

Short Communication

Evaluation of the efficacy of plain silk sutures versus chlorhexidine coated silk sutures on bacterial adherence post periodontal flap surgery

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ABSTRACT

Periodontal disease management is based on non-surgical measures like scaling and root planning and surgical treatment like periodontal flap surgery. Sutures are used for wound approximation following periodontal flap surgery. Sutures impregnated with antibacterial agents have been developed in an attempt to reduce bacterial adherence and colonization. Chlorhexidine, a synthetic antimicrobial drug can be used in such situations. This study aimed to evaluate the wound healing and colony count of *P. gingivalis* in plain silk suture and chlorhexidine gel coated silk suture 7 days post periodontal flap surgery. Twelve periodontitis subjects were selected and divided into group A with 6 subjects who undergone periodontal flap surgery followed by placement of plain silk sutures, group B with 6 subjects who undergone periodontal flap surgery followed by placement of chlorhexidine gel coated silk sutures. On 7th day, wound healing was analysed and the sutures were sent for bacterial culture of *P. gingivalis* bacteria. On intergroup comparison, significant reduction in the CFU count of *P. gingivalis* was observed in group B. But there was no significant difference in wound healing between both groups. The chlorhexidine coated silk sutures resulted in a satisfactory clinical behavior for routine use without the risk of bacterial contamination of the surgical wound. Hence it can be used in the routine wound closure post periodontal flap surgery without the hindrance of bacterial adhesion.

Keywords: Chlorhexidine, Flap surgery, Suture

INTRODUCTION

One of the most widespread inflammatory oral diseases in the world which is considered as the primary cause of tooth morbidity is the periodontal disease. Its principal characteristics include the emergence of periodontal pockets, gingival inflammation, and the loss of alveolar bone and connective tissue around the diseased teeth.¹ The disease has a complex etiology, with periodontopathogens playing a key role in both its onset and progression. As periodontitis triggers tissue deterioration, the collagen fibers of the periodontal ligament break down, establishing the periodontal pocket between the tooth and gingiva.^{2,3}

Earlier the main goals of periodontal therapy have considered to eradicate the disease and preserve a healthy, functional dentition and its supporting tissues.⁴ It includes both surgical and nonsurgical management of disease processes. However, in deep periodontal pockets, nonsurgical treatment does not usually completely eradicate bacterial pathogens from root surfaces. Hence, surgical therapy is indicated in case of deeper pockets, furcation defects or intrabony defects which helps in access to root surface and to the intrabony defects.⁵

One of the objectives of periodontal surgery is the primary wound closure, and the first postoperative week is crucial to ensure the wound stability.⁶ The post-operative progress and the achievement of primary wound

closure are known to be influenced by a number of factors. The success of the surgery depends on preventing biofilm formation, reducing infective complications on surgical wounds, and maintaining wound stability.⁷

The objective of a surgical suture is to approximate the surrounding incision surfaces and compress blood vessels with the goal to establish hemostasis and primary wound healing.⁸ Suture materials permit bacteria to thrive at the surgical site and enhance the host tissue's resistance to infection, even if they deliver tensile strength for wound healing.⁹ Although a wide range of suture materials are available for dental and medical surgeries, physicians must have a solid understanding of the mechanical, physical, and chemical characteristics of these materials in order to select the appropriate one.¹⁰

Sutures should be resilient, manageable, and able to knot securely. It doesn't promote infection and results in minimal tissue irritation. Proper suture selection leads to better outcomes, even though no single suture has all of these characteristics.¹¹ Silk suture is a non-absorbable, natural, braided material that has good tension and stability for the duration of suture.¹² Conversely, the silk suture's braided structure permits surface debris and bacterial collection, which causes the wound to become inflamed.¹³

Suture material can be coated with an antibacterial agent to prevent it from becoming an infection source.¹⁴ Because of its broad-spectrum antibacterial effect, chlorhexidine has been utilized extensively as an antimicrobial agent. It has been demonstrated that chlorhexidine may decrease the number of *Streptococci* and anaerobes in saliva.^{15,16}

Several studies have highlighted the promising potential of chlorhexidine against few Grams positive and Gram-negative bacteria. Further clinical studies are needed to particularly show the efficacy of chlorhexidine gel coated silk sutures following the periodontal flap surgery. Therefore, we aimed to assess and compare the effect of chlorhexidine gel coated silk sutures versus plain silk sutures on wound healing and bacterial culture to check the counts of *P. gingivalis* bacteria following periodontal flap surgery.

