

Association of Glucagon-like Peptide-1 Receptor Agonist Use with Outcomes After Surgical Fixation of Femoral Neck Fractures in Patients with Type 2 Diabetes: A Propensity Score Matched Cohort Analysis

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INTRODUCTION:

Glucagon-like peptide-1 receptor agonists (GLP-1RA) are increasingly used to treat type 2 diabetes mellitus (T2DM) and obesity. GLP-1RA have been associated with decreased postoperative complications after elective total joint arthroplasty. The effect of GLP-1RA use on outcomes in patients with T2DM undergoing surgical fixation for femoral neck fractures (FNFs) remains unclear. This study aimed to evaluate whether GLP-1RA use is associated with differences in medical or surgical outcomes following surgical fixation of FNFs.

METHODS:

A retrospective propensity score-matched cohort study was performed using data from a multi-institutional healthcare system between 2016 and 2023. Adult patients with T2DM who underwent surgical fixation, including open reduction and internal fixation (ORIF) or closed reduction and percutaneous pinning (CRPP) for FNFs were included. Patients using a GLP-1RA were matched 1:2 with patients not on a GLP-1RA, using propensity score matching on age, sex, BMI, smoking status, and Elixhauser Comorbidity Index. Outcomes included length of stay (LOS) and aspiration pneumonitis at index hospitalization, and medical complications, reencounters, surgical site infection (SSI), nonunion, malunion, implant complications, revision surgery, and mortality at 30, 90, and 365 days.

RESULTS:

The final sample included 112 GLP-1RA users and 224 matched GLP-1RA nonusers. Mean age (\pm SD) was 70.5 ± 9.6 (Range: 39 - 90) for GLP-1RA users and 70.34 ± 11.7 (Range: 24-90) for non-users. GLP-1RA use was not associated with an increased risk of LOS or aspiration pneumonitis at the index hospitalization. GLP-1RA use was not significantly associated with increased risk of medical complications (14% vs. 20%), mortality (5.4% vs. 11%), reencounters (68% vs. 64%), implant failure (0.9% vs. 1.3%), or SSI (0% vs. 0.4%) at any time point after surgery. A significantly lower rate of revision hip surgery at 365 days was observed among GLP-1RA users compared to non-users (0% vs. 4.5%, $P = 0.034$).

DISCUSSION AND CONCLUSION:

GLP-1RA use in patients with T2DM undergoing fixation for FNFs was not associated with increased short-term medical or surgical complications. Notably, a reduced rate of revision surgery within one year was observed in the GLP-1RA group. The decreased revision rate may be attributed to improved glycemic control and potential osteoinductive effects of GLP-1RAs. These findings suggest a potential protective role of GLP-1RAs in fracture healing and implant survival, necessitating further prospective evaluation in diabetic and non-diabetic populations.

Demographics			
Variables*	GLP-1RA (n = 112)	No GLP-1RA (n = 224)	P [†]
Age, y, mean (SD)	70.49 (9.64)	70.34 (11.71)	.94
Age Group, n (%)			.13
18-40	1 (0.9%)	4 (1.8%)	
41-60	14 (13%)	38 (17%)	
61-80	83 (74%)	137 (61%)	
81+	14 (13%)	45 (20%)	
Female, n (%)	57 (51%)	104 (46%)	.44
Race, n (%)			.78
African American	55 (49%)	109 (49%)	
Asian	0 (0%)	2 (0.9%)	
Hispanic	0 (0%)	1 (0.4%)	
White	54 (48%)	101 (45%)	
Multi	3 (2.7%)	11 (4.9%)	
BMI, kg/m ² , mean (SD)	29.30 (5.37)	28.41 (5.68)	.11
BMI Group, n (%)			.69
Normal	23 (21%)	59 (26%)	
Overweight	44 (39%)	85 (38%)	
Class 1 Obesity	27 (24%)	53 (24%)	
Class 2 Obesity	12 (11%)	16 (7.1%)	
Class 3 Obesity	6 (5.4%)	11 (4.9%)	
ECL, mean (SD)	4.09 (1.95)	3.99 (1.75)	.85
Current Smoker, n (%)	16 (14%)	28 (13%)	.85
Time to Surgery, d, mean (SD)	1.20 (3.37)	1.02 (1.36)	.97
Mechanism of Injury (n = 310)			-
Fall from Ground Level, n (%)	103 (94%)	194 (86%)	
Fall from Height, n (%)	0 (0%)	2 (1%)	
MCC, MVC, Autoped Accident, n (%)	7 (6%)	6 (3%)	
Missing count, n	2	22	
Surgical Treatment			
CRPP, n (%)	56 (50%)	122 (54%)	
ORIF, n (%)	56 (50%)	102 (46%)	
LOS, d, mean (SD)	4.96 (5.56)	4.95 (3.29)	.276

