

Sub-Gingival and Intra-Canal Irrigation by 2% Chlorhexidine Gluconate (Consepsis®) as Adjunctive Therapy in the Management of Periodontal Pocket

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Abstract

Background: In periodontics and endodontics, the residual chlorhexidine antibacterial effects are attributed to its ability to attach with the hydroxyapatite and release it gradually. Consequently, it could keep a persistent level to create continuous antibacterial effects inside the periodontal pocket and the root canal for a long duration. Thus, the present study aimed to assess the impact of sub-gingival and intra-canal irrigation with 2% Chlorhexidine gluconate (Consepsis®) as adjunctive therapy in the management of periodontal pocket.

Materials and Methodology: This study included thirty patients (50% males and 50% females) with mild to moderate periodontal pocket depth (4 - 6 mm) adjacent to teeth need endodontic therapy (120 teeth) was divided into three equal groups (10 patients included 40 teeth per group).

Each case was treated with endodontic and periodontal therapy, where the treatment was root canal therapy (RCT) and scaling and root planing (SRP) alone in group I. Moreover, intra-canal irrigation by Consepsis® in group II and sub-gingival irrigation by Consepsis® in group III. Plaque index (PLI), Gingival index (GI) and periodontal pocket depth (PPD) were recorded at baseline, 4 weeks, and 6 weeks follow up. Data were collected and analyzed using SPSS software, version 21 and through *t*-test, to assess the statistical significance differences *p*-value ($p < 0.05$).

Results: In the comparison of clinical findings between groups I, II and III, the results of the current study revealed a reduction in all the clinical parameters without statistically significant differences except GI and PPD in the third visit (after six weeks post-treatment), there were statistically significant differences of PPD at the second visit ($p = 0.034$), and there were highly statistically significant differences of GI and PPD at the third visit ($p = 0.001^*$).

Conclusion: In the current study, Consepsis® sub-gingival and intra-canal irrigation as an adjunct to SRP improved the results of the traditional endodontic and periodontal therapy, due to its bactericidal effect on aerobic, and anaerobic bacteria. Thus, it may be considered as adjunctive therapy in the management of periodontal pocket of endodontic-periodontal lesions.

Keywords: Consepsis®; Intra-Canal Irrigation; Sub-Gingival Irrigation

Abbreviations

PLI: Plaque Index; GI: Gingival Index; PPD: Periodontal Pocket Depth; RCT: Root Canal Therapy; SRP: Scaling and Root Planning; CHX: Chlorhexidine Gluconate; \pm SD: Standard Deviation; NaOCl: Sodium Hypochlorite; G: Group; Ws: Weeks

Introduction

Periodontal disease is a chronic inflammatory disease characterized by destruction of the supporting tissues then missing teeth. As we know that bacteria play a significant role in the pathogenesis of periodontal diseases [1]. The main causal factor in the induce and development of periodontal diseases is the biofilm dental plaque [2]. The removal of pathogenic bacteria in the biofilm is considered the main objective of traditional periodontal therapy, but the removal of all periodontal pathogens still a dilemma. Consequently, many studies recently have been aimed at improving the techniques of bacterial plaque removal [3]. Nevertheless, this modality of treatment has some restrictions like disability to reach into the deep structures, so antimicrobial therapy used for this objective [4].

The topical application of antimicrobial agents into the periodontal pocket leading to increase the effectiveness of traditional periodontal therapy through inhibiting the pathogens of periodontal diseases [5].

It is thought that the irrigations with antimicrobial agents may help in the treatment of specific areas as tortuous pockets or furcations where the solutions may reach into these inaccessible areas, so the local application of antimicrobial agents within periodontal pockets has considered as an adjuvant method to traditional periodontal therapy [6]. For this procedure to be efficient, this irrigation should be done after accurate SRP, and the solutions of irrigation must reach all the surfaces of the teeth [7].

