Is Removal of Antibiotic Cement Delivery Devices for Orthopaedic Infection Necessary?

Abhishek Ganta[1], Lauren A Merrell, Jack Christopher Adams[2], Sanjit R Konda[3], Kenneth A Egol[3]
[1]NYU Hospital For Joint Diseases, [2]NYU Langone Orthopedic Hospital, [3]NYU Langone Medical Center

INTRODUCTION:

The purpose of this study was to evaluate if removal or retention of antibiotic cement delivery devices (beads, rods, blocks) after resolution of orthopaedic infection is associated with recurrence of infection.

METHODS: An IRB-approved retrospective review was conducted on a consecutive series of surgically managed patients at an orthopaedic level I trauma center and a tertiary care hospital between January 1, 2010, and June 1, 2022. Included patients were treated by a single surgeon and met the following criteria: 1) fracture definitively treated with internal fixation; 2) development of a confirmed fracture-related infection (as per the FRI Consensus Group's definition) or de novo osteomyelitis; and 3) age 18 years. Electronic Medical Records (EMR) were queried for all patients who had antibiotic-impregnated cement (beads, rods, or blocks) implanted during the course of their treatment for orthopaedic infection (FRI or osteomyelitis). These patients were subsequently divided into patients in whom the antibiotic implants were retained (Retained Cohort), versus patients in whom the antibiotic implants were removed (Removed Cohort). Patients were excluded from this study if treated with a Masquelet procedure. Baseline demographics, medical history, infection characteristics, hospital quality measures, and outcomes were recorded. Univariate analysis was performed to compare the Retained and Removed cohorts.

RESULTS: Of 98 patients treated for orthopaedic infection, 39 (39.8%) underwent implantation of antibiotic-impregnated cement delivery devices: 21 (21.4%) antibiotic beads, 7 (7.1%) antibiotic nails, and 11 (11.2%) antibiotic blocks. Twenty patients (51.3%) comprised the Retained Cohort and 19 patients (48.7%) comprised the Removed Cohort. There were minimal demographic differences between the two cohorts: the Removed cohort had a slightly higher ASA Score (p=0.026) and increased incidence of diabetes (p=0.047). Infection location is reported in Table 1 which demonstrates similar infection location profiles in both cohorts. The Retained and Removed Cohorts demonstrated no difference in eventual resolution of infection (100% in both cohorts), and no significant difference in time in days to resolution of infection (237.00 ± 254.44 Retained vs. 172.74 ± 166.82 Removed, p=0.180). There was no difference in incidence of subsequent infection recurrence following implantation (1 Retained vs. 2 Removed, p=0.605). Compared to the Retained Cohort, the Removed Cohort underwent more reoperations (0.40 vs. 1.84 reoperations, p<0.001) and additional admissions following implantation (0.40 vs. 1.84 readmissions, p<0.001).

DISCUSSION AND CONCLUSION:

Removal of antibiotic delivery devices in patients with orthopaedic infection does not make a difference in the resolution or recurrence of infection. Therefore, additional surgical intervention with the sole purpose of removing antibiotic delivery devices may not be warranted.

Table 1. Demographics and Infection Information

Demographics & Infection Information	**Retained**	**Removed**	***P-Value***
N	20	19	
Variables			
Age *(years; mean ± std)*	44.3 ± 19.58	52.42 ±15.42	0.080
BMI** *(kg/m2, mean ± std)*	28.45 ± 4.89	30.65 ± 6.44	0.121
ASA Score * *(mean± std)*	1.75 ± 0.79	2.21 ± 0.63	**0.026**
Current Smoker, n (%)	8 (40%)	6 (32%)	0.741
Current Drug User, n (%)	6 (30%)	4 (21%)	0.716
Diabetes, n (%)	0 (0%)	4 (21%)	**0.047**
Gender			
Male, n (%)	18 (90%)	15 (79%)	0.407
Female, n (%)	2 (10%)	4 (21%)	0.407
Infection Location			
Upper Extremity:	1 (5%)	1 (5%)	1.00
Humerus, n (%)	1 (5%)	0 (0%)	1.00
Ulna, n (%)	0 (0%)	1 (5%)	0.487
Lower Extremity:	19 (95%)	18 (95%)	1.00
Hip, n (%)	0 (0%)	1 (5%)	0.487
Femur, n (%)	5 (25%)	6 (32%)	0.731
Tibia, n (%)	12 (60%)	8 (42%)	0.343
Ankle, n (%)	1 (5%)	0 (0%)	1.00
Knee, n (%)	1 (5%)	2 (11%)	0.605
Calcaneus, n (%)	0 (0%)	1 (5%)	0.487
Infection Characteristics			
Culture Postitive, n (%)	18 (90%)	15 (79%)	0.407
Culture Negative, n (%)	2 (10%)	4 (21%)	0.407

** Body-Mass Index [BMI]
* American Society of Anesthesiology [ASA]

Table 2. Clinical Outcomes

Clinical Outcomes	**Retained**	**Removed**	***P-Value***
N	20	19	
Clinical Outcomes			
Time to Infection Resolution *(days; mean± std)*	237.00 ± 254.44	172.74 ± 166.82	0.180
Incidence of Additional Infection, n (%)	1 (5%)	2 (11%)	0.605
Number of Reoperations *(mean± std)*	0.40 ± 1.35	1.84 ± 1.26	**<0.001**
Number of Readmissions *(mean± std)*	0.40 ± 1.35	1.84 ± 1.26	**<0.001**
Need for Skin Coverage, n (%)	2 (10%)	0 (0)	0.487
Need for Amputation, n (%)	0 (0%)	1 (5%)	0.487
Time to Final Follow-up *(months; mean± std)*	18.87 ± 23.07	26.08 ± 20.56	0.155