Journal of Population Therapeutics & Clinical Pharmacology

RESEARCH ARTICLE
DOI: 10.53555/gd51s772

# TO COMPARE THE EFFECT OF ROOT SURFACE DEBRIDEMENT WITH AND WITHOUT CHLORHEXIDINE MOUTHWASH IN STAGE III AND STAGE IV PERIODONTITIS PATIENTS

**Dr Wajiha Khan[1*], Dr Awais Khan[2], Dr Haseeb ul Haq[3]**

[1*]Senior Registrar, Periodontology, Sardar Begum Dental College and Hospital, Peshawar, Pakistan
[2,3]House Officer, Sardar Begum Dental College and Hospital, Peshawar, Pakistan

***Corresponding author:** Dr Wajiha Khan,
*Senior Registrar, Periodontology, Sardar Begum Dental College and Hospital, Peshawar, Pakistan.
Email: wajihakhan821@yahoo.com

## ABSTRACT

**Background:** To compare the clinical effectiveness of chlorhexidine mouthwash with and without root surface debridement in patients with Stage lll and Stage IV periodontitis.

**Methods:** A randomized controlled clinical trial was conducted at Sardar Begum Dental College from July 2024 to November 2024. A total of 72 patients with Stage lll and Stage IV periodontitis 'were randomly allocated into two groups One group received RSD followed by CHX at home for 2 weeks and other group received RSD alone with regular oral hygien instructions. Clinical parameters, including probing pocket depth (PPD) and bleeding on probing (BOP), were recorded at baseline and after 3 months. Statistical analysis was performed using SPSS version 26, with $p < 0.05$ considered significant.

**Results:** Both groups demonstrated significant reductions in mean PPD and BOP at 3 months compared to baseline ($p < 0.001$). The RSD-only group showed a mean PPD reduction of –2.1 ± 0.6 mm and a BOP reduction of –35.7 ± 9.1%, while the CHX + RSD group showed reductions of –2.3 ± 0.7 mm and –37.3 ± 9.6%, respectively. However, the between-group differences were not statistically significant ($p > 0.05$).

**Conclusion:** Chlorhexidine mouthwash significantly improves periodontal parameters in Stage lll and Stage IV periodontitis, but the addition of root surface debridement does not provide additional short-term clinical benefit. Longer-term studies are needed to determine whether combined therapy offers superior outcomes.

**Keywords:** Chlorhexidine, Root Surface Debridement, Periodontitis, Pocket Depth, Bleeding on Probing

## INTRODUCTION

Periodontitis is a chronic inflammatory disease of multifactorial origin that results in progressive destruction of the periodontal ligament and alveolar bone, ultimately leading to tooth loss if left untreated. The current classification system defines Stage lll and Stage IV periodontitis as advanced forms of the disease, characterized by deep periodontal pockets, clinical attachment loss, and often, tooth mobility and functional impairment. Management of such patients poses a clinical challenge,

requiring interventions that effectively control inflammation and bacterial load while maintaining long-term stability (1-3).

Mechanical debridement, including scaling and root planing or root surface debridement (RSD), has traditionally been regarded as the cornerstone of periodontal therapy. It aims to remove plaque biofilm and calculus deposits that drive the disease process. In parallel, chlorhexidine (CHX) mouthwash has been widely prescribed due to its potent antimicrobial and anti-plaque effects, often used as an adjunct to mechanical therapy or in situations where thorough debridement is not feasible (4-6).

Despite its widespread use, the clinical value of chlorhexidine when combined with RSD in advanced periodontitis remains controversial. While some studies suggest that adjunctive use may enhance outcomes, others report limited or no additional benefits beyond standard debridement or mouthwash alone. Moreover, potential side effects such as tooth staining, altered taste, and mucosal irritation raise questions about its routine use, particularly in long-term management (7-9).

The present study was designed to evaluate whether chlorhexidine mouthwash provides additional clinical benefits when combined with root surface debridement in patients with Stage lll and Stage IV periodontitis. By comparing 'changes in probing pocket depth (PPD) and bleeding on probing (BOP)' over a three-month period, this trial aimed to clarify the short-term effectiveness of chlorhexidine with RSD and RSD only in managing advanced periodontal disease.