Pulpal infection may cause periodontal tissue destructive changes with the formation of a periodontal pocket adjacent to the tooth. Consequently, the appropriate treatment of combined endodontic and periodontal lesions is based on both endodontic and periodontal therapy [8]. This treatment includes mechanical therapy for the removal of bacteria and chemical treatment by antibiotics and antiseptics for killing infectious organisms [9]. Many methods have been displayed to minimize the root canal microorganism numbers, such as irrigation and intra-canal medication [10].

Chlorhexidine gluconate (CHX) is considered a broad-spectrum antimicrobial agent. It is unparalleled in its capacity to adhere oral mucosa for a long duration, which it is liberated gradually (substantively) and it is not a toxic agent [11]. Furthermore, Consepsis® has been proposed as an alternate irrigating solution as replacement of 3% sodium hypochlorite (NaOCl) in RCT, and it is considered as a bacteriostatic agent at low concentration and as a bactericidal agent at high concentration [12].

Aim of the Study

This study aimed to evaluate the effect of professional intra-canal irrigation with Consepsis® combined with SRP and subgingival irrigation with Consepsis® combined with SRP on PLI, GI, and PPD compared to SRP alone in the management of periodontal pocket.

Materials and Methods

Study design and patients' selection

For the current study, a total of 30 patients (50% males and 50% females) with 120 teeth affected by endodontic lesions associated with mild to moderate periodontal pocket formation (4 - 6 mm) in the age group of 20 - 70 years, were selected from the outpatient clinics, department of periodontics and community dental sciences, college of dentistry, King Khalid University. Before beginning the study, the design and purpose of the study was demonstrated to the patients, and written informed consent taken. The ethics of this study conducted according to the protocol of the Ethical board, College of Dentistry, King Khalid University.

Exclusion criteria

- The patients with any systemic disease.
- Tobacco consumers.
- The sensitive patients to chlorhexidine gluconate.
- Those under medical care.
- The patients who received endodontic and periodontal therapy during the earlier six months.
- The patients had taken antibiotics, oral contraceptives, and immunosuppressive during the earlier six months. All of those patients were excluded from the current study.

Periodontal and endodontic therapy

The samples were divided into three equal groups (n = 10 patients). Before the treatment beginning, the participants received instructions on oral hygiene. All periodontal pockets were treated by SRP, and all teeth were treated by root canal therapy (RCT). In group I, the patients were treated by SRP and RCT without sub-gingival and intra-canal irrigation by Consepsis®. Moreover, in group II, the patients were treated by intra-canal irrigation with Consepsis® and in group III the patients were treated by sub-gingival irrigation with Consepsis® (Figure 1-5).

Sub-gingival and intra-canal irrigation

Each selected tooth was subjected to sub-gingival or intra-canal of irrigation with 150 ml 2% Chlorhexidine gluconate solution 5 minutes using sub-gingival syringe needle tips of Consepsis®. The patients’ instructions of the patients’ oral hygiene should be confirmed after the procedure (Figure 1-5).



Figure 1: Case was managed by SRP and intra-canal irrigation during traditional root canal therapy (Clinical view).



Figure 2: Case was managed by SRP and intra-canal irrigation during traditional root canal therapy (Radiographic view).



Figure 3: Case was managed by SRP and intra-canal irrigation with Consepsis® (Clinical view).



Figure 4: Case was managed by SRP and intra-canal irrigation with Consepsis® (Radiographic view).



Figure 5: Case was managed by SRP and sub-gingival irrigation with Consepsis® (Clinical view).

Periodontal examination

The clinical periodontal parameters were recorded at the sites that were treated on the first day before irrigation, then after 4 weeks and 6 weeks intervals. The following periodontal parameters were recorded:

1. Plaque index (PLI) [13].
2. Gingival index (GI) [14].
3. Periodontal pocket depth (PPD).

Statistical analysis

Statistical analysis was conducted using the SPSS 21.0 version (Chicago Inc., USA). The results were offered as a mean and standard deviation (\pm SD). The frequent measures of analysis were used to compare the scores among the groups and through different periods. The GroupWise comparison test was used to compare two groups at various periods $P < 0.05$ was considered significant.

