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Research Article

Comparative Evaluation of Using Leukocyte-Platelet Rich Fibrin (L-PRF) and Emdogain (EMD) in Guided Tissue Regeneration (GTR) Technique for Reconstruction of Periodontal Intrabony Defects in Patients with Periodontitis

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Abstract

Background: Positive results of using GTR technique for reconstruction of intrabony defects which have been proven in many studies. Aim of this study was to evaluate the effect of using L-PRF and EMD growth factors along with GTR technique for reconstruction of periodontal intrabony defects.

Methods and Materials: Forty five intrabony defects resulted from periodontal disease which can be reconstructed were enrolled in the study. Defects divided into three groups by simple sampling (n = 15). Group 1 just got GTR treatment as control group, group 2 got L-PRF along with GTR treatment and in group 3 EMD used along with GTR. Clinical factors such as periodontal probing depth (PPD), clinical attachment level (CAL), keratinized gingival width (KGW) and bleeding on probing (BOP) were evaluated before and six months after treatment. Also amount of bone fill was evaluated with standard radiography.

Result: Treatment in all three groups significantly result in reduction of PPD and gaining of CAL. Sites with BOP significantly decreased, defects significantly filled with bone, however, there was no significant difference in KGW. Intragroup comparison showed no significant difference among groups in evaluated factors. But the most PPD reduction was 4.5 ± 1 in L-PRF+GTR group, the most CAL gain was 3.73 ± 2 in GTR group, the most reduction in BOP sites were 14 sites in L-PRF+GTR groups and the most bone fill was 73% in GTR group.

Conclusion: Using EMD or L-PRF along GTR treatment does not have additional effect on positive results of GTR treatment alone.

Keywords: *GTR; L-PRF; EMD; Periodontal Probing Depth; Clinical Attachment Level*

Background

Periodontitis is an infectious disease that involves approximately 10 to 30 percent of society. Periodontitis begins by bacteria in dental plaque that result in inflammatory response in periodontal tissue. Inflammation causes periodontal ligament attachment loss and pocket formation [1].

Periodontitis treatment is a cause related therapy; the main goal of treatment is preventing disease progress. Several methods have been introduced to reconstruct periodontal tissues [1,2].

Guided Tissue Regeneration (GTR) is one approach to reconstruct bony defects; which can be done by EMD [1,3].

Scientists invented an approach to separate blood effective factors in regeneration of soft tissue and bony defects. Leukocyte-Platelet Rich Fibrin (L-PRF) causes more periosteal tissues activity that is useful for osseous reconstruction [2,4,5] usage of these growth factors with GBR technique can cause better therapeutic results.

Emdogain (EMD) is consisting of several proteins which are secreted at dental bud stage; it results in periodontium maturation and periodontal tissues adhesion formation. 90% is consisting of a protein named amylogenic that imitates dental bud stage [1] some study has shown the antimicrobial properties of EMD [6].

Histological studies have shown that EMD causes periodontal tissues regeneration and showed better results rather than Open Flap Debridement (OFD) singly [3].

EMD leads to Clinical Attachment Level (CAL) increase and 1.1 mm decrease in pocket depth; but there is not important alteration between usage of EMD or GTR [1].

Some concerns are about viscous and flow able nature of EMD that cannot prevent tissue collapse and maintain space for periodontal tissue reconstruction that decrease clinical success. Another study has shown that EMD with osseous material gains better results [3].

L-PRF consists of a collection of cytokines, glycolic chains and proteins embedded in a fibrin network. This autogenic material comes from a simple and cheap path that does not require any anti-coagulants or material unless a centrifuge. It can cause migration and proliferation of cells such as periosteal cells that are useful for osseous reconstruction [5,7-10].

This structure cause migration and better cell proliferation, it also acts as cellular carrier. Its efficacy have been proved in some therapeutic process such as facial plastic surgery, sinus lift surgery, multiple gingival recessions and coronally advanced flap. L-PRF causes more periosteal cells activity that results in better osseous reconstruction [2,4,5].

Effectiveness of these approaches has been proved but few studies have been conducted about the comparison of them. Also, there is lack of a certain comparison about intra osseous bony defects. So, we conducted this study to evaluate L-PRF and EMD usage in GTR technique for reconstruction of intra osseous bony defects in periodontitis patients.

