The Influence of Prior Dental Pathology on Medical Complications and Peri-Prosthetic Joint Infections Following Primary Shoulder Arthroplasty

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INTRODUCTION:

One of the leading causes of anatomic and reverse shoulder arthroplasty failure and reoperation includes periprosthetic joint infection (PJI). Historically, poor dental health and dental pathology have been considered risk factors for developing infections. Antibiotic prophylaxis before invasive dental procedures is a common practice in the United States. However, consensus regarding the influence of prior dental pathology (DP) on postoperative complications in orthopedic surgical patients, and specifically shoulder arthroplasty patients is lacking. The objectives of this study are to determine the association of DP prior to shoulder arthroplasty (SA) on: 1) medical complications, 2) lengths of stay (LOS), 3) readmissions, 4) implant-related complications including PJIs and 5) healthcare expenditures.

METHODS:

Using a nationwide administrative claims database, we queried all patients undergoing primary shoulder arthroplasty from 2010-2020. Patients and complications were identified using International Classification of Disease, Ninth/Tenth Revision (ICD-9/10) and Current Procedural Terminology (CPT) coding. Patients with history of dental caries or dental implant placement prior to SA represented the study group (n=1419). Patients without prior DP represented controls (n=7062). Study group patients were 1:5 ratio matched to controls by age, sex, and comorbidities. The comorbidities chosen for matching were those that have been found to be prevalent among upper extremity arthroplasty patients. Outcomes assessed included 90-day complications, readmissions, LOS, 2-year implant-related complications, and healthcare reimbursements. Pearson's chi-square analyses were used to compare patient demographics of the two cohorts. Welch's t-tests were used to compare LOS and costs. Multivariable logistic regression models were used to calculate odds ratios (OR) of complications and readmissions while adjusting for age, sex, geographic region, and matched comorbidities. A *p*-value <0.003 was significant.

RESULTS:

Patients with DP had higher odds of 90-day medical complications compared to controls (OR: 1.74, $p<0.0001$), including myocardial infarctions (2.2% vs. 0.8%; OR: 2.79, $p<0.0001$), acute kidney injuries (8.3% vs. 4.6%; OR: 1.92, $p<0.0001$), and pneumonias (8.7% vs. 5.3%; OR: 1.72, $p<0.0001$. Readmission rates (1.97% vs. 1.54%; p=0.248) and LOS (2.17 vs. 2.07 days; $p=0.071$) were similar between groups. Overall 2-year implant-related complications were higher in patients with DP compared to controls (16.1% vs. 11.5%; OR: 1.38, $p=0.0003$), including dislocations (6.4% vs. 4.5%; OR: 1.45, $p=0.002$) and mechanical loosening (4.0% vs. 2.4%; OR: 1.67, $p=0.001$), however PJIs were similar (2.2% vs. 1.9%; OR: 1.12, $p=0.583$). Within the 90-day episode of care interval, healthcare expenditures were not significantly different in patients with recent history of dental work ($12,611 vs 12,059; p=0.075).

DISCUSSION AND CONCLUSION:

Patients with prior DP have higher 90-day medical complications and 2-year implant-related complications. Two-year incidence of PJIs were similar between groups. These findings can be helpful for shoulder surgeons as they counsel and risk stratify patients with a pertinent dental history.

	Prior Dental Work		Controls		
DEMOGRAPHICS	n	%	n	%	*p*-value[Δ]
Age (Years)					
25-29	*	*	*	*	0.574
30-34	*	*	*	*	
35-39	17	1.20	75	1.06	
40-44	46	3.24	221	3.13	
45-49	105	7.40	521	7.38	
50-54	199	14.02	992	14.05	
55-59	238	16.77	1189	16.84	
60-64	254	17.90	1270	17.98	
65-69	230	16.21	1150	16.28	
70-74	222	15.64	1108	15.69	
75-79	94	6.62	468	6.63	
80+	*	*	*	*	
Sex					
Female	776	54.69	3865	54.73	0.99
Male	643	45.31	3197	45.27	
Comorbidities					
COPD	778	54.83	3866	54.74	0.98
Depression	936	65.96	4651	65.86	0.97
Diabetes Mellitus	778	54.83	3874	54.86	0.99
Hypertension	1295	91.26	6461	91.49	0.82
Obesity (BMI >30kg/m²)	797	56.17	3958	56.05	0.96
Tobacco Use	880	62.02	4377	61.98	0.99

Table 1. Demographics of Patients With and Without a History of Dental Work Undergoing Primary Shoulder Arthroplasty. COPD = Chronic Obstructive Pulmonary Disease; BMI = Body Mass Index; * = <11 Patients; N/A = Not Applicable; Δ = Assessed by Pearson's x^2

	Prior Dental Work N (%)	Control N (%)	OR	95% CI	*p*-value
Urinary Tract Infection	201 (14.16)	638 (9.03)	1.72	(1.44-2.04)	**<0.0001**
Pneumoniae	124 (8.74)	377 (5.34)	1.72	(1.38-2.13)	**<0.0001**
Myocardial Infarctions	31 (2.18)	57 (0.81)	2.79	(1.77-4.32)	**<0.0001**
Transfusions	40 (2.82)	129 (1.83)	1.57	(1.08-2.23)	0.014
Surgical Site Infections	27 (1.90)	95 (1.35)	1.41	(0.91-2.17)	0.121
Acute Kidney Injury	117 (8.25)	323 (4.57)	1.92	(1.53-2.39)	**<0.0001**
Venous Thromboemboli	39 (2.75)	117 (1.66)	1.68	(1.16-2.43)	0.006
Pulmonary Emboli	17 (1.20)	70 (0.99)	1.21	(0.71-2.07)	0.477
Deep Venous Thrombosis	27 (1.90)	62 (0.88)	2.19	(1.36-3.41)	0.0008
Cerebrovascular Accident	27 (1.90)	110 (1.56)	1.23	(0.79-1.86)	0.336
Total	650 (45.81)	1978 (28.01)	1.74	(1.53-1.99)	**<0.0001**

Table 2. Comparison of Incidence and Odds of Ninety-Day Medical Complications and PJIs Among Patients With and Without a History of Dental Work Undergoing Primary Shoulder Arthroplasty.
OR = Odds-Ratio; 95% CI = 95% Confidence Interval

	Prior Dental Work N (%)	Control N (%)	OR	95% CI	*p*-value
Peri-Prosthetic Fracture	50 (3.52)	183 (2.59)	1.38	(1.00-1.90)	0.049
Mechanical Loosening	57 (4.02)	172 (2.44)	1.67	(1.22-2.25)	0.001
PJI	31 (2.18)	137 (1.94)	1.12	(0.75-1.66)	0.583
Dislocation	91 (6.41)	317 (4.49)	1.45	(1.13-1.84)	0.002
Total	229 (16.14)	809 (11.46)	1.38	(1.15-1.63)	0.0003

Table 3. Comparison of Incidence and Odds of 2-Year Implant Related Complications Among Patients With and Without a History of Dental Work Undergoing Primary Shoulder Arthroplasty.
PJIs = Peri-Prosthetic Joint Infections; OR = Odds-Ratio; 95% CI = 95% Confidence Interval