Results

The results of the different treatment methods in the current study were based on ten patients per treatment type ($n = 10$). The range of the patients' age was 20 to < 30 years old included ten patients (33.3%), 30 to < 40 years old included seven patients (23.3%), 40 to < 50 years old included 11 patients (36.7%) and 60 to 70 years old included two patients (6.7%). When a comparison of means of age, there were no significant differences in the mean of age among the patient groups of the present study where the mean and standard deviation (\pm SD) of age in group I was 39.1 ± 14.01 years and 41.36 ± 14.6 years in group II, whereas it was 34.2 ± 9.6 years in group III as shown in table 1 and figure 6 and 7.

Average age group wise			Distribution the patients according to range of the age			
GI (n = 10)	GII (n = 11)	GIII (n = 9)	20 to < 30 y	30 to < 40y	40 to < 50y	50 to 70y
39.1 ± 14.01	41.36 ± 14.6	34.2 ± 9.6	10 (33.3%)	7(23,3%)	11(36.7%)	2(6.7%)

Table 1: Average and distribution of age group wise.

Y: Year. GI: Group I. GII: Group II. GIII: Group III. n: Number of patients.

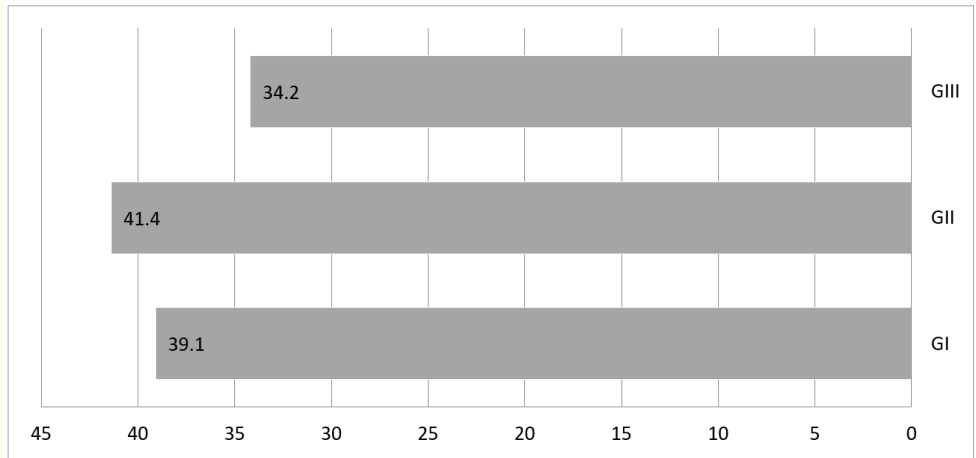


Figure 6: Average age group wise.

GI: Group I. GII: Group II. GIII: Group III. n: Number of patients.

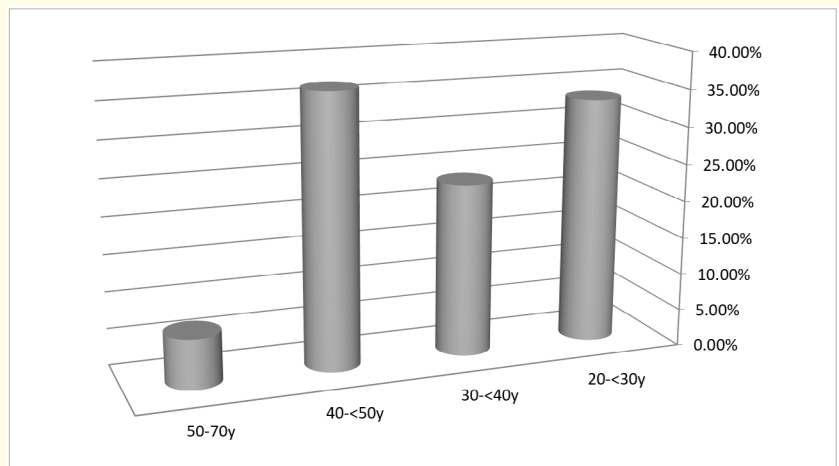


Figure 7: Distribution the patients according to the rage of the age.