METHODS

Type of the study

This study was a comparative study.

Study design

A total of 12 subjects undergoing periodontal flap surgery aged between 25-60 years, were selected from the outpatient department of periodontics, P. M. N. M. dental college and hospital, Bagalkot. Ethical approval was taken from the institutional ethical committee for the

study. Keeping alpha error at 5%, power of the study at 80%, the sample size estimated was 6 in each group. Subjects will be randomly divided into 2 groups: group A with 6 subjects who undergone periodontal flap surgery followed by placement of plain silk sutures and group B with 6 subjects who undergone periodontal flap surgery followed by placement of chlorhexidine gel coated silk sutures.

Duration of study

Study carried out from January 2025 to March 2025.

Inclusion criteria

Subjects who are having ≥ 5 mm periodontal pockets, patients aged 25-60 years with periodontitis, systemically healthy patients requiring periodontal flap surgery were included in this study.

Exclusion criteria

Patients with systemic diseases that could influence periodontal conditions, patients who have undergone periodontal therapy in the past 6 months, patients on any systemic antibiotics, anti-inflammatory, hormonal therapy or corticosteroid therapy, subjects consuming tobacco in any form, pregnant and lactating women, teeth with hopeless prognosis, subjects who are using chemical plaque control agents were excluded. Subjects who are having ≥ 5 mm periodontal pockets undergone periodontal flap surgery followed by the placement of plain 3-0 black silk/chlorhexidine gel coated 3-0 black silk suture. In both the groups, periodontal dressings were not placed at the surgical site. On the 7th day, the sutures were removed and placed in sterile container containing transport medium and were sent to the department of molecular biology and immunology, Maratha Mandal's NGH institute of dental sciences and research centre, Belgaum for the bacterial culture. The degree of surgical healing was clinically assessed using the wound healing index by Landry et al which grades the wound on a scale of 1-5, where 1 indicates very poor healing and five indicates excellent healing.¹⁷

The data collected was analyzed using independent t test or Mann-Whitney U test for the comparison of two groups. All the participants were clearly explained regarding the need and design of the study. A duly signed written informed consent was obtained from all the subjects willing to participate in the study.

RESULTS

The conducted study meticulously aimed to assess and compare the effect of chlorhexidine gel coated silk sutures versus plain silk sutures following periodontal flap surgery. This investigation enrolled 12 individuals within the age range of 25-60 years, characterized by probing depths ≥ 5 mm, and clinically diagnosed with

chronic periodontitis. The evaluation was done by comparing the wound healing index after 7 days of surgery and CFU count of *P. gingivalis* between both the groups. No post-operative infection, swelling or allergic reaction was seen in any of the groups.

The results of our study showed that there was a statistical difference in the colony count of *P. gingivalis* between both groups. CFU count of *P. gingivalis* showed a mean difference of 40.33 ± 7.84 in group A and group B showed a mean difference of 29.50 ± 6.28 after the bacterial culture with $p=0.0374$ which was statistically significant when analyzed using Mann-Whitney U test. This shows that group B who received chlorhexidine gel coated sutures have resulted in more reduction in bacterial count (Table 1 and Figure 1).

Wound healing was evaluated after 7 days of periodontal flap surgery during suture removal. Satisfactory healing was observed in both the groups. On comparison there was no statistical difference observed in WHI between both the groups. WHI showed a mean difference of 4.33 ± 0.52 in group A and 4.50 ± 0.55 in group B after 7 days with a $p=0.6889$, which was not significant (Table 2).

Hence the results provide more accuracy in the performance of chlorhexidine gel coated sutures in the reduction of bacterial count of *P. gingivalis* even though no significant difference in wound healing index in the intergroup comparison. Hence on intergroup comparison even though no significant difference was observed in the wound healing index, more reduction in the bacterial

count of *P. gingivalis* was observed in group B, which provides more evidence in the accuracy of the performance of chlorhexidine gel coated sutures.

