Post-operative Complications In Patients With Atrial Fibrillation After Primary Total Shoulder Arthroplasty: A 1:1 Propensity Matched Cohort Analysis

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INTRODUCTION: Atrial fibrillation (AF) is a common cardiac comorbidity associated with increased risk of bleeding and complications following surgery. Few studies have evaluated the impact of preoperative diagnosis of AF on complications following primary total shoulder arthroplasty (TSA). The purpose of this study is to evaluate the risk of 90-day and 2-year postoperative medical and implant-related complications in patients undergoing TSA with a diagnosis of AF.

METHODS: A multicenter database TriNetX was queried for patients who underwent primary TSA between 2013 and 2023. After exclusion criteria, patients were divided into two cohorts, those diagnosed with a preoperative diagnosis of AF prior to TSA and those without a preoperative diagnosis of AF (non-AF). The AF and non-AF cohorts were propensity matched in a 1:1 ratio. Three thousand eight hundred sixty-four (3,864) male, female, and unknown gendered patients were included in each cohort after propensity matching. Medical complications included sepsis, infection, stroke, pneumonia, renal failure, myocardial infarction (MI), venous thromboembolism (VTE), hemorrhage, blood transfusion, wound dehiscence, superficial surgical site infection (SSI), deep SSI, organ/space SSI, readmission, and mortality. Implant-related complications include revision TSA, periprosthetic joint infection (PJI), periprosthetic fracture, dislocation, and mechanical loosening. Risk ratios (RR) and 95% confidence intervals (CIs) were computed, and the complication rates were analyzed using the TriNetX system. Categorical variables were assessed using the chi-squared test, while continuous variables were evaluated with independent t-tests. The level of statistical significance was set at $P < 0.05$. The study was exempt from Institutional Review Board approval due to the use of deidentified patient records.

RESULTS SECTION: Within 90 days following primary TSA, patients with AF showed a significantly increased risk of stroke, pneumonia, and VTE compared to the non-AF cohort ($p < 0.05$). Within 2 years following TSA, patients with AF showed a significantly increased risk of stroke, pneumonia, VTE, MI, renal failure, blood transfusion, mortality, total implant-related complication rate, and PJI compared to the non-AF cohort ($p < 0.05$).

DISCUSSION: Our study identified that a preoperative diagnosis of atrial fibrillation is associated with an increased risk of stroke, pneumonia, and VTE after 90 days following primary total shoulder arthroplasty, and an additional increase in risk of MI, renal failure, blood transfusion, and mortality after 2 years, postoperatively. Additionally, the AF patients in our study demonstrated a higher incidence of PJI after 2 years following TSA. The retrospective nature of the study hinders the ability to establish causality, and the use of a national surgical database limits our ability to account for the duration and type of AF (e.g., paroxysmal vs. persistent), as well as the specific anticoagulation regimen used. Despite these limitations, our study included a large sample size and used propensity matching of AF and control cohorts to improve the validity of our comparisons.

SIGNIFICANCE/CLINICAL RELEVANCE: Our findings strengthen current knowledge by providing evidence that AF is an independent risk factor for both short and long-term systemic and implant-related complications following TSA. By recognizing the risks associated with preoperative AF, surgeons may be better equipped to identify high-risk surgical candidates and employ risk mitigation strategies such as careful anticoagulation management and cardiac optimization.

IMAGES AND TABLES:

Table I. Patient Demographics and Comorbidities in Patients with and without Atrial Fibrillation undergoing TSA. Bold p-value indicates statistical significance with p-value set to <0.05.