When a comparison of the clinical findings, according to the age range distribution. There were differences without statistical significance in all clinical parameters according to the age range distribution at all study intervals except GI, where there was highly statistical significance in the patients' age range 30 - < 40 years (p = 0.00) and statistical significance in the patients' age range 40 - < 50 years (p = 0.014). Consequently, there were reduced in the PLI, GI, and PPD among the patients in all ranges of age distribution at 4 weeks and 6 weeks compared to baseline, but the reduction in clinical parameters in the patients' age range 20 to < 30 years old was more than other age ranges in the present study as shown in table 2 and figure 8.

1 st		PLI			GI				PPD				
		2 nd	3 rd	P value	1 st	2 nd	3 rd	P value	1 st	2 nd	3 rd	P value	
20 - <30 Years	M	2.0	1.1	1.4	0.511	2.0	1.0	1.7	0.583	4.4	3.8	3.2	0.511
	SD ±	0.1	0.3	0.5		0.1	0.00	.05		0.7	0.8	0.4	
30 - <40 Years	M	2.0	1.6	1.4	0.450	2.0	1.1	1.6	0.000*	4.3	4.0	3.1	0.421
	SD ±	0.1	0.5	0.5		0.01	.04	0.5		0.5	0.6	0.4	
40 - <50 Years	M	1.9	1.3	1.7	0.245	2.0	1.6	1.8	0.014*	4.6	4.2	3.4	0.450
	SD ±	0.3	0.5	0.5		.01	0.5	0.4		0.8	0.6	0.5	
60 - <70 Years	M	2.0	1.0	2.0	0.331	2.0	1.0	2.0	0.433	5.0	4.5	4.0	0.245
	SD ±	0.0	0.1	0.0		.01	.001	0.0		0.00	.7	0.0	

Table 2: Clinical findings, according to the age range distribution

1st: First visit. 2nd: Second visit. 3rd: Third visit. PLI: Plaque index.

GI: Gingival Index; PPD: Periodontal Pocket Depth; M: Mean; SD: Standard Deviation.