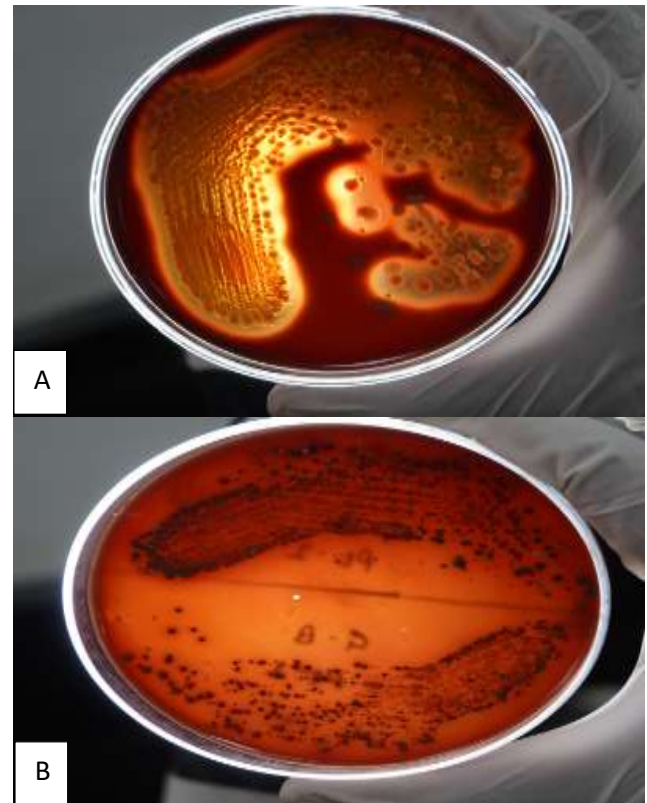


Figure 1 (A and B): CFU count of *P. gingivalis*. A- Group A and B-group B.

Table 1: Comparison of group A and B with CFU counts.

Groups	Mean	SD	Median	Mean rank	U value	Z value	P value
Group A	40.33	7.84	40.50	8.75	4.50	2.0817	0.0374
Group B	29.50	6.28	30.00	4.25			

Table 2: Comparison of group A and B with WHI.

Groups	Mean	SD	Median	Mean rank	U value	Z value	P value
Group A	4.33	0.52	4.00	6.00	15.00	-0.4003	0.6889
Group B	4.50	0.55	4.50	7.00			

DISCUSSION

The current study evaluated the efficacy of chlorhexidine gel coated silk sutures versus plain silk sutures following periodontal flap surgery by evaluating the WHI and CFU count of *P. gingivalis*. One of the most common reported complications of a surgery is the infection caused by sutures. Sutures can serve as the nidus for such an infection via adhering bacteria entering the wounds by capillary action and form infamous biofilms, leading to chronic infections. Hence the sutures can cause so called suture-associated infections, induced by proliferation of adhering pathogens.¹⁸

As many surgeons consider the silk suture to be the gold standard, and also because among natural suture materials it has been demonstrated with better handling characteristics hence it was chosen as a material of choice for this study. Also, the multifilament sutures are preferred, because monofilament is more difficult to manipulate, exhibits poor knot security and has sharp ends that irritate oral tissue.¹⁹ To overcome the limitation of suture as infection spreading, anti-microbial coatings for surgical sutures protecting sutures by inhibiting bacterial growth.²⁰ The use of chlorhexidine is well-established in the control of supragingival plaque formation after periodontal surgery. The broad-spectrum

antimicrobial activity of chlorhexidine prevents biofilm formation and reduces gingival inflammation, and both effects are fundamental especially during the first postoperative days, due to the suspension/alteration of mechanical plaque removal.²¹

In current study there was more reduction in CFU count of *P. gingivalis* with a $p=0.0374$ in group B but no significant difference in WHI among both groups ($p=0.6889$) was observed. Similar results were observed in another study conducted by Gupta et al where they compared the bacterial colonization on plain suture, chlorhexidine and tetracycline coated plain sutures in 30 patients. The results showed that the antibacterial coated sutures showed statistically significant difference in CFUs/ml compared to plain uncoated sutures with a $p<0.05$ after 15 days of surgery.²²

