



A COMPARATIVE STUDY OF EFFECTIVENESS OF TRICLOSAN COATED POLYGLACTIN 910 VERSUS PLAIN POLYGLACTIN 910 IN REDUCTION OF SURGICAL SITE INFECTION

General Surgery

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ABSTRACT

Background : This study compares the incidence of superficial surgical site infection in surgical wound where the subcutaneous layer was closed with triclosan coated polyglactin 910 suture versus closure with the plain polyglactin 910. **Method :** We undertook a study to compare the incidence of superficial SSI where the sub-cutaneous layer has been closed with Triclosan coated polyglactin 910 suture versus closure with the plain polyglactin 910 sutures; at SMIMER, Surat, Gujarat. **Result :** A total of 69 patients (12.64 %) developed SSIs. In group A, the SSIs incidence was 26 (4.76 %). In group B; the SSI incidence was 43 (7.88 %). In group A average duration of hospital stay was 4.32 days while in group B, that was 4.84 days. **Conclusion :** The rate of SSI in sutured wound in hypertensive patient was significantly lower in patients where Triclosan coated polyglactin 910 was used. There was no difference in rate of SSI in sutured wound in diabetic patients. The rate of SSI in sutured wound was significantly lower in patients where Triclosan coated polyglactin 910 was used than in patients where plain polyglactin 910 was used. The clean, clean contaminated and contaminated wounds had no difference in rate of SSI, when tissue closure was done either by Triclosan coated or plain polyglactin 910. The dirty wound had significantly reduced rate of surgical site infection when subcutaneous tissue closure was done by Triclosan coated polyglactin 910 as compared to that of plain polyglactin 910

KEYWORDS

Triclosan, Polyglactin 910, Surgical site infection

INTRODUCTION

Surgical site infection (SSI) is the second most common nosocomial infection after urinary tract infection (1). Among surgical patients, SSI is the most common nosocomial infection (1). It is a matter of concern as it involves significant morbidity and incurs a significant financial burden. The rate of SSI ranges from 23 % to 38 % (2, 3, 4). The incidence of SSI was highest after cardiovascular (5, 6) and gastrointestinal surgery (7, 8). The most common pathogens found in SSIs are *Staphylococcus aureus*, *Pseudomonas aeruginosa* and *Escherichia coli* (5,6,7). Suture materials have been a contributor among other factors for SSI (8). By fixing drugs onto suture material, biologically active suture materials have been created.

Triclosan is a broad spectrum antibacterial agent effective against bacteria and fungi (9). Preliminary studies using triclosan coated suture materials have shown a decrease in the incidence of SSIs (10). The antimicrobial efficacy of this material in reducing both bacterial adherence to the suture and microbial viability have been proven in vitro (11, 12) and in animal models (13, 14). Coated sutures with Triclosan were compared clinically to no impregnated suture material in extra-gynecological surgery and were shown to perform as well or better than traditional sutures with respect to intra-operative handling and wound healing in pediatric general surgery, pediatric neurosurgery, thoracic and abdominal surgery (15, 16). However, other studies suggested that Triclosan coated sutures could be inefficient or might have potential adverse effects such as wound dehiscence and should be used with caution (15, 16). Triclosan [5-chloro-2- (2,4 dichlorophenoxy) phenol] is a broad-spectrum antibacterial agent that inhibits bacterial fatty acid synthesis at the enoyl-acyl carrier protein reductase step. It is used in a multitude of contemporary consumer products including soaps, detergents, tooth-pastes, skin care products, cutting boards and mattress pads. Triclosan passively dissipates from implanted sutures to the surrounding tissues where it is absorbed into the bloodstream and gets widely distributed (17).

AIMS AND OBJECTIVES

To compare the incidence of superficial surgical site infection in surgical wound where the subcutaneous layer will be closed with triclosan coated polyglactin 910 suture versus closure with the plain polyglactin 910.

METHODOLOGY

Source of data

We undertook a study to compare the incidence of superficial SSI where the sub-cutaneous layer has been closed with Triclosan coated polyglactin 910 suture versus closure with the plain polyglactin 910 sutures; at SMIMER, Surat, Gujarat.

Patients fulfilling the inclusion criteria were randomized in two groups. In group A patients, closure of subcutaneous tissue of a surgical incision was done with triclosan coated polyglactin 910 suture. In group B patients, closure of sub-cutaneous tissue of a surgical incision was done with plain polyglactin 910 suture. The study was conducted for the period of 18 months from February 2020 to August 2021. (group A, n=273; group B, n=273).

Type Of Study

The study was a prospective observational study.

Statistical Tool (software)

The statistical tool (software) was SAS/STAT software.

