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Topical Vancomycin in Pediatric Spine Surgery Does Not Reduce Surgical Site Infection: A Retrospective Cohort Study

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Abstract

Study Design: Retrospective cohort study.
Objectives: Evaluate the effectiveness of topical vancomycin in reducing surgical site infection (SSI) in pediatric patients undergoing posterior spinal fusion (PSF).
Summary of Background Data: There has been increased interest in use of topical vancomycin to reduce SSI in spine surgery with mixed results reported in the literature. In Summer 2012, our institution implemented the use of topical vancomycin in definitive primary and revision PSF as part of our infection control protocol.
Methods: After IRB approval, a consecutive series of 527 patients (538 procedures) undergoing PSF January 2010-December 2014 were retrospectively reviewed to identify the occurrence of SSI. Based on published results from a similar study, an a priori power analysis determined 190 patients were needed per group to achieve 0.90 power. In 228 procedures, topical vancomycin was used (Vanco) and in 310 procedures it was not (No Vanco). Exclusion criteria were $<$90 days follow-up, $>$18 years at time of surgery, and combined anterior and posterior fusion. Two-sample *t* tests, Wilcoxon rank-sum tests, and Fisher exact tests were used to compare the cohorts.
Results: Groups were similar in age, sex, implant density, fusion length, risk categorization, and surgical time ($p > .05$). No Vanco had significantly higher blood loss and incidence and amount of intraoperative allogenic transfusion ($p < .001$). Incidence of SSI was 3% (7/228) in Vanco and 2% (6/310) in No Vanco ($p = .4099$). Six of the 7 SSIs occurred in high-risk patients in Vanco and 5 of 6 occurred in high-risk patients in No Vanco ($p = 1$). Reoperation within 90 days was 6% (13/228) in Vanco and 4% (11/310) in No Vanco ($p = .2912$). Occurrence of other complications was similar between Vanco, 3% (7/228), and No Vanco, 2% (5/310).
Conclusion: Use of topical vancomycin did not reduce incidence of SSI for pediatric patients undergoing PSF at our institution.
Level of Evidence: Level III.

Keywords: Topical vancomycin; Posterior spinal fusion; Pediatric; Surgical site infection

Introduction

Surgical site infection (SSI) is a common complication following posterior spinal fusion (PSF). Reported rates of SSIs following spinal fusion range from 0.7% to 5.69% [1-3]. SSI is associated with substantial medical, emotional, and financial burden [4]. Preventing SSI in PSF is integral for both reducing patient risk and health care cost.

Recently, the use of topical vancomycin has become an increasingly used technique to prevent SSI in spine surgery [5-8]. Several reports in adult spine surgery suggest topical vancomycin is effective in reducing the incidence of SSI

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[9-17]. Further studies have shown a substantial decrease in health care costs of between $200,000 and $400,000 per 100 spinal fusions associated with the use of topical vancomycin [11,15]. Two studies investigating the associated risk of topical vancomycin have found this technique to be safe to patients, reporting low incidences of complications [18,19].

Although the literature surrounding adult spinal surgery is abundant, studies on the use of topical vancomycin in pediatric spinal surgery are more limited. Several studies, similar to the adult spine literature, report the use of topical vancomycin to be safe, with evidence of little to no associated risks or complications [20-22]. Gentamycin mixed into bone graft has also been shown in an uncontrolled cohort study to reduce the infection rate after spinal fusion in children with neuromuscular scoliosis [23]. However, to our knowledge, no studies have investigated whether the use of topical vancomycin effectively prevents SSI after spine surgery in a pediatric population.

The purpose of this study was to determine the effectiveness of topical vancomycin powder in reducing SSI among pediatric patients undergoing PSF. As part of our antibiotic prophylactic protocol, surgeons began using topical vancomycin powder during spine surgery in the summer of 2012. Our primary aim was to compare the incidence of SSI between patients who did and did not receive topical vancomycin. Our secondary aim was to compare the proportion of patients who returned to the operating room within 90 days following surgery. We hypothesized that the incidence of SSI and proportion of patients who returned to the operating room would be significantly lower among patients who received topical vancomycin compared with patients who did not.

