Impact of Prior Fragility Fractures on Complications After Total Knee Arthroplasty

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INTRODUCTION: Fragility fractures (FFs) are common in the United States, affecting over 1.5 million Americans annually. Fragility fractures are pathognomonic for osteoporosis, yet osteoporosis is often undertreated. Many patients undergoing total knee arthroplasty (TKA) have a history of FF. Recent FF within three years of total hip arthroplasty (THA) has been associated with elevated risk of additional FF, periprosthetic fracture (PPF), and revision THA. However, the effect of recent FF on outcomes following TKA remains unknown. The purpose of this study was to characterize the effects of prior FF on the incidence of secondary FF following TKA, PPF, and revision TKA (rTKA).

METHODS: Patients older than 49 who underwent TKA for osteoarthritis were identified in the PearlDiver Database. Patients were stratified based on whether they sustained a FF within three years of TKA. Univariate analysis was conducted on demographic characteristics, comorbidities, and postoperative outcomes using Pearson chi-square analysis. Patients were followed for as long as data were available, with a maximum follow up of 10 years. If a postoperative outcome was significant on univariate analysis ($p < 0.05$), a multivariable analysis using Cox proportional hazard's model was conducted to adjust for other potential risk factors. In order to determine such factors, demographics and comorbidities with p-values <0.2 were included in the multivariable analysis. Additionally, Kaplan-Meier analysis was used to estimate survival free from secondary FF, PPF, and rTKA in both cohorts.

RESULTS: 10,974 patients who underwent TKA had a prior FF and 479,573 did not. Patient demographic information and comorbidities can be found in Table 1. Univariate analysis demonstrated that patients with prior FF had statistically higher incidences of secondary FF and PPF ($p<0.001$; Table 2), but no difference in the incidence of rTKA. After adjusting for risk factors, Cox proportional hazard's model showed that patients with FF before TKA had higher risk of secondary FF (HR 2.91, $p<0.01$; Table 3) and PPF (HR 2.06, $p<0.001$; Table 3). This is shown graphically in Figures 1 and 2.

DISCUSSION AND CONCLUSION: Recent FF before TKA increases postoperative risk for PPF and additional FF, but risk of revision does not appear to be affected. It is thus important to both educate patients about the increased risks of these potential complications as well as to ensure that appropriate management of fragility fracture is undertaken prior to TKA to minimize complications.

Table 1: Demographics of FF before TKA vs. Control

	Total	Prior FF	Prior FF	No Prior FF	No Prior FF	P-value
	n	n	%	n	%	
Total	490547	10974	2.24%	479573	97.76%	
Age		68.71		65.26		**<0.001**
Gender						**<0.001**
Male	189709	2520	22.96%	187189	39.03%	**<0.001**
Female	300838	8454	77.04%	292384	60.97%	**<0.001**
Congestive Heart Failure	62444	2004	18.26%	60440	12.60%	**<0.001**
Arrhythmias	165350	4645	42.33%	160705	33.51%	**<0.001**
Valvular Disease	94056	2756	25.11%	91300	19.04%	**<0.001**
Pulm Circ Disorders	30048	989	9.01%	29059	6.06%	**<0.001**
Peripheral Vascular Disease	92590	2910	26.52%	89680	18.70%	**<0.001**
Hypertension	333013	8138	74.16%	324875	67.74%	**<0.001**
Paralysis	8334	318	2.90%	8016	1.67%	**<0.001**
Other neurological disorders	29539	1102	10.04%	28437	5.93%	**<0.001**
Chronic Pulmonary Disease	139722	3933	35.84%	135789	28.31%	**<0.001**
Diabetes Mellitus	101194	2715	24.74%	98479	20.53%	**<0.001**
Hypothyroidism	119067	3397	30.95%	115670	24.12%	**<0.001**
Chronic Kidney Disease	67299	1941	17.69%	65358	13.63%	**<0.001**
Liver Disease	47603	1201	10.94%	46402	9.68%	**<0.001**
Peptic Ulcer Disease	6907	258	2.35%	6649	1.39%	**<0.001**
Rheumatoid Arthritis and Collagen Vascular Disease	40557	1303	11.87%	39254	8.19%	**<0.001**
Coagulopathy	52541	1572	14.32%	50969	10.63%	**<0.001**
Fluid and electrolyte disorders	123097	4043	36.84%	119054	24.83%	**<0.001**
Blood loss anemia	19084	665	6.06%	18419	3.84%	**<0.001**
Deficiency anemia	62292	2014	18.35%	60278	12.57%	**<0.001**
Alcohol abuse	2850	132	1.20%	2718	0.57%	**<0.001**
Drug abuse	22532	807	7.35%	21725	4.53%	**<0.001**
Psychoses	12918	523	4.77%	12395	2.58%	**<0.001**
Depression	143420	4450	40.55%	138970	28.98%	**<0.001**
Obesity	16825	438	3.99%	16387	3.42%	**0.001**
Smoking	29427	917	8.36%	28510	5.94%	**<0.001**
Osteoporosis	32966	2670	24.33%	30296	6.32%	**<0.001**
Vitamin D Deficiency	54714	1815	16.54%	52899	11.03%	**<0.001**
Dementia	1804	123	1.12%	1681	0.35%	**<0.001**

Table 2: Univariate Analysis of Complication Rates Following TKA

OUTCOME	Prior FF		No Prior FF		P-value
	n	%	n	%	
Revision	191	1.74%	7692	1.60%	0.26
Periprosthetic Fracture	78	0.71%	981	0.20%	**<0.001**
Secondary Fragility Fracture	1289	11.75%	10106	2.11%	**<0.001**

Figure 1: Kaplan-Meier Survival Free from PPF Following TKA

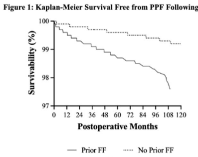

Figure 2: Kaplan-Meier Survival Free from Secondary FF Following TKA

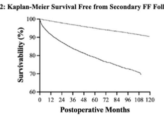

Table 3: Multivariate Cox Proportional Hazards Model Analysis of Complication Rates Following TKA

OUTCOME	Prior FF		No Prior FF	
	Adjusted Hazard Ratio	P-value	Adjusted Hazard Ratio	P-value
Revision	-	-	-	-
Periprosthetic Fracture	2.06 (1.74-2.44)	**<0.001**	-	-
Secondary Fragility Fracture	2.91 (2.79-3.04)	**<0.001**	-	-