No Difference in Surgical Site Infection Rates Between Cefazolin and Alternative Antibiotics Following Spine Surgery

Daniel Rusu[1], Aidan Lindgren[1], William J. Karakash[1], Nicole Hang[1], Jadesola Olurin[1], Christian Au[1], Marco Napolitano[1], Rakhi Banerjee[1], Elizabeth Lechtholz-Zey[1], Jisun Chin[1], Henry Avetisian[1], Marc A. Abdou[1], Jeffrey C. Wang[1], Raymond J. Hah[1], Ram K. Alluri[1]
[1]Keck School of Medicine of University of Southern California, Los Angeles, CA, Department of Orthopaedic Surgery
drusu@usc.edu

Disclosures: Daniel Rusu (N), Aidan Lindgren (N), William J. Karakash (N), Nicole Hang (N), Jadesola Olurin (N), Christian Au (N), Rakhi Banerjee (N), Elizabeth Lechtholz-Zey (N), Jisun Chin (N), Henry Avetisian (N), Marc A. Abdou (ATEC Spine), Jeffrey C. Wang (Biomet, Novapproach, Seaspine, Synthes, GS Medical, DepuySynthes, Bioretec, Bone Biologics, Electrocore, PearlDiver, Surgitech, Illuminant), Raymond J. Hah (ATEC, NuVasive, Medtronic, Globus, Orthofix, SI-Bone, Cerapedics, Evolution Spine), Ram K. Alluri (Orthofix, eCential Robotics, Globus, Medtronic, HIA technologies, NeoOnc, ATEC, Max BioPharma)

INTRODUCTION: Surgical site infections (SSIs) occur at a rate of 0.7-10% following spinal surgery with deep infections reported at 1-2% despite preoperative antibiotic prophylaxis. Cefazolin is the most commonly used antibiotic for surgical prophylaxis in orthopaedics due to its broad coverage against skin flora, however superiority of one antibiotic over others is debated. The current North American Spine Society (NASS) 2013 guidelines on antibiotic prophylaxis in spine surgery state the superiority of one antibiotic has not been clearly demonstrated, while recent studies reported prophylactic vancomycin had a higher risk of infection. This study aims to compare rates of SSIs, deep infections, and superficial wound infections between prophylactic cefazolin and other antibiotics following spine surgery.

METHODS: All patients who underwent spine surgery at a single academic university hospital between 2015 and 2021 with follow up of at least 3 months were identified from electronic medical records. Patients were excluded if they had indications of trauma or malignancy, evidence of infection prior to admission, prior incision and drainage of an abscess, prior posterior instrumentation within 1 year, or prior surgery with absence of posterior instrumentation within 3 months. Patients who received a different antibiotic postoperatively were excluded. Patients were grouped based on preoperative antibiotic (cefazolin vs alternative). Primary outcomes were rates of surgical site infections, either superficial or deep, which necessitated irrigation and debridement in the operating room. Potential confounding covariables were measured including age, gender, comorbidities, operative time, and topical antibiotic or drain use. Chi-squared test was performed for infection rates between groups given cefazolin vs an alternative antibiotic. Associations between demographic, comorbidity, operative time, and topical antibiotic or drain use covariables were assessed through multivariable logistic regression. This study was approved by an institutional review board (HS-23-00758).

RESULTS SECTION: 3055 patients with a mean follow-up time of 699 days were identified. Of those, 2603 (85.2%) patients received preoperative cefazolin, while 452 (14.8%) patients received an alternate antibiotic. Compared to patients who received an alternate antibiotic, patients who received cefazolin did not experience statistically significantly different rates of SSIs (2.19% vs 1.77%), superficial wound infections (1.31% vs 0.88%), and deep wound infections (0.96% vs 0.88%) (all $p>0.05$; Table 1). With the sample size obtained, the study had 80% power to find a minimal detectable effect size of 1.76% for combined SSI, 1.35% for superficial infection, and 1.18% for deep infection. Of the alternate antibiotic group, 234 patients received vancomycin and 213 received clindamycin. Multivariate logistic regression demonstrated that operative time was significantly associated with rates of SSIs (OR: 1.004 [1.002-1.006], p=0.003).

DISCUSSION: In this large, single-institution study, pooled rates of SSIs, superficial wound infections, or deep wound infections were not found to be statistically significantly different between preoperative cefazolin and those receiving alternative prophylactic antibiotics. These findings align with current NASS guidelines denying the superiority of any one antibiotic in spine surgery. The only independent risk factor for SSIs identified was operative time, consistent with prior literature linking longer procedures to higher infection risk.

SIGNIFICANCE/CLINICAL RELEVANCE: (1-2 sentences): The study suggests there may not be a difference between cefazolin and alternative antibiotics when used prophylactically for spine surgery. Additionally, results suggest that efforts in reducing operative time may reduce SSI rates.

Table 1. Rates of Surgical Site Infection (SSI), Superficial Wound Infection, and Deep Wound Infection in Patients Receiving Preoperative Cefazolin Versus Alternative Antibiotics.

	Cefazolin (*N = 2603*)	**Non-Cefazolin (*N = 452*)**	**P-Value**
SSI	57	8	0.724
Superficial Wound Infection	34	4	0.645
Deep Wound Infection	25	4	1.000

Table 2. Multivariate Logistic Regression on Rates of Surgical Site Infection

Variable	**Odds Ratio**	**95% Confidence Interval**	**P-Value**
Age	0.978	0.948 - 1.009	0.156
Gender	0.737	0.331 - 1.645	0.456
Follow-up Time (days)	1.000	1.000 - 1.000	0.405
BMI	1.029	0.971 - 1.092	0.335
ASA Classification	1.128	0.559 - 2.659	0.620
Smoking Status	1.238	0.501 - 3.063	0.643
Preoperative A1c	1.202	0.892 - 1.619	0.226
Operative Time (min)	1.004	1.002 - 1.006	**0.003**
Topical Antibiotic Administered	1.426	0.586 - 3.472	0.434
Drain Placed	0.893	0.345 - 2.309	0.815
Preoperative Antibiotic	1.353	0.393 - 4.650	0.631