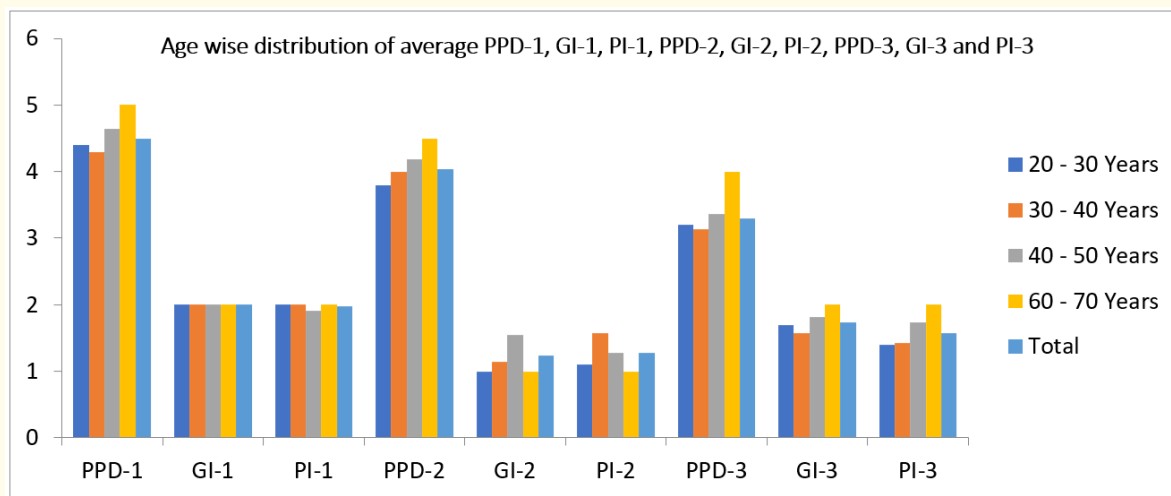


Figure 8: Clinical findings, according to the age range distribution

PPD: Periodontal Pocket Depth; GI: Gingival Index; PLI: Plaque Index; 1, 2, 3: At first, second and third visit.

On the other hand and in the comparison between group I, II, and III, there was a reduction in PLI, GI and PPD among all the patients' groups at 4 weeks and 6 weeks compared to baseline, but the reduction of PLI, GI, and PPD were more in group I than group II and III and they were more in group III than group II. There were differences in PLI, GI and PPD at 4 weeks and 6 weeks compared to a baseline without statistical significance differences ($p > 0.05$), but there were highly statistically significant differences were observed in the scores of GI ($p = 0.000$) and PPD ($p = 0.001$) at 6 weeks, moreover statistical significant differences in the score of PPD at 4 weeks ($p = 0.034$) as shown in table 3 and figure 9.

		Clinical findings												
		PLI				GI				PPD				
		GI	GII	GIII	P value	GI	GII	GIII	P value	GI	GII	GIII	P value	
BL	M	1.9	2.0	2.0	2.0	0.534	2.0	2.0	2.0	0.293	4.4	4.2	4.2	0.250
	SD ±	0.3	0.01	0.01	0.01		0.01	0.1	0.1		0.1	0.7	0.4	
4 Ws	M	1.2	1.4	1.2	1.2	0.381	1.5	1.0	1.2	0.327	4.0	4.2	3.9	0.034*
	SD ±	0.4	0.5	0.4	0.4		0.5	0.1	0.4		0.7	0.8	0.5	
6 Ws	M	1.7	1.6	1.4	1.4	0.413	1.7	1.9	1.6	0.000*	3.2	3.6	3.2	0.001*
	SD ±	0.5	0.5	0.5	0.5		0.5	0.3	0.5		0.4	0.5	0.4	

Table 3: Clinical findings

BL: Baseline; PLI: Plaque Index; GI: Gingival Index; PPD: Periodontal Pocket Depth; Ws: Weeks; M: Mean; SD: Standard Deviation; *: Statistically Significance Differences.

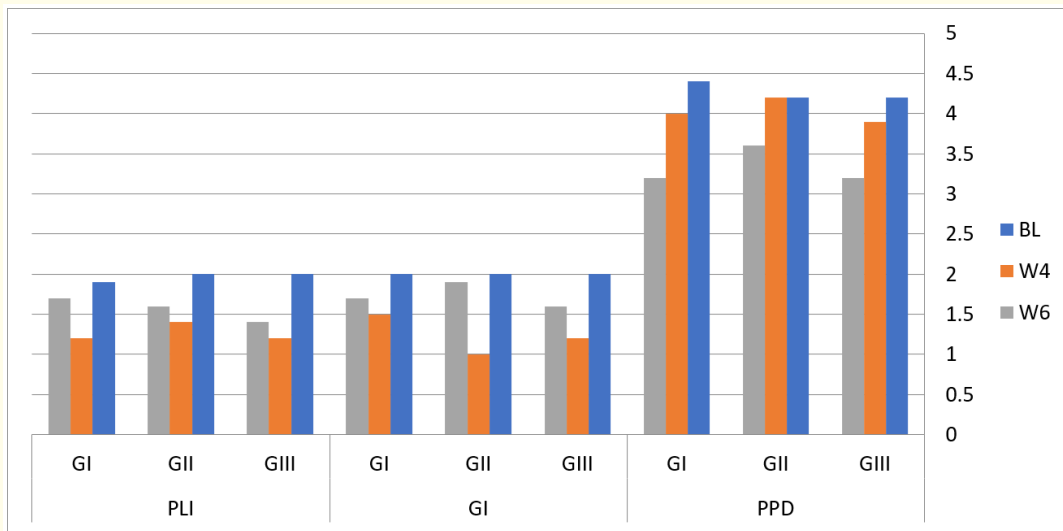


Figure 9: Clinical results.

