RESEARCH PAPER

Comparative Evaluation of Healing Efficacy Between Bioactive & Triclosan Coated Sutures - A Prospective Study

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ABSTRACT

Sutures serve as nidus for bacterial colonization in oral wounds, increasing surgical site infection risk amid saliva's 7.5×10^8 microbial load/mL. Thus, the aim of our study was to compare healing efficacy of i-PRF-coated bioactive sutures versus triclosan-coated polyglactin sutures in periodontal flap surgery in total of 60 sites (30/group) in 10 chronic periodontitis patients requiring flap surgery post-Phase I therapy. Where, group A received conventional sutures coated with injectable platelet-rich fibrin (i-PRF: 700 rpm, 4 min); Group B received Ethicon Vicryl® Plus using Landry Healing Index for assessing wound healing on day 7 post-suture removal, alongside plaque/gingival/bleeding indices. We have found that, both groups showed satisfactory healing without infections: bioactive sutures (3.87±0.68) vs triclosan-coated (4.10±0.76), p=0.215. Pre-surgical indices were 1.20±0.63 (PI), 1.10±0.32 (GI), 1.10±0.74 (BI). We have come to conclude that, i-PRF-coated sutures demonstrated comparable healing to triclosan-coated sutures, suggesting antibacterial coatings may not significantly enhance periodontal wound healing capacity.

Keywords: i-PRF, Triclosan-Coated Suture, Wound Healing, Antibacterial Coatings, Flap Surgery.

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INTRODUCTION

The success of any surgical intervention largely depends on proper wound closure and the prevention of bacterial contamination at the surgical site during the healing phase.[1] Sutures play an important role in facilitating wound healing by enabling the re-approximation of tissues separated due to surgical or accidental trauma. This not only promotes primary intention healing but also aids in controlling hemorrhage. Therefore, the selection of an appropriate suture material is critical for effective wound repair. Despite their therapeutic benefits, sutures are foreign bodies and can serve as a nidus for bacterial colonization, frequently contributing to postoperative

wound infections among the most common complications in surgical practice.[2] In the oral cavity, this risk is further increased due to constant exposure to saliva, which contains approximately 7.5×10^8 microorganisms per milliliter. This microbial load can lead to capillary wicking of pathogens along the suture thread, triggering a persistent inflammatory response, delaying healing and increasing the risk of surgical site infection. To overcome this challenge, antimicrobial-coated sutures have been developed to minimize microbial colonization and enhance wound healing. Agents such as triclosan and chlorhexidine are frequently used to coat suture materials due to their proven antibacterial efficacy.[2] The localized delivery of antimicrobial agents via sutures offers several advantages, including reduced systemic toxicity, lower risk of antimicrobial resistance and the ability to deliver therapeutic concentrations directly at the surgical site.[3] This approach not only reduces microbial burden but also enhances neutrophil function, creating a more favorable environment for tissue repair. More recently, injectable platelet-rich fibrin (i-PRF), introduced by Joseph Choukroun in 2014, has gained attention for its regenerative and antimicrobial properties. i-PRF is rich in growth factors and cellular components that contribute to accelerated tissue regeneration and effective microbial defense, thus supporting optimal wound healing.[4]

Although the use of triclosan-coated sutures is well-documented in literature, there is a scarcity of literature regarding the effectiveness of i-PRF-coated (bioactive) sutures in promoting wound healing following periodontal surgery. Moreover, to date, no in vivo study has directly compared the healing outcomes of i-PRF-coated sutures with those of triclosan-coated sutures in periodontal flap procedures. This represents a significant gap in the existing research. Hence, the present was done to evaluate and compare the healing efficacy of bioactive sutures conventional sutures coated with i-PRF with that of triclosan-coated polyglactin sutures in periodontal flap surgery.

MATERIALS AND METHODS

This prospective split- mouth clinical study was conducted at a private institution in Udaipur. It included patients diagnosed with chronic periodontitis who required conventional periodontal flap surgery. The study was initiated following approval from the Institutional Ethics Committee and all clinical procedures were carried out in accordance with the Declaration of Helsinki. Written informed consent was taken from each patient after clearly explaining the study in a language they understood. A total of 60 sites in 10 systemically healthy patients aged between 25-55 years were selected for the study. Only those patients indicated for periodontal flap surgery, with residual probing depths greater than 5 mm involving at least 3 teeth & papilla after Phase I therapy, were included. Patients were excluded if they were smokers, immunocompromised, pregnant or lactating women, allergic to triclosan, on medications affecting periodontal healing, or had taken antibiotics in the past 3 months. Following Phase I therapy; a periodontal re-evaluation was performed after one month. Patients with persistent periodontal pocket depths greater than 5 mm were scheduled for flap surgery. Treatment sites were randomly assigned in a split- mouth design.

