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Comparing The Eeficacy Of Triclosan Coated Sutures Versus Chlorhexidine Sutures In Preventing Surgical Site Infection: A Prospective Split Mouth Study

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Abstract
The aim of the present study was to evaluate the efficacy of triclosan coated sutures and the chlorhexidine sutures in preventing the surgical site infections. This study was conducted on 20 patients based on the inclusion and exclusion criterion. It was concluded that both triclosan and chlorhexidine impregnated polyglactin sutures have a significant ability in preventing surgical site infection. However, chlorhexidine sutures showed reduced infection rates, erythema and trismus as compared to triclosan sutures in healthy patients undergoing surgical removal of third molar under local anaesthesia. Therefore, their use in various intraoral procedures for effective control of inflammatory and infectious conditions should be highlighted.

Keywords: *Triclosan impregnated polyglactin sutures; chlorhexidine diacetate-impregnated polyglactin sutures; infection; erythema; swelling; pain; trismus.*

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I. Introduction

Surgical site infections (SSIs) are infections of tissues, organs, or spaces exposed by surgeons during performance of an invasive procedure. SSIs are the second most frequent nosocomial infection, after urinary tract infection.[1,2] Global incidence rates of SSIs vary from 4.5% to 20%, depending on the region and facilities available and 12.5% to 17.7% in India according to one study Suture materials used for treating wounds were originally natural materials, such as animal tendons and cotton fibres. Usage of these materials often resulted in severe infections. Sterilisation reduced these complications significantly. However, sutures are still foreign materials, which tend to attract bacteria. Postoperative wound infections are still the second most common perioperative complication. In view of this risk of infection, much recent academic and industrial research in this area has focused on avoiding bacterial colonisation of medical materials from the beginning, especially using antibacterial coating.[5]

Suture materials used during surgery carry risk of postoperative wound infections and associated complications like bone infection, organ abscess, bacteraemia, endocarditis, sepsis [5-7]. Evidence suggests that the suture knot may act as a nidus or scaffold for bacterial colonization and replication that can ultimately result in SSI [8]. It has also been hypothesized that a certain “wicking” phenomenon, occurring more frequently with braided or multifilament suture materials, could be responsible for the diffusion of the infection in the wound [9.]

Various studies indicate that the incidence of postoperative infections following the surgical removal of third molar ranges from 1 to 5.8% and the routine use of antibiotics is not a necessity for the prevention of such a low incidence of infection [10]. Antibiotic resistance is currently a serious concern, and it is estimated that 6–7% of patients who are given antibiotics have some kind of adverse reaction to it [10.] But as most patients may lack confidence in their surgeon who do not prescribe antibiotics, clinicians at times are forced to prescribe antibiotics following the procedure [11.]

Recent research has been focusing on avoiding bacterial colonization of sutures by using various antibacterial coating. An antibacterial coating may prevent the adherence of bacteria on medical materials, but it is not possible to kill bacteria that adhere to suture materials, once a biofilm has formed [12.] The presence of antibacterial coatings on sutures is thought to prevent delay in wound healing by limiting the ability of these opportunistic microbes to adhere on the sutures [13.]

Among antimicrobials, triclosan and chlorhexidine have a broad antibacterial spectrum as well as high biocompatibility indices.

The search for a more appropriate suture material has resulted in various commercially available newer materials, like Triclosan, an antibacterial coated polyglactin 910 (vicryl plus*, Johnson and Johnson limited, India) and

Chlorhexidine, an antibacterial coated polyglactin 910 (3-0) (PECTRYL®CS, Dolphin suture) which replace the conventional method of administering antibiotic in routine third molar surgeries and help in

maximising antimicrobial benefits locally and reducing antibiotic load systemically and the complications that follow [14]. With a rich case bank established over 3 decades we have been able to publish extensively in our domain [15–25.] Based on this inspiration we aim to evaluate the efficacy of triclosan coated sutures versus chlorhexidine coated sutures in preventing surgical site infection after removal of an impacted mandibular third molar.

II. Materials And Methods

Study Settings: The comparative study was done on atleast 20 healthy individuals both male and female who will visit Department of Oral and Maxillofacial surgery at PDM College of Dental sciences, Bahadurgarh for two minor oral surgical procedures in different quadrants, after research and ethical committee clearance from the institute.

Duration of study: Study was conducted during the period of April 2022 to March 2024.

Sample Selection/Source of Data: This clinical research was done on atleast 20 healthy individuals both male and female who will visit Department of Oral And Maxillofacial surgery at PDM College of Dental sciences, Bahadurgarh

Inclusion Criteria:
a) Healthy individuals above 18 years of age
b) Patients indicated for two minor oral surgical procedures in different quadrants
c) Patients with no prior signs of local clinical infection or pain with adequate mouth opening and normal TMJ function.

Exclusion Criteria:
a) Patients on drugs that might alter the course of study and affect the healing of the surgical site, e.g. aspirin, NSAIDS, steroids, and cytotoxic drugs.
b) Patients who have taken antibiotics prior, in a span of 2-3 weeks for any head and neck infections or upper respiratory tract(penicillin/cephalosporin)
c) Patients with known allergic reactions to chlorohexidine, beta -lactams and cephalosporins.
d) Patients lost to follow-up.
e) Pregnancy and lactating mothers or oral contraceptives.
f) Patients with poor oral hygiene
g) Patients under radiotherapy or chemotherapy
h) Chronic smoker

Sample Size: This clinical research was done on 20 healthy individuals both male and female requiring minor oral surgical procedures in the two different quadrants of the same individual.

The patients chosen as per the above inclusion and exclusion criteria will be the study subjects. The antimicrobial triclosan- impregnated polyglactin suture and the diacetate chlorhexidine-impregnated polyglactin suture will be used.
1. GROUP A: Individual who were given triclosan-impregnated 3-0 polyglactin sutures in simple interrupted sutures
2. GROUP B: Individuals who were given antimicrobial chlorhexidine diacetate-impregnated 3-0 polyglactin sutures in a simple interrupted fashion.

Sampling Technique: The individuals selected for the study was explained about the procedure and written consent will be taken. Ethical clearance was obtained from the institution. Preoperative investigations was done which includes Blood investigations: Hb (haemoglobin), BT (Bleeding Time), CT (Clotting Time) and Radiographic investigations: IOPA (intra oral periapical)/OPG(Orthopantomography) if indicated. In our prospective study, we included 20 individuals with 40 surgical sites who were indicated to undergo minor surgical procedure under local anaesthesia at our limit.

The patients were divided into two groups for the study.
1) GROUP 1: Individuals who were given antimicrobial triclosan-impregnated 3-0 polyglactin sutures in simple interrupted sutures
2) GROUP 2: Individuals who were given antimicrobial chlorhexidine-impregnated 3-0 polyglactin sutures in a simple interrupted fashion.

Evaluation was done on 0, 3rd and 7th days. Post operative instructions was given. On 7th day, sutures will be removed and suture specimen was send for microbiological evaluation.