## METHODOLOGY

This was a randomized controlled clinical trial conducted at the Department of Periodontology, Sardar Begum Dental College, Peshawar. The study was carried out over a period, from July 2024 to November 2024. The trial was designed to evaluate and compare the effects of root surface debridement alone versus chlorhexidine mouthwash combined with root surface debridement (RSD) in patients diagnosed with Stage lll and Stage IV periodontitis. The study protocol was reviewed and approved by the Institutional Ethical Committee of Sardar Begum Dental College. Written informed consent was obtained from all participants prior to inclusion. Patients were assured of confidentiality and the right to withdraw at any stage without affecting their treatment.

A total of 72 patients fulfilling the inclusion criteria were enrolled in the study. The sample size was calculated based on expected improvement in probing pocket depth with a power of 80% and a significance level of 5%. Participants were selected using a non-probability consecutive sampling method and were then randomly allocated into two equal groups (36 patients each) using a computer-generated randomization table.

### Inclusion Criteria

- Patients aged between 30 and 60 years.
- Diagnosed with Stage lll and Stage IV periodontitis based on current classification criteria.
- Presence of at least 20 natural teeth.
- No periodontal therapy in the preceding six months.
- Willingness to participate and provide informed consent.

### Exclusion Criteria

- Patients with systemic conditios or medications known to affect periodontal status (e.g., immunosuppressants, calcium channel blockers).
- Pregnant or lactating women.
- Current use of any antimicrobial or medicated mouthwash.
- Known allergy or intolerance to chlorhexidine.
- History of periodontal surgery within the last year.

Participants were randomly assigned to one of two groups:

**Group A (RSD + CHX):** Patients underwent full-mouth root surface debridement under local anesthesia using ultrasonic and hand instruments, completed in a single session. In addition, they

were prescribed 0.12% chlorhexidine mouthwash (10 mL, twice daily for 30 seconds) to use at home for 2 weeks following the debridement.

**Group B (RSD only):** Patients received full-mouth root surface debridement performed in a single session under local anesthesia, along with standard oral hygiene instructions. No chlorhexidine mouthwash was prescribed.

All participants were provided with standardized oral hygiene instructions, including twice-daily brushing with fluoridated toothpaste. Compliance with mouthwash use was reinforced at each follow-up visit.

Clinical evaluation was performed at baseline and after three months by a single calibrated examiner who was blinded to group allocation. The following periodontal parameters were recorded:

- **Probing Pocket Depth (PPD):** Measured at six sites per tooth using a UNC-15 periodontal probe, and expressed as mean pocket depth per patient.
- **Bleeding on Probing (BOP):** Recorded as the percentage of sites showing bleeding within 30 seconds of probing.

Calibration was achieved by repeating measurements on 10 patients prior to the study until intra-examiner reliability reached >90% agreement.

Data were entered and analyzed using SPSS version 26. Continuous variables were expressed as mean ± standard deviation, while categorical variables were presented as frequencies and percentages. 'Within-group comparisons between baseline and 3-month values were analyzed using paired t-tests'. Between-group comparisons were performed using independent t-tests for continuous data and chi-square tests for categorical data. A p-value of <0.05 was considered statistically significant.

## RESULT

The baseline demographic and clinical characteristics of the 72 patients (36 in each group) are presented in Table 1. The mean age of participants in the RSD-only group was 45.3 ± 6.9 years, while that of the CHX + RSD group was 44.8 ± 7.2 years, showing no significant difference (p = 0.76). Gender distribution was also comparable, with a nearly equal male-to-female ratio in both groups (p = 0.82). The prevalence of smoking and diabetes was similar, with no statistically significant differences (p = 0.80 and p = 0.78, respectively). Distribution by disease severity was balanced between groups, with Stage lll and Stage IV periodontitis patients equally represented (p = 0.81). Baseline mean probing pocket depth (PPD) was 6.2 ± 0.8 mm in the RSD-only group and 6.3 ± 0.9 mm in the CHX + RSD group (p = 0.67). Similarly, baseline bleeding on probing (BOP) percentages were 68.5 ± 10.3% and 69.2 ± 11.1%, respectively (p = 0.84). These findings confirm that both groups were well matched at baseline, with no significant differences across demographic or clinical parameters.

