

Risk factors for septic loosening following primary total joint arthroplasty

Janna van den Kieboom¹, Ruben Oganessian¹, Paul Walker¹, Venkatsaikhil Tirumala¹, Christian Klemt¹, John Drago¹, Kaya Adelzadeh¹, Andriana Velmahos¹, Saimrunali Dadigala¹, Travis Dang¹, Alina Syros¹, Young-Min Kwon¹

¹Bioengineering Laboratory, Department of Orthopaedic Surgery, Massachusetts General Hospital, Harvard Medical School, Boston, MA, USA
ymkwon@mgh.harvard.edu

Disclosures: Janna van den Kieboom (N); Venkatsaikhil Tirumala (N); Ruben Oganessian (N); Paul Walker (N); John Drago (N); KA (N); Alina Syros (N); Saimrunali Dadigala (N); Travis Dang (N); Andriana Velmahos (N); Christian Klemt (N); Young-Min Kwon (5- Stryker;5- Zimmer Biomet; 5- Depuy;5- Corentec; 5- Smith&Nephew)

INTRODUCTION: With a continuously increasing volume of total hip arthroplasty (THA) and total knee arthroplasty (TKA) in the United States, the frequency of periprosthetic joint infection (PJI) is, too, expected to rise. Septic loosening poses a difficult problem for the orthopaedic surgeon in the setting of PJI, and the treatment is challenging and often cost intensive due to a complex diagnostic work-up and interdisciplinary approach. Treatment of septic loosening is complicated, consisting of intravenous antibiotics, resection of implant components, temporary antibiotic-containing spacer placement, and reimplantation of new components. Whereas risk factors for PJI alone are well established, studies investigating risk factors on septic loosening after total joint arthroplasty (TJA) are currently lacking. The aim of this study is to establish important risk factors for septic loosening in patients who underwent TJA.

METHODS: A retrospective review was performed on a cohort of 4191 consecutive patients that underwent revision hip and knee TJA, of which a total of 99 patients underwent revision TJA for septic loosening. Patient demographics including type of primary hip and knee prostheses and revision surgery were recorded alongside clinical outcomes such as complications, readmission and re-revision rates. Risk factors for septic loosening were identified using Pearson Chi-Square test. Continuous variables were compared using Student's t-test.

RESULTS: The study included 4092 patients that underwent revision TJA for reasons other than non-septic loosening, and 99 patients that underwent revision TJA for septic loosening. Patients undergoing revision TJA for septic loosening demonstrated a significantly higher BMI ($p=0.053$) and American Society of Anesthesiologists (ASA) score ($p=0.009$; Table 1). The statistical analysis demonstrated cardiovascular disease (CVD) ($p=0.001$), diabetes mellitus ($p=0.002$), renal disease ($p=0.038$), liver disease ($p=0.008$), and smoking ($p=0.001$) as risk factors for septic loosening (Table 1). There was no correlation between septic loosening and the presence of systemic inflammatory disease ($p=0.423$), respiratory disease ($p=0.709$), and drug abuse ($p=0.566$). Patients that underwent revision TJA for septic loosening had significantly longer length of hospital stays ($p<0.001$), increased 30, 60 and 90 day readmission rates ($p=0.002$, $p=0.021$, $p<0.001$), increased re-revision rates ($p=0.025$) and increased death rates ($p=0.047$) compared to other revision indications (Table 1).

DISCUSSION: The findings of this study demonstrate a high BMI and ASA score as well as comorbidities including diabetes mellitus, renal disease and liver disease as risk factors for septic loosening following primary hip and knee TJA. The risk factors presented in this study correlate with the risk factors for PJI, however liver disease has not been established for PJI. Patients with septic loosening also had significantly inferior outcomes when compared to patients that underwent revision TJA for other indications. The awareness of these risk factors and outcomes has the potential to assist in clinical decision making as early diagnosis and treatment of infectious complications of TJA are essential in order to optimize patient outcome.

SIGNIFICANCE/CLINICAL RELEVANCE: This study demonstrates that a high BMI and ASA score as well as multiple comorbidities including diabetes mellitus, renal disease and liver disease are risk factors for septic loosening following primary hip and knee TJA.

Table 1: Patient cohort characteristics

Characteristic	Control (N=4092)	Septic loosening (N=99)	p-value
Female/male	2193/1899	41/58	0.016
Age (years)	66.1 ± 12.9	67.6 ± 13.5	0.180
BMI (kg/m ²)	30.8 ± 7.4	31.9 ± 7.4	0.053
ASA score			0.009
Cardiovascular disease	950 (23.2%)	37 (37.4%)	0.001
Hypertension	1759 (43.0%)	48 (48.5%)	0.190
Diabetes Mellitus	461 (11.2)	21 (21.2%)	0.002
Renal disease	247 (6.0%)	11 (11.1%)	0.038
Malignancy	272 (6.6%)	8 (8.1%)	0.572
Depression	388 (9.5%)	11 (11.1%)	0.585
Liver disease	108 (2.6%)	7 (7.1%)	0.008
Endocrine disease	475 (11.6%)	13 (13.1%)	0.641
Respiratory disease	487 (11.9%)	13 (13.1%)	0.709
Systemic inflammatory	251 (6.1%)	9 (9.1%)	0.423
Smoking	271 (6.6%)	14 (14.1%)	0.001
Alcohol	1197 (29.3%)	21 (21.2%)	0.082
Drugs	55 (1.3%)	2 (2.0%)	0.566
Mean Follow-up Time (months)	47.8 ± 52.2	45.5 ± 56.8	0.427
30 day readmission	465 (11.1%)	21 (21.2%)	0.002
60 day readmission	607 (14.8%)	23 (23.2%)	0.021
90 day readmission	709 (16.9%)	30 (30.3%)	<0.001
Re-revision	650 (15.8%)	24 (24.2%)	0.025
Death rate	347 (8.5%)	14 (14.1%)	0.047
Length of Stay (days)	5.1 ± 4.5	6.2 ± 6.2	<0.001