The groups were as follows-

Group A: BIOACTIVE SUTURE (conventional suture coated with i-PRF)

Group B: TRICLOSAN- COATED POLYGLACTIN SUTURE (Ethicon Vicryl® Plus)

Study Procedure

All surgeries were performed under local anesthesia (2% lignocaine with 1:80000 adrenaline). Intracrevicular incisions were made, and a full-thickness mucoperiosteal flap was elevated. Following debridement and irrigation, the flap was re-approximated using direct loop interdental interrupted sutures based on group allocation. Post- operative instructions were given to the patients in their mother tongue, analgesics were prescribed and no periodontal dressing was placed onto the surgical site in both the groups. No antibiotics were prescribed to both groups of patients. Suture removal was done on 7th day post operatively.

Preparation of Bioactive Sutures

Venous blood (10 mL) was withdrawn into non-coated vacutainers (Figure 01). Without centrifugation, injectable platelet-rich fibrin (i-PRF) was prepared by centrifuging at 700 rpm for 4 minutes (Figure 02). Approximately 4 mL of i-PRF was collected and transferred to a sterile Petri dish containing suture material. The sutures were agitated for 10 minutes to

ensure uniform elution/coating (Figure 03) and stored under aseptic conditions until use.

FIGURE 01: BLOOD WITHDRAWAL

FIGURE 02: PREPARED i-PRF

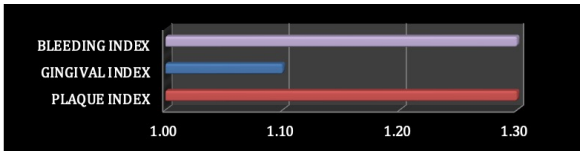


FIGURE 03: CONVENTIONAL SUTURE ELUTED WITH i-PRF

Parameters evaluated

Postoperative soft tissue healing was assessed using Landry Healing Index, a validated clinical index for evaluating wound healing following periodontology surgery. In addition, the Plaque index (PI), Gingival index (GI) and bleeding index (BI) were recorded one week after completion of Phase I therapy to assess oral hygiene status and gingival inflammation.

Statistical analysis

Descriptive **(Mean± *SD*)** and comparative statistical analysis were used to compare and illustrate the results. *Student* "t" test was performed to compare the healing tissue response between bioactive sutures and triclosan coated sutures. P< 0.05 was considered statistically significant. Statistical analysis was performed using "SPSS 9" software.

RESULTS

Assessment of clinical parameter-

The data obtained was tabulated and was statistically analyzed. Following one week of Phase I therapy, clinical parameters were evaluated to assess treatment response. The mean score for ***Plaque index (PI), gingival index (GI) and bleeding index (BI)*** **were recorded as *1.20± 0.63, 1.10± 032*** *and* ***1.10± 0.74*** *respectively as shown in graph 01.*

Graph 01: Graphical representation showing mean value of clinical parameter

Healing assessment-

Wound healing was assessed for both the group using "HEALING INDEX" by Landry et al. on the 07th day after suture removal. The healing for all the surgical sites was satisfactory and uneventful with a mean healing score of **3.87± *0.68*** for group 1 as shown in figure 04 while **4.10± *0.76*** for group 2 as shown in figure 05

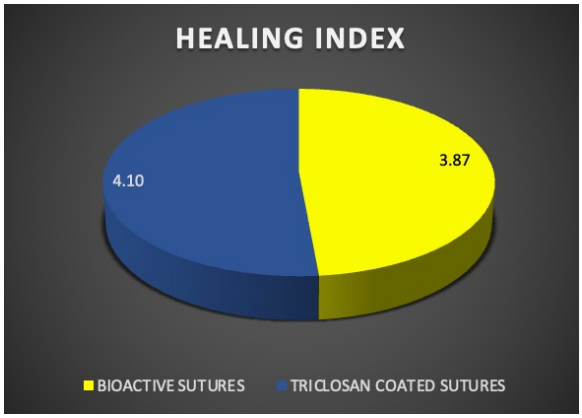
FIGURE 04: HEALING (DAY 07) GROUP 1

FIGURE 05: HEALING (DAY 07) GROUP 2

COMPARATIVE ASSESSMENT OF HEALING INDEX BETWEEN GROUP 01 AND GROUP 02- *Student* "t" test was performed to compare the healing tissue response between BS & TCS. Overall P values for both the groups showed no statistically significant co-relations. Healing was uneventful and satisfactory in both the groups and none of our subjects showed any incidences of surgical site infection of the operating sites as shown in table 01 & graph 02.