**Table 1. Baseline Characteristics of Study Participants (n = 72)**

| Variable | RSD Only (n=36) | CHX + RSD (n=36) | p-value |
|---|---|---|---|
| Age (years, mean ± SD) | 45.3 ± 6.9 | 44.8 ± 7.2 | 0.76 |
| Gender (Male/Female) | 21 / 15 | 22 / 14 | 0.82 |
| Smoking (%) | 12 (33.3%) | 11 (30.6%) | 0.80 |
| Diabetes (%) | 9 (25.0%) | 8 (22.2%) | 0.78 |
| Stage lll/ Stage IV | 20 / 16 | 19 / 17 | 0.81 |
| Baseline mean PPD (mm) | 6.2 ± 0.8 | 6.3 ± 0.9 | 0.67 |
| Baseline BOP (% sites) | 68.5 ± 10.3 | 69.2 ± 11.1 | 0.84 |

*No significant differences between groups at baseline (all p > 0.05).*

'Table 2 summarizes the periodontal outcomes after 3 months of intervention'. Both groups demonstrated significant within-group improvements in PPD and BOP compared to baseline (p <

0.001). In the RSD-onlygroup, mean PPD reduced from 6.2 mm at baseline to 4.1 ± 0.9 mm at 3 months, while in the CHX + RSD group, it declined from 6.3 mm to 4.0 ± 1.0 mm. The mean reduction in PPD was –2.1 ± 0.6 mm in the RSB-only group and –2.3 ± 0.7 mm in the CHX + RSD group. Despite these improvements, the between-group difference was not statistically significant (p = 0.48). Similarly, BOP percentage reduced substantially in both groups. The RSD-only group showed a decline from 68.5% to 32.8 ± 8.7%, while the CHX + RSD group decreased from 69.2% to 31.9 ± 9.2%. The reductions were –35.7 ± 9.1% and –37.3 ± 9.6% respectively, with no significant between-group difference (p = 0.59). These results indicate that although chlorhexidine mouthwash led to notable improvements in periodontal status, the addition of root surface debridement did not yield any superior benefit over chlorhexidine alone.

**Table 2. Comparison of Periodontal Outcomes at 3 Months**

| Parameter | RSD Only (n=36) | CHX + RSD (n=36) | p-value (between groups) |
|---|---|---|---|
| Mean PPD at 3 months (mm) | 4.1 ± 0.9 | 4.0 ± 1.0 | 0.64 |
| Mean reduction in PPD (mm) | –2.1 ± 0.6 | –2.3 ± 0.7 | 0.48 |
| BOP at 3 months (% sites) | 32.8 ± 8.7 | 31.9 ± 9.2 | 0.71 |
| Reduction in BOP (%) | –35.7 ± 9.1 | –37.3 ± 9.6 | 0.59 |

*Both groups showed significant within-group improvements from baseline ($p < 0.001$), but there were no statistically significant differences between the groups ($p > 0.05$).*

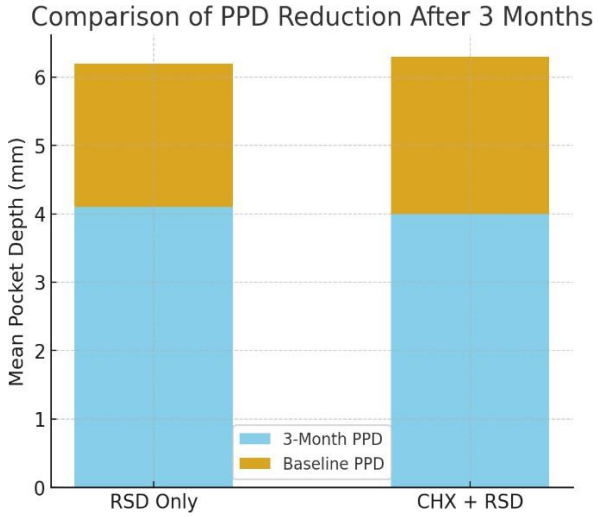


**Figure 1: Pocket Depth (PPD) Reduction showing baseline vs. 3 months for both groups.**

## DISCUSSION

This randomized clinical trial compared the clinical effects of chlorhexidine mouthwash used alone versus in combination with root surface debridement (RSD) in patients with Stage lll and Stage IV periodontitis. The primary outcomes were probing pocket depth (PPD) and bleeding on probing (BOP) after a three-month follow-up. Although both groups demonstrated significant improvements compared to baseline, there was no additional benefit observed when RSD was combined with chlorhexidine mouthwash.