Materials and Methods

After institutional review board approval, electronic medical records were queried for patients who underwent PSF at a single tertiary institution from January 2010 through December 2014. An a priori power analysis was performed in SAS 9.4 (SAS Institute, Cary, NC) based on results from a similar study by Theologis et al. [15]. Using a Pearson chi-square test for two proportions, an SSI incidence of 2.6% for those who received topical vancomycin and 10.9% for those who did not, and an alpha of 0.05, a minimum of 190 patients were needed in each group to achieve a power of 0.90.

Exclusion criteria were older than 18 years at time of surgery, combined anterior and posterior spinal fusion, and less than 90 days' follow-up. Development of the study cohort is demonstrated in Figure 1. For all patients who met inclusion criteria, patient electronic medical records were retrospectively reviewed to collect demographic variables (year of procedure, age, sex), clinical variables (diagnosis, risk categorization, BMI percentile), surgical variables (procedure type, procedure time, length of fusion, implant density, estimated blood loss, use of intravenous vancomycin, use of topical vancomycin, topical vancomycin dose, occurrence and amount of intraoperative allogenic blood transfusion, compliance with prophylactic antibiotic protocol), and postoperative variables (clinical follow-up, occurrence of SSI, time to infection, culture results, occurrence of complications other than SSI, return to the operating room within one year).

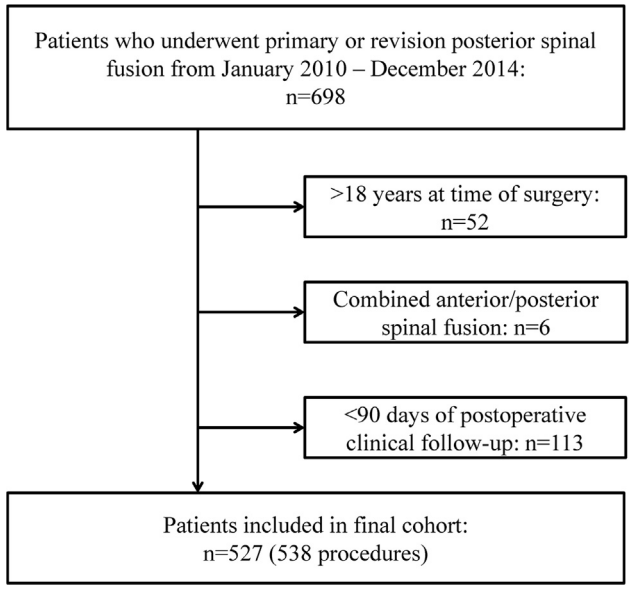

Fig. Development of the study cohort.

Risk categorization factors in patient susceptibility to intra- and postoperative complications were based on their diagnosis, presence of preexisting comorbidities, and procedure [8]. Patients with a diagnosis of adolescent idiopathic scoliosis who undergo primary PSF with no known comorbidities are categorized as low-risk. All other diagnoses are categorized as high risk. Patients, regardless of diagnosis, undergoing vertebral column resection, revision PSF, or PSF with pelvic fixation are categorized as high risk. Compliance to the prophylactic antibiotic protocol was achieved when all three predefined protocol criteria were met: correct intravenous antibiotics administered within one hour prior to incision, intravenous antibiotics redosed intraoperatively if blood loss and/or surgical time thresholds met, and intravenous antibiotics discontinued within 24 hours postoperatively [24]. For occurrence of SSI, we used the Centers for Disease Control and Prevention (CDC) National Healthcare Safety Network's definition of a deep incisional SSI. The CDC defines a deep SSI as occurring within 90 days postoperatively, involving deep soft tissues of the incision, and exhibiting one of the following: purulent drainage, positive culture from either a spontaneous dehiscence or aspiration, fever or localized pain/tenderness, or abscess or other evidence of infection detected on a gross anatomical or histopathologic examination or imaging test [25].

Operative methods

All patients undergoing spine procedures at our institution receive a standard perioperative antibiotic prophylaxis