A comparison of the effects of two types of periodontal dressings with and without zinc oxide on non-surgical periodontal treatment

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Abstract

Background: Periodontal dressings have recently become an important research topic in periodontal treatment. Periodontal dressings have also proven effective in supporting non-surgical mechanical therapy for short-term clinical outcomes. **Objective:** This study evaluated the effects of two types of periodontal dressings, with and without zinc oxide, on non-surgical periodontal treatment. **Materials and Methods:** This randomized controlled trial, with a split-mouth design, was conducted on 31 patients with stage II-III periodontitis (AAP/EFP 2017). After scaling and root planing, two types of periodontal dressings were applied in opposite sextant regions. Clinical periodontal indices were assessed at baseline and 1 week, 1 month, 3 months, and 6 months after treatment. Radiographs were obtained at baseline and 6 months after treatment. **Results:** After treatment, the plaque index (PII), bleeding on probing index (BOP), probing pocket depth (PPD), and clinical attachment level (CAL) in both groups were significantly reduced compared with baseline values. The periodontal dressing without zinc oxide showed higher effects than periodontal dressing with zinc oxide in terms of changes in the gingival index (GI), PPD, and CAL. **Conclusion:** Periodontal dressings, especially without zinc oxide, support clinical improvement in stage II-III periodontitis through non-surgical therapy.

Keywords: *periodontitis, non-surgical periodontal treatment, periodontal dressing.*

1. INTRODUCTION

Periodontitis is one of the most common diseases affecting the oral cavity. It is important to treat the disease promptly, as it not only results in tooth loss, but also affects the general health of the patient [1]. In the treatment of periodontitis, non-surgical therapy with scaling and root planing (SRP) has become the "gold standard"[2]. To support and increase the effectiveness of non-surgical mechanical therapy, periodontal dressings have been suggested to protect the treatment area and create pressure on the treatment area, thereby helping the periodontal tissue adapt to the underlying structure, providing better stability, preventing the invasion of bacteria, and improving clinical parameters [3-7].

Since 1923, several types of periodontal dressings have been developed and researched. However, there is still debate regarding the need to select the most suitable type for clinical application. Coe-Pak (GC, USA) is one of the most widely used dressings containing zinc oxide. It is based on a metallic oxide and fatty acid reaction; however, it has some disadvantages, including inappropriate setting time and poor flowability. Coe-pak was reported to cause bacterial and plaque accumulation at the site of surgery, which can delay post-surgical wound healing [8], [9]. A zinc oxide non-containing dressing, Reso-pac (Hager and Werken GmbH and Co., Germany), is a soft, soluble, and hydrophilic dressing with the ability to adhere to oral tissues, facilitating easy coverage and protection of the wound. In addition to being the main component of cellulose, Reso-pac contains myrrh, which has disinfectant, adhesive, and hemostatic properties. This dressing material resulted in fibrin formation in wounds. Reso-pac has also been reported to have pleasant taste and elastic properties, which relieve wounds from excessive tension [8].

Recently, there have been many publications on the effectiveness of periodontal dressing in non-surgical treatment, such as that by Sigusch et al. (2005), Genovesi et al. (2012), Keestra et al. (2014), Monje et al. (2016) [3, 5-7]. The results of the above studies showed significant clinical improvement when using periodontal dressing; however, each study used a different type of periodontal dressing, and there was no comparison of the effectiveness of Coe-pak and Reso-pac periodontal dressings. In Vietnam, there are currently no studies on the effects of periodontal dressings on periodontitis treatment. Therefore, to better understand the effectiveness of periodontal dressing in non-surgical treatment, we conducted this study to compare the results of

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non-surgical periodontal treatment using two types of periodontal dressings with and without zinc oxide.

2. MATERIALS AND METHODS

Ethical approval

The study was conducted between June 2022 and August 2024. The protocol and informed consent form were reviewed and approved by the Institutional Ethics Committee of the Hue University of Medicine and Pharmacy, Hue University, Hue, Vietnam (Number: H2022/252). Thirty-one participants were recruited from the Family Medicine Center of Hue University of Medicine and Pharmacy. It was mandatory for participants to read and sign the consent form before inclusion in the present study.