Inclusion Criteria

- All patients undergoing surgery, which need approximation of subcutaneous tissue.

Exclusion Criteria

- Immunocompromised individuals (human immunodeficiency virus (HIV), bleeding disorder, patients on steroid therapy and on immunosuppressive therapy).
- Known hypersensitivity to suture material.
- Pre-existing surgical site infection.

Data Collection

History taking and clinical examination as per the proforma.

The surgical sites were examined for wound discharge, exudates, wound integrity and signs of inflammation till the day of discharge.

Assessment of wound using Southampton wound scoring system wound assessment grades (18)

- 0 Normal healing
- I Normal healing with mild bruising or erythema
- II Erythema and signs of inflammation
- III Clear or homogenous discharge
- IV Pus discharge
- V Deep or severe wound infection

RESULTS

Most patients were of age group 20-29 and 30-39 years. Three hundred seventy one (67.95%) patients were male and 175 (32.05%) patients were female. Two hundred fifty five (46.70%) patients were operated for acute appendicitis and 115 (21.06%) patients were operated for inguinal hernia. These patients contributed almost 67 % of the total cases. In hypertensive patients, SSI rate was 4.05 % in group A and 14.86% in group B. This difference was statistically significant with P value 0.013. In diabetic patients, the SSI rate was 13.4 % in group A and 8.7% in group B. This difference was statistically not significant with P value 0.859.

A total of 69 patients (12.64 %) developed SSIs. In group A, the SSIs incidence was 26 (4.76 %) on post-operative day (pod) 3, 11 (2.01 %) on pod 5, 2 (0.37 %) on pod 7, 10 and 1 (0.18 %) on pod 30. In group B; the SSI incidence was 43 (7.88 %) on pod 3, 18 (3.3 %) on pod 5, 5 (0.92 %) on pod 7, 3 (0.55 %) on pod 10 and 2 (0.37 %) on pod 30.

Table-1: Findings

	surgical site infection		no infection		total	
	no. of patients	percentage	no. of patients	percentage	no. of patients	percentage
Clean	26	4.76%	162	29.67%	188	34.43%
Triclosan coated polyglactin 910	11	2.01%	68	12.45%	79	14.47%
plain polyglactin 910	15	2.75%	94	17.22%	109	19.96%
clean-contaminated	6	1.10%	28	5.13%	34	6.23%
Triclosan coated polyglactin 910	1	0.18%	10	1.83%	11	2.01%
plain polyglactin 910	5	0.92%	18	3.30%	23	4.21%
Contaminated	11	2.01%	244	44.69%	255	46.70%
Triclosan coated polyglactin 910	5	0.92%	141	25.82%	146	26.74%
plain polyglactin 910	6	1.10%	103	18.86%	109	19.96%
Dirty	26	4.76%	43	7.88%	69	12.64%
Triclosan coated polyglactin 910	9	1.65%	28	5.13%	37	6.78%
plain polyglactin 910	17	3.11%	15	2.75%	32	5.86%
Total	69	12.64%	477	87.36%	546	100.00%

In group A average duration of hospital stay was 4.32 days while in group B, that was 4.84 days. The P value was 0.013.

Table-2 : Hospital Stay

suture material	average duration of hospital stay (mean)	SD	P value
Triclosan coated polyglactin 910	4.32 days	2.16	0.013
plain polyglactin 910	4.84 days	2.7	

DISCUSSION

Surgical site infections remain a major burden in healthcare sector. This requires more research to find new innovative ways of reducing it. Decreasing the risk for surgical site infection requires a multifaceted approach. The purpose of this study was to evaluate the effectiveness of triclosan coated polyglactin 910 suture in reducing the rate of superficial surgical site infections.

The addition of Triclosan to polyglactin 910 suture does not affect the physical handling properties or performance characteristics like the ease of passage through tissues, first throw knot holding, knot security and so on.

A study proved that treating polyglactin 910 with Triclosan was an effective strategy in decreasing surgical site infection by proving decreased adherence of both Gram positive and Gram negative bacteria to Triclosan coated suture material.

There was no associated experimental chronic or major adverse target organ toxicity, carcinogenicity or potential for mutagenic, clastogenic

or teratogenic effects. There was no adverse effects on male or female fertility, or endocrine function noted during pharmacokinetic studies.

CONCLUSION

The study compared various outcomes after closure of sub cutaneous tissue of surgical wounds with triclosan coated and uncoated polyglactin 910 sutures. The majority of patients were from 20-29 years age group. The male to female patients' ratio was 2:1. The most common ailment was appendicitis and the most common operative procedure was appendectomy.

