Are Corticosteroid Injections Jeopardizing Midfoot Fusion?

Vidushan Nadarajah, Jibraun Emerson[1], Kate Veloso Panzer[1], Caroline Tippett[1], Michael Mitry Hadeed, Venkat Perumal
[1]Orthopaedic Surgery

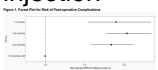
INTRODUCTION: Midfoot osteoarthritis (OA) is commonly treated with intra-articular corticosteroid injections prior to surgical fusion. However, the impact of injection timing on postoperative outcomes remains unclear. This study evaluates the association between the timing of corticosteroid injections and postoperative complications following midfoot arthrodesis.

METHODS: We conducted a retrospective cohort study using the PearlDiver Mariner database (2015–2024), identifying 82,144 patients who underwent midfoot arthrodesis. Patients were stratified into five groups based on timing of corticosteroid injection before surgery: <1 month, 1–2 months, 2–3 months, >3 months, and no injection (control). Outcomes included postoperative complications and revision surgery within one year. Multivariable logistic regression and Cox proportional hazards models were used to evaluate adjusted odds and time-to-event outcomes, respectively.

RESULTS: Postoperative complication rates were significantly higher in all injection groups compared to controls ($p < 0.0001$). Adjusted odds ratios for complications were highest in the 1–2 month group (OR = 2.04, 95% CI: 1.77–2.35), followed by <1 month (OR = 1.90) and 2–3 months (OR = 1.84). Time-to-event analysis confirmed these findings, with hazard ratios similarly elevated (HR range: 2.05–2.38). Revision rates followed a parallel trend, with the <1 month group showing the highest unadjusted odds (OR = 1.53) and hazard of revision (HR = 1.49, $p = 0.0005$). Additional covariates, including age, male sex, and comorbidity burden, were independently associated with increased complication and revision risk.

DISCUSSION AND CONCLUSION: Corticosteroid injections administered within three months prior to midfoot arthrodesis are associated with significantly increased risks of postoperative complications and revision surgery. These findings suggest that injection timing is a modifiable risk factor and support delaying elective midfoot fusion following corticosteroid injection to reduce surgical failure.

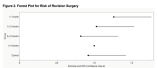
Figure 1. Forest Plot for Risk of Postoperative Complications



Total cases (up to a maximum four) are used (2 in figure 1).

Figure 1. Forest plot showing the odds ratios (ORs) and 95% confidence intervals (CIs) for postoperative complications based on timing of corticosteroid injection prior to midfoot fusion. The reference group is patients receiving injections more than 3 months before surgery.

Figure 2. Forest Plot for Risk of Revision Surgery



Total cases (up to a maximum four) are used (2 in figure 2).

Figure 2. Forest plot showing the odds ratios (ORs) and 95% confidence intervals (CIs) for revision surgery based on timing of corticosteroid injection prior to midfoot fusion. The reference group is patients receiving injections more than 3 months before surgery.

Table 1. Study Cohort and Baseline Characteristics

Group	Sample size	Age (mean ± SD)	Male N (%)	Female N (%)
<1 month	822	66.6 ± 12.1	563 (31.0%)	439 (69%)
1-2 months	1316	65.8 ± 13.8	427 (32.4%)	889 (67.6%)
2-3 months	1257	1257.0	97.6 (12.5)	407 (32.4%)
>3 months	8346	59.1 ± 12.6	2716 (32.5%)	5630 (67.5)
Control	75893	55.0 ± 16.0	26657 (37.6%)	47236 (62.2%)

SD: Standard deviation; N, Number; %, percent

Table 1. Baseline characteristics of the study cohort stratified by corticosteroid injection timing groups and control. Includes sample size, mean age, and sex distribution.

