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Original Research

Evaluation of Surgical Site Infection Rates with Conventional Sutures Vs Antimicrobial-Coated Sutures in Abdominal Surgeries

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ABSTRACT

Background: Surgical site infections (SSIs) are a significant cause of morbidity and healthcare costs, particularly in abdominal surgeries. The use of antimicrobial-coated sutures has been proposed as a strategy to reduce SSIs by preventing microbial colonization at the surgical site. This study evaluates the rates of SSIs associated with conventional sutures versus antimicrobial-coated sutures in abdominal surgeries.

Materials and Methods: This prospective study included 200 patients undergoing elective abdominal surgeries in a tertiary care hospital. Patients were randomized into two groups: Group A (n=100) received conventional sutures, and Group B (n=100) received antimicrobial-coated sutures. Patient demographics, surgical details, and comorbidities were recorded. SSIs were assessed based on clinical and microbiological criteria up to 30 days postoperatively. Statistical analysis was performed using the chi-square test, and a p-value <0.05 was considered significant.

Results: The incidence of SSIs was significantly lower in Group B (antimicrobial-coated sutures) compared to Group A (conventional sutures). In Group A, 20% of patients developed SSIs, whereas only 8% of patients in Group B had SSIs (p=0.01). Most infections were caused by *Escherichia coli* and *Staphylococcus aureus*. The average length of hospital stay was shorter in Group B (7 days) compared to Group A (10 days).

Conclusion: Antimicrobial-coated sutures significantly reduce the rate of SSIs in abdominal surgeries compared to conventional sutures. Their use may improve postoperative outcomes and reduce hospital stays, highlighting their potential as a valuable intervention in surgical practice.

Keywords: Surgical site infections, antimicrobial-coated sutures, abdominal surgeries, postoperative outcomes, infection prevention.

INTRODUCTION

Surgical site infections (SSIs) are among the most common healthcare-associated infections, accounting for significant morbidity, prolonged hospital stays, and increased healthcare costs globally [1]. Abdominal surgeries, due to their complexity and proximity to the gastrointestinal tract, pose a particularly high risk for SSIs, with reported incidence rates ranging from 2% to 20% [2]. The prevention of SSIs is a critical aspect of surgical care and involves the implementation of various strategies, including perioperative antibiotic prophylaxis, aseptic surgical techniques, and appropriate wound closure materials [3].

Sutures play a crucial role in wound healing, but they can also serve as a nidus for bacterial colonization, contributing to the development of SSIs [4]. Antimicrobial-coated sutures, such as those coated with triclosan, have been developed to counteract this issue by providing localized antimicrobial activity that inhibits bacterial adhesion and growth along the suture line [5]. Several studies have suggested that these sutures may reduce the incidence of SSIs compared to conventional sutures, particularly in high-risk procedures like abdominal surgeries [6,7].

However, the efficacy of antimicrobial-coated sutures in reducing SSIs remains a subject of debate, as outcomes vary across studies due to differences in

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study design, patient populations, and surgical settings [8]. This study aims to evaluate the impact of antimicrobial-coated sutures on SSI rates in abdominal surgeries compared to conventional sutures, providing further evidence to guide clinical decision-making.

MATERIALS AND METHODS

Study Design and Setting: This prospective, randomized, controlled study was conducted at a tertiary care hospital over a period of 12 months. Informed consent was secured from all participants before enrolment.

Study Population: A total of 200 patients scheduled for elective abdominal surgeries were included in the study. Patients aged 18 to 65 years, with American Society of Anesthesiologists (ASA) scores I–III, were eligible. Patients with pre-existing infections, immunocompromised conditions, or allergies to suture materials were excluded.

Randomization and Group Allocation: Participants were randomly assigned into two groups using a computer-generated randomization sequence. Group A (n=100) received conventional sutures for wound closure, while Group B (n=100) received antimicrobial-coated sutures containing triclosan. The surgeon and postoperative assessors were blinded to group allocation.

Surgical Procedure and Postoperative Care: All surgeries were performed under aseptic conditions by experienced surgeons following standard protocols. Perioperative prophylactic antibiotics were administered to all patients. Wound closure was performed using the assigned sutures. Postoperative wound care was standardized, and patients were monitored for 30 days post-surgery.

Outcome Measures: The primary outcome was the incidence of SSIs, defined based on the Centres for Disease Control and Prevention (CDC) criteria, which include clinical signs of infection (erythema, warmth, and purulent discharge) and microbiological confirmation. Secondary outcomes included the length of hospital stay and wound healing time.

Data Collection: Demographic and clinical data, including age, gender, comorbidities, type of surgery, and duration of operation, were collected. Wound assessments were performed on postoperative days 3, 7, 14, and 30 by blinded assessors. Wound swabs were obtained for microbiological analysis in cases of suspected infection.

Statistical Analysis: Data were analyzed using SPSS software version 25. Continuous variables were presented as mean ± standard deviation, and categorical variables were expressed as percentages. The chi-square test was used for categorical variables, while continuous variables were compared using the independent t-test. A p-value <0.05 was considered statistically significant.