HEALING INDEX (LANDRY ET AL) MEAN±*SD*	
BS	3.87± *0.68*
TCS	4.10± *0.76*
P VALUE	**0.215 (<0.05)**

TABLE 01: RESULTS OF HEALING INDEX



GRAPH 02: GRAPHICAL ASSESSMENT OF HEALING SCORES BETWEEN BOTH GROUPS

DISCUSSION

Following periodontal surgical procedures, the appropriate closure and stabilization of wound margins in their intended position are essential factors that significantly impacts the success of the outcome. The selection of a suitable suture material and technique plays a crucial role in maintaining tissue approximation, minimizing postoperative complications and promoting optimal wound healing. Surgical site infection (SSI) is one of the leading causes of under the umbrella of postoperative complications. Surgical sutures due to their wicking action can pull the bacteria and fluid into the wound site and pose a risk of developing SSIs.[5] In a systematic review, Wu et al. (2017) stated that antimicrobial sutures significantly reduced SSI risk. In the literature, the use of antibacterial agents such as triclosan and chlorhexidine has been reported to coat the surgical sutures.[6] In addition to these agents one of the recently introduced injectable platelet concentrate i-PRF has gained popularity. The rationale for their use showed an enhanced number of platelets and bioactive molecules and bioactive peptides which ultimately aid in the healing of both hard and soft tissues.[7]

Hence, the present study was first of a kind and can also be assumed to be a novel study in which the healing efficacy of an i-PRF on conventional suture was compared to commercially available triclosan coated polyglactin sutures utilizing the healing index established by Landry et al. A split mouth study was designed in 60 sites in 10 male subjects divided into 2 groups. **GROUP 1** comprised of 30 sites with pocket depth of ≥5mm involving minimum of three teeth with surgical reflection of at least three interdental papillae and the approximation of flap was done with bioactive sutures and **GROUP 2** comprised of 30 sites with pocket depth of ≥5mm involving minimum of three teeth with surgical reflection of at least three interdental papillae and the approximation of flap was done with triclosan coated sutures. Healing was satisfactory, uneventful and none of our subjects in either of the groups reported any incidence of postoperative pain, suppuration, allergy or surgical site infection. The mean healing index for bioactive sutures and triclosan coated sutures were **3.87± *0.68* *and* 4.10± *0.76*** *r*espectively, showing no statistically significant changes between both the groups, *r*espectively, showing no statistically significant changes between both the groups. Thus, we can infer

that the presence or absence of antibacterial coating on the suture does not affect wound- healing capacity of tissues. None of the patients developed any suture site infection during the follow-up period.

These results matched the findings of other studies. Kruthi et al. reported that healing at the surgical site was slightly better on the 6th postoperative day in areas where triclosan-coated suture (TCS) was used in comparison to NCS after minor oral surgical procedures.[8] Similar findings were recorded by Sharma et al. using chlorhexidine coated suture (CCS).[9] On the other hand, Rasić et al. did not report any added benefit using antibacterial suture. Ford et al. observed a decreased incidence of POP (post-operative pain) and diminished edema with the use of TCS as compared to standard non-coated suture (NCS).[10]

The probable explanation for the non- significant findings of our study could be attributed to the concentration of i-PRF coating on the conventional suture threads, which may have been insufficient to exert the potential effects. Additionally, as the sutures passed through the tissue, i-PRF coating might have undergone disintegration, further reducing its effectiveness. Another contributing factor could be the continuous exposure to saliva, leading to a "wash- out" effect of the i-PRF from the suture surface. Further well-designed studies with standardized coating techniques, varying concentrations of i-PRF and larger sample sizes are required to validate these observations.

CONCLUSION

Within the limitations of the present study, it can be concluded that both i-PRF-coated conventional sutures and triclosan-coated polyglactin sutures demonstrated satisfactory and uneventful wound healing following periodontal surgical procedures, with no reported postoperative complications such as pain, infection, or allergic reactions. Although triclosan-coated sutures showed slightly higher mean healing index scores, the difference was not statistically significant when compared to bioactive i-PRF-coated sutures. The findings suggest that the presence of an antibacterial coating alone may not significantly influence the overall healing capacity of periodontal tissues. However, factors such as the concentration and stability of i-PRF coating, along with its susceptibility to degradation and wash-out, may have impacted its effectiveness. Therefore, further large-scale, well-controlled clinical trials with standardized coating protocols and varying i-PRF concentrations are warranted to better understand its potential as a bioactive suture material in periodontal surgery.

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CONFLICT ON INTEREST

None

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