Data Collection Procedure- All patients chosen for the study were prepared in standard aseptic conditions and the cases were operated utilising incisions and procedural step. Following the surgical procedure, adequate curettage, debridement, thorough irrigation and wound was closed with triclosan-impregnated (3-0) polyglactin or chlorhexidine diacetate-impregnated (3–0) polyglactin. They were given saline mouthwashes postoperatively for 7 days to be used thrice daily after the procedure.

The data was collected on the basis of certain parameters recorded during and after surgery. These parameters include abnormal erythema, postoperative pain and swelling. Microbiological evaluation was done including microbial growth along with no of colonies grown in media.

III. Observation And Result

Data was analysed using Statistical Package for Social Sciences (SPSS) version 21, IBM Inc. Descriptive data was reported for each variable. Summarised data was presented using Tables and Graphs. Data was not normally distributed as tested using the Shaperio-Wilk W test (p-value was less than 0.05) FOR VAS and erythema scores. Wilcoxon signed rank test (2 groups), and Fried mann test (3 or more) was used for dependent groups. For swelling, CFU. Repeated measures of anova and paired t test were used.A level of $p<0.05$ was considered statistically significant.

Demographic Details Of The Patients

TABLE 1: Mean ± SD age years of the patients according to Gender

AGE	SEX	N=20	Mean	Std. Deviation
	MALES	12	27	6.71
	FEMALES	8	28	4.84
P value			0.989, ns	

Independent t-test, level of significance set at $p < 0.05$

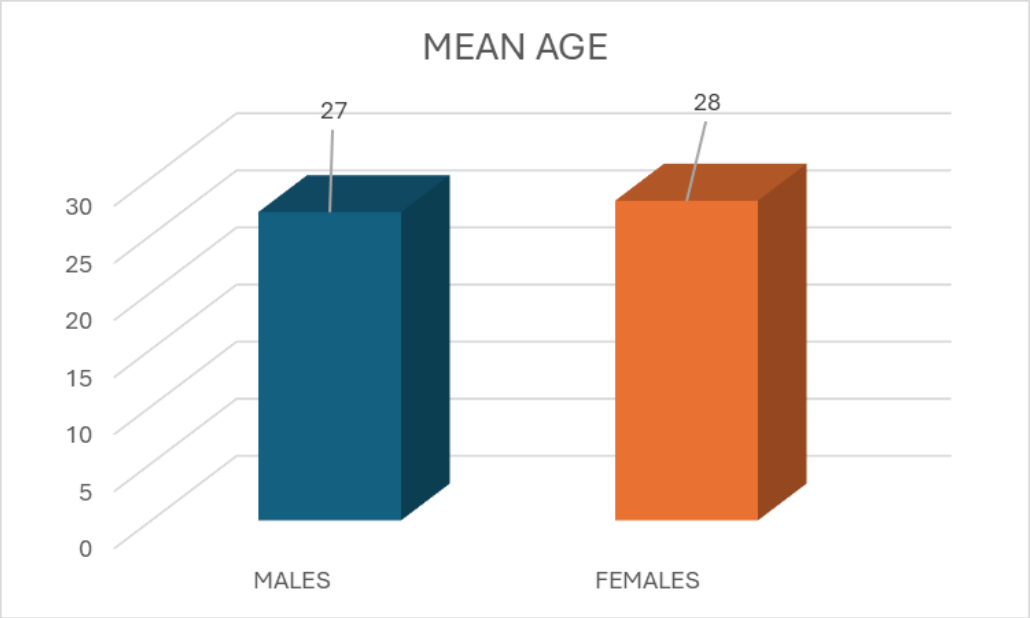


FIGURE 1: Mean ± SD age years of the patients according to Gender

Table 1 and Figure 1: The Mean ± SD age of the patient males was 27 ± 6.71 years, and females were 28 ± 4.84 years. It was non-significant.

Table 2: Distribution Of Patients According To Dressing At The Surgical Site

		N	%
GROUP A	Individuals who were given triclosan-impregnated 3-0 polyglactin sutures in simple interrupted sutures	20	100
GROUP B	Individuals who were given antimicrobial chlorhexidine diacetate impregnated 3-0 polyglactin sutures in a simple interrupted fashion.		

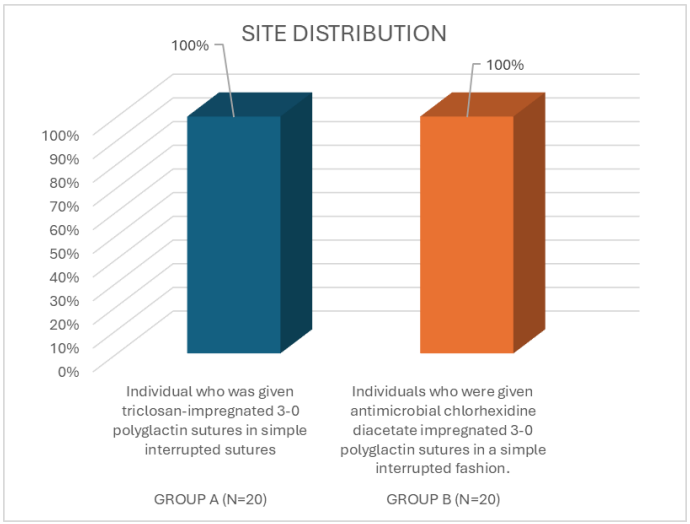


Figure 2: Distribution Of Patients According To Two Types Of Different Antibacterial Coated Sutures In Preventing Surgical Site Infection

Table 2 and Figure 2: This was a split-mouth study, with the same patients receiving both treatments at different follow-up visits with 20 SITES.

Table 3: Comparison Of Vas Scores Among Two Groups: Intra Group

	GROUP A		GROUP B	
	Mean	SD	Mean	SD
Pre-op (n=20)	6.6	1.2312	6.1	1.2937
Post-op Day 3 (n=20)	2.3	0.8645	1.7	0.8013
Post-op Day 7 (n=20)	0.95	0.8256	0.4	0.5026
P Value	0.001*, sig		0.001*, sig	
POST HOC	Post-op Day 7< post-op Day 3, Pre-op		Post-op Day 3< post-op Day 1, Pre-op	
FRIED MAN TEST, WILCOXON SIGNED-RANK TEST LEVEL OF SIGNIFICANCE SET AT P ≤ 0.05 SIG: SIGNIFICANT				