Object selection

Participants were recruited from among patients who underwent dental examinations and were diagnosed with stage II-III periodontitis (AAP/EFP, 2017).

The inclusion criteria were as follows.

- Age ≥ 18 years old
- Diagnosed with stage II-III periodontitis (AAP/EFP 2017) [10]
- At least 18 teeth present (excluding third molars) [5]
- Commitment to participate in the study and follow-up visits.

The exclusion criteria were as follows.

- Allergic to any component of the periodontal dressing
- Teeth with combined endodontic and periodontal lesions
- Current smoking
- Pregnancy and lactation
- Systemic diseases that affect periodontal healing
- Use of antibiotics within 6 months
- Surgical periodontal therapy in the last 3 years

The patients were periodically examined before treatment (T0), 1 week (T1), 1 month (T2), 3 months (T3), and 6 months (T4) using five clinical indexes: plaque index (PII), gingival index (GI), bleeding on probing (BOP), periodontal probing depth (PPD), and clinical attachment loss (CAL). X-rays were taken at baseline and 6 months after treatment to assess the bone loss index (BLI) [11].

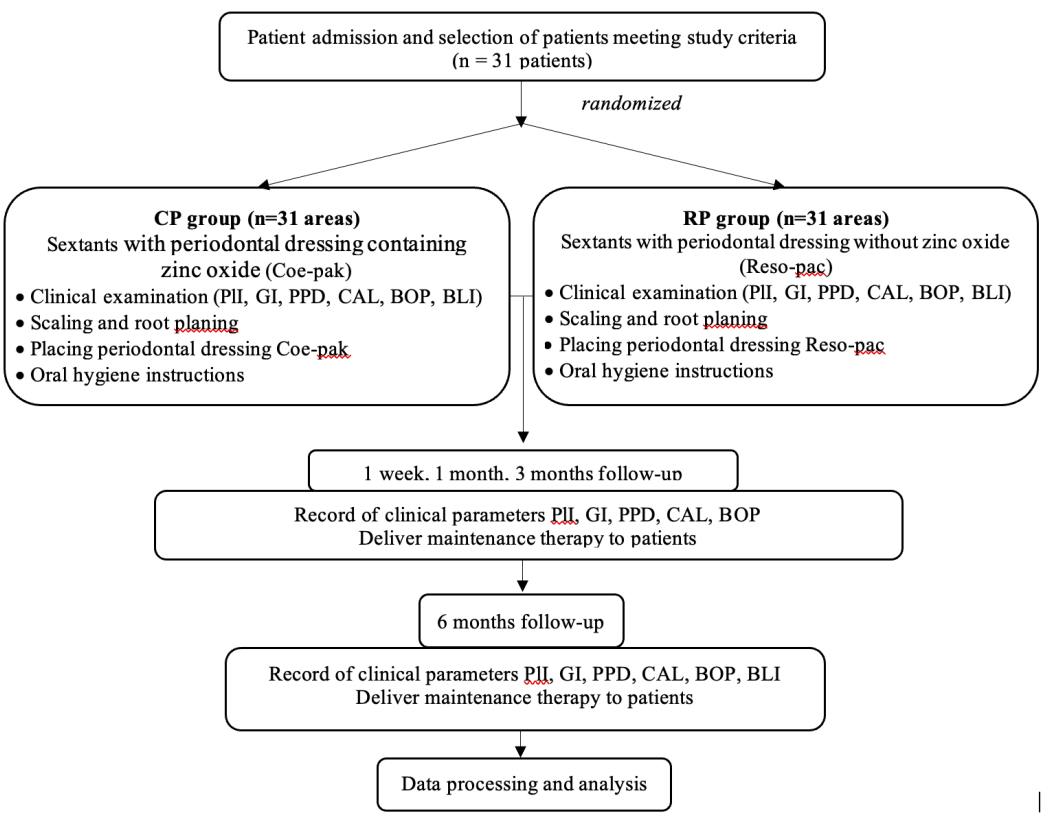

Figure 1. Schematic diagram of the study design

The non-surgical periodontal therapy procedure

- After the clinical examination, scaling and root planing using ultrasonic and hand instruments were performed full-mouth within 24h.