Medical Outcomes			
Variables*	GLP-1RA (n = 112)	No GLP-1RA (n = 224)	P [†]
Number of Reencounters, mean (SD)	2.25 (2.41)	2.31 (3.31)	.403
Days to First Reencounter, d, mean (SD)	58.11 (69.96)	71.53 (91.89)	.786
Aspiration Pneumonitis, n (%)	1 (1%)	2 (1%)	> .999
30 Day Outcomes, n (%)			
Reencounters	38 (34%)	71 (32%)	.68
CVA	0 (0%)	1 (0.4%)	> .999
DVT	0 (0%)	0 (0%)	
PE	2 (1.8%)	3 (1.3%)	> .999
PNA	0 (0%)	0 (0%)	
AKI	12 (11%)	22 (9.8%)	.798
Hypoglycemic Event	2 (1.8%)	6 (2.7%)	.724
Overall Medical Complications	14 (1.3%)	28 (1.3%)	> .999
Mortality/Discharge to Hospice	3 (2.7%)	8 (3.6%)	.758
90 Day Outcomes, n (%)			
Reencounters	59 (53%)	102 (46%)	.217
CVA	0 (0%)	1 (0.4%)	> .999
DVT	0 (0%)	0 (0%)	
PE	2 (1.8%)	6 (2.7%)	.724
PNA	0 (0%)	1 (0.4%)	> .999
AKI	14 (13%)	34 (15%)	.508
Hypoglycemic Event	2 (1.8%)	8 (3.6%)	.506
Overall Medical Complications	16 (14%)	44 (20%)	.227
Mortality/Discharge to Hospice	3 (2.7%)	14 (6.3%)	.159
365 Day Outcomes, n (%)			
Reencounters	78 (68%)	143 (64%)	.466
CVA	1 (0.9%)	3 (1.3%)	> .999
DVT	1 (0.9%)	0 (0%)	.333
PE	4 (3.6%)	10 (4.5%)	.781
PNA	0 (0%)	6 (2.7%)	.194
AKI	34 (30%)	52 (23%)	.157
Hypoglycemic Event	5 (4.5%)	15 (6.7%)	.415
Overall Medical Complications	36 (32%)	67 (30%)	.676
Fragility Fracture	1 (0.9%)	0 (0%)	.333
Mortality/Discharge to Hospice	6 (5.4%)	24 (11%)	.105

Surgical Outcomes			
Variables*	GLP-1RA (n = 112)	No GLP-1RA (n = 224)	P [†]
30 Day Outcomes, n (%)			
Revision Surgery	0 (0%)	1 (0.4%)	> .999
SSI	0 (0%)	0 (0%)	-
Implant Failure	0 (0%)	0 (0%)	-
Femoral Head Osteonecrosis	0 (0%)	0 (0%)	-
90 Day Outcomes, n (%)			
Revision Surgery	0 (0%)	2 (0.9%)	.554
SSI	0 (0%)	1 (0.4%)	> .999
Implant Failure	0 (0%)	2 (0.9%)	.554
Femoral Head Osteonecrosis	0 (0%)	0 (0%)	-
Nonunion	0 (0%)	2 (0.9%)	.554
Malunion	0 (0%)	0 (0%)	-
365 Day Outcomes, n (%)			
Revision Surgery	0 (0%)	10 (4.5%)	.034
SSI	0 (0%)	1 (0.4%)	> .999
Implant Failure	1 (0.9%)	3 (1.3%)	> .999
Femoral Head Osteonecrosis	0 (0%)	1 (0.4%)	> .999
Nonunion	0 (0%)	5 (2.2%)	.174
Malunion	0 (0%)	0 (0%)	-

GLP-1RA = glucagon-like peptide-1 receptor agonist, SSI = surgical site infection, PJI = prosthetic joint infection, PFFX = periprosthetic fracture.
*Frequency (N) and percentage are presented for categorical variables.
†P-values determined using Pearson's chi-squared test or Fisher's exact test for categorical variables. Values in bold indicate statistical significance ($P < 0.05$).

GLP-1RA = glucagon-like peptide-1 receptor agonist, CVA = cerebrovascular accident, DVT = deep vein thrombosis, PE = pulmonary embolism, PNA = pneumonia, AKI = acute kidney injury.
*Mean and Standard Deviation (SD) are presented for continuous variables. Frequency (N) and percentage are presented for categorical variables.
†P-values determined using Pearson's chi-squared test or Fisher's exact test for categorical variables and the Wilcoxon rank-sum test for continuous variables. Values in bold indicate statistical significance ($P < 0.05$).

*Mean and Standard Deviation (SD) for continuous variables. Frequency (N) and percentage for categorical variables.
†P-values using the chi-squared test or Fisher's exact test for categorical variables and the Wilcoxon rank-sum test for continuous variables. Values in bold indicate statistical significance ($P < 0.05$).
*Normal = 18.5 - 24.9 kg/m²; Overweight = 25.0 - 29.9 kg/m²; Class 1 Obesity = 30 - 34.9 kg/m²; Class 2 Obesity = 35 - 39.9 kg/m²; Class 3 Obesity = >40 kg/m².