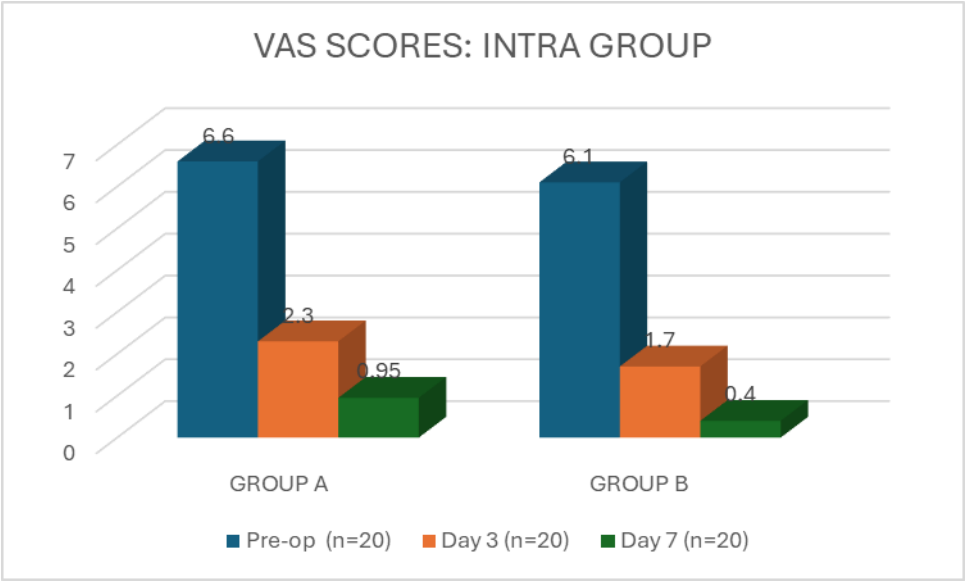


Table 3 and Figure 3: The Visual Analog Scale (VAS) scores were compared between Group A and Group B at three different time points: pre-operatively, postoperative day 3, and postoperative day 7.

For Group A, the pre-operative mean VAS score was 6.6 (SD = 1.23), significantly decreasing by postoperative day 3 to a mean of 2.3 (SD = 0.86). By postoperative day 7, the mean VAS score declined to 0.95 (SD = 0.83). The P-value for these comparisons was 0.001, indicating a statistically significant reduction in VAS scores over time within Group A.

Similarly, in Group B, the preoperative mean VAS score was 6.1 (SD = 1.29). This score also significantly decreased by postoperative day 3 to a mean of 1.7 (SD = 0.80). By postoperative day 7, the mean VAS score further dropped to 0.4 (SD = 0.50). The P-value for Group B was also 0.001, reflecting a significant reduction in VAS scores over time.

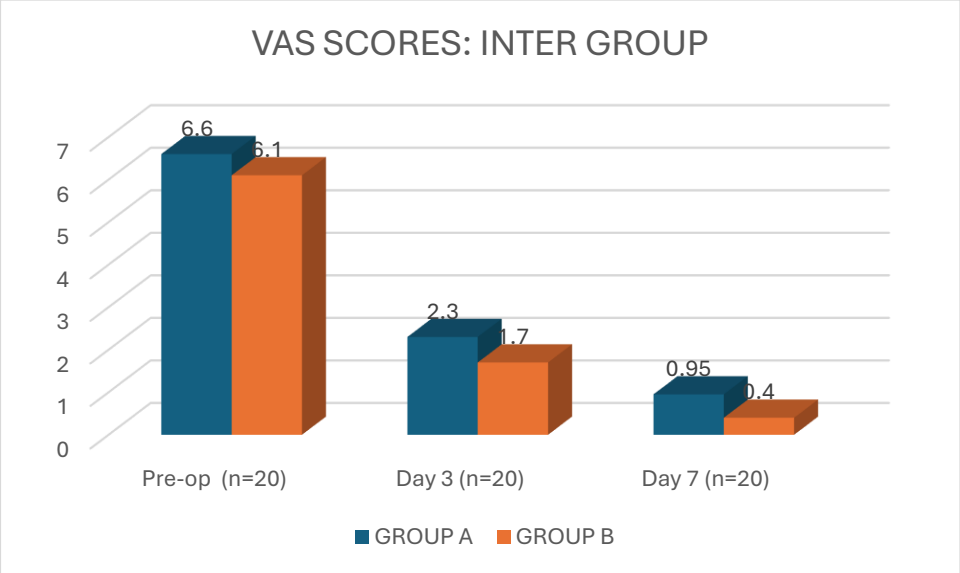
Post hoc analysis revealed that, in both groups, the VAS scores on postoperative day 7 were significantly lower than those on postoperative day 3 and the pre-operative period. Additionally, the VAS scores on postoperative day 3 were significantly lower than the pre-operative scores.

Both Group A and Group B showed significant reductions in pain levels, as measured by VAS scores, from the pre-operative period through postoperative day 7, with statistically significant differences observed at each time point. The use of the Friedman test confirmed that these changes were substantial, with a significance level set at $P \leq 0.05$.

Table 4: Comparison Of Vas Scores Among Two Groups: Inter-Group

	GROUP A		GROUP B		P VALUE
	Mean	SD	Mean	SD	
Pre-op (n=20)	6.6	1.2312	6.1	1.2937	0.218, NS
Post-op Day 3 (n=20)	2.3	0.8645	1.7	0.8013	0.029*, SIG
Post-op Day 7 (n=20)	0.95	0.8256	0.4	0.5026	0.014*, SIG

Wilcoxon Signed-Rank Test
Level Of Significance Set At $P \leq 0.05$
Sig: Significant



The inter-group comparison of Visual Analog Scale (VAS) scores between Group A and Group B at different time points—pre-operatively, postoperative day 3, and postoperative day 7—revealed significant findings.

Pre-operatively, Group A had a mean VAS score of 6.6 (SD = 1.23), while Group B had a mean VAS score of 6.1 (SD = 1.29). The P-value of 0.218 indicates no significant difference between the two groups at this initial time point.

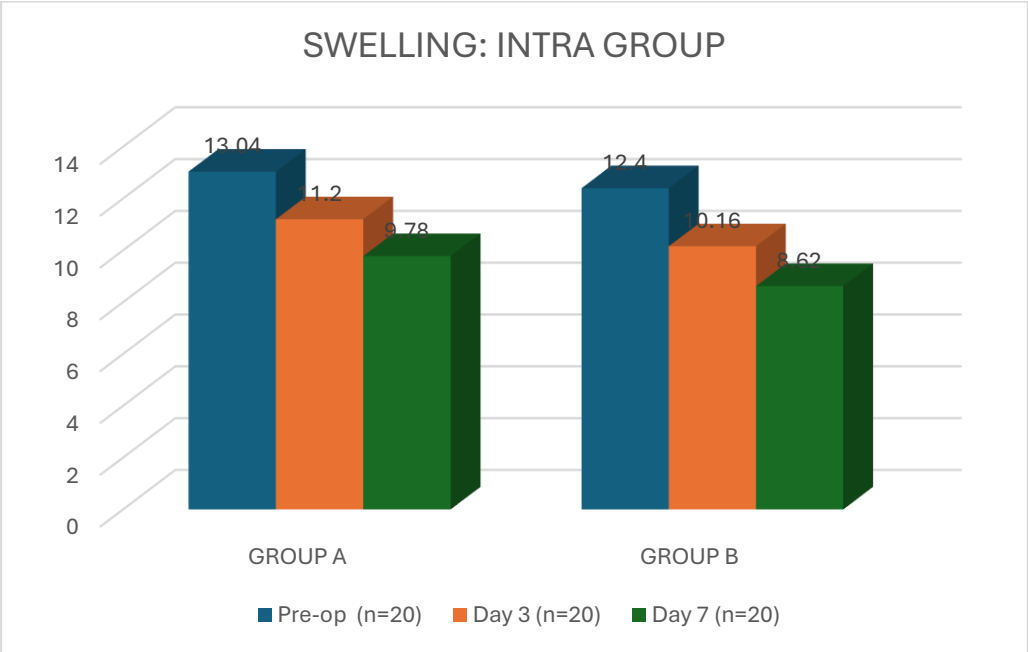
On postoperative day 3, the mean VAS score for Group A decreased to 2.3 (SD = 0.86), while Group B's mean score decreased to 1.7 (SD = 0.80). The P-value for this comparison was 0.029, indicating a statistically significant difference between the two groups, with Group B showing lower pain levels.

