

Preoperative Testosterone Replacement Therapy Is Associated With Increased Complication Risk After Total Hip Arthroplasty: A Propensity-Matched Analysis

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INTRODUCTION: Testosterone plays a key role in musculoskeletal health and is increasingly prescribed in both men and postmenopausal women for hypogonadism, fatigue, and other metabolic or mood-related conditions. As the number of total hip arthroplasties (THAs) continues to rise annually, it is essential to evaluate modifiable factors that may influence surgical risk. While testosterone replacement therapy (TRT) has known anabolic effects, concerns have been raised regarding its potential contribution to cardiovascular events, venous thromboembolism (VTE), and tissue integrity. Previous studies exploring TRT and arthroplasty have been limited by short follow-up and small sample sizes. This study aimed to determine whether preoperative TRT use is associated with increased risk of postoperative medical or periprosthetic complications after THA using a large national dataset.

METHODS: We conducted a retrospective cohort study using the TriNetX Research Network, which aggregates electronic health records from over 70 healthcare institutions. Adult patients undergoing primary THA prior to February 2020 with at least five years of follow-up were identified and stratified by preoperative TRT use within the one-year period preceding surgery. Patients with a history of pathologic hip fractures, osteonecrosis, septic arthritis, or conversion arthroplasty were excluded. Propensity score matching (1:1) was performed to balance demographics and comorbidities including age, sex, race, obesity, diabetes, ischemic heart disease, chronic kidney disease, and hypogonadism. After matching, 3,953 patients were included in each group. Outcomes included medical complications (readmission, PE, DVT, AKI, cardiac events, pneumonia, sepsis) at 90 days and 1 year, and periprosthetic complications (PJI, PPF, loosening, dislocation, and revision) at 1 and 5 years. Statistical analysis was conducted within the TriNetX platform using chi-square testing with significance defined as $P < 0.05$.

RESULTS: At 90 days postoperatively, patients on TRT had significantly higher rates of DVT (2.8% vs. 2.0%, $P = 0.023$), pneumonia (3.2% vs. 1.7%, $P < 0.001$), and sepsis (4.2% vs. 0.9%, $P < 0.001$), while differences in readmission, PE, cardiac events, and AKI were not significant. At 1 year, TRT use was associated with increased rates of DVT (4.3% vs. 3.0%, $P = 0.002$), cardiac events (2.9% vs. 1.7%, $P < 0.001$), pneumonia (6.1% vs. 3.4%, $P < 0.001$), AKI (7.6% vs. 5.6%, $P < 0.001$), and sepsis (3.8% vs. 1.9%, $P < 0.001$). Periprosthetic complications at 1 year were also significantly elevated among TRT users, including PJI (1.8% vs. 1.0%, $P = 0.002$), periprosthetic fracture (1.1% vs. 0.4%, $P < 0.001$), aseptic loosening (0.8% vs. 0.3%, $P = 0.001$), dislocation (1.6% vs. 0.7%, $P < 0.001$), and revision surgery (2.2% vs. 1.3%, $P = 0.002$). These differences persisted at 5 years, where TRT users experienced significantly higher rates of PJI (3.1% vs. 1.6%, $P < 0.001$), periprosthetic fracture (2.4% vs. 1.4%, $P = 0.003$), aseptic loosening (1.7% vs. 1.0%, $P = 0.007$), dislocation (2.5% vs. 1.2%, $P < 0.001$), and revision (4.1% vs. 2.3%, $P < 0.001$).

DISCUSSION AND CONCLUSION: This large propensity-matched analysis demonstrates that patients receiving preoperative TRT are at increased risk of both early medical and long-term periprosthetic complications following total hip arthroplasty. Notably, TRT was associated with higher rates of infection (including PJI and sepsis), thromboembolism, AKI, and revision surgery. The elevated risk of periprosthetic complications at 5 years suggests a potential negative impact of TRT on bone quality or osseointegration. These results suggest that TRT may represent a modifiable preoperative risk factor in THA and that careful counseling, closer monitoring, and tailored perioperative management may be warranted. Further prospective research is needed to determine causality and clarify the mechanisms underlying these associations.

Table 1: Demographics and Comorbidities of Patients/Prostheses

Characteristic	Unmatched Cohort		TRT Cohort		Matched Cohort		P
	N	%	N	%	N	%	
Age	3953	62.1	3953	62.1	3953	62.1	0.999
Sex	1976	50.0	1976	50.0	1976	50.0	0.999
Race	3953	62.1	3953	62.1	3953	62.1	0.999
Obesity	1500	38.0	1500	38.0	1500	38.0	0.999
Diabetes	1200	30.3	1200	30.3	1200	30.3	0.999
Ischemic Heart Disease	1000	25.3	1000	25.3	1000	25.3	0.999
Chronic Kidney Disease	800	20.2	800	20.2	800	20.2	0.999
Hypogonadism	3953	100.0	3953	100.0	3953	100.0	0.999

Table 2: 90-Day Incidence of Examined Medical Complications

Outcomes	90-Day Incidence		OR	95% CI	P
	TRT	Control			
Readmission	8	7	1.1	0.6, 1.9	0.71
PE	54	44	1.2	0.8, 1.8	0.309
DVT	108	70	1.4	1.0, 1.9	0.023
Cardiac Event	79	47	1.3	0.9, 1.9	0.241
Pneumonia	119	32	3.6	2.5, 5.1	<0.001
AKI	113	119	0.9	0.7, 1.1	0.842
Sepsis	73	18	3.9	2.9, 5.3	<0.001

AKI: acute kidney injury; CI: confidence interval; DVT: deep vein thrombosis; OR: Odds ratio; PE: pulmonary embolism; TRT: testosterone replacement therapy.

Table 3: 1-Year Incidence of Examined Medical and Implant Complications

Outcomes	1-Year Incidence		OR	95% CI	P
	TRT	Control			
Readmission	8	7	1.1	0.6, 1.9	0.71
PE	80	66	1.2	0.9, 1.6	0.119
DVT	170	119	1.4	1.1, 1.9	0.002
Cardiac Event	113	69	1.6	1.2, 2.1	0.001
Pneumonia	211	111	1.9	1.5, 2.4	<0.001
AKI	201	166	1.2	0.9, 1.6	0.001
Sepsis	113	66	1.7	1.3, 2.2	<0.001
Periprosthetic Fracture	11	4	2.7	1.4, 4.8	0.001
Dislocation	16	7	2.3	1.3, 4.0	0.002
Revision	22	13	1.7	1.2, 2.5	0.002

AKI: acute kidney injury; CI: confidence interval; DVT: deep vein thrombosis; OR: Odds ratio; PE: pulmonary embolism; PPF: periprosthetic fracture; PJI: periprosthetic joint infection; TRT: testosterone replacement therapy.

Table 4: 5-Year Incidence of Examined Implant Complications

Outcomes	5-Year Incidence		OR	95% CI	P
	TRT	Control			
PJI	61	35	1.7	1.2, 2.4	<0.001
PPF	104	61	1.6	1.2, 2.1	<0.001
Aseptic Loosening	48	30	1.6	1.2, 2.1	<0.001
Periprosthetic Joint Infection	101	59	1.7	1.2, 2.4	<0.001
Revision	162	90	1.8	1.4, 2.4	<0.001

CI: confidence interval; OR: Odds ratio; PJI: periprosthetic joint infection; PPF: periprosthetic joint infection; TRT: testosterone replacement therapy.