Materials and Methods

This Randomized controlled prospective single blind clinical trial was done at periodontics department of Hamadan dentistry faculty of Medical Sciences at 1394-95.

The patients were selected from the patients who were referred to periodontics department of Hamadan dentistry faculty. We considered reconstruct able vertical bone lesions and minimum 6 mm pocket depth to include the patients in trial. The exclusion criterias were these: smoking; pregnancy; any systemic disease and pocket depth greater than 9 mm.

45 intra osseous bony defects were randomly divided into three equal groups (group 1: GTR+ L-PRF, group 2: GTR+ EMD, group 3: GTR). The third group was the control. We used Nano bone (Artoss) and absorbable collagen membrane (hamanandsaz kish). Therese study variables were evaluated: BOP, PD, CAL. Radiographic evaluations was done using Long cone Parallel technique before and three months after surgery.

Stent was used to record the periodontal probe path. CEJ (cement enamel junction) was considered as the reference point for measurement or the edge of restoration instead of it.

UNC 15 probe (Friedy, chicagi IL, USA) was used for measures and the whole surgery and measurements at stage one and two were done by one person. Evaluations were both clinical and radiographic.

Scaling was done for patients after initial clinical, radiographic and periodontal chart evaluations. Oral hygiene instructions were include at this stage. The patient enrolled in the surgical process if the plaque index was lesser than 20%.

In Group 1 (GTR+ L-PRF) the patients were referede to Imonology depertment od university before the surgery for blood sample taking.The Medifuge centrifugation system (Silfradent S. R. L. Santa Sofia, Italy) was used for L-PRF preparation after taking 10 ml blood. Any materials such as anticoagulants were used (800g, 2700 rpm, 10 minutes) [11-13]. L-PRF was used in mix with bone material and the membrane was placed on it.

In Group 2 (GTR+ EMD) Adequate amount of EMD was shot into the lesion before placing the bone material.

In Group 3 (GTR) depth of the lesion and PD were measured before the surgery. Granulation tissue and remained calculus were removed after reflecting the sulcular incision flap. CAL was measured at this stage. GTR was done using Nano bone soaked in saline and blood and resorb able trimmed membrane. The flap sutured by silk 4.0 (Supa Co. IRAN) and dressed COE-PAK (GC Co. USA).

Kruskal-Wallis and Person Chi-Square were used for statistical analysis. The significance level was considered as < 0.05.

Results

This study showed that all the therapeutic methods are successful to reduce PPD and BOP and enhance CAL and clinical status. But there is no significant difference in attached gingiva width. Table 1 shows before and after treatment procedure in three groups.

Group	Mean		Differences		t	df	P-value
			Standard deviation				
GTR+L-PRF	Pair 1	PPD before - PPD after	4.533333	1	16.56	14	< 0.001
	Pair 2	CAL before - CAL after	3.6	2	8.51	14	< 0.001
	Pair 3	KG before - KG after	0	1	0.00	14	1.000
	Pair 4	BF before - BF after	-70.5333	4	-67.73	14	< 0.001
GTR+EMD	Pair 1	PPD before - PPD after	4.333333	1	15.08	14	< 0.001
	Pair 2	CAL before - CAL after	3.4	2	8.76	14	< 0.001
	Pair 3	KG before - KG after	-0.13333	1	-1.00	14	0.334
	Pair 4	BF before - BF after	-68	4	-72.65	14	< 0.001
GTR	Pair 1	PPD before - PPD after	4.4	1	15.20	14	< 0.001
	Pair 2	CAL before - CAL after	3.733333	2	8.90	14	< 0.001
	Pair 3	KG before - KG after	-0.13333	1	-1.00	14	0.334
	Pair 4	BF before - BF after	-73	4	-63.22	14	< 0.001

***Table 1**: Descriptive statistics od study variables before and after treatment.*

There was no significant differences between study groups for PPD decrease (GTR 4.4 ± 1, L-PRF 4.53 ± 1, EMD 4.33 ± 1) P-value = 0.89 (Table 2).

Variable	SS	Df	MS	F	P-value
Intercept	12.4	1	12.4	10.0	.003
PPD before	34.8	1	34.8	28.2	.000
Group	0.3	2	0.1	0.1	.897
Error	50.7	41	1.2		
Whole	95.6	44			

Table 2*: Comparison of PPD before and after treatment in groups.*

The average increase of CAL was 3.73 ± 2 GTR, 3.6 ± 2 L-PRF and 3.4 ± 2 EMD that is not significant (P-value = 0.66). the data is shown in table 3 with modified effect of CAL before treatment.