By postoperative day 7, the mean VAS score in Group A further decreased to 0.95 (SD = 0.83); in Group B, it decreased to 0.4 (SD = 0.50). The P-value for this comparison was 0.014, again showing a significant difference between the two groups, with Group B continuing to exhibit lower pain levels than Group A.

In summary, while there was no significant difference in pre-operative VAS scores between the two groups, Group B experienced significantly lower VAS scores post-operatively on both day three and day seven compared to Group A. This suggests that Individuals who were given antimicrobial chlorhexidine diacetate impregnated 3-0 polyglactin sutures in a simple interrupted fashion. May be more effective in reducing post-operative pain

Table 5: Comparison Of Swelling Among Two Groups: Intra Group

	Group A		Group B	
	Mean	Sd	Mean	Sd
Pre-Op (N=20)	13.04	1.18	12.40	1.26
Post-Op Day 3 (N=20)	11.20	0.77	10.16	1.23
Post-Op Day 7 (N=20)	9.78	0.79	8.62	1.01
P Value	0.001*, Sig		0.001*, Sig	
Post Hoc	Post-Op Day 7< Post-Op Day 3, Pre-Op		Post-Op Day 3< Post-Op Day 1, Pre-Op	
Repeated Measures Of Anova, Paired T Test Level Of Significance Set At $P \leq 0.05$ Sig: Significant				



The intra-group comparison of swelling between Group A and Group B was conducted at three different time points: pre-operatively, on post-operative day 3, and on post-operative day 7.

In Group A, the mean swelling measurement was 13.04 (SD = 1.18) pre-operatively. This significantly decreased by post-operative day 3 to 11.20 (SD = 0.77), and further reduced by post-operative day 7 to 9.78 (SD = 0.79). The P-value for these changes was 0.001, indicating a statistically significant reduction in swelling over time within Group A.

Similarly, in Group B, the mean swelling measurement was 12.40 (SD = 1.26) pre-operatively. On post-operative day 3, the mean swelling decreased significantly to 10.16 (SD = 1.23), and by post-operative day 7, it further reduced to 8.62 (SD = 1.01). The P-value for Group B was also 0.001, reflecting a significant reduction in swelling over time.

Post hoc analysis revealed that, in both groups, the swelling on post-operative day 7 was significantly lower than on post-operative day 3 and the pre-operative period. Additionally, the swelling on post-operative day 3 was significantly lower than in the pre-operative period.

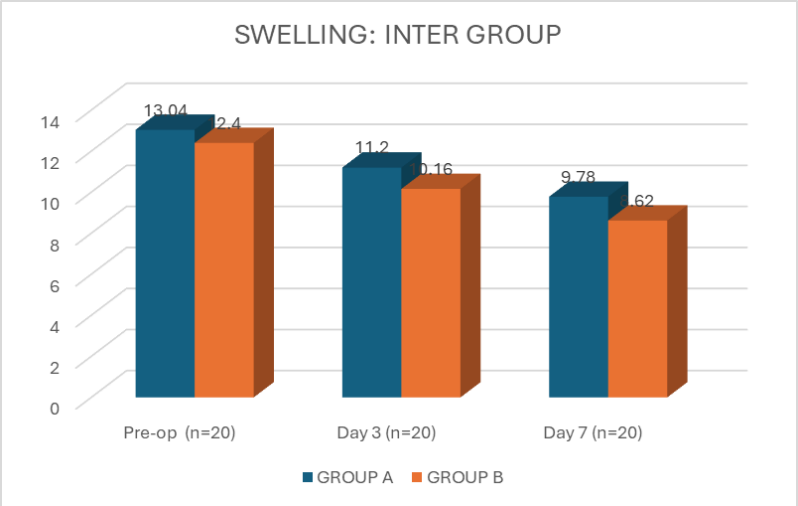
Overall, both Group A and Group B demonstrated a significant reduction in swelling from the pre-operative period through post-operative day 7, with statistically significant differences observed at each time

point. These results were confirmed using the repeated measures of anova and paired t test, with the level of significance set at P ≤ 0.05.

Table 6: Comparison Of Swelling Among Two Groups: Inter-Group

	Group A		Group B		P Value
	Mean	Sd	Mean	Sd	
Pre-Op (N=20)	13.04	1.18	12.40	1.26	0.103, Ns
Post-Op Day 3 (N=20)	11.20	0.77	10.16	1.23	0.003*, Sig
Post-Op Day 7 (N=20)	9.78	0.79	8.62	1.01	0.001*, Sig

Paired T Test
Level Of Significance Set At P ≤ 0.05
Sig: Significant



The inter-group comparison of swelling between Group A and Group B was evaluated at three different time points: pre-operatively, on post-operative day 3, and on post-operative day 7.

Pre-operatively, Group A had a mean swelling measurement of 13.04 (SD = 1.18), while Group B had a mean of 12.40 (SD = 1.26). The P-value for this comparison was 0.103, indicating no statistically significant difference in swelling between the two groups before the surgery.

On post-operative day 3, the mean swelling in Group A decreased to 11.20 (SD = 0.77), whereas in Group B, it decreased to 10.16 (SD = 1.23). The P-value for this comparison was 0.003, indicating a statistically significant difference between the two groups, with Group B experiencing less swelling.

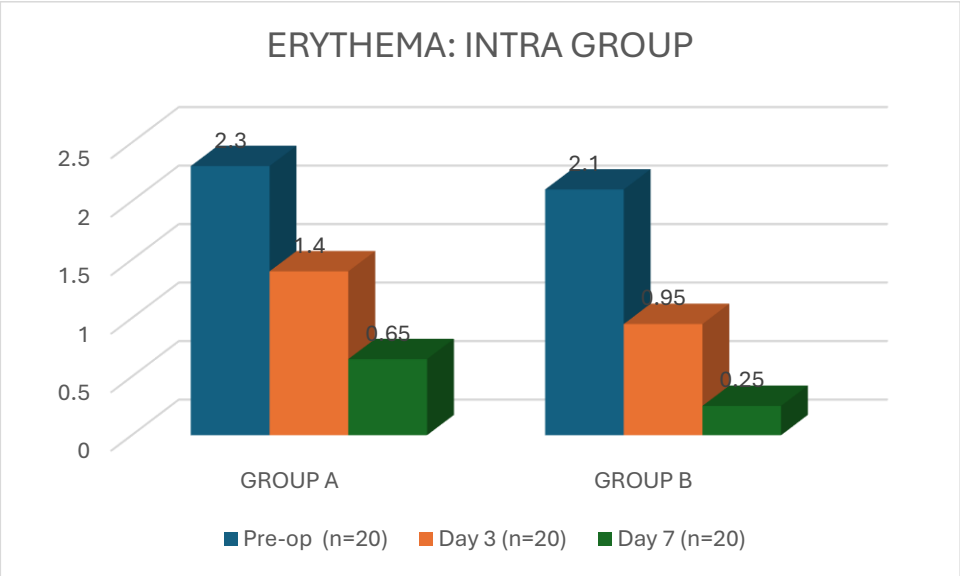
By post-operative day 7, the mean swelling in Group A further reduced to 9.78 (SD = 0.79), while in Group B, it decreased to 8.62 (SD = 1.01). The P-value for this time point was 0.001, showing a significant difference between the groups, with Group B continuing to show lower swelling compared to Group A.