- Two opposite sextants were selected for periodontal dressing. One sextant (CP group) was placed in a periodontal dressing containing zinc oxide (Coe-pak), and the other sextant (RP group) was placed in a periodontal dressing without zinc oxide (Reso-pac). The materials were mixed following the manufacturer's instructions. A periodontal dressing was applied to adapt to the papillae with slight pressure in the interproximal space area.

- Each patient was instructed to maintain a good level of oral hygiene using the modified Bass technique and interdental cleaning but to avoid brushing and flossing the periodontal dressing area for seven days.

- After 7 days, the periodontal dressings were removed from both sides.

Changes in periodontal indices were calculated from each treated sextant by subtracting the average value at baseline (T0) from the average value at post-treatment (T1/T2/T3/T4).

Statistical analyses

All data were collected in an Excel database and analyzed using SPSS version 26.0. Independent sample t-tests and Mann-Whitney U tests were used for intergroup comparisons at the same time points. The Wilcoxon test was used to compare the same values between different time points. Statistical significance was set at $p<0.05$.

3. RESULTS

This study included 15 men and 16 women. The average age of participants was 50.39 ± 9.42 years. The clinical parameters (PII, GI, PPD, CAL, BOP, and BLI) of both groups at baseline and 1 week, 1 month, 3 months, and 6 months are shown in Table 1 and Figure 2.

Table 1. Comparison of clinical parameters at baseline, 1st week, 1st month, 3rd month and 6th month between two groups

Clinical parameters	Time	RP Group (Mean ± SD)	CP Group (Mean ± SD)	*p*
PII	Baseline (T_0)	2.05 ± 0.34	2.04 ± 0.27	0.904**
	1 week (T_1)	0.87 ± 0.18	0.85 ± 0.14	0.608**
	1 month (T_2)	1.47 ± 0.22	1.52 ± 0.24	0.464*
	3 months (T_3)	1.61 ± 0.17	1.64 ± 0.17	0.431*
	6 months (T_4)	1.79 ± 0.26	1.76 ± 0.26	0.767**
GI	Baseline (T_0)	1.73 ± 0.27	1.69 ± 0,33	0.572*
	1 week (T_1)	1.24 ± 0.21	1.39 ± 0.34	0.044*
	1 month (T_2)	1.51 ± 0.26	1.57 ± 0.32	0.187**
	3 months (T_3)	1.46 ± 0.21	1.55 ± 0.24	0.133**
	6 months (T_4)	1.59 ± 0.22	1.60 ± 0.23	0.849**
PPD (mm)	Baseline (T_0)	2.54 ± 0.40	2.57 ± 0.37	0.796*
	1 week (T_1)	2.46 ± 0.35	2.49 ± 0.34	0.739*
	1 month (T_2)	2.34 ± 0.41	2.44 ± 0.33	0.302*
	3 months (T_3)	2.27 ± 0.42	2.38 ± 0.34	0.257*
	6 months (T_4)	2.28 ± 0.39	2.34 ± 0.34	0.568*
CAL (mm)	Baseline (T_0)	2.92 ± 0.42	2.98 ± 0.45	0.688**
	1 week (T_1)	2.83 ± 0.41	2.88 ± 0.45	0.822**
	1 month (T_2)	2.68 ± 0.40	2.82 ± 0.46	0.248**
	3 months (T_3)	2.66 ± 0.45	2.83 ± 0.48	0.165**
	6 months (T_4)	2.60 ± 0.43	2.82 ± 0.47	0.081**

BOP (%)	Baseline (T_0)	68.82 ± 21.83	65.73 ± 25.45	0.772**
	1 week (T_1)	33.87 ± 11.27	40.86 ± 12.19	0.022*
	1 month (T_2)	39.11 ± 16.41	47.45 ± 15.54	0.044*
	3 months (T_3)	37.63 ± 13.20	42.07 ± 18.27	0.278*
	6 months (T_4)	47.45 ± 17.60	46.51 ± 20.84	0.848*
BLI	Baseline (T_0)	4.10 ± 0.60	4.06 ± 0.57	0.820**
	6 months (T_4)	4.00 ± 0.68	4.03 ± 0.55	0.844**

** Independent Sample T-test for the intergroup comparison at the same time point*

*** Mann-Whitney U test for the intergroup comparison at the same time point*

At baseline, there were no statistically significant differences in periodontal parameters between the two groups (p>0.05). The PII, PPD, CAL, and BLI indices at different time points after treatment were not significantly different between the two study groups (p>0.05). For the GI index, the difference between the two groups was statistically significant 1 week after treatment (p<0.05). The difference in BOP index between the two groups was statistically significant at 1 week and 1 month after treatment (p<0.05).

