

Anti-Diabetic Medications' Effect on Outcomes and Glycemic Markers following Total Joint Arthroplasty

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INTRODUCTION:

Diabetes is a well-known risk factor for infection following total joint arthroplasty (TJA), but the effect of the various medication classes on improving glycemic control may alter a patient's risk profile after surgery. This study sought to examine the association between anti-diabetic medications, clinical outcomes, and postoperative glycemic markers in diabetic patients following TJA.

METHODS:

We retrospectively reviewed diabetic patients prescribed oral/subcutaneous medication(s) and/or insulin who underwent primary TJA from 2011-2020. Patients were stratified into four cohorts based on medication protocols: metformin only, insulin only, single oral/subcutaneous agent, or those receiving >1 medication. Patient demographics, clinical data, and preoperative/postoperative glycemic markers were collected and compared using ANOVA and chi-squared tests.

RESULTS:

A total of 3,122 diabetic total knee arthroplasty (TKA) or total hip arthroplasty (THA) patients with available outcomes data were included in the study. There were no differences in 90-day readmission or revision rates. However, a significant difference in infection rate was noted between cohorts (5.2% vs. 8.7% vs. 8.9% vs. 9.7%; p<0.001), with the metformin-only cohort having the lowest rate of infection and the > 1 medication cohort having the highest rate, despite this group not having the highest HbA1c values at the time of surgery. Preoperative HbA1c (6.46 vs. 7.43 vs. 6.65 vs. 7.04; p<0.001), postoperative HbA1c (6.44 vs. 7.06 vs. 6.58 vs. 7.09; p<0.001), and delta HbA1c (-0.05 vs. 0.18 vs. -0.10 vs. 0.12; p=0.024) statistically differed between groups. Comparing patients taking metformin to those who were not, preoperative (6.62 vs. 6.94; p<0.001), postoperative (6.58 vs. 6.94; p=0.028), and delta HbA1c (-0.01 vs. 0.05; p=0.024) statistically differed.

DISCUSSION AND CONCLUSION:

This study demonstrates that diabetic medication regimen may affect clinical outcomes following TJA and even among groups with similar diabetic control, the addition of metformin may provide superior outcomes. In addition, postoperative improvement in HbA1c may also be influenced by specific medication protocols.

Table Legend:

- Cohort 1: metformin only
- Cohort 2: insulin only
- Cohort 3: single other (non-metformin)
- Cohort 4: > 1 anti-diabetic med

Table. HbA1c and Fasting Glucose values stratified by anti-glycemic medication cohort.

| | 1 (n=882) | 2 (n=185) | 3 (n=343) | 4 (n=887) | P-Value |
|--------------------------------------------|-------------|-------------|---------------|-------------|---------|
| Preop HbA1c (mg/dL) | 6.66±0.8 | 7.43±1.2 | 6.65±1.0 | 7.04±1.0 | <0.001* |
| Postop HbA1c (0-4 months postop) | 6.44±0.9 | 7.06±1.4 | 6.58±1.0 | 7.09±1.1 | <0.001* |
| Delta HbA1c | -0.05±0.7 | 0.18±1.0 | -0.10±0.9 | 0.12±0.8 | 0.024* |
| Preop Fasting Glucose (mg/dL) | 282.42±80.1 | 312.63±89.8 | 292.05±85.6 | 305.68±87.3 | <0.001* |
| Postop Fasting Glucose (0-4 months postop) | 273.33±82.8 | 332.33±80.1 | 288.71±80.6 | 305.98±80.3 | 0.056 |
| Delta Fasting Glucose | -6.68±22.4 | 53.33±87.6 | -6.78.75±25.2 | -4.68±87.3 | 0.212 |

Table. Metformin Cohorts

| | Metformin Included (n=1766) | No-Metformin (n=1356) | P-Value |
|------------------------|-----------------------------|-----------------------|---------|
| Preop HbA1c | 6.62±0.8 | 6.94±1.1 | <0.001* |
| Postop HbA1c | 6.58±1.0 | 6.94±1.1 | 0.028* |
| Delta HbA1c | -0.01±0.8 | 0.05±0.9 | 0.024* |
| Preop Fasting Glucose | 285.71±85.2 | 302.60±85.9 | 0.041 |
| Postop Fasting Glucose | 278.21±80.0 | 316.15±80.6 | 0.002* |
| Delta Fasting Glucose | -5.81±33.9 | 2.00±58.24 | 0.083 |

Table. Adverse Outcomes stratified by anti-glycemic medication cohort.

| | Group 1 (n=1245) | Group 2 (n=185) | Group 3 (n=343) | Group 4 (n=1011) | P-Value |
|------------------------------|------------------|-----------------|-----------------|------------------|---------|
| 90-day Readmission - no. (%) | 14 (6.0) | 13 (6.7) | 49 (9.3) | 54 (9.3) | 0.622 |
| Days to Readmission | 38.69±27.1 | 25.08±19.0 | 36.59±29.1 | 37.61±29.1 | 0.433 |
| Revisions - no. (%) | 39 (3.3) | 9 (4.3) | 39 (4.6) | 41 (4.3) | 0.364 |
| Days to Revision | 105.13±62.9 | 106.59±92.0 | 103.94±62.1 | 109.26±67.8 | 0.889* |
| Infections - no. (%) | 66 (5.2) | 17 (9.2) | 51 (8.9) | 98 (9.7) | <0.001* |