Bisphosphonates Increase the Risk of Periprosthetic Fracture after Total Hip Arthroplasty

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INTRODUCTION: Osteoporosis is common among patients undergoing primary total hip arthroplasty (THA), yet it remains unclear whether bisphosphonate treatment can lower the risk of complications in these patients. The purpose of this study was to evaluate the effect of bisphosphonates on osteoporotic patients undergoing primary THA.

METHODS: Using a large national insurance database, 30,137 patients with osteoporosis prior to primary unilateral THA were identified during 2010-2020. Bisphosphonate users were defined as patients who began bisphosphonate treatment at least 6 months prior to surgery. Patients requiring THA for tumor or fracture were excluded, as were patients using corticosteroids or other medications for osteoporosis. Bisphosphonate users and bisphosphonate naïve patients were matched 1:1 based on age, gender, Elixhauser comorbidity index, and a history of obesity, rheumatoid arthritis, tobacco use, and alcohol abuse. Kaplan-Meier and multivariate analysis were used to compare two-year outcomes between groups, with a significance level of $p<0.05$.

RESULTS: Among matched cohorts of 9,844 patients undergoing primary THA (Table 1), bisphosphonate use was associated with a significantly higher two-year rate of periprosthetic fracture (odds ratio [OR] 1.29, 95% confidence interval [CI] 1.04-1.61, p=0.022, Figure 1). There was a trend toward increased risk of any revision with bisphosphonate use (OR 1.19, CI 1.00-1.41, p=0.056). Among matched cohorts of 1,865 patients undergoing uncemented THA, bisphosphonate users experienced a higher rate of periprosthetic fracture (2.3% vs. 1.4%, p=0.089), although this did not reach statistical significance with the numbers available (Table 2). There were no significant differences in two-year outcomes between matched groups of 302 bisphosphonate users and bisphosphonate naïve patients after cemented THA with the sample size available for study (Tables 3 and 4).

DISCUSSION AND CONCLUSION: In osteoporotic patients, bisphosphonate use prior to primary THA is an independent risk factor for periprosthetic fracture. Additional long-term data is needed to determine if cemented fixation is the optimal treatment strategy for these patients.

Figure 1. Two-year Kaplan-Meier survival curve with periprosthetic fracture after primary total hip arthroplasty as the endpoint. Dashed lines represent 95% confidence intervals.

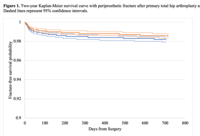

Table 1. Demographics and two-year outcomes in matched cohorts undergoing primary THA

	ALL THA PATIENTS		
	Bisphosphonate Naive	**Bisphosphonate Users**	**p value**
N	9844	9844	
DEMOGRAPHICS			
Female	9290 (94.4%)	9290 (94.4%)	1.000
Age (mean ± std. dev.)	70.9 ± 6.7	70.9 ± 6.7	0.601
ECI (mean ± std. dev.)	4.83 ± 3.13	4.84 ± 3.14	0.823
Obesity	1066 (10.8%)	1066 (10.8%)	1.000
Rheumatoid Arthritis	544 (5.5%)	544 (5.5%)	1.000
Tobacco Use	1687 (17.1%)	1687 (17.1%)	1.000
Alcohol Abuse	94 (1.0%)	94 (1.0%)	1.000
2-YEAR OUTCOMES			
Periprosthetic Joint Infection	170 (1.7%)	156 (1.6%)	0.468
Periprosthetic Fracture	**146 (1.5%)**	**188 (1.9%)**	**0.024**
Aseptic Loosening	96 (1.0%)	112 (1.1%)	0.296
Dislocation	169 (1.7%)	156 (1.6%)	0.502
Any Revision	239 (2.4%)	282 (2.9%)	0.062
Mortality	1 (0.0%)	6 (0.1%)	0.131

THA, total hip arthroplasty; ECI, Elixhauser Comorbidity Index; std. dev., standard deviation

Table 2. Demographics and two-year outcomes in matched cohorts undergoing uncemented THA