The rate of SSI in sutured wound in hypertensive patient was significantly lower in patients where Triclosan coated polyglactin 910 was used. There was no difference in rate of SSI in sutured wound in diabetic patients. The rate of SSI in sutured wound was significantly lower ($p = 0.028$) in patients where Triclosan coated polyglactin 910 (15.75 %) was used than in patients where plain polyglactin 910 (9.52 %) was used. The clean, clean contaminated and contaminated wounds had no difference in rate of SSI, when tissue closure was done either by Triclosan coated or plain polyglactin 910. The dirty wound had significantly reduced rate of surgical site infection when subcutaneous tissue closure was done by Triclosan coated polyglactin 910 as compared to that of plain polyglactin 910.

REFERENCES

- C.D.C (1999). National nosocomial infections surveillance (NNIS) System Report, Data Summary from January 1990 - May 1999. Am. J. Infect. Control. 27: 520-532.
- Kamat US, Ferreira AM, Kulkarni MS, Motghare DD. A prospective study of surgical site infections in a teaching hospital in Goa. Indian J Surg 2008; 70: 120-4.
- Subramanian KA, Prakash A, Shriniwas, Bhujwala RA. Postoperative wound infection. Ind J Surg 1973; 57-64.
- Ganguly PS, Khan Y, Malik A. Nosocomial infection and hospital procedures. Indian J Common Med 2000; 990-1014.
- Bhatia JY, Pandey K, Rodriguez C, Mehta A, Joshi VR. Postoperative wound infection in patients undergoing coronary artery bypass graft surgery: A prospective study with evaluation of risk factors. Indian J Med Microbiol 2003; 21: 246-51.
- Pawar M, Mehta Y, Ansari A, Nair R, Trehan N. Nosocomial infections and balloon counter-pulsation: Risk factors and outcome. Asian Cardiovasc Thorac Ann 2005; 13: 316-20.
- Murthy R, Sengupta S, Maya N, Shivananda PG. Incidence of post-operative wound infection and their antibiogram in a teaching and referral hospital. Indian J Med Sci 1998; 52: 553-5.
- Henry-Stanley MJ, Hess DJ, Barnes AM, Dunny GM, Wells CL. Bacterial contamination of surgical suture resembles a bio-film. Surg Infect. 2010 Oct; 11 (5): 433-9.
- Heath RJ, Rubin JR, Holland DR, Zhang E, Snow ME, Rock CO (1999). Mechanism of triclosan inhibition of bacterial fatty acid synthesis. J. Biol. Chem. 274 (16): 11110-4.
- Fujita T. Antibiotic-coated surgical sutures against surgical site infection. Surgery 2010; 147: 464-5.
- Zorrilla LM, Gibson EK, Jeffy SC, Crofton KM, Setzer WR, Cooper RL, Stoker TE. The effects of triclosan on puberty and thyroid hormones in male rats. Toxicol Sci 2009; 107: 56-64.
- Wolff MS, Teitebaum SL, Pinney SM, Windham G, Liao L, Biro F, Khushi LH, Erdman C, Hiatt RA, Rybak ME, Calafat AM. Breast cancer and environment research centers. Investigation of relationships between urinary biomarkers of phyto-estrogens, phthalates and phenols and pubertal stage in girls. Environmental health perspectives. 2010; 9: 19-22.
- Barblot TA. Chemistry and safety of triclosan and its use as an antimicrobial coating on coated Vicryl Plus antibacterial sutures. Surg infect 2002; 3 (suppl 1): S45-53.
- Deliaert AE, Van den kerchove E, Tuinder S, Fieuws S, Sawor JH, Meesters-Caberg MA, Van de hulst RR. The effect of triclosan coated sutures in wound healing. A double blind randomized prospective pilot study. J Plast Reconstr Aesthet Surg 2009; 62: 771-3.
- Justinger C, Moussavian MR, Schlueter C, Kopp B, Kollmar O, Schiling MK. Antibacterial coating of abdominal closure sutures and wound infection. Surgery 2009; 145: 330-4.
- Marco F, Vallez, R Gonzalez P, Ortega L, De la lama J, Lopez-Duran L. Study of the efficacy of coated Vicryl plus antibacterial suture in an animal model of orthopedic surgery. Surg infect 2007; 8: 359-65.
- Gray D, Barrett S, Bhattacharya, Butcher M, Enoch S, Fumertola S, Stephen-Haynes J, Edwards Jones V, Leaper D, Strohal R, White R, Wicks G, Young TPHM band and its potential contribution to wound management. Wounds UK 2010; 6:40-6.
- Bailey IS, Karran SE, Toyn K, Brough P, Ranaboldo C, Karran SJ. Community surveillance of complications after hernia surgery. BMJ 1992; 304 (6825): 469-71.