



Original Research Article

Evaluation of anti-inflammatory effect of vitamin c using mesotherapy approach in the treatment of persistent gingivitis

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ABSTRACT

Background: Vitamin C, being a strong reducing agent, can regulate the resolution of the inflammatory process and stimulate the tissue repair. It enhances the synthesis of collagen type I, reduced by inflammatory process, keeps the balance between collagen I and collagen III, and modifies the rate of fibroblast proliferation. Mesotherapy is a minimally invasive procedure which involves local intradermal therapy with biologically active substances given in minor quantities to the area of pathology. However, the studies on local injection of Vitamin C showed inconclusive results.

Aim: The aim of the present study is to evaluate the efficiency of the locally injected vitamin C in the treatment of persistent gingival inflammation.

Materials and Methods: After one week of SRP, ten patients with persistent gingival inflammation were included in the study. In the test group, five patients were treated with single application of locally delivered vitamin C into the gingival tissues and the other five patients in the control group were given saline as the placebo. Plaque index and sulcus bleeding index were evaluated at baseline and at 1 week post-operatively.

Results: Group A (Test group) showed a mean difference of 1.75 (pre and post op) in plaque scores which are statistically significant compared to that of group B (control group) that showed a mean difference of 0.15 in plaque scores which is not statistically significant. Sulcus bleeding index scores were statistically significantly (pre and post op) only in test group. There is no difference in plaque index and sulcus bleeding index between the test and control group at baseline, but a significant difference was observed between the two groups at 1 week follow up in plaque and sulcus bleeding index, favouring the test group.

Conclusion: Vitamin C that is injected using mesotherapy approach has a synergistic interaction with SRP for treating persisting inflammation of the gingiva than compared to that of placebo at 1 week follow up period.

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1. Introduction

Inflammation of the gingiva without a loss of connective tissue connection is known as gingivitis.¹ Dental plaque-induced gingivitis and non-plaque-induced gingivitis are two different types of gingival disorders. It was demonstrated in the experimental study done by Loe

et al. that forgoing all forms of oral hygiene led to an accumulation of plaque and debris, which in turn caused gingival inflammation.² The most prevalent type of gingival disease is gingivitis caused by dental plaque. Clinical indications of gingival inflammation include plaque or calculus, changes in shape, bleeding upon provocation, and redness and sponginess of the gingival tissue.³

The host cells are stimulated by bacterial infections to release pro inflammatory cytokines, which draw in

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neutrophils. Reactive oxygen species, which the neutrophils create and are essential for several biological activities. Tissue damage could result from the overproduction of these reactive oxygen species. The antioxidants regulate the overproduction and actions of reactive oxygen species.⁴ Vitamin E, vitamin C, and beta-carotene are examples of dietary antioxidants, while glutathione, ubiquinol, and uric acid are antioxidants created by the body during metabolism. Reduced antioxidant activity or nutritional deficits may exacerbate plaque-induced gingivitis.⁵

As the human body cannot generate ascorbic acid, also known as vitamin C, which is an antioxidant found in both plants and animals, ascorbic acid must be consumed through diet.⁵ The daily recommended intake of vitamin C is between 75 and 90 milligrams. The excess reactive oxygen species that are present in the body can be neutralised by vitamin C, a reducing agent. The inflammatory process is modulated by vitamin C, which controls the production of cytokines that promote inflammation as well as the beginning of immune cell phagocytosis and chemotaxis. Moreover, vitamin C aids in the creation of collagen and promotes the growth of fibroblasts. It is crucial for the development of blood vessels.⁶

A minimally invasive procedure known as mesotherapy uses local intradermal therapy that works in conjunction with other pharmacological and non-pharmacological treatments. The foundation of mesotherapy is the idea that local intradermal therapy results in a "micro deposit" of the medication, which is subsequently gradually released into the surrounding tissues, reaching effective concentrations in the target area. The quick rate of onset and persistent local impact of local intradermal treatment are its key benefits.⁷ There is some evidence that suggests vitamin C injections administered locally are effective in decreasing chronic gingival inflammation.

2. Aims and Objectives

2.1. Aim

The aim of the present study is to evaluate the efficiency of the locally injected vitamin C in the management of persistent gingivitis.

2.2. Objectives

1. To assess the efficiency of SRP+placebo saline in reducing the gingival inflammation.
2. To evaluate the efficiency of SRP and Vitamin C administration in reducing the gingival inflammation.
3. To compare the efficacy of Vitamin C as an adjunct to SRP and SRP+placebo saline in the management of gingival inflammation.