RESULTS

Demographic and Clinical Characteristics: The study included 200 patients, equally divided between Group A (conventional sutures) and Group B (antimicrobial-coated sutures). The mean age of participants was 45.3 ± 12.8 years in Group A and 44.6 ± 13.2 years in Group B (p=0.72). Both groups had similar gender distributions, with males constituting 60% in Group A and 58% in Group B (p=0.84). The prevalence of comorbidities, such as diabetes (20% in Group A vs. 18% in Group B), and hypertension (25% in Group A vs. 23% in Group B), was comparable between groups (p>0.05) (Table 1).

Table 1: Baseline Demographic and Clinical Characteristics

Variable	Group A (n=100)	Group B (n=100)	p-value
Mean Age (years)	45.3 ± 12.8	44.6 ± 13.2	0.72
Male (%)	60	58	0.84
Diabetes (%)	20	18	0.67
Hypertension (%)	25	23	0.79

Incidence of Surgical Site Infections: The incidence of SSIs was significantly lower in Group B compared to Group A. In Group A, 20 patients (20%) developed SSIs, while only 8 patients (8%) in Group B had SSIs (p=0.01) (Table 2). Most infections in both groups were caused by *Escherichia coli* and *Staphylococcus aureus.*

Table 2: Incidence of Surgical Site Infections

Outcome	Group A (n=100)	Group B (n=100)	p-value
Patients with SSIs (%)	20 (20%)	8 (8%)	0.01
Common pathogens	E. coli (50%)	E. coli (62%)	
	S. aureus (40%)	S. aureus (30%)	

Length of Hospital Stay: The average length of hospital stay was significantly shorter in Group B compared to Group A. Patients in Group A had a mean hospital stay of 10 ± 3.2 days, whereas patients in Group B stayed for an average of 7 ± 2.5 days (p=0.001) (Table 3).

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Table 3: Length of Hospital Stay

Group	Mean Hospital Stay (days)	p-value
Group A	10 ± 3.2	
Group B	7 ± 2.5	0.001

Wound Healing Time: The mean time for complete wound healing was also shorter in Group B (12 ± 3.5 days) compared to Group A (16 ± 4.2 days, p=0.003) (Table 4).

Table 4: Wound Healing Time

Group	Mean Wound Healing Time (days)	p-value
Group A	16 ± 4.2	
Group B	12 ± 3.5	0.003

Antimicrobial-coated sutures demonstrated a significant reduction in SSI incidence, shorter hospital stays, and faster wound healing compared to conventional sutures. These findings support their routine use in abdominal surgeries (Tables 2–4).

DISCUSSION

This study demonstrates that antimicrobial-coated sutures significantly reduce the incidence of surgical site infections (SSIs) compared to conventional sutures in abdominal surgeries. The findings align with existing evidence, highlighting the potential of antimicrobial sutures as a preventive measure in surgical care.

The incidence of SSIs in the conventional suture group (20%) was consistent with previous reports that estimate SSI rates in abdominal surgeries to range from 15% to 25% [1,2]. In contrast, the SSI rate in the antimicrobial-coated suture group was markedly lower at 8%, indicating a substantial benefit. Antimicrobial-coated sutures, particularly those containing triclosan, have been shown to inhibit bacterial colonization on suture material, thereby reducing microbial biofilm formation, which is a key factor in SSIs [3,4].

The microbiological profile of SSIs in this study was dominated by *Escherichia coli* and *Staphylococcus aureus*, which is consistent with the literature [5,6]. Antimicrobial sutures are particularly effective against these pathogens due to their broad-spectrum activity, which prevents initial colonization [7].

A significant reduction in the length of hospital stay was observed in the antimicrobial suture group (7 days) compared to the conventional suture group (10 days). This reduction can be attributed to fewer SSIs and faster wound healing, resulting in earlier discharge. Similar findings have been reported in previous studies, emphasizing the economic benefits of using antimicrobial-coated sutures in high-risk surgeries [8,9].

The wound healing time was also significantly shorter in the antimicrobial-coated suture group, likely due to reduced inflammation and infection. Studies have demonstrated that infections prolong wound healing by delaying the inflammatory phase and impairing granulation tissue formation [10,11]. By minimizing infection, antimicrobial sutures can facilitate more rapid progression through the phases of wound healing [12].

The findings of this study are in agreement with meta-analyses that have confirmed the efficacy of antimicrobial-coated sutures in reducing SSI rates across various surgical disciplines [13,14]. However, some studies have reported limited or no benefits of antimicrobial sutures, particularly in clean surgeries where the baseline SSI risk is low [15]. These discrepancies may stem from differences in surgical types, patient populations, and study designs.

The study is not without limitations. The sample size, while adequate for detecting differences in SSI rates, may not fully represent all subgroups of patients undergoing abdominal surgeries. Additionally, the study was conducted in a single centre, which may limit the generalizability of the findings. Future multicentre studies with larger sample sizes are recommended to confirm these results and evaluate cost-effectiveness in diverse settings.

CONCLUSION

This study reinforces the efficacy of antimicrobial-coated sutures in reducing SSIs, shortening hospital stays, and improving wound healing outcomes in abdominal surgeries. Their routine use in high-risk procedures may enhance patient outcomes and reduce healthcare costs.

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