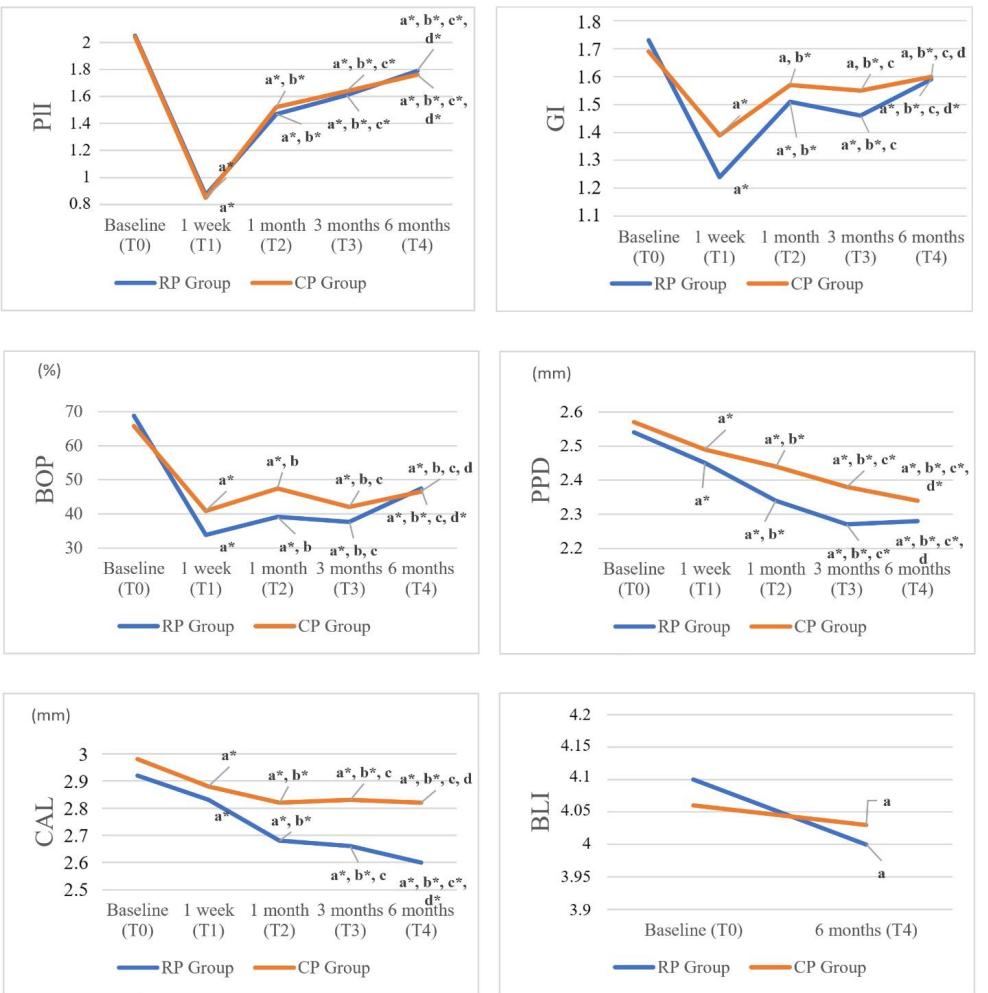

Figure 2. Changes in plaque index (PII), gingival index (GI), bleeding on probing (BOP), probing pocket depth (PPD), clinical attachment loss (CAL), and bone loss index (BLI) in the two study groups after one week and one, three, and six months.