Our findings are consistent with earlier reports questioning the routine use of adjunctive agents when adequate plaque control and chlorhexidine rinses are prescribed. Studies noted that while chlorhexidine is effective in reducing gingival inflammation and bacterial load, its benefit as an adjunct is often transient and not superior to mechanical therapy alone when long-term outcomes are considered. Similarly, studies in a systematic review highlighted that chlorhexidine provides significant reductions in bleeding indices, but the evidence for additional improvement when combined with mechanical therapy remains weak (10-12).

Studies emphasized that chlorhexidine mouthwash consistently reduces plaque and gingival bleeding in the short term, but long-term reliance on rinses without sustained patient compliance and mechanical plaque control may not yield superior outcomes. In our study, both groups achieved

significant reductions in PPD and BOP, which is in line with these observations. However, the absence of a difference between groups suggests that the benefits of chlorhexidine may plateau, and the addition of single-session RSD does not produce measurable improvements within three months (13-15).

Contrastingly, other studies have reported enhanced outcomes when RSD is performed, particularly in deep pockets. Studies showed that scaling and root planing, when performed thoroughly, produces more stable improvements in pocket depth reduction. However, our trial included patients with generalized Stage lll and Stage IV disease, where systemic factors such as smoking and diabetes might have influenced healing responses. Moreover, the relatively short follow-up period may have limited our ability to detect long-term differences in attachment gain or disease stability (16-18).

Another consideration is patient adherence. Only second group was prescribed chlorhexidine mouthwash, and good compliance may have minimized differences between interventions. It is also possible that the anti-inflammatory and antimicrobial properties of chlorhexidine were sufficient to mask any additional short-term benefits of RSD (19, 20).

Overall, our results support the notion that chlorhexidine mouthwash and RSD is effective in reducing periodontal inflammation in the short term, but that adjunctive RSD may not confer a clear added advantage over three months. Longer follow-up studies with larger sample sizes and stratified analysis of deep versus shallow sites may help clarify whether there are subgroups of patients who derive additional benefit from combined therapy.

## CONCLUSION

Chlorhexidine mouthwash with RSD significantly improved periodontal health by reducing probing pocket depth and bleeding on probing in Stage lll and Stage IV periodontitis patients. However, its combination with root surface debridement did not provide superior clinical outcomes over a three-month period. These findings suggest that while chlorhexidine remains a valuable adjunct for managing periodontal inflammation, its additional use alongside single-session RSD may not be necessary for short-term improvement. Future research with longer follow-up and site-specific analysis is recommended to evaluate whether combined approaches yield benefits in the long term or in patients with advanced disease profiles.

## REFERENCES

1. Katsaros T, Mayer E, Palaiologou A, Romero-Bustillos M, Evans GH, Lallier TE, et al. Effect of different concentrations of commercially available mouthwashes on wound healing following periodontal surgery: a randomized controlled clinical trial. 2020;24(10):3587-95.
2. Prietto NR, Martins TM, dos Santos Santinoni C, Pola NM, Ervolino E, Bielemann AM, et al. Treatment of experimental periodontitis with chlorhexidine as adjuvant to scaling and root planing. 2020;110:104600.
3. Alzoman H, Alojaym TG, Chalikkandy SN, Mehmood A, Rashed F, Divakar DDJOH, et al. Comparison of an herbal-and a 0.12% chlorhexidine-based oral rinse as adjuncts to nonsurgical mechanical debridement in the management of peri-implant mucositis: A randomised controlled trial. 2020;18(4):a45069.
4. de Melo Menezes K, Roncalli da Costa Oliveira AG, César de Vasconcelos Gurgel BJIJoO, Implants M. Impact of 0.12% Chlorhexidine Gluconate Mouthwash on Peri-Implant Mucositis and Gingivitis After Nonsurgical Treatment: A Multilevel Analysis. 2021;36(6).
5. Seth TA, Kale TA, Lendhey SS, Bhalerao PVJJoISoP. Comparative evaluation of subgingival irrigation with propolis extract versus chlorhexidine as an adjunct to scaling and root planing for the treatment of chronic periodontitis: A randomized controlled trial. 2022;26(2):151-6.
6. Kale A, Mahale S, Sethi K, Karde PJIJIRSET. Clinical and microbial comparative evaluation of 0.1% chlorine dioxide mouthwash versus 0.2% chlorhexidine mouthwash after periodontal surgery: A randomized clinical trial. 2020;6:935-9.

