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Management of the Periodontal Pocket by the Platelets Rich Plasma

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ABSTRACT

Objective: *Chronic periodontitis (CP) is a common inflammatory disease that causes destruction to the supporting tissues of the teeth. Many treatment modalities tried to stop disease progression. Platelets rich plasma (PRP) is one of the regenerative methods that are used in adjunct to conventional periodontal treatment. The aim of this study was to evaluate the anti-inflammatory effect of PRP by monitoring the lymphocyte count before and after its application to the periodontal pocket.* ***Methods:*** *Around 20 patients with CP and a pocket depth equal to or deeper than 4 mm, subjected to scaling, root planning, and PRP injection into the pocket. Lymphocyte count measured before and after 1 month from PRP application. Clinical periodontal parameters are taken in 2 visits with customized stent fabrication.* ***Results:*** *All clinical periodontal parameters show a reduction in their value following one month after PRP application. There was a marked reduction in the lymphocyte count; mean (2.47 ± 0.91) to (1.94 ± 0.77) after the treatment with PRP.* ***Conclusions:*** *In addition to its traditional uses, PRP has a great role in the periodontal treatment by its anti-inflammatory effect.*

Keywords: Lymphocyte count, Periodontal pocket, Platelet-rich plasma

INTRODUCTION

Chronic periodontitis is "an infectious disease resulting in inflammation within the supporting tissues of the teeth, progressive attachment and bone loss" [1].

Progression of CP is depending on the virulent microorganisms and host response to pathogenic infection [2]. Scaling and root planning is considered as a conventional non-surgical treatment of periodontal diseases [3]. PRP injection; concentrated platelets from autologous blood activated by the addition of thrombin and calcium, work to improve periodontal ligament (PDL) cell production and protein development, which leads to accelerating periodontal wound healing [4].

When PRP is activated, the growth factors and proteins are released to the local environment accelerating postoperative wound healing and tissue repair [5].

Examination of the connective tissue during periodontal disease under a microscope reveals a disruption of the normal anatomy of the connective tissues by a huge infiltration of numerous defense cells, particularly neutrophils, macrophages, plasma cells, and lymphocytes, with the extracellular release of their destructive enzymes [6]. Changes in leukocyte, neutrophil and lymphocyte numbers are used as a healing monitor during periodontal treatment [7].

The aim of this study was to evaluate the anti-inflammatory effect of PRP in the treatment of pockets, as an adjunct to scaling and root planning, by measuring the lymphocyte count before and after the treatment.

PATIENTS AND METHODS

Sample Selection and Study Design

Total 20 patients were involved in this study. All patients have no history of any systemic disease, from both genders, with CP according to the periodontal disease classification system of the American Academy of Periodontology, with a pocket depth equal or more than 4 mm. Patient's age ranged from 25 to 50 years old [8].

The exclusion criteria included smokers, alcohol drinkers, pregnant women, a pathological condition in the area, patients on medication; anti-inflammatory drugs, antibiotic treatments within the last 3 months. All these conditions affect the lymphocyte count.

Patient Preparation and Stent Fabrication

Informed consents were taken. All patients were subjected to conventional periodontal treatment; motivation, instruction, supragingival and subgingival scaling. Impressions were taken for occlusal stent fabrication to standardize the readings for the same site throughout the visits. It was made from thermal forming splint/co-polyester with 1 mm thickness.

Clinical Periodontal Parameters Recording

In the first visit, before root planning, periodontal parameters (plaque index (PLI), gingival index (GI), bleeding on probing (BOP), probing pocket depth (PPD) and relative attachment level (RAL) were recorded as a baseline before PRP application. The stent adjusted to cover two-thirds of the crown. RAL was recorded from the lower border of the stent to the deepest point of the pocket. RAL was measured to the teeth involved in this study. In the second visit; after 1 month from PRP application, all periodontal parameters were recorded.

PRP Preparation

About 7 milliliters (ml) of blood was taken from each patient at the first visit; to prepare the PRP and to estimate lymphocytes count. One ml of blood was used to estimate the lymphocyte count and 6 ml of blood were collected in 3, sodium citrate, vacuum tubes (each tube with two ml), with a gentle rocking of the tubes back and forth several times to ensure the complete incorporation of blood with the anticoagulant. The blood then was subjected to centrifuge at two cycles: the first cycle was at 3000 rounds per minute (rpm) for 5 minutes, then the plasma supernatant layer (which contain platelets and white blood cells) was taken and put it in a plain tube ready to the second cycle [9]. The second cycle was at 3500 rpm for 15 minutes. The upper two-thirds of the solution was discarded, the lower third (which contain the red spot; platelet pallets) was taken as a pure PRP. By using insulin syringe; 10% of the syringe volume was filled with calcium chloride (activator) and 90% by PRP; was added slowly, with forth and back motion to mix the syringe contents.