In summary, although there was no significant difference in swelling between Group A and Group B pre-operatively, Group B exhibited significantly less swelling compared to Group A on both post-operative day 3 and post-operative day 7. These results were validated using the paired t test, with the level of significance set at P ≤ 0.05.

Table 8: Comparison Of Erythema Among Two Groups: Intra Group

	GROUP A		GROUP B	
	Mean	SD	Mean	SD
Pre-op (n=20)	2.30	0.57	2.10	0.64
Post-op Day 3 (n=20)	1.40	0.50	0.95	0.51
Post-op Day 7 (n=20)	0.65	0.67	0.25	0.44
P Value	0.001*, sig		0.001*, sig	
POST HOC	Post-op Day 7< post-op Day 3, Pre-op		Post-op Day 3< post-op Day 1, Pre-op	

FRIED MAN TEST, WILCOXON SIGNED-RANK TEST
LEVEL OF SIGNIFICANCE SET AT P ≤ 0.05
SIG: SIGNIFICANT



The intra-group comparison of erythema between Group A and Group B was assessed at three time points: pre-operatively, on post-operative day 3, and on post-operative day 7.

In Group A, the mean erythema score was 2.30 (SD = 0.57) pre-operatively. This score significantly decreased to 1.40 (SD = 0.50) by post-operative day 3, and further reduced to 0.65 (SD = 0.67) by post-operative day 7. The P-value for these changes was 0.001, indicating a statistically significant reduction in erythema over time within Group A.

Similarly, in Group B, the mean erythema score was 2.10 (SD = 0.64) pre-operatively. By post-operative day 3, this score decreased significantly to 0.95 (SD = 0.51), and by post-operative day 7, it further declined to 0.25 (SD = 0.44). The P-value for Group B was also 0.001, reflecting a significant reduction in erythema over time.

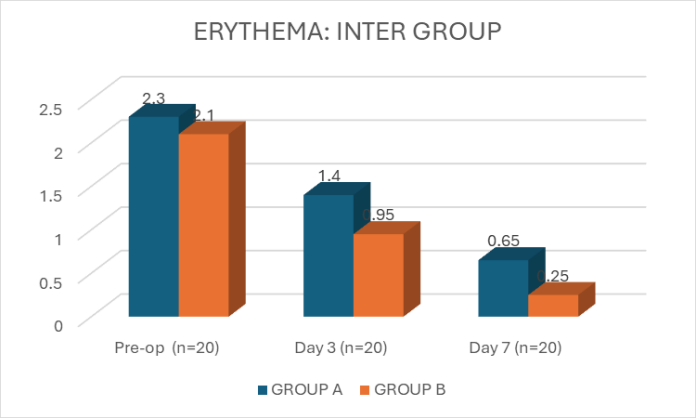
Post hoc analysis indicated that, in both groups, the erythema on post-operative day 7 was significantly lower than on post-operative day 3 and the pre-operative period. Additionally, the erythema on post-operative day 3 was significantly lower than in the pre-operative period.

In conclusion, both Group A and Group B showed a significant reduction in erythema from the pre-operative period through post-operative day 7, with statistically significant differences observed at each time point. The use of the Friedman test and Wilcoxon signed-rank test confirmed the significance of these changes, with the level of significance set at P ≤ 0.05.

Table 9: Comparison Of Erythema Among Two Groups: Inter-Group

	Group A		Group B		P Value
	Mean	Sd	Mean	Sd	
Pre-Op (N=20)	2.30	0.57	2.10	0.64	0.304, Ns
Post-Op Day 3 (N=20)	1.40	0.50	0.95	0.51	0.008*, Sig
Post-Op Day 7 (N=20)	0.65	0.67	0.25	0.44	0.032*, Sig

Wilcoxon Signed-Rank Test
Level Of Significance Set At P ≤ 0.05
Sig: Significant



The inter-group comparison of erythema between Group A and Group B was evaluated at three different time points: pre-operatively, on post-operative day 3, and on post-operative day 7.

Pre-operatively, Group A had a mean erythema score of 2.30 (SD = 0.57), while Group B had a mean score of 2.10 (SD = 0.64). The P-value for this comparison was 0.304, indicating no statistically significant difference between the two groups before surgery.

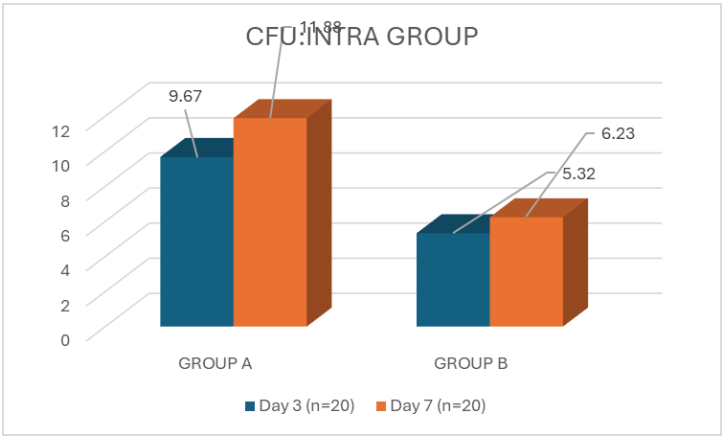
On post-operative day 3, the mean erythema score in Group A decreased to 1.40 (SD = 0.50), while in Group B, it decreased more significantly to 0.95 (SD = 0.51). The P-value for this comparison was 0.008, indicating a statistically significant difference between the two groups, with Group B showing a greater reduction in erythema.

By post-operative day 7, the mean erythema score in Group A further decreased to 0.65 (SD = 0.67), whereas in Group B, it decreased to 0.25 (SD = 0.44). The P-value for this comparison was 0.032, again showing a significant difference between the groups, with Group B continuing to exhibit lower erythema levels compared to Group A.

In summary, while there was no significant difference in erythema levels between Group A and Group B pre-operatively, Group B demonstrated significantly lower erythema levels on both post-operative day 3 and post-operative day 7. These findings were confirmed using the Wilcoxon signed-rank test, with the level of significance set at $P \leq 0.05$. This suggests that the treatment applied to Group B may have been more effective in reducing erythema compared to Group A.

