

Is Osteoporosis a Contraindication for Cementless Total Hip Arthroplasty in Younger Patients? A matched cohort analysis of 71,578 patients.

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INTRODUCTION: Osteoporosis is a common comorbidity in patients undergoing total hip arthroplasty (THA), including many under 75. As life expectancy and activity levels rise, orthopedic surgeons are increasingly encountering younger osteoporotic patients requiring THA. Cementless fixation is typically preferred in younger individuals due to its potential for long-term biologic stability, though its success depends on adequate bone quality, often compromised in osteoporosis. While cemented implants remain a traditional choice for poor bone, cementless THA continues to dominate in U.S. practice. Despite known risks in other joint replacements, the specific impact of osteoporosis on cementless THA outcomes in this population remains unclear. This study addresses that gap by comparing postoperative complications and implant survivorship in osteoporotic vs. non-osteoporotic patients under 75.

METHODS: We conducted a retrospective cohort study using the TriNetX Research Network, identifying 71,578 patients aged 75 or younger who underwent cementless primary THA. Patients were divided into osteoporotic and non-osteoporotic groups based on diagnosis within six months prior to surgery. A 1:1 propensity score match was applied to balance comorbidities and demographics. Primary outcomes included THA revision, periprosthetic fracture (PPF), aseptic loosening (ASL), periprosthetic joint infection (PJI), mechanical complications, and hospital readmissions at 90 days, 1 year, and 3 years. Secondary outcomes included blood transfusion, deep vein thrombosis (DVT), and pulmonary embolism (PE). Kaplan–Meier analysis was used to assess implant survivorship at 3 years.

RESULTS:

After matching, 7,837 patients remained in each cohort. No significant differences were found in primary or secondary outcomes at 90 days or 1 year. At 3 years, the osteoporotic cohort had a significantly higher risk of PPF (1.89% vs. 1.21%). All other outcomes, including revision, ASL, PJI, and medical complications, were comparable. Kaplan–Meier analysis showed no significant difference in 3-year implant survivorship between the groups.

DISCUSSION AND CONCLUSION:

Our analysis showed that, aside from an increased risk of periprosthetic fracture (PPF) at 3 years, cementless THA resulted in comparable outcomes between osteoporotic and non-osteoporotic patients under 75. There were no significant differences in implant survivorship, revision rates, aseptic loosening, periprosthetic joint infection, or readmission across all follow-up periods. Secondary medical complications, such as transfusion, DVT, PE, were also similar between groups, suggesting osteoporosis does not independently elevate perioperative medical risk in younger patients.

The higher PPF risk observed in the osteoporotic group at 3 years is consistent with expected long-term effects of bone loss. However, the relatively low absolute fracture rate, especially in a younger cohort with a mean age of 61, may reflect preserved bone integrity and better biologic healing potential compared to older populations. It is possible that initial implant stability was sufficient, with later fractures occurring due to progressive deterioration or minor trauma as activity resumed with aging. These results underscore the importance of continued follow-up and monitoring in osteoporotic patients, even if they are younger.

Notably, cementless fixation still proved successful despite concerns over reduced bone quality. This may be attributed to improvements in implant design, including porous coatings and biologic enhancements that promote osseointegration, even in compromised bone. Additionally, most of the existing studies looking at the effect of osteoporosis on THA outcomes focused on geriatric cohorts or lacked proper adjustment for comorbidities, making our matched comparison more reflective of younger patient outcomes.

While cemented fixation remains an appropriate option for patients with significant cortical thinning or metabolic bone disease, it is associated with its own challenges, such as bone cement implantation syndrome, longer operative times, and delayed mobilization, that may be less suitable for active, non-geriatric individuals. These findings suggest that cementless THA, when paired with careful intraoperative assessment and patient-specific decision-making, remains a safe and effective strategy in younger osteoporotic patients.

