipsilateral as well as bilateral joint replacements represents a risk factor for increased fracture rates following TJA.

**Table 1:** Patient cohort characteristics and outcomes revision TJA

Characteristic	Control n=1192	Contralateral n=318	p-value	Ipsilateral n=40	p-value	Both n=899	p-value
Female/male	636/556	167/151	0.790	28/12	0.038	40/28	0.379
Right/left	625/567	149/169	0.077	25/15	0.210	40/28	0.305
Age (years)	67.9 ± 13.3	68.4 ± 13.4	0.559	68.8 ± 13.9	0.656	69.8 ± 14.2	0.246
BMI (kg/m <sup>2</sup> )	30.1 ± 7.0	31.0 ± 7.4	0.139	28.2 ± 6.1	0.149	29.5 ± 6.8	0.534
Cardiovascular disease	698 (58.6%)	174 (54.7%)	0.218	24 (60.0%)	0.855	42 (61.8%)	0.601
Diabetes Mellitus	146 (12.2%)	43 (13.5%)	0.285	4 (10.0%)	0.686	2 (2.9%)	0.337
Renal disease	71 (6.0%)	14 (4.4%)	0.542	3 (7.5%)	0.669	6 (8.8%)	<b>0.020</b>
Malignancy	85 (7.1%)	29 (9.2%)	0.233	0 (0.0%)	0.258	6 (8.8%)	0.600
Depression	119 (10.0%)	30 (9.4%)	0.770	4 (10.0%)	0.997	7 (10.3%)	0.934
Smoking	103 (8.6%)	15 (4.7%)	0.021	2 (5.0%)	0.417	5 (7.4%)	0.712
Alcohol	359 (30.1%)	85 (26.7%)	0.234	10 (25.0%)	0.487	25 (36.8%)	0.247
Drugs	21 (1.7%)	4 (1.2%)	0.532	1 (2.5%)	0.729	5 (7.3%)	<b>0.002</b>
Follow-up Time (mo)	43.0 ± 46.7	55.7 ± 56.2	0.005	64.8 ± 62.5	0.029	48.24 ± 44.5	0.566
Periprosthetic fracture	298 (25.0%)	90 (28.3%)	0.231	18 (45.0%)	0.004	35 (51.5%)	<b>0.004</b>
30 day readmission	194 (16.3%)	54 (17.0%)	0.762	9 (22.5%)	0.297	19 (27.9%)	<b>0.013</b>
60 day readmission	238 (20.0%)	68 (21.4%)	0.576	9 (22.5%)	0.694	23 (33.8%)	<b>0.006</b>
90 day readmission	267 (22.4%)	81 (25.5%)	0.248	10 (25.0%)	0.694	28 (41.2%)	<b>&lt;.001</b>
Re-revision	178 (14.9%)	51 (16.0%)	0.626	8 (20.0%)	0.379	17 (25.0%)	<b>0.026</b>
Death rate	104 (8.7%)	28 (8.8%)	0.964	1 (2.5%)	0.964	7 (10.3%)	0.657
Length of Stay (days)	5.2 ± 3.6	5.0 ± 4.1	0.599	6.8 ± 4.3	0.006	5.1 ± 3.3	0.905