Table 10: Comparison Of Colony Forming Unit Among Two Groups: Intra Group

	GROUP A		GROUP B	
	Mean	SD	Mean	SD
Post-op Day 3 (n=20)	9.67	4.97	5.32	4.65
Post-op Day 7 (n=20)	11.88	4.86	6.23	4.85
P Value	0.001*, sig Post-op Day 7> post-op Day 3		0.061,ns	
PAIRED T TEST LEVEL OF SIGNIFICANCE SET AT $P \leq 0.05$ SIG: SIGNIFICANT				



The intra-group comparison of colony-forming units (CFUs) in Group A and Group B was analyzed at two post-operative time points: day 3 and day 7.

In Group A, the mean CFU count on post-operative day 3 was 9.67 (SD = 4.97). By post-operative day 7, the mean CFU count significantly increased to 11.88 (SD = 4.86). The P-value for this comparison was 0.001, indicating a statistically significant increase in CFUs from day 3 to day 7 within Group A.

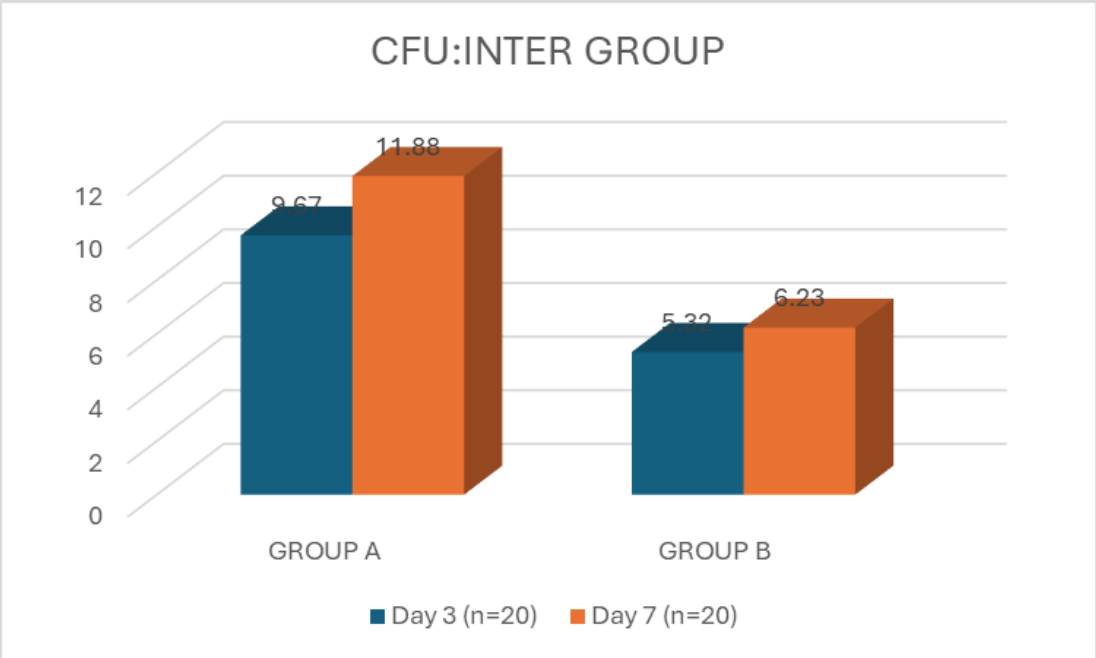
Similarly, in Group B, the mean CFU count on post-operative day 3 was 5.32 (SD = 4.65). By post-operative day 7, this count also increased to 6.23 (SD = 4.85). The P-value for this change was 0.061, demonstrating a non significant rise in CFUs from day 3 to day 7 within Group B.

In conclusion, Group A significant increase in CFU counts between post-operative day 3 and day 7. These findings were validated using the paired t test, with a level of significance set at $P \leq 0.05$. This suggests a notable rise in bacterial colony formation over time in both groups.

Table 11: Comparison Of Colony Forming Unit Among Two Groups: Inter-Group

	Group A		Group B		P Value
	Mean	Sd	Mean	Sd	
Post-Op Day 3 (N=20)	1.40	0.50	0.95	0.51	0.007*, Sig
Post-Op Day 7 (N=20)	0.65	0.67	0.25	0.44	0.001*, Sig

Wilcoxon Signed-Rank Test
Level Of Significance Set At $P \leq 0.05$
Sig: Significant



The inter-group comparison of colony-forming units (CFUs) between Group A and Group B was assessed at two post-operative time points: day 3 and day 7.

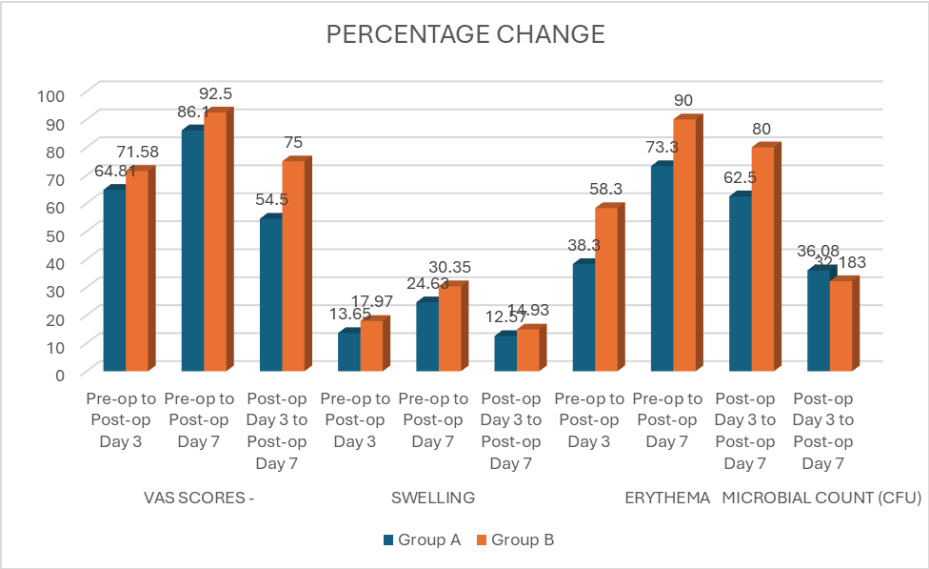
On post-operative day 3, Group A had a mean CFU count of 1.40 (SD = 0.50), while Group B had a lower mean CFU count of 0.95 (SD = 0.51). The P-value for this comparison was 0.007, indicating a statistically significant difference between the two groups, with Group B showing fewer CFUs than Group A.

By post-operative day 7, the mean CFU count in Group A decreased to 0.65 (SD = 0.67), whereas in Group B, it decreased further to 0.25 (SD = 0.44). The P-value for this comparison was 0.001, again showing a significant difference between the groups, with Group B continuing to exhibit a lower CFU count compared to Group A.

In summary, Group B demonstrated significantly lower CFU counts compared to Group A on both post-operative day 3 and day 7. These findings suggest that the treatment or intervention applied to Group B was more effective in reducing bacterial colony formation. The differences between the groups were statistically significant, as confirmed by the Wilcoxon signed-rank test, with the level of significance set at $P \leq 0.05$.