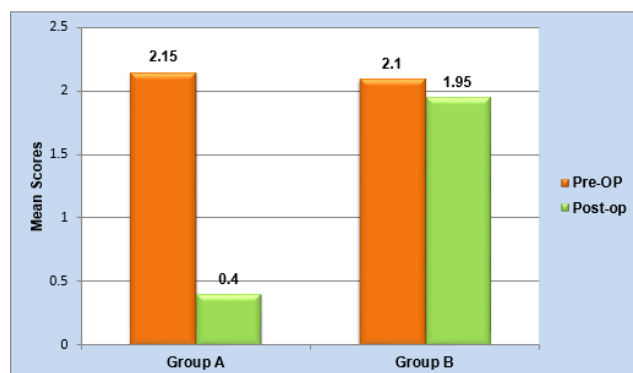
3. Materials and Methods

This study was conducted in the Department of Periodontics, Mamata Dental College, Khammam, Telangana. The study protocol was approved by the institutional ethical committee, and written informed consent was obtained from the patients after explaining about the procedure. Patients reporting to the Department of Periodontics were selected based on the following inclusion criteria: (i) Patients aged between 20-50 years (ii) systemically healthy (iii) plaque induced gingivitis. Exclusion criteria includes (i) Patients with systemic diseases (ii) pregnant and lactating women (iii) treatment with antibiotic medication within 1 month before the study (iv) smokers.

3.1. Study design

All the patients with gingival inflammation received oral hygiene instructions and underwent full-mouth scaling and root planing using ultrasonic instruments with hand instruments. Mouth rinsing with 0.12% chlorhexidine was advised twice a day. A total of 10 patients with persistent gingivitis after a maintenance period of 4 weeks were included. Five patients were injected with Vitamin C, and the other five patients received injection with placebo saline.

The affected region was anesthetized with 1:80000 lidocaine-adrenaline. The patients in the test group received intraepidermal injection with 0.6 mL (150 mg concentration) Vitamin C which was introduced into the keratinized gingival tissues using insulin syringes (mesotherapy approach). The patients in the control group received intraepidermal injection with 0.6 mL placebo saline. After the treatment, analgesics was prescribed to the patients, which was used only if it is necessary. Patients were recalled after 1 week for evaluation. Plaque Index⁸ (Silness and Loe, 1964) and Sulcus Bleeding Index⁹ (SBI) (Muhlemann and Son, 1971) were recorded at baseline and at 1 week.



Graph 1: Mean comparison of plaque scores within group

Table 1: Mean comparison of plaque scores within group

Plaque scores		N	Mean	SD	Mean difference	P value
Group A	Pre -op	5	2.1500	0.41833	1.7500	0.000*
	Post -op	5	0.4000	0.13693		
Group B	Pre -op	5	2.1000	0.60208	0.150	0.070
	Post -op	5	1.9500	0.67082		

Paired sample t test

P<0.05 considered statistically significant

Table 2: Mean comparison of plaque score between groups

Plaque scores		N	Mean	SD	P value
Pre-op	Group A	5	2.1500	0.41833	0.883
	Group B	5	2.1000	0.60208	
Post-op	Group A	5	0.4000	0.13693	0.001*
	Group B	5	1.9500	0.67082	

Independent t test

P<0.05 considered statistically significant

Table 3: Mean comparison of sulcus bleeding scores within group

Sulcus bleeding		N	Mean	SD	Mean difference	P value
Group A	Pre -op	5	3.2500	0.72887	1.600	0.035*
	Post -op	5	1.6000	0.37914		
Group B	Pre -op	5	2.7500	0.54199	0.100	0.178
	Post -op	5	2.6500	0.62750		

Wilcoxon signed rank test t test

P<0.05 considered statistically significant

Table 4: Mean comparison of sulcus bleeding score between groups

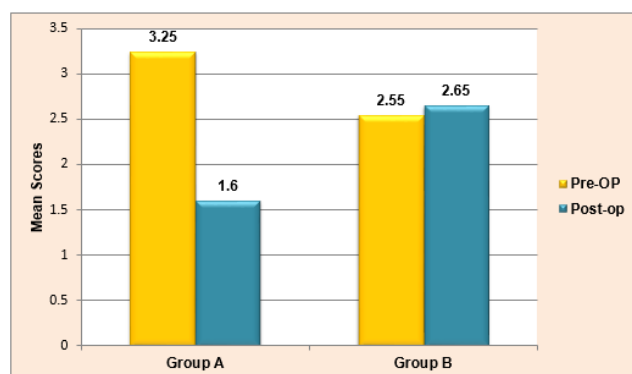
Sulcus bleeding scores		N	Mean	SD	P value
Pre-op	Group A	5	3.2500	0.72887	0.222
	Group B	5	2.5500	0.54199	
Post-op	Group A	5	1.6000	0.37914	0.008*
	Group B	5	2.6500	0.62750	

Independent Mann-whitney U test

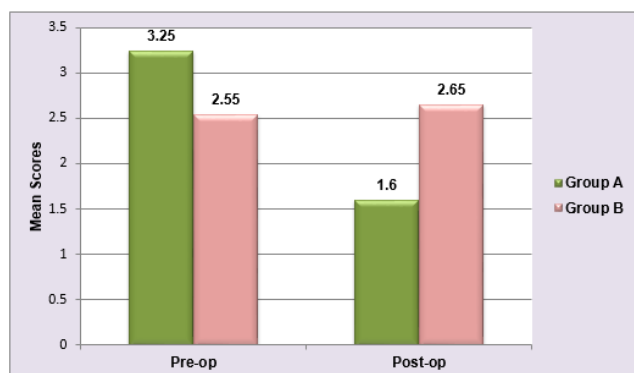
P<0.05 considered statistically significant



Graph 2: Mean comparison of plaque score between groups



Graph 3: Mean comparison of sulcus bleeding scores within group



Graph 4: Mean comparison of sulcus bleeding score between groups

4. Results

A total of 10 patients with persistent gingivitis after a maintenance period of 4 weeks were included, where 5 patients received injection of vitamin C into the gingival tissues and the other 5 patients received injection with placebo saline. The reduction of gingival inflammation were measured using Plaque index and Sulcus bleeding index at baseline and at 1 week post treatment. Statistical analysis was performed to evaluate the efficacy the vitamin C therapy.