	Unmatched Cohort			Matched Cohort		
Characteristic	**AF (% of Cohort)**	**Non-AF (% of Cohort)**	**p-value**	**AF (% of Cohort)**	**Non-AF (% of Cohort)**	**p-value**
Total	3,915 (100%)	41,205 (100%)		3,864 (100%)	3,864 (100%)	
Age at Index	73.20 ± 8.18 (100%)	68.00 ± 9.57 (100%)	**<0.001**	71.70 ± 7.61 (100%)	71.8 ± 7.60 (100%)	0.633
Gender						
Male	2,022 (51.65%)	17,212 (41.77%)	**<0.001**	1,982 (51.29%)	1,985 (51.37%)	0.946
Female	1,735 (44.32%)	22,272 (54.05%)	**<0.001**	1,725 (44.64%)	1,708 (44.20%)	0.697
Unknown	158 (4.04%)	1,721 (4.18%)	0.673	157 (4.06%)	171 (4.43%)	0.430
Race						
White	3,442 (87.92%)	33,687 (81.76%)	**<0.001**	3,394 (87.84%)	3,407 (88.17%)	0.649
Black or African American	162 (4.14%)	2,931 (7.11%)	**<0.001**	162 (4.19%)	159 (4.12%)	0.864
Asian	29 (0.74%)	393 (0.95%)	0.186	29 (0.75%)	26 (0.67%)	0.685
American Indian or Alaska Native	10 (0.26%)	128 (0.31%)	0.550	10 (0.26%)	10 (0.26%)	1.000
Native Hawaiian or Other Pacific Islander	10 (0.26%)	64 (0.16%)	0.139	10 (0.26%)	10 (0.26%)	1.000
Other	34 (0.87%)	627 (1.52%)	**<0.001**	32 (0.83%)	30 (0.78%)	0.799
Unknown	235 (6.00%)	3,375 (8.19%)	**<0.001**	234 (6.06%)	232 (6.00%)	0.924
Ethnicity						
Hispanic or Latino	74 (1.89%)	1,611 (3.91%)	**<0.001**	74 (1.92%)	67 (1.73%)	0.552
Not Hispanic or Latino	3,154 (80.56%)	31,366 (76.12%)	**<0.001**	3,108 (80.44%)	3,101 (80.25%)	0.841
Unknown	687 (17.55%)	8,228 (19.97%)	**<0.001**	682 (17.65%)	696 (18.01%)	0.677
Overweight and Obesity	870 (22.22%)	5,323 (12.92%)	**<0.001**	846 (21.89%)	858 (22.21%)	0.742
Type 2 DM	1,001 (25.57%)	6,479 (15.72%)	**<0.001**	980 (25.36%)	994 (25.73%)	0.715
Primary HTN	2,642 (67.48%)	18,424 (44.71%)	**<0.001**	2,592 (67.08%)	2,666 (69.00%)	0.071
Tobacco Use	42 (1.07%)	489 (1.19%)	0.528	41 (1.06%)	46 (1.19%)	0.590
Heart Failure	809 (20.66%)	1,274 (3.09%)	**<0.001**	758 (19.62%)	705 (18.25%)	0.124
TIA or Stroke	233 (5.95%)	823 (2.00%)	**<0.001**	224 (5.80%)	224 (5.80%)	1.000
Peripheral Vascular Disease	215 (5.49%)	751 (1.82%)	**<0.001**	200 (5.18%)	195 (5.05%)	0.796

DM, Diabetes Mellitus; HTN, Hypertension; TIA, Transient Ischemic Attack

Table II. Matched Cohort Comparison of Two-Year Postoperative Medical Complications Following Primary TSA. Bold p-value indicates statistical significance with p-value set to <0.05.

Complication	AF (%)	Non-AF (%)	Risk Ratio	95% CI	p-value
Sepsis	≤10* (0.26%)	0 (0.00%)	-	-	-
Infection	67 (1.73%)	49 (1.27%)	1.37	0.95-1.97	0.092
Stroke	247 (6.39%)	183 (4.74%)	1.35	1.12-1.63	**0.002**
Pneumonia	377 (9.76%)	247 (6.39%)	1.53	1.31-1.78	**<0.001**
Renal Failure	533 (13.79%)	408 (10.56%)	1.31	1.16-1.47	**<0.001**
Myocardial Infarction	51 (1.32%)	32 (0.83%)	1.59	1.03-2.47	**0.036**
VTE (PE + DVT)	329 (8.51%)	282 (7.30%)	1.17	1.01-1.36	**0.048**
Hemorrhage	15 (0.39%)	16 (0.41%)	0.94	0.46-1.89	0.857
Blood Transfusion	154 (3.99%)	119 (3.08%)	1.29	1.02-1.64	**0.031**
Wound Dehiscence	36 (0.93%)	45 (1.17%)	0.80	0.52-1.24	0.315
Superficial SSI	17 (0.44%)	≤10* (0.26%)	1.70	0.78-3.71	0.177
Deep SSI	≤10* (0.26%)	≤10* (0.26%)	1.00	0.42-2.40	1.00
Organ/Space SSI	≤10* (0.26%)	≤10* (0.26%)	1.00	0.42-2.40	1.00
Readmission	495 (12.81%)	468 (12.11%)	1.06	0.94-1.19	0.352
Mortality	83 (2.15%)	35 (0.91%)	2.37	1.60-3.51	**<0.001**

VTE, Venous Thromboembolism; PE, Pulmonary Embolism; DVT, Deep Vein Thrombosis; SSI, Surgical Site Infection
* Less than 10 instances of the complication were found

Table III. Matched Cohort Comparison of Two-Year Postoperative Implant Complications Following Primary TSA. Bold p-value indicates statistical significance with p-value set to <0.05.

Complication	AF	Non-AF	Risk Ratio	95% CI	p-value
Total Complication Rate	393 (10.17%)	330 (8.54%)	1.19	1.04-1.37	**0.014**
Reoperation	120 (1.42%)	117 (1.29%)	1.03	0.80-1.32	0.843
PJI	89 (2.30%)	59 (1.53%)	1.51	1.09-2.09	**0.013**
Periprosthetic Fracture	34 (0.88%)	40 (1.04%)	0.85	0.54-1.34	0.483
Dislocation	107 (2.77%)	105 (2.72%)	1.02	0.78-1.33	0.889
Mechanical Loosening	33 (0.85%)	37 (0.96%)	0.89	0.56-1.42	0.631

PJI, Periprosthetic Joint Infection