Table 2a. Complication by Injection Timing

Group	Complications n (%)	Total patients n (%)	P value
<1 month	11 (1.37%)	822 (0.76%)	
1-2 months	28 (2.5%)	1316 (1.6%)	
2-3 months	22 (1.75%)	1257 (1.53%)	<0.0001
>3 months	216 (2.58%)	8346 (10.16%)	
Control	822 (1.16%)	70893 (85.95%)	

Table 2a. Incidence of postoperative complication across corticosteroid injection timing groups and control, with associated P-values.

Table 2b. Breakdown of Complications

Group	Revision/pseudarthrosis	Hardware/prominence/irritation
<1 month	11	
1-2 months	29	
2-3 months	22	
>3 months	214	

Table 2b. Breakdown of specific complications, including nonunion/pseudarthrosis, by timing group.

Table 2c: Revision Surgeries

Group	Revisions n (%)	Total patients n (%)
<1 month	92 (14.7%)	822 (0.79%)
1-2 months	189 (12.9%)	1316 (1.8%)
2-3 months	136 (10.9%)	1257 (1.53%)
>3 months	959 (10.3%)	8346 (10.16%)
Control	8329 (11.8%)	70893 (86.95%)

Table 2c. Incidence of revision surgeries stratified by injection timing and control.

Table 3a. Risk of Post-operative Complications

Group	Odds ratio (95% CI)	P value
<1 month	1.90 (1.55-2.34)	<0.0001
1-2 months	2.04 (1.77-2.35)	<0.0001
2-3 months	1.84 (1.58-2.13)	<0.0001
>3 months	1.00 (ref)	-

CI, confidence interval; ref, reference

Table 3a. Logistic regression analysis of the odds of postoperative complications by corticosteroid injection timing, with >3 months as the reference group.

Table 3b. Risk of Revision Surgery

Group	Odds ratio (95% CI)
<1 month	1.51 (1.26-1.76)
1-2 months	1.26 (1.03-1.53)
2-3 months	1.07 (0.82-1.32)
>3 months	1.00 (ref)
Control	1.17 (0.92-1.42)

Table 3b. Logistic regression analysis of the odds of revision surgery by injection timing and control.

Table 4a. Time-to-Complication Analysis – Cox Model

Group	Events	Person-Time (years)	Hazard Ratio	P value
<1 month	11	822	2.22 (1.70-2.82)	<0.0001
1-2 months	29	1316	2.38 (2.02-2.79)	<0.0001
2-3 months	22	1257	2.05 (1.75-2.44)	<0.0001
>3 months	216	8346	1.0 (ref)	

Table 4a. Cox proportional hazards model analyzing time-to-postoperative complications across groups.

Table 4b. Time-to-Complication Analysis – Covariate Effects

Variable	Hazard ratio (95% CI)	P value
Age (years)	1.04 (1.04-1.04)	<0.0001
Sex (male vs. female)	1.14 (1.08-1.21)	<0.0001
Charlson Comorbidity Index	1.09 (0.97-1.20)	<0.0001

Table 4b. Covariate effects on time-to-complication, including age, sex, and Charlson Comorbidity Index (CCI).

Table 5a. Time-to-Revision Analysis – Cox Model

Group	Events	Person-Time (years)	Hazard Ratio	P value
<1 month	92	822	1.49 (1.18-1.87)	0.0005
1-2 months	189	1316	1.28 (1.10-1.52)	0.0018
2-3 months	136	1257	1.20 (1.00-1.48)	0.028
>3 months	959	8346	1.0 (ref)	-

Table 5a. Cox proportional hazards model analyzing time-to-revision surgery across corticosteroid timing groups.

Table 5b. Time-to-Revision Analysis – Covariate Effects

Variable	Hazard ratio (95% CI)	P value
Age (years)	1.06 (1.05-1.07)	<0.0001
Sex (male vs. female)	1.12 (1.06-1.18)	<0.0001
Charlson Comorbidity Index	1.07 (1.05-1.9)	<0.0001

Table 5b. Covariate effects on time-to-revision, including age, sex, and Charlson Comorbidity Index (CCI).