Percentage Change From Baseline

	Group A	Group B:
Vas Scores -	Decrease	
Pre-Op To Post-Op Day 3	64.81	71.58
Pre-Op To Post-Op Day 7	86.1	92.5
Post-Op Day 3 To Post-Op Day 7	54.5	75
Swelling	Decrease	
Pre-Op To Post-Op Day 3	13.65	17.97
Pre-Op To Post-Op Day 7	24.63	30.35
Post-Op Day 3 To Post-Op Day 7	12.57	14.93
Erythema	Decrease	
Pre-Op To Post-Op Day 3	38.3	58.3
Pre-Op To Post-Op Day 7	73.3	90
Post-Op Day 3 To Post-Op Day 7	62.5	80
Microbial Count (Cfu)	Increase	
Post-Op Day 3 To Post-Op Day 7	36.08	32.183



In evaluating the percentage change from baseline for both groups, notable trends emerge. For Visual Analog Scale (VAS) scores, which measure pain, both groups experienced a significant reduction over time. Group A reported a 64.81% decrease from pre-operative to Post-op Day 3, and an 86.1% decrease by Post-op Day 7. The decrease from Post-op Day 3 to Post-op Day 7 was 54.5%. Group B showed a larger reduction, with a 71.58% decrease from pre-operative to Post-op Day 3, and a 92.5% decrease by Post-op Day 7. The reduction from Post-op Day 3 to Post-op Day 7 was 75%.

Swelling decreased in both groups, although Group B experienced a higher percentage reduction. Specifically, Group A's swelling decreased by 13.65% from pre-operative to Post-op Day 3 and by 24.63% by Post-op Day 7, with a 12.57% reduction from Post-op Day 3 to Day 7. Group B had a 17.97% decrease from pre-operative to Post-op Day 3 and a 30.35% decrease by Post-op Day 7, with a 14.93% reduction from Post-op Day 3 to Day 7.

Erythema, or redness of the skin, also saw reductions in both groups. Group A exhibited a 38.3% decrease from pre-operative to Post-op Day 3 and a 73.3% decrease by Post-op Day 7, with a 62.5% decrease from Post-op Day 3 to Day 7. Group B showed a larger decrease, with a 58.3% reduction from pre-operative to Post-op Day 3 and a 90% decrease by Post-op Day 7, and an 80% decrease from Post-op Day 3 to Day 7.

Conversely, microbial count (measured in CFU) increased from Post-op Day 3 to Post-op Day 7 for both groups, with Group A showing a 36.08% increase and Group B a 32.18% increase. This indicates a potential rise in microbial presence during the postoperative period.

IV. Discussion

Surgical sutures are used to repair organs and tissues during operations. In planned or elective surgery, a controlled incisional wound is made by the surgeon through the skin to gain access to deeper tissues or organs so that they can perform the required operative procedure (e.g. removing a liver tumour or replacing a knee joint). In emergency surgery where the skin is intact (e.g. emergency laparotomy) the process of incision is similar. For emergency surgery where the skin is broken, such as an open fracture or soft-tissue laceration, an incision may

not always be required to access the injured subcutaneous structures. Instead, the existing traumatic wound may be debrided (damaged tissue removed from the wound) or excised (surgical removal of the wound in its entirety) as the initial part of the operative procedure. Once the operative procedure is complete, the surgeon then uses surgical sutures to reconstruct the tissue layers they have had to cut through to reach the relevant tissues or organs. The surgical wound is closed 'layer-by-layer' finishing with the skin wound closure. The number of layers will depend on the anatomical location of the operation. For example, the abdomen has several layers of tissue between the viscera and the skin, and usually all layers are repaired before the skin is closed. In contrast, the hand has only one layer between the skin and the deeper structures, with only the skin requiring closure with sutures.

A variety of suture materials are available to tackle the variability in surgical wound requirements. Sutures may be absorbable or non-absorbable, braided or a single filament (known as monofilament), and range in gauge as well as chemical and physical properties (Rose 2021). Although many more variations of suture type exist, these four characteristics are fundamental. Antimicrobial sutures consist of surgical sutures that are coated in, or impregnated with, a substance that is toxic to bacteria. Antimicrobial coatings prevent bacterial adherence and proliferation on the suture material by interrupting essential cell mechanisms within the bacterial cells. Several products have been introduced to the market during the past decade, including triclosan-coated polydioxanone antimicrobial sutures (PDS Plus; Ethicon, Johnson & Johnson, Livingston, Scotland, UK; Diener 2014).The vast majority of antimicrobial sutures are coated in triclosan. Triclosan has been in use in healthcare settings since the 1970s but was only introduced as a suture coating in 2002 (De Jonge 2017). It is generally considered a safe product in the context of antimicrobial sutures, and is commonly used in commercial and environmental processes (Barbolt 2002).Triclosan (5-chloro-2 (2, 4-dichlorophenoxyphenol)) is a broad-spectrum antiseptic that is active against both gram-positive and gram-negative bacteria, through interference with microbial lipid synthesis (Bhargava 1996; Jones 2000). This causes reduced bacterial growth and inhibits bacterial colonisation of the suture material, demonstrated in both in-vivo and in-vitro studies (Katz 1981; Ming 2008).Antimicrobial sutures feel and handle the same as standard sutures, which makes double-blind clinical trials feasible.

How the intervention might work

The effect of suture material on the pathogenesis of SSIs was demonstrated in the 1950s, with subsequent historical studies defining its role (Elek 1957). Sutures may be particularly prone to increase the risk of infection in emergency surgical conditions where there is associated tissue damage or devascularised tissue (Edlich 1968). This may explain the reported differences in effectiveness of antimicrobial sutures in emergency versus planned surgery in high quality studies (De Jonge 2017). There are many ways for bacteria to infiltrate in and around a surgical wound, including from normal skin bacterial flora, intestinal contents during emergency bowel surgery, and environmental contamination in open wounds. Although there are innate immune defences against bacterial wound infection, once foreign material, such as surgical sutures, become contaminated with bacteria, these mechanisms fail. This is primarily due to bacterial biofilm formation (Kathju 2014; Mingmalairak 2011). Coating surgical sutures in triclosan inhibits the local growth of bacteria, prevents bacteria from adhering to the surface of the sutures, and prevents bacterial biofilm formation in vitro and in vivo (Edmiston 2004; Ming 2008).There have been numerous randomised controlled trials (RCT) of antimicrobial sutures, with meta-analysis indicating they could reduce SSI risk by around 28% (risk ratio (RR) 0.72, 95% confidence interval (CI) 0.60 - 0.86; I^2 = 30%; De Jonge 2017).