BL: Baseline; PLI: Plaque Index; GI: Gingival Index; PPD: Periodontal Pocket Depth; Ws: Weeks.

At the end of the study, there was an improvement in all clinical findings at 4 weeks and 6 weeks follow up visits when compared to baseline, but the improvements were not statistically significant ($p > 0.05$) where the improvement was observed among the patients of group III more than group I and II also the results of the present study displayed that there was an improvement in PLI, GI and PPD scores among the patients of group III more than group II at all these study intervals.

Discussion

Periodontal and endodontic lesions are intimately connected and are considered the commonest oral diseases that are causing loss of teeth [15] that is in agreement with the results of Rotstein I, Simon JH (2006) study which revealed that the endodontic lesion induces periodontal pocket formation [16].

As is well known that the endodontic lesion is occurring as a result of the destructive effect of facultative anaerobic bacteria on pulp tissues and periodontal disease, so different antibacterial agents have been applied as adjunctive of endodontic-periodontal lesions therapy to suppress microbiota, especially in the cases of deep and complex periodontal pockets formation. Accordingly, chemo-mechanical preparation of root canal during endodontic therapy is preferred as the first stage for enhancement of periodontal pocket healing [17-19]. From this perspective, sub-gingival irrigation by antimicrobial agents, when applied with an irrigation tool, may be useful as an adjunctive method [20].

Furthermore, it should be noted that the long duration use of Chlorhexidine gluconate (CHX) as anti-plaque agents depended on the non-specific plaque hypothesis. Consequently, the sub-gingival used of CHX may lead to alteration in the microbiota of sub-gingival areas [21,22].

Through that the present study, we were capable to treat moderate deep periodontal pockets that were associated with the endodontic lesion, which may have needed a topical application of antimicrobial agents, by sub-gingival irrigation using 2% CHX (Consepsis®). The objective of this clinical study was a comparison between SRP alone (control group), Consepsis® sub-gingival irrigation with SRP, and Consepsis® root canal irrigation with SRP as adjunctive therapy of periodontal pocket among endodontic-periodontal cases.

In the study of Raheja J., *et al.* (2014), there were an antimicrobial effect of intra-canal medicaments on the external root surface as an adjunctive approach in the treatment of chronic periodontitis [23]. Correspond to the results of Basrani., *et al.* (2002) study where they found that CHX had antimicrobial effects, even 1 week after intra-canal irrigation, and reduced the adherence of the periodontal pathogens to the host cells like *Pgingivalis* [24,25]. Moreover, the results of de Lucena JM., *et al.* (2013) study revealed that intra-canal irrigation with CHX is active in the management of endodontic-periodontal lesions [26].

Clinically and according to the earlier study that was carried out by Chen SY., *et al.* (1997), they had been found that there were significant effects of the untreated endodontic lesion on periodontal pocket healing where the reduction of pocket depth was lesser compared to the cases of treated endodontic lesions [27]. In another previous study, there were differences in all clinical periodontal parameters without statistical significance differences among the patient group that was treated by SRP alone at all study intervals except PLI, where there were statistically significant differences only at 5 weeks ($P < 0.05$). Moreover, there were statistically significant differences in all clinical periodontal parameters among the patient group that was treated with 2% CHX alone ($P < 0.05$), but the statistically significant differences were more among the patients that were treated by SRP and 2% CHX irrigation at all study intervals ($P < 0.01$) [28].