	UNCEMENTED THA		
	Bisphosphonate Naive	**Bisphosphonate Users**	**p value**
N	1865	1865	
DEMOGRAPHICS			
Female	1779 (95.4%)	1779 (95.4%)	1.000
Age (mean ± std. dev.)	71.7 ± 6.6	71.7 ± 6.6	0.963
ECI (mean ± std. dev.)	5.54 ± 3.2	5.54 ± 3.18	1.000
Obesity	252 (13.5%)	252 (13.5%)	1.000
Rheumatoid Arthritis	47 (2.5%)	47 (2.5%)	1.000
Tobacco Use	428 (22.9%)	428 (22.9%)	1.000
Alcohol Abuse	18 (1.0%)	18 (1.0%)	1.000
2-YEAR OUTCOMES			
Periprosthetic Joint Infection	37 (2.0%)	32 (1.7%)	0.627
Periprosthetic Fracture	27 (1.4%)	42 (2.3%)	0.089
Aseptic Loosening	24 (1.3%)	24 (1.3%)	1.000
Dislocation	31 (1.7%)	31 (1.7%)	1.000
Any Revision	41 (2.2%)	45 (2.4%)	0.743
Mortality	2 (0.1%)	3 (0.2%)	1.000

THA, total hip arthroplasty; ECI, Elixhauser Comorbidity Index; std. dev., standard deviation

Table 3. Demographics and two-year outcomes in matched cohorts undergoing cemented THA

	CEMENTED THA		
	Bisphosphonate Naive	**Bisphosphonate Users**	**p value**
N	302	302	
DEMOGRAPHICS			
Female	294 (97.4%)	294 (97.4%)	1.000
Age (mean ± std. dev.)	75.7 ± 4.8	75.7 ± 4.7	0.877
ECI (mean ± std. dev.)	5.98 ± 3.06	5.96 ± 2.96	0.935
Obesity	28 (9.3%)	28 (9.3%)	1.000
Rheumatoid Arthritis	2 (0.7%)	2 (0.7%)	1.000
Tobacco Use	67 (22.2%)	67 (22.2%)	1.000
Alcohol Abuse	2 (0.7%)	2 (0.7%)	1.000
2-YEAR OUTCOMES			
Periprosthetic Joint Infection	11 (3.6%)	6 (2.0%)	0.325
Periprosthetic Fracture	5 (1.7%)	3 (1.0%)	0.722
Aseptic Loosening	4 (1.3%)	4 (1.3%)	1.000
Dislocation	11 (3.6%)	6 (2.0%)	0.325
Any Revision	9 (3.0%)	2 (0.7%)	0.068
Mortality	0 (0.0%)	0 (0.0%)	1.000

THA, total hip arthroplasty; ECI, Elixhauser Comorbidity Index; std. dev., standard deviation

Table 4. The effect of bisphosphonates on two-year outcomes after THA with multivariate analysis of matched groups

	ALL THA		UNCEMENTED THA		CEMENTED THA	
	OR (95% CI)	**p value**	**OR (95% CI)**	**p value**	**OR (95% CI)**	**p value**
Periprosthetic Joint Infection	0.92 (0.73 - 1.14)	0.435	0.86 (0.53 - 1.39)	0.542	0.53 (0.18 - 1.43)	0.224
Periprosthetic Fracture	**1.29 (1.04 - 1.61)**	**0.022**	1.58 (0.97 - 2.60)	0.068	0.59 (0.12 - 2.46)	0.479
Aseptic Loosening	1.17 (0.89 - 1.54)	0.261	1.00 (0.56 - 1.78)	0.996	1.07 (0.23 - 4.99)	0.928
Dislocation	0.92 (0.74 - 1.15)	0.467	1.00 (0.60 - 1.66)	0.999	0.53 (0.18 - 1.46)	0.231
Any Revision	1.19 (1.00 - 1.41)	0.056	1.10 (0.72 - 1.70)	0.660	0.21 (0.04 - 1.04)	0.055
Mortality	5.95 (1.01 - 112.38)	0.099	1.51 (0.25 - 11.56)	0.652	NA	-

THA, total hip arthroplasty; OR, odds ratio, expressed as bisphosphonate users relative to bisphosphonate naïve patients; CI, confidence interval