



General Surgery

EFFICACY OF ANTIBACTERIAL COATED VERSUS UNCOATED SUTURE MATERIAL IN SUBCUTANEOUS CLOSURE OF LAPAROTOMY INCISIONS IN PREVENTION OF POSTOPERATIVE SUPERFICIAL SURGICAL SITE INFECTION

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ABSTRACT **Introduction:** Triclosan is a broad spectrum antiseptic that has been widely used in humans for over 30 years. This study was aimed to evaluate the efficacy of new antibacterial suture (coated Polyglactin 910 with triclosan) compared with a traditional suture (coated Polyglactin 910) in reducing abdominal surgical site infection.

Patients and methods: A total of 60 patients undergoing abdominal surgeries between October 2015 and September 2017 were included in the study. These patients were randomized into two groups that is group A (coated Polyglactin 910 with triclosan) and group B (coated Polyglactin 910).

Observations and results: Both the groups were comparable in terms of patient demographics. Higher incidence of superficial SSI incidence was seen in Group B (30%) compared to Group A (10%), but this was not statistically significant ($P=0.053$). The mean length of hospital stay in group A was slightly lower compared to group B.

Conclusion: The study showed that the use of new antibacterial suture (coated Polyglactin 910 with triclosan) showed better efficacy in reducing abdominal surgical site infections when compared to traditional suture (coated Polyglactin 910) even though this was not statistically proven.

KEYWORDS : Surgical site infections; Suture material; coated Polyglactin 910 with triclosan; coated Polyglactin 910; antibacterial sutures.

INTRODUCTION

Surgical Site Infections (SSIs) are infections of tissues, organs, or spaces exposed by surgeons during performance of an invasive procedure. Surgical site infections (SSI) are the second most frequent nosocomial infection, after urinary tract infection¹⁻³. Global incidence rates of SSI's vary from 4.5% to 20%, depending on the region and facilities available⁴. A host of factors are known for increase a person's susceptibility for developing a SSI, including patient related factors and surgeon related factors⁵. Patient-related factors have to be taken into account but are difficult to change once a surgical intervention is needed.

Since suture materials have been proven to be a contributor to SSI⁶, they have been the focus of research and development centered on making them less conducive to bacterial overgrowth. By fixing drugs onto suture material, biologically active suture materials have been created⁷. Recently a new antimicrobial suture polyglactin 910 coated with triclosan has been introduced. Triclosan is a broad spectrum antiseptic that has been widely used for over 30 years in humans. There was no evidence of carcinogenic potential, genotoxicity, and skin sensitization potential in 2 years of animal model studies.

The purpose of this study is to compare the rate of superficial SSIs in patients using coated polyglactin 910 with triclosan for subcutaneous layer of laparotomy incisions closure with that of coated polyglactin 910 alone.

PATIENTS AND METHODS

The present study was a single-center, prospective, observational, randomized study. It was conducted on patients undergoing abdominal surgeries in Mamata General Hospital from October 2015 to September 2017. A total of 60 patients undergoing abdominal surgeries by vertical incision were randomized into 2 groups and studied. In group A subcutaneous layer was approximated with coated polyglactin 910 with triclosan whereas in group B coated polyglactin 910 alone was used. The local research and ethics committee approved the study protocol.

Patients who were immunocompromised (diabetics, human immunodeficiency virus (HIV), bleeding disorders, patients on steroid therapy), suffering from malignancies or patients with known hypersensitivity to suture or its components, pre-existing surgical site infection and those patients who developed a deep incisional or organ/space infection were excluded from the study.

Wound inspection was done everyday from the second post-operative day onwards till the day of discharge followed by weekly wound inspection till 30 days. In case of infection, patients were treated accordingly. The CDC criteria for defining a superficial surgical site infection were followed while assessing the wound.

Statistical Analysis: Paired T test for quantitative data and Pearson chi square test for qualitative data were used to evaluate the P value. Differences were considered statistically significant, if $P < 0.05$. IBM SPSS Statistics for Windows, version 24 (IBM Corp., Armonk, N.Y., USA) software program was used for statistical calculations.

OBSERVATIONS AND RESULTS:

In this series of 60 patients, 37 were males and 23 were female. Most of the patients were aged between 41 to 50 years in each group (40% in Group A, 33.3% in Group B). The mean age in Group A was 43.53 ± 12.25 years and in group B, mean age was 43.7 ± 11.59 years. In group A 33.3% patients had clean contaminated wound compared to 36.7% in group B. In group A 43.3% patients had contaminated wound compared to 40% in group B. The demographic characteristics and surgical parameters were comparable in both the groups ($P > 0.05$). The results of the study are depicted in table 1.

Higher incidence of superficial SSI incidence was seen in Group B (30%) compared to Group A (10%) but this was not statistically significant ($P=0.053$).

