Type 2 Diabetic Patients with Neuropathy Face Increased Risk of Adverse Complications after Total Knee Arthroplasty

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INTRODUCTION:

Knee arthroplasty is a growing field, with total knee arthroplasties becoming the standard of care for the treatment of intractable joint cartilage destruction of the knee; such as that due to rheumatoid or osteoarthritis, posttraumatic degenerative joint disease, or osteonecrosis. While a relatively safe procedure, there is little research on the association between patients with diabetic neuropathies and their impact on adverse outcomes after total knee arthroplasty. The purpose of this study is to evaluate the association between diabetic neuropathy and the likelihood of poor surgical outcomes and complications following arthroplastic procedures of the knee.

METHODS: The National Inpatient Sample (NIS) database was queried to identify all patients with type 2 diabetes, with and without neuropathy utilizing ICD-9 codes 250.00 and 250.60, who underwent total knee arthroplasty, isolated by ICD-9 code 81.54, between 2000 and 2014. Patient demographics, comorbidities, pay method and total charges, LOS, deyo index, and complications were collected. Univariate analysis of complication rates between type 2 diabetic patients with or without neuropathies was conducted using chi-square analysis. Multivariate logistic regression models accounted for age, sex, pay, and deyo score and were utilized to identify the associations between DMII patient neuropathic status and the risk of complications.

RESULTS:

19,038 patients with type 2 diabetes underwent TKA and met inclusion criteria, 787 (4.1%) patients had neuropathy while 18,251 (95.9%) did not. Of these, 374 (2.0%) patients experienced mortality; 350 (93.6%) without neuropathy, 24 (6.4%) with. 13,167 (69.2%) of the overall patient population were white, while 2,383 (12.5%) were black and 1,726 (9.1%) were Hispanic. 595 (4.5%) of white patients experienced neuropathy, 97 (4.1%) of black, and 38 (2.2%) of Hispanic. Mean of age of patients with and without neuropathy were not significantly different at 67.48 and 67.01 years old, respectively (p=0.164). Patients with neuropathy demonstrated significantly different rates of medical complications (p<0.001), CNS complications (p=0.048), pneumonia (p<0.001), ARF (p<0.001), sepsis (p<0.001), readmission (p<0.001), surgical complications (p<0.001), blood transfusions (p<0.001), and mortality (p=0.025). Multivariate logistic regression revealed that patients with DMII neuropathy had a significantly higher rate of sepsis (OR: 1.514, CI: 1.144-2.005, p=0.004). In multivariate logistic regression, no other significant difference in risk of complication was seen between DMII patients with or without neuropathy when confounds were accounted for.

DISCUSSION AND CONCLUSION: Patients with DMII who had neuropathy and were undergoing total knee arthroplasty were found to have a significantly higher rate of post-surgical sepsis. Patients with DMII and neuropathy should be counseled on the increased risk of complication and should be optimized with regards to their comorbidities prior to surgery. Further research is needed to explore the risk of complications and poor outcomes in type 2 diabetic patients with neuropathies receiving total knee arthroplasty.

Table 1 – Patient Demographics: DMII with or without Neuropathy who underwent TKA

Variable	DMII without neuropathy	DMII with neuropathy	P-value
Total (19,038)	18,251 (95.9%)	787 (4.1%)	
Sex			<0.001
Male	6605 (95.0%)	348 (5.0%)	
Female	11646 (96.4%)	439 (3.6%)	
Race			
White	12572 (95.5%)	595 (4.5%)	<0.001
Black	2286 (95.9%)	97 (4.1%)	
Hispanic	1688 (97.8%)	38 (2.2%)	
Asian or Pacific Islander	410 (97.6%)	10 (2.4%)	
Native American	79 (95.2%)	4 (4.8%)	
Other	1135 (96.4%)	42 (3.6%)	
Pay			
Medicare	10492 (95.4%)	507 (4.6%)	0.008
Medicaid	1053 (96.5%)	38 (3.5%)	
Private Insurance	5459 (96.6%)	194 (3.4%)	
Self-Pay	146 (95.4%)	7 (4.6%)	
No Charge	3 (100.0%	0 (0.0%	
Other	1098 (96.4%)	41 (3.6%)	
Age (years at admission)	67.01 ± 9.340	67.48 ± 8.855	0.164
Length of Stay	3.89 ± 2.360	4.35 ± 4.309	<0.001
DEYO Index	1.4970 ± 0.84822	2.8399 ± 1.10044	<0.001
Total Charges	42939.67 ± 24376.70	42826.11 ± 32355.456	0.923