PRP application

After anesthetized the affected tooth, root planning was done by using universal curette. PRP was injected into the pocket. Slight pressure was applied to the area using moist gauze for 5 minutes for a clot to be formed [10].

Lymphocyte count

In the first visit, 1 ml was used to estimate lymphocyte count. In the second visit, 1 ml of blood was also used to estimate lymphocyte count, after 1 month from PRP application.

Statistical analysis

Statistical analysis was made with the Statistical Package for Social Sciences (SPSS) (version 20.0; Armonk, New York, 2011) [11]. Both descriptive (mean, standard deviation, percentage) and inferential statistics (t-test, person correlation) were used. The relationship was considered significant if the probability was $p<0.05$.

RESULTS

The clinical periodontal parameters (PLI, GI, BOP, PPD, and RAL) have shown a reduction in their mean values after 1 month from the treatment with the PRP, with a highly significant difference (Table 1). During this period (1 month), no complications had been observed.

Table 1 Differences between the clinical periodontal parameters at the baseline and one month after the application of PRP

Variables	Baseline		After one month		T value*	p-value	
	Mean	SD	Mean	SD			
PLI	0.84	0.22	0.76	0.21	17.19	<0.000	HS
GI	1.75	0.25	1.38	0.20	30.84	<0.000	HS
BOP %	74.58	28.22	38.82	21.50	4.50	<0.000	HS
PPD	5.13	0.67	4.41	0.73	33.84	<0.000	HS
RAL	8.72	2.27	7.89	2.31	17.19	<0.000	HS
*One sample T-test; HS: Highly significant; SD: standard deviation							

There was a marked reduction in the lymphocyte count; at baseline (2.47 ± 0.91) and after 1 month (1.94 ± 0.77) with a highly significant difference ($p \leq 0.000$) between them (Table 2).

Table 2 Differences between the lymphocyte count at the baseline and one month after the application of PRP

Variables	Baseline		After one month		T value*	p-value	
	Mean	SD	Mean	SD			
Lymphocyte Count	2.47	0.91	1.94	0.77	12.14	<0.000	HS
*One sample T-test; HS: Highly significant; SD: standard deviation							

When the amount of plaque increased, the lymphocyte count also increased leading to an increase in the gingival inflammation and destruction of the periodontium (Table 3).

Table 3 Pearson correlation between lymphocyte count and clinical periodontal parameters

Variables	Statistical analysis	PLI	GI	BOP	PPD	RAL
Lymphocyte Count	r	0.24	0.15	0.21	0.01	-0.14
	p-value	0.30	0.50	0.36	0.93	0.55
r: Pearson Correlation						

DISCUSSION

Many articles had studied the regeneration property of PRP [12]. Our study results showed a decrease in the mean value of clinical periodontal parameters (PLI, GI, BOP, PPD, and RAL) after one month of using PRP. This result could be due to the growth factors that were released from the platelets which accelerate the healing process [10,13].

There was a noticeable decrease in lymphocyte concentration after PRP treatment; this is because the platelets in the PRP release a considerable amount of RANTES (a major monocyte chemoattractant) from its alpha granules. RANTES also inhibit many cytokines released by basophils [10,14]; resolution of inflammation and decrease in the concentration of Lipoxin A4 (anti-inflammatory marker) which in turn depress the number of inflammatory cells [13].

CONCLUSION

Concerning the correlation between the lymphocyte count and clinical periodontal parameters, the study revealed a direct proportion between lymphocyte count and PLI, GI, BOP, and PPD; because when the PLI scores increase, it indicates increasing in the bacterial toxins, increasing in the inflammatory process, so increasing in the lymphocyte count. Also when the GI scores increase, indicate increasing in the inflammatory process, increase in the lymphocyte count. BOP is the parameter to measure the activity of the pocket when the mean percent of BOP increased indicate increasing the inflammatory process and increasing lymphocyte count. PRP has anti-inflammatory properties; it decreases the inflammation and accelerates the healing process; decreasing the pocket depth and increasing the attachment gain.

DECLARATIONS

Conflict of Interest

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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