** p<0.05, Wilcoxon test; a: compared to baseline; b: compared to 1st week; compared to 1st month; c: Compared to 3rd month.*

At the first week follow-up, the results showed that the PII, GI, BOP, PPD, and CAL indices were significantly reduced in both groups (p<0.05). After 1, 3, and 6 months, there was a significant reduction in the PII, BOP, PPD, and CAL indices compared with baseline in both groups (p<0.05). The BLI index of both groups showed insignificant differences at 6 months as compared to at baseline (p>0.05).

Table 2. Reduction of clinical parameters in two groups after treatment compared to baseline

Clinical parameters	Group	RP Group	CP Group	*p*
	Δ	**(Mean ± SD)**	**(Mean ± SD)**	
PII	**Δ1**	-1.18 ± 0.35	-1.20 ± 0.32	0.893**
	Δ2	-0.58 ± 0.46	-0.53 ± 0.35	0.643*
	Δ3	-0.49 ± 0.39	-0.40 ± 0.30	0.293*
	Δ4	- 0.26 ± 0.32	-0.29 ± 0.29	0.725*
GI	**Δ1**	-0.49 ± 0.30	-0.30 ± 0.35	0.010**
	Δ2	-0.22 ± 0.34	-0.11 ± 0.40	0.271*
	Δ3	-0.27 ± 0.33	-0.13 ± 0.38	0.143*
	Δ4	- 0.14 ± 0.32	-0.09 ± 0.35	0.534*
BOP (%)	**Δ1**	-34.95 ± 20.77	-24.86 ± 28.62	0.118*
	Δ2	-29.70 ± 24.53	-18.28 ± 27.50	0.089*
	Δ3	-31.18 ± 23.47	-23.56 ± 27.65	0.246*
	Δ4	-21.37 ± 22.82	-19.22 ± 28.84	0.746*
PPD (mm)	**Δ1**	-0.09 ± 0.09	-0.08 ± 0.08	0.843**
	Δ2	-0.20 ± 0.06	-0.13 ± 0.08	<0.001**
	Δ3	-0.27 ± 0.06	-0.19 ± 0.09	<0.001**
	Δ4	-0.26 ± 0.04	-0.23 ± 0.09	0.007**
CAL (mm)	Δ1	-0.09 ± 0.20	-0.10 ± 0.10	0.374**
	Δ2	-0.24 ± 0.13	-0.16 ± 0.08	0.42**
	Δ3	-0.26 ± 0.12	-0.15 ± 0.09	0.001**
	Δ4	-0.32 ± 0.06	-0.15 ± 0.06	<0.001**
BLI	Δ4	-0.13 ± 0.34	-0.06 ± 0.25	0.394**

** Independent Sample T-test for the intergroup comparison*

*** Mann-Whitney U test for the intergroup comparison*

$_{1}^{2}$$_{3}^{4}$ mean change of clinical parameters at 1st week, 1st month, 3rd month, 6th month respectively, compared to baseline.

The reductions in PII, BOP, and BLI indices between the two groups were not statistically different (p>0.05). The changes in the clinical parameters of the RP group were higher than those of the CP group: GI index at 1 week, PPD index at 1-3-6 months, and CALindices at 3 and 6 months (p<0.05).

4. DISCUSSION

The effectiveness of non-surgical periodontal treatment using periodontal dressings with and without ZnO was evaluated through changes in the periodontal indices PII, GI, PPD, CAL, BOP, and BLI in the study areas after 1 week, 1 month, 3 months, and 6 months of treatment, as compared to baseline.

PII index

The results in Tables 1 and 2 and Figure 2 show that the oral hygiene status of patients in both groups at all follow-up periods was significantly improved compared to that at baseline. The sharp decrease in the PII index in both groups after 1 week was due to the periodontal dressing. Periodontal dressing acts as a physical barrier against salivary or bacterial contamination and food impaction. At 1, 3, and 6 months, the PII index increased again (p<0.05), which can be explained by the fact that although all

patients were instructed on oral hygiene at follow-up visits, not all patients followed it correctly. Irregular and careless oral hygiene led to an increase in the PII index.

A similar result was recorded in the study by Bali et al. (2022), in which the plaque index decreased significantly from the 1st day to day 7th and 14th days after periodontal surgery in both the Coe-pak and Reso-pac groups. The PII decreased more strongly in the Reso-Pac group than in the Coe-Pak group on the 7th postoperative day [12]. Coe-pak has been proven to be more effective than Reso-Pak in decreasing plaque and granulation tissue formation postoperatively. Reso-pac is more biocompatible with human gingival fibroblasts than Coe-pak [8].