7. Bollain J, Pulcini A, Sanz-Sánchez I, Figuero E, Alonso B, Sanz M, et al. Efficacy of a 0.03% chlorhexidine and 0.05% cetylpyridinium chloride mouth rinse in reducing inflammation around the teeth and implants: A randomized clinical trial. 2021;25(4):1729-41.
8. de Vasconcelos Gurgel BC. Impact of 0.12% Chlorhexidine Gluconate Mouthwash on Peri-Implant Mucositis and Gingivitis After Nonsurgical Treatment: A Multilevel Analysis. 2021.
9. Zhao H, Hu J, Zhao LJBOH. Adjunctive subgingival application of Chlorhexidine gel in nonsurgical periodontal treatment for chronic periodontitis: a systematic review and meta-analysis. 2020;20(1):34.
10. Hussain AM, van Der Weijden G, Slot DEJIJoDH. Effect of a sodium hypochlorite mouthwash on plaque and clinical parameters of periodontal disease-a systematic review. 2022;20(1):40-52.
11. Jervøe-Storm P-M, Eberhard J, Needleman I, Worthington HV, Jepsen SJCDoSR. Full-mouth treatment modalities (within 24 hours) for periodontitis in adults. 2022(6).
12. Ma L, Diao XJBOH. Effect of chlorhexidine chip as an adjunct in non-surgical management of periodontal pockets: a meta-analysis. 2020;20(1):262.
13. Nambiar S, Malothu S, Karmakar S, Varkey A, Chandra D, Chava VKJJoP, et al. Comparison of ozonated olive oil and chlorhexidine gel as an adjunct to nonsurgical periodontal therapy for the treatment of chronic periodontitis: A randomized controlled clinical trial. 2022;14(Suppl 1):S94-S8.
14. Aarif TS, Sheikh S, Baksh R, Muglikar S, Ghodke P, Ansari W, et al. Comparison of Effectiveness of 2% Propolis Solution Versus 0.2% Chlorhexidine Mouthwash as a Subgingival Irrigant Following Scaling and Root Planing: A Clinical and Microbiological Study.
15. Collins JR, Veras K, Hernández M, Hou W, Hong H, Romanos GEJCOI. Anti-inflammatory effect of salt water and chlorhexidine 0.12% mouthrinse after periodontal surgery: a randomized prospective clinical study. 2021;25(7):4349-57.
16. Deus FP, Ouanounou AJIdj. Chlorhexidine in dentistry: pharmacology, uses, and adverse effects. 2022;72(3):269-77.
17. Siddharth M, Singh P, Gupta R, Sinha A, Shree S, Sharma KJJCdp. A comparative evaluation of subgingivally delivered 2% curcumin and 0.2% chlorhexidine gel adjunctive to scaling and root planing in chronic periodontitis. 2020;21(5):494-9.
18. Vishnusripriya J, Melath A, Feroz M, Subair K, Chandran NJJoISoP. Comparative evaluation of locally delivered probiotic paste and chlorhexidine gel as an adjunct to scaling and root planing in treating chronic periodontitis: A split-mouth randomized clinical trial. 2022;26(3):262-8.
19. Ardakani MT, Farahi A, Mojab F, Moscowchi A, Gharazi ZJJoAP, Dentistry I. Effect of an herbal mouthwash on periodontal indices in patients with plaque-induced gingivitis: A cross-over clinical trial. 2022;14(2):109.
20. Ramanauskaite E, Machiulskiene VJBOH. Antiseptics as adjuncts to scaling and root planing in the treatment of periodontitis: a systematic literature review. 2020;20(1):143.