In another study, Karde et al evaluated the antibacterial efficacy of resorbable triclosan-coated suture (TCS) and chlorhexidine-coated suture (CCS) along with its effect on healing after periodontal flap surgery in comparison to noncoated polyglycolic acid sutures (NCSs). healing index was evaluated during day 0 (baseline), day 8, day 15, and day 30. Also, aerobic and anaerobic bacterial growth around each suture was evaluated after day 8. The results reported that there was no statistical difference between healing indices within all three groups but more reduction of anaerobic bacteria was observed in TCS, ($p=0.027$).²³

Sharma et al reported that after comparing the microbial colonization on polyglactin 910 suture coated with chlorhexidine with non-coated polyglactin 910 sutures. in patients undergoing periodontal flap surgery, higher aerobic bacterial load was observed on polyglactin 910 suture coated with chlorhexidine and higher anaerobic bacterial load was observed on non-coated polyglactin 910 suture and the differences between the groups were insignificant.²⁴

In our study periodontal dressings were not given to both the groups as it can result in bias. And more reduction in *P. gingivalis* count was reported in group B who was given chlorhexidine coated plain silk sutures with a mean difference of 40.33 ± 7.84 in group A and 29.50 ± 6.28 in group B with $p=0.0374$ when the sutures were sent to the laboratory after 7 days of periodontal flap surgery. But inter group comparison of wound healing index was not significant with a mean difference of 4.33 ± 0.52 in group A and 4.50 ± 0.55 in group B after 7 days with a $p=0.6889$. Apart from the limitations of this study including smaller sample size, shorter follow up and evaluation of only one organism, the results of this study showed that the chlorhexidine coated silk sutures has a satisfactory clinical behavior for routine use without the risk of bacterial contamination of the surgical wound.

CONCLUSION

Based on the observations of this present study, chlorhexidine gel coated sutures resulted in less bacterial adherence compared with plain silk sutures which proves the antiseptic and antibacterial potential of chlorhexidine in the infection control after periodontal flap surgery. The methods used in the present study were safe and satisfactory for well-being of all the patients. But still, further clinical studies are not available to prove the infection control properties of chlorhexidine gel coated silk sutures in periodontal flap surgery. Hence more clinical trials of long term and large sample size need to be performed to evaluate the efficacy of chlorhexidine gel coated silk sutures post periodontal flap surgery sutures on bacterial adherence.

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Conflict of interest: None declared

Ethical approval: The study was approved by the Institutional Ethics Committee

REFERENCES

1. Rosen PS, Reynolds MA, Bowers GM. The treatment of intrabony defects with bone grafts. *Periodontol* 2000. 2000;22:88-103.
2. Varghese SS, Thomas H, Jayakumar ND, Sankari M, Lakshmanan R. Estimation of salivary tumor necrosis factor-alpha in chronic and aggressive periodontitis patients. *Contemp Clin Dent*. 2015;6(1):S152-6.
3. Panda S, Jayakumar ND, Sankari M, Varghese SS, Kumar DS. Platelet rich fibrin and xenograft in treatment of intrabony defect. *Contemp Clin Dent*. 2014;5(4):550-4.
4. Thamaraiselvan M, Elavarasu S, Thangakumaran S, Gadagi JS, Arthie T. Comparative clinical evaluation of coronally advanced flap with or without platelet rich fibrin membrane in the treatment of isolated gingival recession. *J Indian Society Periodontol*. 2015;19(1):66-71.
5. Ramesh A, Varghese SS, Jayakumar ND, Malaiappan S. Chronic obstructive pulmonary disease and periodontitis-unwinding their linking mechanisms. *J Oral Biosci*. 2016;58(1):23-6.
6. Polimeni G, Xiropaidis AV, Wikesjö UM. Biology and principles of periodontal wound healing/regeneration. *Periodontol* 2000. 2006;41:30-47.
7. Szpadarska AM, Walsh CG, Steinberg MJ, DiPietro LA. Distinct patterns of angiogenesis in oral and skin wounds. *J Dent Res*. 2005;84(4):309-14.
8. Cohen ES. Atlas of cosmetic and reconstructive periodontal surgery. PMPH-USA. 2007.
9. Srinivasulu K, Kumar ND. A review on properties of surgical sutures and applications in medical field. *Int J Res Eng Technol*. 2014;2(2):85-96.
10. Özçaka Ö, Arikan F, Sönmez Ş, Veral A, Kendirci S. Evaluation of the tissue reaction of five different