GI index

In this study, the GI index in both groups after 1 week was significantly improved compared with that at baseline. However, similar to the PII index, the gingivitis status increased again after 1, 3, and 6 months. Poor plaque control leads to bacterial and plaque deposition, creating conditions for inflammatory reactions in the periodontal tissue.

When comparing the RP and CP groups at 1 week, the mean value and change in the GI index showed that gingivitis was better in the RP group than in the CP group ($p<0.05$) (Tables 1 and 2). This is consistent with the results of Petelin et al., which concluded that cellulose periodontal dressing (Reso-pac) is more biocompatible with gingival fibroblasts. Reso-pac showed the best epithelialization and vascularity, the least inflammatory reaction in the first four days, and the most suitable periodontal dressing (compared to Barricaid, Fittydent, Mycotect, and Coe-pak) [13].

BOP index

In both study groups, the BOP index during the follow-up period was lower than that at the baseline. Reduced inflammation in the periodontal pocket might result in increased tissue resistance to periodontal probing force, leading to decreased gingival bleeding [14].

Other studies of non-surgical periodontal treatment combined with periodontal dressing have reported a reduction in gingival bleeding during follow-ups. The bleeding scores in Hameed et al. and Keestra et al. 's studies were significantly reduced after 3 months [4], [5]. Similarly, a previous study by Genovesi et al. reported that full-mouth bleeding score values decreased from 35.3% to 5.3% after 2 months of treatment ($p<0.05$) [3].

When comparing the two groups, the BOP index of the RP group was lower than that of the CP group at 1 week and 1 month ($p<0.05$) (Table 1). These results also reflect a better reduction in gingivitis in the RP group.

PPD index

After non-surgical treatment, the PPD index in both groups decreased continuously during the follow-up period. Besides the reduction in gingival inflammation, the remodeling of periodontal tissue during the healing process might contribute to the improvement of the PPD index. In this phase, fibroblasts proliferate and migrate, which stimulates collagen synthesis as an extracellular matrix. Fibroblasts and collagen formed in periodontal tissues cause an increase in tissue resistance toward probing pressure, which causes pocket depth reduction [15]. The placement of a periodontal dressing during non-surgical treatment may support this healing process [3], [4]. In a study by Hameed et al., the PPD value at the dressing site decreased significantly after 3 months, which was double that of the area without periodontal dressing [4].

In this study, comparing two types of periodontal dressing, the RP group had a higher change in PPD values than the CP group ($p<0.05$) (Table 2). The ability of Reso-pac to stabilize earlier may help in the inflammatory process, facilitating the regeneration of periodontal tissue.

CAL index

The CAL index expresses the ability of gingival connective tissue to re-attach to the root surface, indicating the effectiveness of periodontal treatment. This non-surgical treatment combined with periodontal dressing application improved the CAL index at all assessed periods. Similar results were shown in previous studies by Hameed et al. and Sigusch et al., compared to the group without periodontal dressing [4], [7]. In our study, when comparing the two periodontal dressing groups, the CAL index did not differ at each post-treatment time point, but the CAL reduction level in the RP group was significantly higher than that in the CP group at 3 and 6 months post-treatment, as compared with baseline (Table 2).

BLI index

The results in Tables 1 and 2 and Figure 2 show that there were statistically insignificant differences in the BLI index after 6 months in both groups as well as between the two groups. Despite better improvement in clinical indices (GI, PPD, CAL), periodontal dressing without zinc oxide (Reso-pac) did not show any effects on bone level changes, as compared with periodontal dressing with zinc oxide (Coe-pak). The limitations of short-term follow-up

and the conventional X-ray assessment method might make it difficult to detect small and early changes in the alveolar bone in the study groups.

5. CONCLUSION

Non-surgical treatment of stage II-III periodontitis combined with periodontal dressing resulted in significant improvements in PII, BOP, PPD, and CAL indexes compared to baseline. Periodontal dressings without zinc oxide showed better changes in GI, PPD, and CAL indexes when compared to periodontal dressings containing zinc oxide.

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