Triclosan is an antimicrobial agent that is commercially used in many products such as soaps, deodorants, shower gels and toothpastes because of its antimicrobial efficacy with low toxicity to humans. Hence, triclosan-coated absorbable suture materials were commercially launched to prevent surgical site infections.[6]

The zone of bacterial inhibition surrounding the knotted sutures using triclosan coated suture material in vitro colonization experiments showed an antimicrobial effect over Staphylococcus aureus and Staphylococcus epidermidis. [39] In vivo studies on triclosan-coated sutures exhibited significant inhibition of bacterial colonies on its surface near the infected site without compromising the mechanical property of the suture.[7]

Chlorhexidine is a widely used antimicrobial in various forms. It has shown high anti-infective efficacy in several studies involving orthopaedic, obstetric , surgical and dental applications [27-30]. Chlorhexidine diacetate is a bisbiguanide compound with a rapid bactericidal activity against both gram-positive and gram negative organisms. The antibacterial effect of chlorhexidine is related to its action on the bacterial cell membrane and precipitation of intracellular contents configuring it with both bactericidal and bacteriostatic properties.[31]

In the present study we have compared the efficacy of triclosan coated sutures (group A) and the chlorhexidine coated sutures (group B). 20 patients were selected from the department based on the inclusion and exclusion. A split mouth study was carried out which includes 40 extraction sites. Three clinical parameters were evaluated for both the groups which included pain, abnormal erythema and swelling post operatively. Patients were evaluated on the day of extraction, at day 3 and at day 7. After suture removal at day 7 a microbiological analysis was done for all the patients.

The inter-group comparison of Visual Analog Scale (VAS) scores between Group A and Group B at different time points—pre-operatively, postoperative day 3, and postoperative day 7—revealed significant findings.

Pre-operatively, Group A had a mean VAS score of 6.6 (SD = 1.23), while Group B had a mean VAS score of 6.1 (SD = 1.29). The P-value of 0.218 indicates no significant difference between the two groups at this initial time point.

On postoperative day 3, the mean VAS score for Group A decreased to 2.3 (SD = 0.86), while Group B's mean score decreased to 1.7 (SD = 0.80). The P-value for this comparison was 0.029, indicating a statistically significant difference between the two groups, with Group B showing lower pain levels.

By postoperative day 7, the mean VAS score in Group A further decreased to 0.95 (SD = 0.83); in Group B, it decreased to 0.4 (SD = 0.50). The P-value for this comparison was 0.014, again showing a significant difference between the two groups, with Group B continuing to exhibit lower pain levels than Group A.

In summary, while there was no significant difference in pre-operative VAS scores between the two groups, Group B experienced significantly lower VAS scores post-operatively on both day three and day seven compared to Group A. This suggests that Individuals who were given antimicrobial chlorhexidine diacetate impregnated 3-0 polyglactin sutures in a simple interrupted fashion. May be more effective in reducing post-operative pain.

The inter-group comparison of swelling between Group A and Group B was evaluated at three different time points: pre-operatively, on post-operative day 3, and on post-operative day 7.

Pre-operatively, Group A had a mean swelling measurement of 13.04 (SD = 1.18), while Group B had a mean of 12.40 (SD = 1.26). The P-value for this comparison was 0.103, indicating no statistically significant difference in swelling between the two groups before the surgery.

On post-operative day 3, the mean swelling in Group A decreased to 11.20 (SD = 0.77), whereas in Group B, it decreased to 10.16 (SD = 1.23). The P-value for this comparison was 0.003, indicating a statistically significant difference between the two groups, with Group B experiencing less swelling.

By post-operative day 7, the mean swelling in Group A further reduced to 9.78 (SD = 0.79), while in Group B, it decreased to 8.62 (SD = 1.01). The P-value for this time point was 0.001, showing a significant difference between the groups, with Group B continuing to show lower swelling compared to Group A.

In summary, although there was no significant difference in swelling between Group A and Group B pre-operatively, Group B exhibited significantly less swelling compared to Group A on both post-operative day 3 and post-operative day 7. These results were validated using the paired t test, with the level of significance set at $P \leq 0.05$.

The inter-group comparison of erythema between Group A and Group B was evaluated at three different time points: pre-operatively, on post-operative day 3, and on post-operative day 7.

Pre-operatively, Group A had a mean erythema score of 2.30 (SD = 0.57), while Group B had a mean score of 2.10 (SD = 0.64). The P-value for this comparison was 0.304, indicating no statistically significant difference between the two groups before surgery.

On post-operative day 3, the mean erythema score in Group A decreased to 1.40 (SD = 0.50), while in Group B, it decreased more significantly to 0.95 (SD = 0.51). The P-value for this comparison was 0.008, indicating a statistically significant difference between the two groups, with Group B showing a greater reduction in erythema.

By post-operative day 7, the mean erythema score in Group A further decreased to 0.65 (SD = 0.67), whereas in Group B, it decreased to 0.25 (SD = 0.44). The P-value for this comparison was 0.032, again showing a significant difference between the groups, with Group B continuing to exhibit lower erythema levels compared to Group A.

In summary, while there was no significant difference in erythema levels between Group A and Group B pre-operatively, Group B demonstrated significantly lower erythema levels on both post-operative day 3 and post-operative day 7. These findings were confirmed using the Wilcoxon signed-rank test, with the level of significance set at $P \leq 0.05$. This suggests that the treatment applied to Group B may have been more effective in reducing erythema compared to Group A.

These results are in accordance with different authors conducted earlier. According to a review study by Zeitler et al., [10] the use of antibiotics tend to show little improvement in trismus. According to the study by Mohan et al. [14] follow up visits showed no statistical difference in patients treated with prophylactic antibiotics compared to those treated with chlorhexidine sutures in relation to trismus. This was in accordance with our study.

There seemed to also be a slight difference in values of abnormal erythema between the groups. According to a study Obermeier et al [41], the chlorhexidine laurate coating (CL11) molecularly similar to chlorhexidine diacetate which is chlorhexidine palmitate, best meets the medical requirements for a fast bacterial eradication. It also has a high drug release during the first clinically most relevant 48 h with a good biocompatibility. The lower incidence of erythema (6.66%) in the chlorhexidine group on the 7th day

postoperatively, could be attributed to this reason which resulted in prevention of biofilm formation over the suture material.

The inter-group comparison of colony-forming units (CFUs) between Group A and Group B was assessed at two post-operative time points: day 3 and day 7.

On post-operative day 3, Group A had a mean CFU count of 1.40 (SD = 0.50), while Group B had a lower mean CFU count of 0.95 (SD = 0.51). The P-value for this comparison was 0.007, indicating a statistically significant difference between the two groups, with Group B showing fewer CFUs than Group A.

By post-operative day 7, the mean CFU count in Group A decreased to 0.65 (SD = 0.67), whereas in Group B, it decreased further to 0.25 (SD = 0.44). The P-value for this comparison was 0.001, again showing a significant difference between the groups, with Group B continuing to exhibit a lower CFU count compared to Group A.

In summary, Group B demonstrated significantly lower CFU counts compared to Group A on both post-operative day 3 and day 7. These findings suggest that the treatment or intervention applied to Group B was more effective in reducing bacterial colony formation. The differences between the groups were statistically significant, as confirmed by the Wilcoxon signed-rank test, with the level of significance set at $P \leq 0.05$.

V. Conclusion

Within the limits of this study,it can be concluded that both triclosan and chlorhexidine impregnated polyglactin sutures have a significant ability in preventing surgical site infection. However, chlorhexidine sutures showed reduced infection rates, erythema and trismus as compared to triclosan sutures in healthy patients undergoing surgical removal of third molar under local anesthesia. Therefore, their use in various intraoral procedures for effective control of inflammatory and infectious conditions should be highlighted.

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