- suture materials in rabbit palatal mucosa. *EÜ Dişhek Fak Derg*. 2010;31:29-37.
11. Moy RL, Waldman B, Hein DW. A review of sutures and suturing techniques. *Dermatologic Surg*. 1992;18(9):785-95.
 12. Baqain ZH, Moqbel WY, Sawair FA. Early dental implant failure: risk factors. *Brit J Oral Maxillofac Surg*. 2012;50(3):239-43.
 13. Yaltirik M, Dedeoglu K, Bilgic B, Koray M, Ersev H, Issever H, Dulger O, Soley S. Comparison of four different suture materials in soft tissues of rats. *Oral Dis*. 2003;9(6):284-6.
 14. Storch ML, Rothenburger SJ, Jacinto G. Experimental efficacy study of coated VICRYL plus antibacterial suture in guinea pigs challenged with *Staphylococcus aureus*. *Surgical Infect*. 2004;5(3):281-8.
 15. Sanz M, Newman MG, Anderson L, Matoska W, Otomo-Corgel J, Saltini C. Clinical enhancement of post-periodontal surgical therapy by a 0.12% chlorhexidine gluconate mouthrinse. *J Periodontol*. 1989;60(10):570-6.
 16. Newman MG, Sanz M, Nachnani S, Saltini C, Anderson L. Effect of 0.12% chlorhexidine on bacterial recolonization following periodontal surgery. *J Periodontol*. 1989;60(10):577-81.
 17. Landry RG, Turnbull RS, Howley T. Effectiveness of benzydamine HCl in the treatment of periodontal post-surgical patients. *Res Clin Forums*. 1988;10:105-18.
 18. Gomez-Alonso A, Garcia-Criado FJ, Parreno-Manchado FC, Garcia-Sanchez JE, Garcia-Sanchez E, Parreno-Manchado A, et al. Study of the efficacy of Coated VICRYL Plus® Antibacterial suture (coated Polyglactin 910 suture with Triclosan) in two animal models of general surgery. *J Infect*. 2007;54(1):82-8.
 19. Grigg TR, Liewehr FR, Patton WR, Buxton TB, McPherson JC. Effect of the wicking behavior of multifilament sutures. *J Endodont*. 2004;30(9):649-52.
 20. Edmiston CE, Seabrook GR, Goheen MP, Krepel CJ, Johnson CP, Lewis BD, Brown KR, Towne JB. Bacterial adherence to surgical sutures: can antibacterial-coated sutures reduce the risk of microbial contamination? *J Am College Surgeons*. 2006;203(4):481-9.
 21. Lambert PM, Morris HF, Ochi S. The influence of 0.12% chlorhexidine digluconate rinses on the incidence of infectious complications and implant success. *J Oral Maxillofac Surg*. 1997;55(12):25-30.
 22. Gupta SJ, Tevatia S, Khatri V, Dodwad V. Comparative evaluation of antiseptic pomade to prevent bacterial colonization after periodontal flap surgery-A clinical and microbiological study. *J Dent Spec*. 2017;5:102-7.
 23. Karde PA, Sethi KS, Mahale SA, Mamajiwal A, Kale AM, Joshi CP. Comparative evaluation of two antibacterial-coated resorbable sutures versus noncoated resorbable sutures in periodontal flap surgery: A clinico-microbiological study. *J Indian Society Periodontol*. 2019;23(3):220-5.
 24. Sharma C, Rajiv NP, Galgali SR. Microbial adherence on 2 different suture materials in patients undergoing periodontal flap surgery-A pilot study. *J Med Sci Clin Res*. 2017;5:23390-7.

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