INPLASY

The Association of Intraoperative Vancomycin and Infections in Open Spine Surgery: A Systematic Review and Meta-Analysis of Randomized Controlled Trials

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ADMINISTRATIVE INFORMATION

Support - N/A.

Review Stage at time of this submission - Piloting of the study selection process.

Conflicts of interest - None declared.

INPLASY registration number: INPLASY2024110117

Amendments - This protocol was registered with the International Platform of Registered Systematic Review and Meta-Analysis Protocols (INPLASY) on 28 November 2024 and was last updated on 28 November 2024.

INTRODUCTION

Review question / Objective

Aim 1. To determine if intraoperative vancomycin is effective in preventing post-operative infections after spine surgery
Aim 2. To determine if the efficacy of interoperative vancomycin differs across surgical approach, instrumentation status, and region of spine

Patients: Adult patients undergoing spine surgery with or without instrumentation
Intervention: Intraoperative vancomycin
Comparator: No Intraoperative antibiotics
Outcomes: Incidence of infection, including but not limited to:

- Surgical site infection (SSI)
- Deep wound infections
- Sepsis
- Osteomyelitis

Rationale Wound infections and other post-operative infections are a common complication after spine surgery, with reported incidences ranging from 3% to as high as 15%. Infections carry significant morbidity, leading to readmissions, reoperations, increased overall costs of care, and mortality. Current strategies for preventing these infections include pre-surgical optimization of modifiable patient risk factors, such as smoking cessation. Another popular method of infection prophylaxis involves the utilization of antibiotics intraoperatively, applied to the surgical wound during surgery. Despite clinical guidelines encouraging the use of intraoperative antibiotics for infection prophylaxis, the evidence in support of such recommendations remains weak, specifically of the utility of interoperative vancomycin, a widely used beta-lactam antibiotic with efficacy against methicillin resistant staphylococcus aureus (MRSA). Furthermore, these recommendations are largely made on the evidence provided largely by retrospective cohort analyses. In the past years, several RCTs have been published studying the efficacy of intraoperative vancomycin in preventing surgical

infections in spine surgery. Significantly, the results of these studies are conflicting in their results, and are at times inconsistent with current clinical recommendations and common practice. Thus, we sought to perform a systematic review of the literature for RCTs that investigate intraoperative vancomycin application and post-operative infections following spine surgery and conduct a meta-analysis of their results. In doing so, we hope to better understand the true efficacy of intraoperative vancomycin in preventing post-operative infection after spine surgery.

Condition being studied The utility of intraoperative vancomycin in preventing post-operative infections after spine surgery is not well established. These infections lead to significant morbidity and mortality, requiring readmission to the hospital, reoperations, and leading to prolonged hospitalizations.

METHODS

Search strategy

Medline
(vancomycin) AND (spine surgery)
Embase
('spine surgery')/br OR (('cervical spine'):ti,ab,kw) OR (('lumbar spine'):ti,ab,kw) OR (('thoracic spine'):ti,ab,kw) AND (('vancomycin'):ti,ab,kw)
Scopus
TITLE-ABS-KEY (((spine AND surgery) OR (lumbar AND spine) OR (cervical AND spine) OR (thoracic AND spine)) AND (vancomycin))
Google Scholar
allintitle: vancomycin spine surgery spine OR surgery OR lumbar OR spine OR cervical OR spine OR thoracic OR spine OR vancomycin -meta -review -systematic

Participant or population Adult patients undergoing spine surgery with or without instrumentation

Intervention Intraoperative vancomycin

Comparator No Intraoperative vancomycin/ standard of care

Study designs to be included Randomized Controlled Trials

Eligibility criteria Exclusion: Non-randomized clinical and observational studies, case series, case reports, brief reports, pilot reports, opinion pieces, theses, conference proceedings, letters and commentaries, editorials, meta-analysis and reviews, surgical technique papers, abstracts, conference proceedings, and non-English language articles without available translations.

Information sources Medline, Embase, Scopus, Google Scholar

Main outcome(s)
Incidence of infection:
- Surgical site infection (SSI)
- Deep wound infections
- Sepsis
- Osteomyelitis

Additional outcome(s) N/A

Data management Data will be managed via Covidence Software and with a predetermined excel form.

Selection Process:
Two independent reviewers will screen articles for relevance first based on titles and abstracts, and then will assess full-text articles for eligibility. Disagreements between reviewers will be resolved in both phases of selection by consensus or by a third reviewer.

Data Collection Process:
Each selected study will be distributed to two individuals for data extraction in duplicate using a pre-determined excel database with the selected variables. We do not anticipate any need to contact the authors of the selected studies to obtain patient level data.

Data items for extraction
- Author information
- Year of publication
- Effect size
- Upper limit of Confidence Interval
- Lower limit of Confidence Interval
- Study Size (number of patients in each treatment arm)
- Incidence rates in each treatment arm
- Standard Error
- Demographic and Patient enrollment characteristics

Metadata
- Journal name where study was published
- Year of publication
- Analysis approach: intention-to-treat vs per-protocol
- Adherence to CONSORT
- Potential sources of Bias

Quality assessment / Risk of bias analysis Risk of bias will be assessed at the study level:

- The Risk of Bias in randomized trials (RoB 2) tool will be utilized
- Competing interest in studies will be noted
- Studies will be assessed on quality based on adherence to CONSORT guidelines
- A funnel plot using Egger tests will be used to assess publication bias
- We will also use the Grading of Recommendations Assessment, Development, and Evaluation (GRADE)

Strategy of data synthesis Due to predicted variability in patient selection among the studies, we will utilize a random effects model with restricted maximum-likelihood estimation for the meta-analysis and data synthesis. Study heterogeneity will be assessed using the inconsistency index (I^2).

Subgroup analysis Subgroup analysis will be made by assess the efficacy of the intervention in the following groups:

- Cervical spine
- Thoracic Spine
- Lumbar
- With instrumentation
- No instrumentation
- Deep

Sensitivity analysis Sensitivity analysis will be conducted via the leave one-out-method. Publication bias will be assessed using the Egger test and visually assessed using funnel plots. Additionally, statistical heterogeneity and magnitude of heterogeneity will be assessed utilizing the Cochran $\chi 2$ tests and the I^2 statistic. Statistical analyses will be performed using R studio (version 4.3.1). Alpha shall be set at 0.05 and all tests for significance will be 2-sided.

Language restriction Non-English language publications without translation

Country(ies) involved United States

Other relevant information

Keywords Spine Surgery, Intraoperative Vancomycin, Prophylaxis

Dissemination plans Publication in peer-reviewed journal

Contributions of each author

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