In the present study, the patients who were treated by SRP and Consepsis® sub-gingival irrigation displayed a better overall reduction in the clinical parameters than the patients who were treated by SRP alone and the patients who were treated by SRP and Consepsis® intra-canal and sub-gingival irrigation at all study intervals. Despite the differences in these clinical parameters between groups were

without statistically significant, those differences in PPD and GI were statistically significant differences at 4 weeks and 6 weeks among the patients who were treated by SRP and Consepsis® sub-gingival irrigation. These results were in agreement with other earlier studies [29-32].

Consequently, The effect of Consepsis® irrigation on all clinical parameters was high at the end of week 4 in all groups of the current study except PPD, where it was high at the end of week 6. The results of the present study revealed that Consepsis® sub-gingival and intra-canal irrigation have an effective periodontal therapy with SRP. This effect may be due to the direct influence of Consepsis® sub-gingival irrigation on periodontal status. These results agree with previous studies that confirm the efficiency of 2% CHX irrigation on plaque formation. This result also was seen in GI and PPD [30,33].

In the present study, we designed a different comparison between Consepsis® sub-gingival irrigation with SRP, Consepsis® intra-canal irrigation with SRP, and SRP alone in the treatment of periodontal pocket among the patients of endodontic therapy. Depend on our knowledge, this comparison clinical study may be from the first clinical studies in the college of dentistry, King Khalid University, Saudi Arabia, which has been used endodontic-periodontal subjects of this study.

At the beginning of the current study, we thought that the application of Consepsis® is compatible with its effects as broad-spectrum antimicrobial agents, and patients will be comfortable with it. Which agree with the clinical results of our study, which were confirmed the objectives in the use of two methods, Consepsis® irrigation in the treatment of periodontal pocket compared to the traditional periodontal therapy where there was an improvement in all clinical parameters at all study intervals among all patients of the present study. When comparing PLI, GI and PPD in the groups of the present study, there were improvements in group III more than group I and group II. It may be due to the effect of Consepsis® irrigation in group III on the periodontal pocket more than in group II where this effect was due to the direct influence on the root canal, which is associated with the periodontal pocket.

It is suggested to design a study with Consepsis® intra-canal and other antimicrobial agents in a long-term program for obtaining more improvement PLI, GI, and PPD in the treatment of endodontic-periodontal lesions. The main advantages of the present study reduced the side effects of Consepsis® on the oral mucosa and increased its influence on sub-gingival pathogens. Although there are no symptoms in the present study about the systemic reaction of Consepsis® in the treatment of periodontal pocket, and regarding increased bacterial resistance problem in periodontal therapy can be solved by the increased duration of irrigation in the clinical visit, lead to an increasing concentration of the drug into periodontal pockets.

The chemo-mechanical therapy promotes the clinical effects of that procedure by removal of dental plaque and necrotic tissues in addition to the killing of periodontal pathogens, so the patients in the present study who were treated by combined Consepsis® irrigation displayed more reduction in clinical parameters (PI, GI, and PPD) in compared with SRP alone. Consequently, Sub-gingival and intra-canal irrigation after SRP could be an effective therapy in the periodontal pocket in patients with endodontic-periodontal lesions.

Limitation of the Study

The main limitation of this study is the low number of participants due to the reduction of endodontic-periodontal lesions cases with moderate periodontitis and the patients' withdrawal during the follow-up period. Moreover, the sample size was short (30 patients), the follow-up time was incommensurate with the complete healing, and the bacteriological investigation was not available.

Conclusion

At the end of the present study, we conclude that frequent irrigation of Consepsis® sub-gingivally or intra-canal as adjunctive therapy of periodontal pocket may diminish dental plaque and gingival inflammation and reduced pocket depth but it is not efficient, so we sug-

gest using sub-gingival irrigation with Consepsis® as a combined formula with other broad-spectrum antimicrobial agents for long-term therapy of periodontal pocket within maintenance phase of periodontal treatment.

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Conflict of Interest

The authors emphasize that there is no conflict of interests related to the publication of this article.

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