Escherichia coli was the commonest organism cultured from the infected wounds in both the groups (25% of the cultures; $n=12$) and in 41.7% of cultured no growth was noted. Incidence of organisms cultured is depicted in table 2.

Table 1: Comparison of variables studied

Variable		Group A (coated polyglactin 910 with triclosan)	Group B (coated polyglactin 910)	P value (Paired T test)
Mean age (years)		43.53 ± 12.25	43.7 ± 11.59	0.15
Gender distribution	Male	18 (60%)	19 (63.3%)	0.5
	Female	12 (40%)	11 (36.7%)	
Type of surgery	Emergency	22 (73.3%)	22 (73.3%)	1
	Elective	08 (26.7%)	08 (26.7%)	
Distribution of cases according to type of wound	Clean	07 (23.3%)	07 (23.3%)	0.94 (Pearson chi square test)
	Clean Contaminated	10 (33.3%)	11 (36.7%)	
	Contaminated	13(43.3)	12(40%)	
	Dirty	00	00	
Mean operating time	Elective	117.5 ± 47.13	108.75 ± 19.59	0.34
	Emergency	122.7 ± 33.54	130 ± 29.11	
Incidence of SSSI according to type of wound	Clean	00	00	0.053 (Pearson chi square test)
	Clean Contaminated	02(6.7%)	02(6.7%)	
	Contaminated	01(3.3%)	07(23.3%)	
Mean Hospital Stay		10.7 ± 2.07	11.9 ± 2.87	0.61

Table 2: Incidence of organism cultured in both groups

Organisms	Group A (n=03)		Group B (n=09)	
	No	%	No	%
E.coli	1	33.3	2	22.2
S.aureus	0	0.0	1	11.1
Klebsiella	1	33.3	1	11.1
Pseudomonas	0	0.0	1	11.1
No growth	1	33.3	4	44.4

DISCUSSION:

SSIs have been responsible for the increasing cost, morbidity and mortality related to surgical operations and continue to be a major problem even in hospitals with most modern facilities and standard protocols of preoperative preparation and antibiotic prophylaxis⁸.

Cheng K⁹ in his study on 1138 patients found various risk factors responsible for SSI. Those risk factors include type of operation, wound classification, volume of blood loss, blood transfusion, ASA score before operation, operative duration, diabetes, cancer, use of a gastrointestinal or urinary catheter, postoperative drainage, pre-procedural WBC. These risk factors suggest that all patients having any type of operative procedure should be monitored for potential triggers of SSI in routine clinical practice.

The influence of the suture material on SSIs has been developed over the last 50 years¹⁰. During that period surgeons have shown that surgical sutures, like any other implant in human body, can cause microbial adherence and colonization. When the sutured material becomes contaminated, local mechanisms of wound decontamination become ineffective⁶. Triclosan coated polyglactin 910 was developed to prevent microbial colonization of suture material in operative wounds.

S Hoshino¹¹ in a retrospective controlled trial including both emergency and elective surgeries reported the rate of SSI as 12.2% in conventional coated polyglactin 910 group and 6.6% in coated polyglactin 910 with triclosan suture group. The difference was statistically significant. In the present study, SSIs were seen in emergency cases alone, but this was statistically insignificant. The present study differs from this study with respect to closure of subcutaneous tissue alone instead of entire abdominal wall.

A total of 3 (10%) superficial SSIs have been encountered in the group A, out of total 30 study individuals, whereas in group B, there were 9 (30%) cases with superficial SSIs. Although more number of SSIs were encountered in the group B, these results were statistically insignificant with a P value of 0.053.

Mingmalairak et al¹² (2009) reported a prospective, randomized study to assess the efficacy of coated polyglactin 910 with triclosan against coated polyglactin 910 sutures alone in reducing rates of SSI in patients undergoing appendectomy. The rate of SSI was statistically insignificant between the two treatment groups. The authors concluded that coated polyglactin 910 with triclosan was safe in surgical practice, with a comparable outcome to coated polyglactin 910 but that more studies are needed to confirm this.

Chen et al¹³ (2011) reported a prospective study to evaluate the effect of triclosan-coated sutures on surgical wide excision of head or neck cancers and reconstructive procedures. Cervical wound infection rate in this study was 14.9% (17/112) in the triclosan group and 14.7% (19/129) in the control group, and these rates were not significantly different. In this study, triclosan-coated polyglactin 910 sutures did not reduce the infection rate of cervical wounds after head or neck cancer surgery.

We acknowledge the drawback of the study with small sample size.

CONCLUSION:

The study showed that the use of new antibacterial suture (coated Polyglactin 910 with triclosan) showed better efficacy in reducing abdominal surgical site infections when compared to traditional suture (coated Polyglactin 910) even though this was not statistically proven. More studies with a large sample size are recommended to determine the efficacy of antibacterial suture materials in the prevention of SSIs.

Conflicts of interest: Authors declare that they have no conflicts of interest.

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