Obstructive Sleep Apnea is Associated with an Increased Risk of Medical and Surgical Complications After Total Shoulder Arthroplasty: A Systematic Review and Meta-Analysis

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INTRODUCTION*:* Obstructive sleep apnea (OSA) is a prevalent, yet underdiagnosed condition in patients undergoing total shoulder arthroplasty (TSA). A more comprehensive understanding of the association between OSA and TSA complication risk may benefit patient outcomes through allocating more resources towards preoperatively optimizing at-risk patients.

METHODS: PubMed, Embase, and Cochrane databases were queried in September 2024. Data pertaining to study characteristics and complications after TSA stratified by a diagnosis of OSA with polysomnography were recorded. DerSimonian-Laird random-effects models were used to quantitatively evaluate the association between OSA and complications by generating pooled odds ratios (OR) with 95% confidence intervals (CI).

RESULTS: Four studies comprised of a total of 147,991 patients (mean age 68.7 years, 57.5% female) were included. The incidence of OSA within the study population was 29.1%. Patients diagnosed with OSA demonstrated a significantly higher overall complication rate (OR = 2.22; 95% CI:1.75-2.83, p < 0.01) compared with controls. Patients with OSA were found to have significantly higher odds of developing pulmonary embolisms (OR:2.53, 95%CI: 1.52-4.20), acute kidney injury/failure (OR:1.68, 95% CI:1.28-2.19), pneumonia (OR:2.62, 95% CI:1.35-5.09), respiratory distress (OR:2.29, 95% CI:1.27 - 4.13), and requiring transfusions (OR:2.42, 95% CI:1.17-4.99) within 90-days postoperatively. OSA was significantly associated with the likelihood of having multiple surgical complications, including mechanical loosening (OR:1.94, 95% CI:1.19-3.16)], prosthetic joint infection (OR:1.40, 95% CI:1.28-1.53), periprosthetic fracture (OR:1.34, 95% CI:1.14-1.58]) and instability (OR:1.38, 95% CI:1.22 - 1.54) at two-years postoperatively.

DISCUSSION: The main findings of the current study are as follows: (1) strong evidence based on predefined criteria was found to support an association between OSA and all-cause complications and specifically transfusion, pulmonary, vascular, and renal complications; (2) strong evidence was found to support an association between OSA and several postoperative surgical complications at two-year follow-up; and (3) no evidence was found to support associations between OSA and cardiac, gastrointestinal, genitourinary, wound complications, or sepsis. The data and associations derived from the current study may provide valuable prognostic data, assist in determining candidates for ambulatory surgery, and help inform perioperative care teams as to which potential adverse events may occur at a greater rate after TSA in patients with a preoperative OSA diagnosis. Select patients with OSA may benefit from more intensive preoperative medical clearance or postoperative surveillance, though future studies are needed to determine if such preventative measures can mitigate adverse events in this population.

SIGNIFICANCE/CLINICAL RELEVANCE: OSA nearly doubles the overall 90-day complication risk after TSA and increases odds of PE, pneumonia, respiratory distress, AKI, and transfusion; it also confers higher two-year surgical risks including loosening, infection, instability, and periprosthetic fracture, without clear increases in cardiac, GI, GU, wound, or sepsis events. Clinically, patients with OSA should be screened and optimized (e.g., confirm diagnosis, reinforce CPAP adherence), receive heightened perioperative vigilance (VTE prophylaxis, respiratory monitoring), and be counseled carefully about risks and the potential need to avoid ambulatory pathways.

Table 1. Risk factor strength of evidence classifications.

Evidence classification	Description
Strong	Increased risk for complication in patients with OSA compared to baseline risk (OR>2.0) or had a strong protective effect (OR<0.8) and statistically significant.
Moderate	OR between 1.5-2.0 and statistically significant
Minimal	OR between 1.0-1.5 and statistically significant
Marginal to none	Nonsignificant OR (p>0.05)

Table 2. Summary table for odds ratios in decreasing order of strength of association derived from meta-analyses. Reference group of odds ratios is patients without obstructive sleep apnea.

90 Day Complication	OR (95% CI)	P-Value
Pneumonia	2.62 (1.35 - 5.09)	<0.01 *
Pulmonary Embolism	2.53 (1.52 - 4.20)	<0.01 *
Transfusions	2.42 (1.17 - 4.99)	0.02 *
Respiratory distress	2.29 (1.27 - 4.13)	<0.01 *
Genitourinary	2.28 (1.00 - 5.20)	0.05
DVT/VTE	2.16 (1.34 - 3.48)	<0.01 *
Neurologic	2.08 (0.91 - 4.74)	0.08
Gastrointestinal	1.78 (0.67 - 4.74)	0.25
Acute Kidney Failure/Injury	1.68 (1.28 - 2.19)	<0.01 *
Cardiac	1.53 (0.69-3.41)	0.30
Wound complications	1.42 (0.29 - 6.86)	0.79
Sepsis	1.42 (0.10 - 19.94)	0.79
Total (Overall) Complications	2.22 (1.75 - 2.83)	<0.01 *
2 Year Complications	**OR (95% CI)**	**P-Value**
Aseptic Mechanical Loosening	1.94 (1.19 - 3.16)	0.01 *
Prosthetic Joint Infection	1.40 (1.28 - 1.53)	<0.01 *
Dislocation of Prosthetic Joint	1.38 (1.22 - 1.54)	<0.01 *
Periprosthetic Fracture	1.34 (1.14 - 1.58)	0.01 *

OR, odds ratio; CI, confidence interval.