4.1. Plaque index

The mean plaque scores within the test group were evaluated using paired sample t test (Table 1). The mean plaque score within the test group pre operatively was 2.14 ± 0.41 . The mean plaque score within the test group post-operatively was 0.4 ± 0.13 . The test group showed a reduction of plaque scores post treatment compared to baseline levels with a statistically significant difference of 1.75 ($p=0.005$).

The mean plaque scores within the control group were evaluated using paired sample t test (Table 1). The mean plaque score within the control group pre operatively was 2.1 ± 0.6 . The mean plaque score within the control group post-operatively was 1.9 ± 0.67 . The control group showed no change of plaque scores post treatment compared to baseline levels with a difference of 0.15 ($p=0.07$).

Comparison of mean plaque scores between test and control groups at baseline showed no statistically significant difference ($p=0.8$). The comparison of Mean plaque scores in test group (0.4 ± 0.13) and the control group (1.9 ± 0.67) post-operatively showed a statistically significant difference favouring the test group ($p=0.001$). (Table 2)

4.2. Sulcus bleeding index

The mean sulcus bleeding scores within the test group were evaluated using Wilcoxon signed rank t test (Table 3). The mean sulcus bleeding score within the test group pre operatively was 3.25 ± 0.72 . The mean plaque score within the test group post-operatively was 1.6 ± 0.37 . The test group showed a reduction of sulcus bleeding scores post treatment compared to baseline levels with a statistically significant difference of 1.65 ($p=0.0035$).

The mean sulcus bleeding scores within the control group were evaluated using Wilcoxon signed rank t test (Table 3). The mean sulcus bleeding scores within the control group pre operatively was 2.75 ± 0.54 . The mean plaque score within the control group post-operatively was 2.65 ± 0.62 . The control group showed no change of sulcus bleeding scores post treatment compared to baseline levels with a difference of 0.1 ($p=0.17$).

Comparison of mean sulcus bleeding scores between test and control groups at baseline showed no statistically significant difference ($p=0.2$). The comparison of Mean sulcus bleeding scores in test group (1.6 ± 0.37) and the control group (2.65 ± 0.62) post-operatively showed a statistically significant difference favouring the test group ($p=0.008$). (Table 4).

5. Discussion

Chronic inflammation of gingiva persists in some instances even after meticulous oral hygiene reinforcement. Hence, antibiotics are used as an adjunct to SRP but because of the development of adverse effects and resistance to these drugs, alternative methods have been opted.⁶

Antioxidants levels are rapidly reduced in inflammatory conditions leading to increase in the free radical levels. Hence greater doses of antioxidants such as vitamin C are required to lessen the inflammatory process. Required doses of vitamin C at high concentrations are obtained when it is delivered locally into the inflammatory site.¹⁰

Mammucari et al.⁷ observed that local intradermal therapy of anti-inflammatory agents showed a reduction in the localized inflammation.

The present study showed a statistically significant decrease in plaque scores and sulcus bleeding scores in test group where Vitamin C is locally injected into the inflamed gingival tissue compared to that of control group.

Brahmavar et al.¹¹ conducted a study where locally injected vitamin C in gingival tissues showed a 100% reduction in gingival inflammation as observed clinically with improved color, form and from Sulcus Bleeding Index scores, from the average baseline value over the 2 week period. Yussif et al.⁶ conducted a study in which a notable improvement in gingival health was seen with the vitamin C which is injected into the gingival tissues using mesotherapy approach. These studies were in accordance to the present

study where a reduction of inflammation with vitamin c is observed.

The locally injected Vitamin C is more efficient than topically used Vitamin C dentifrice or gel seen in studies by Daniels et al.¹² and Shimabukuro et al.¹³ due to several limitations such as prolonged improvement time, limited absorption, instability when exposed to solutions, air, heat, or light.

Yussif et al⁶ observed an increased number of fibroblasts, collagen fibers, new capillaries with locally injected Vitamin C.

The limitations of the present study are small sample size, Short term follow up period, single application of vitamin c, lack of histopathological examination.

6. Conclusion

Locally injected Vitamin C showed a beneficial effect as an adjunct to SRP for treating persisting inflammation of the gingiva than compared to that of SRP and placebo saline at 1 week follow up period. Large sample size with long term evaluations are required for efficient results.

7. Source of Funding

None.

8. Conflict of Interest

None.

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