Second-Site Periprosthetic Joint Infection After Subsequent Primary Hip or Knee Arthroplasty: Risk factor Assessment

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INTRODUCTION: The risk factors for developing a periprosthetic joint infection (PJI) are well described. However, those associated with developing a second-site or metachronous PJI (MPJI) following a subsequent primary arthroplasty are poorly understood. The purpose of our study is to determine (1) prevalence and (2) risk factors associated with developing a second-site PJI in patients with a prior history of PJI who undergo a subsequent THA or TKA.

METHODS:

A retrospective, single-center case-control study identified 77 patients treated for an index PJI (hip or knee) between 2013-2022, and who also underwent another primary arthroplasty after completing treatment for their first PJI. We identified patients from this group who developed a second-site PJI. Diagnosis was made using the 2018 Musculoskeletal Infection Society (MSIS) criteria. Minimum follow-up was 2 years. The prevalence of second-site PJI was calculated, and risk factors were assessed by comparing patients with a single PJI and those with MPJI.

RESULTS:

9/77 patients (11.7%) with a prior history of treated PJI developed a second-site PJI after a subsequent primary THA (7/30) or TKA (2/38). Average follow-up was 4.9 ± 2.7 years. Patients who developed a second-site PJI had a significantly shorter onset of index PJI (27.5 weeks) compared to those with only a single-site PJI (104.1 weeks), p=0.003. No other statistically significant differences were found when comparing characteristics of the index PJI, nor for demographic and medical comorbidity data. Average time for developing a second-site PJI was 56.3 ± 72.3 weeks after a subsequent primary arthroplasty.

DISCUSSION AND CONCLUSION:

Patients with a history of PJI are at high risk [11.7%] for developing a second-site PJI after a subsequent THA or TKA. Orthopedic surgeons should be aware of the prevalence and potential risk factors for metachronous PJI when considering a second hip or knee arthroplasty in this unique patient population.

Figure 1.

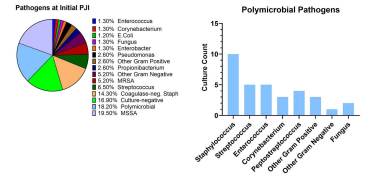

Figure 1. Index PJI Microbiology Data. Proportions of pathogens detected via intraoperative cultures at index PJI for both groups (figure 1A). Breakdown of pathogens detected in polymicrobial infections (figure 1B).

Table 1a. Characteristics of index PJI	Single PJI (n=68)	Metachronous PJI (n=9)	P value
Sex, M/F (%)	30/38 (44.1/55.9)	3/6 (33.3)/(66.7)	0.539[1]
Age, y (SD)	65.4 (9.0)	66.1 (12.9)	0.557[2]
BMI (SD)	33.3 (7.6)	30.4 (6.0)	0.222[2]
> 1 prosthesis at initial infection, n (%)	14 (20.6)	4 (44.4)	0.112[1]
Revision surgery before PJI, n (%)	17 (25.0)	3 (33.3)	0.592[1]
Time to PJI, wk (SD)	104.1 (143.4)	27.5 (48.6)	0.003[1]*
Acute PJI (<1 mo), n (%)	18 (26.5)	3 (33.3)	0.664[1]
Acute-delayed PJI, n (%)	21 (30.9)	4 (44.4)	0.414[1]
Delayed PJI (<12 mo), n (%)	29 (42.6)	2 (22.2)	0.240[1]
Recurrent index PJI, n (%)	15 (22.1)	4 (44.4)	0.143[1]
Two-stage resection arthroplasty, n (%)	49 (72.1)	8 (88.9)	0.279[1]
>1 treatment method	14 (20.6)	4 (44.4)	0.112[1]
Bacteremia, n (%)	9 (13.2)	1 (11.1)	0.859[1]
ASA Status (I/ II/ III/ IV)	(0/ 19/ 44/ 5)	(0/ 2/ 7/ 0)	0.921[1]
Table 1b. Comparison of medical comorbidities			
Hypertension, n (%)	54 (79.4)	7 (77.8)	0.910[1]
Type 2 diabetes mellitus, n (%)	19 (27.9)	1 (11.1)	0.279[1]
Chronic kidney disease, n (%)	8 (11.8)	2 (22.2)	0.380[1]
Existing ASCVD, n (%)	23 (33.8)	2 (22.2)	0.485[1]
Heart failure, n (%)	6 (8.8)	1 (11.1)	0.822[1]
Atrial fibrillation, n (%)	10 (14.7)	1 (11.1)	0.772[1]
COPD, n (%)	7 (10.3)	0 (0)	0.313[1]
Asthma, n (%)	13 (19.1)	0 (0)	0.150[1]
Cirrhosis, n (%)	3 (4.4)	1 (11.1)	0.395[1]
History of DVT or PE, n (%)	14 (20.6)	1 (11.1)	0.500[1]
Depression or anxiety, n (%)	35 (51.5)	4 (44.4)	0.692[1]
Malignancy, n (%)	15 (22.1)	4 (44.4)	0.143[1]
Thyroid disease, n (%)	15 (22.1)	2 (22.2)	0.991[1]
Rheumatoid arthritis, n (%)	6 (8.8)	1 (11.1)	0.822[1]
Use of immune modifying drugs, n (%)	11 (16.2)	2 (22.2)	0.649[1]
Current tobacco use, n (%)	10 (14.7)	1 (11.1)	0.772[1]

Table 1. Comparison between single PJI and metachronous PJI groups at index PJI. Chi-square testing[1]. T-test: Two-Sample Assuming Unequal Variances[2]. Asterisks indicate statistical significance (P < .05).

	Primary Diagnosis	Time to Index PJI, wk (SD)	Index PJI pathogen	Recurrent index PJI	Time to 2nd PJI, wk (SD)	Sepsis	2nd PJI pathogen	Joints involved	Outcome of 2nd PJI
1	OA	7.3	Citrobacter	No	27.0	No	CoNS	L THA + L TKA	Eradicated
2	OA	6.1	Polymicrobial	No	9.6	No	MSSA	L THA + R THA	Eradicated
3	OA	146.3	Culture-negative	Yes	40.0	No	Bacteroides	L TKA + R THA	Chronic antibiotic suppression
4	OA	1.7	Candida albicans	Yes	1.6	No	Culture-negative	R TKA + R THA	Permanent spacer + Antifungal suppression
5	AVN	0.9	Polymicrobial	No	71.7	Yes	Group A Strep	R THA + L TKA	Eradicated
6	OA	5.6	Pseudomonas	No	5.7	No	Pseudomonas	R THA + L THA	Chronic antibiotic suppression
7	OA	12.9	Polymicrobial	Yes	134.4	No	CoNS	L TKA + R THA	Girdlestone
8	Post-traumatic	62.4	CoNS	No	211.3	No	Pepto	R TKA + R THA	Eradicated
9	RA	4.1	MSSA	Yes	5.4	Yes	MRSA	L TKA + R THA	Girdlestone + Antibiotic suppression
		avg 27.5 (48.5)		44.4%	avg 56.3 (72.3)	22.2%			

Table 2. Summary of Metachronous PJI Cases. OA: osteoarthritis. AVN: avascular necrosis. RA: rheumatoid arthritis. CoNS: Coagulase-negative Staphylococcus. MSSA: methicillin-susceptible Staphylococcus aureus. MRSA: methicillin-resistant Staphylococcus aureus. Pepto: Peptostreptococcus. TKA: total knee arthroplasty. THA: total hip arthroplasty.