Table 2 –TKA complications in DMII patients with or without Neuropathy: Univariate Analysis

Postoperative Outcome	DMII without neuropathy	DMII with neuropathy	P-value
Medical Complications (any)	3474 (93.5%)	240 (6.5%)	<0.001
Altered Mental Status	277 (93.9%)	18 (6.1%)	0.087
CNS Complications	22 (88.0%)	3 (12.0%)	0.048
Acute Myocardial Infarction	391 (95.4%)	19 (4.6%)	0.607
Pulmonary Complications	106 (93.8%)	7 (6.2%)	0.270
Pneumonia	912 (93.4%)	64 (6.6%)	<0.001
Pulmonary Embolism	328 (95.3%)	16 (4.7%)	0.627
Deep Venous Embolism	388 (95.3%)	19 (4.7%)	0.584
Gastrointestinal Complication	82 (97.6%)	2 (2.4%)	0.419
Urinary Tract Infection	241 (95.6%)	11 (4.4%)	0.853
Acute Renal Failure	1787 (92.3%)	150 (7.7%)	<0.001
Sepsis	682 (91.1%)	67 (8.9%)	<0.001
Surgical Complications (any)	5809 (95.0%)	308 (5.0%)	<0.001
Wound Complications	918 (94.7%)	51 (5.3%)	0.070
Transfusion of Blood	5164 (94.8%)	282 (5.2%)	<0.001
Prosthetic Implant Joint Complications	485 (94.9%)	26 (5.1%)	0.272
Readmission	10811 (95.4%)	523 (4.6%)	<0.001
Reoperation	2853 (95.8%)	126 (4.2%)	0.775
Revision	625 (94.7%)	35 (5.3%)	0.125
Mortality	350 (93.6%)	24 (6.4%)	0.025

Table 3 –THA complications in DMII patients with or without Neuropathy: Multivariate Logistic Regression

Postoperative Outcomes	Odds Ratio [95%] (Crude)	p-value	Odds Ratio [95%]	P-value
Medical Complications	1.866 [1.596-2.182]	<0.001	1.057 [0.892-1.253]	0.519
Altered Mental Status	1.519 [0.938-2.460]	0.089	0.992 [0.598-1.648]	0.976
CNS Complications	3.171 [0.947-10.616]	0.061	2.210 [0.610-8.009]	0.227
Acute Myocardial Infarction	1.130 [0.709-1.801]	0.607	0.867 [0.533-1.411]	0.567
Pulmonary Complications	1.536 [0.713-3.312]	0.273	0.973 [0.436-2.170]	0.947
Pneumonia	1.683 [1.292-2.192]	<0.001	0.932 [0.703-1.235]	0.624
Pulmonary Embolism	1.134 [0.683-1.883]	0.627	0.881 [0.519-1.494]	0.638
Deep Venous Embolism	1.139 [0.715-1.815]	0.584	0.829 [0.510-1.346]	0.448
Gastrointestinal Complication	0.565 [0.139-2.300]	0.425	0.614 [0.144-2.619]	0.510
Urinary Tract Infection	1.059 [0.576-1.947]	0.853	0.712 [0.378-1.339]	0.291
Acute Renal Failure	2.170 [1.804-2.609]	<0.001	1.084 [0.886-1.327]	0.433
Sepsis	2.397 [1.845-3.115]	<0.001	1.514 [1.144-2.005]	0.004
Surgical Complications	1.377 [1.190-1.595]	<0.001	1.029 [.880-1.204]	0.717
Wound Complications	1.308 [0.978-1.751]	0.071	0.971 [0.715-1.318]	0.850
Transfusion of Blood	1.415 [1.219-1.643]	<0.001	1.068 [0.909-1.254]	0.425
Readmission	1.363 [1.172-1.585]	<0.001	1.067 [0.910-1.251]	0.423
Reoperation	1.029 [0.847-1.250]	0.775	1.217 [0.990-1.496]	0.062
Revision	1.313 [0.927-1.859]	0.126	1.185 [0.819-1.714]	0.368
Mortality	1.609 [1.057-2.448]	0.026	0.823 [0.527-1.283]	0.389