Variable	SS	df	MS	F	P-value
Intercept	91.4	1	91.4	58.7	.000
CAL before	175.8	1	175.8	113.0	.000
Group	1.3	2	0.6	0.4	.666
Error	63.8	41	1.6		
Whole	243.2	44			

Table 3: Comparison of CAL before and after treatment in groups.

The mean KGW (keratinized gingiva width) differences was not significant between groups (-0.13 ± 1 GTR, 0 ± 1 L-PRF, -0.13 ± 1 EMD) P-value = 0.67 (Table 4).

Variables	SS	df	MS	F	P-value
Intercept	1.1	1	1.1	4.0	.051
KG before	54.9	1	54.9	210.7	.000
Group	0.2	2	0.1	0.4	.671
Error	10.7	41	0.3		
Whole	66.4	44			

Table 4: Comparison of KGW before and after treatment in groups.

The mean increased amount BF (bone fill) was 73% in GTR group, 70.5% in L-PRF group and 68% in EMD group that there is no significant differences between them (P-value = 0.12) (Table 5).

Variables	SS	df	MS	F	P-value
Intercept	223731.8	1	223731.8	13584.3	.000
Group	187.5	2	93.8	5.7	.12
Error	691.7	42	16.5		
Whole	879.2	44			

Table 5: Comparison of BF variable in study groups.

BOP changes were not significant in study groups (P-value = 0.2) as shown in table 6.

	Chi-square	df	P-value
Person Chi-Square	3.3	2	0.2

Table 6: Comparison of BOP variable in study groups.

Discussion

Periodontitis is one of the prevalent disease that results in different bone loss patterns. The ideal treatment is reconstruction of them [7]. Studies show graft material, growth factors or combination therapy is useful to enhance the treatment outcomes [14]. GTR is the gold standard approach for localized intra osseous bone defects [15]. So, we considered the method as control group. Growth factors are used for enhance treatment results recently. Extent and defect morphology are two important item for technique selecting [14].

Evaluating the effect of L-PRF growth factors or EMD with GTR was the purpose of this study. We measured clinical parameters like BOP, BF, CAL, PD and radiographic evaluations. Dori stated that these are the main measurable factors for clinical healing evaluation of defects [8,14].

Sculean., *et al.* found that GTR or EMD+GTR can significantly decrease PD and CAL but there is no significant differences between them. The simple open flap surgery also can recover the defect that is significantly lower than the other groups. All of the methods have stable results with regular follow ups and good oral hygiene [7,16,17].

Artzi., *et al.* evaluated the effect of EMD+GTR with xenografts in treatment of intra osseous bone defects. They reported 1.1 ± 35.5 decrease for GTR group and 9.0 ± 87.4 increase for clinical attachment gain (both significant). The achieved results are the same as us. Also, they reported these for EMD+GTR group: 28.1 ± 15.5 for PD and 21.1 ± 2.5 for clinical attachment gain. The results reveal that the frame work of bone material is the main key for reconstruction and the effect of EMD is lower [18].

Siciliano., *et al.* stated that titanium reinforced membrane cause better results than EMD alone [19].

Osseous defects have different shape and morphology that influence their treatment outcome. EMD without membrane is not so better than GTR alone [18-20].

Despite these findings EMD is useful for class II formation involvement even alone or with GTR technique [21,22].

Despite the real that GTR decrease PD and CAL; EMD is a useful selection because of GTR technique complexity [8].

There is no useful study to compare the treatment outcomes of using L-PRF for defects reconstruction. PD and CAL decrease were not significant in L-PRF group comparing control. This can be justified by the study of Jamal., *et al*. they concluded that PRF cannot increase growth factors upper than the physiologic level. This can be in related to infectious nature of periodontal lesions that influence negatively on growth factors [23].

L-PRF has been used separately as a graft material or with DFDBA. It is valuable to notice that the membrane was not used so that the results were not significant [24].

We evaluated the same morphologic defects and PD and CAL differences were significant. BOP is more related to oral hygiene status rather than selective therapy. It is also useful to mention that growth factors are below membrane and cannot influence attached gingiva width.

Conclusion

All three reconstruction methods are useful to treat osseous lesions but usage of EMD or L-PRF with GTR cannot enhance the result.

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