Cementless THA showed comparable medical and implant-related outcomes in patients under 75, regardless of osteoporosis status, except for a higher risk of periprosthetic fracture at 3 years in the osteoporotic group. These findings suggest that osteoporosis alone may not be a strict contraindication for cementless fixation in younger patients. While cemented fixation remains appropriate for those with severe bone compromise, cementless THA remains a safe and viable alternative when bone quality allows. With proper intraoperative assessment and individualized planning, cementless fixation can help avoid the added risks and recovery delays linked to cemented techniques.

Table of Risk Ratios—90 Day 1/1 (Matched)							
Measure	Osteoporosis (n)	No Osteoporosis (n)	Osteoporosis Proportion (%) out of 7,837	No Osteoporosis Proportion (%) out of 7,837	Risk Ratio	95% CI	p-value
Primary Outcomes							
Ampicillin Allergy	12	10	0.15%	0.13%	1.221	(0.528, 2.824)	0.64
TIA Revisions	105	98	1.34%	1.25%	1.125	(0.854, 1.479)	0.40
Periprosthetic Fracture	61	54	0.78%	0.71%	1.111	(0.781, 1.605)	0.54
Periprosthetic Joint Infection	89	86	1.14%	1.10%	1.041	(0.790, 1.435)	0.69
Readmission	77	100	0.99%	1.28%	0.81	(0.603, 1.088)	0.16
Secondary Outcomes							
Transfusion	194	216	2.48%	2.76%	0.945	(0.780, 1.144)	0.56
Deep Vein Thrombosis (Lower Extremity)	51	51	0.65%	0.65%	1.032	(0.781, 1.503)	0.87
Pulmonary Embolism	26	16	0.33%	0.20%	1.662	(0.892, 3.095)	0.11

Table of Risk Ratios—1 Year 1/1 (Matched)							
Measure	Osteoporosis (n)	No Osteoporosis (n)	Osteoporosis Proportion (%) out of 7,837	No Osteoporosis Proportion (%) out of 7,837	Risk Ratio	95% CI	p-value
Primary Outcomes							
Ampicillin Allergy	25	20	0.32%	0.26%	1.268	(0.765, 2.108)	0.43
TIA Revisions	110	143	1.41%	1.82%	1.099	(0.876, 1.378)	0.42
Periprosthetic Fracture	93	74	1.19%	0.94%	1.291	(0.903, 1.749)	0.10
Periprosthetic Joint Infection	118	114	1.50%	1.46%	1.037	(0.862, 1.250)	0.89
Readmission	109	115	1.39%	1.47%	0.992	(0.745, 1.287)	0.95
Secondary Outcomes							
Transfusion	235	232	3.00%	2.96%	1.062	(0.888, 1.269)	0.51
Deep Vein Thrombosis (Lower Extremity)	85	80	1.08%	1.02%	1.096	(0.809, 1.485)	0.55
Pulmonary Embolism	50	35	0.64%	0.45%	1.462	(0.958, 2.249)	0.08

Table of Risk Ratios—3 Year 1/1 (Matched)							
Measure	Osteoporosis (n)	No Osteoporosis (n)	Osteoporosis Proportion (%) out of 7,837	No Osteoporosis Proportion (%) out of 7,837	Risk Ratio	95% CI	p-value
Primary Outcomes							
Ampicillin Allergy	50	24	0.64%	0.31%	2.091	(0.966, 4.537)	0.07
TIA Revisions	213	196	2.72%	2.50%	1.138	(0.946, 1.378)	0.18
Periprosthetic Fracture	148	95	1.89%	1.21%	1.601	(1.239, 2.067)	<0.05
Periprosthetic Joint Infection	189	177	2.41%	2.26%	1.064	(0.893, 1.254)	0.39
Readmission	153	159	1.95%	2.03%	1.007	(0.809, 1.254)	0.95
Secondary Outcomes							
Transfusion	294	284	3.75%	3.62%	1.085	(0.925, 1.273)	0.32
Deep Vein Thrombosis (Lower Extremity)	151	138	1.93%	1.76%	1.129	(0.896, 1.419)	0.3
Pulmonary Embolism	95	76	1.21%	0.97%	1.605	(0.947, 2.742)	0.11