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RESEARCH ARTICLE

COMPARATIVE EVALUATION OF THE TREATMENT OF GINGIVAL RECESSIONS WITH CONNECTIVE TISSUE GRAFT AND PLATELET-RICH FIBRIN MEMBRANE

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ABSTRACT

Purpose: The purpose of this study is to compare the options for treatment of Miller's Class I and Class II gingival recessions using coronally advanced flap (CAF) and platelet rich fibrin membrane (PRFm) with CAF and connective tissue graft (CTG).

Materials and methods: A surgical treatment was carried out on 30 subjects (23 women and 7 men) with a total of 118 symmetrical recessions of Class I and Class II by Miller on different places of the jaws, using two different methods. On one side of the jaw was held a plastic covering of the recessions with CAF in combination with PRFm (test group), and on the other side – CAF in combination with connective tissue graft (control group). The clinical evaluation includes: gingival recession depth (GRD), probing pocket depth (PPD), clinical attachment level (CAL), keratinized gingival width (KGW), gingival thickness (GTH), mean percent of root coverage (RC %). The results were observed for six months postoperatively.

Results: The average values for the GRD measured six months postoperatively for the control group are 0.37 ± 0.36 mm and 0.70 ± 0.41 mm for the test group. The results for CAL for the control group are 2.01 ± 0.44 mm and 2.28 ± 0.50 mm for the test group, while the mean percent of root coverage (RC %) is $90.29 \pm 9.05\%$ for the control group and $80.48 \pm 10.19\%$ for the test group. The values for GTH are 1.04 ± 0.16 mm for the control group and 0.92 ± 0.09 mm for the test group.

Conclusion: Both the compared methods show good results in terms of all evaluated parameters. The group treated with CAF + CTG showed better results with a statistically significant difference for the RC% and the average values for GRD, GTH and CAL. The results of our study demonstrate a good potential for PRFm used in the treatment of Miller's Class I and Class II gingival recessions.

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INTRODUCTION

Most authors nowadays take the treatment of gingival recessions with coronally advanced flap (CAF) and connective tissue graft as a "gold standard". (Baccini et al., 2013) Although the results are indisputable these techniques have some disadvantages and limitations. For example there is greater postoperative discomfort for the patient and a greater risk of early and late complications in the donor site. (Rotundo, 2012) In the past few years there have been some publications about the treatment of gingival recessions with the usage of platelet-rich fibrin membrane (PRFm) showing promising results.

(Anilkumar et al., 2009; Jankovic et al., 2010; Aleksić et al., 2010; Del Corso et al., 2009; Gupta et al., 2014; Uraz et al., 2013) The PRFm is an autogenous solid biomaterial containing an increased amount of leukocytes and platelets. This biomaterial releases growth factors slowly and lasts for at least 7-28 days. (Dohan et al., 2006; Dohan Ehrenfest et al., 2009; Dohan Ehrenfest et al., 2009) PRFm is made from the blood of the patient which includes no chemical or biological additions. It is used to stimulate the bone and soft tissue regeneration in oral and maxillofacial surgery, dental implantology and periodontal surgery. (Dohan Ehrenfest, 2010; Saluja et al., 2011) It is also used for the healing for extraction wounds (Zhao et al., 2011), treatment of intraosseous defects (Chang et al., 2011), radicular cysts (Zhao et al., 2012), influence of the bone in response to bisphosphonate osteonecrosis (Kim et al., 2014) and more.

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Purpose

The purpose of this study is to compare the options for treatment of Miller's Class I and Class II gingival recessions using coronally advanced flap (CAF) and platelet rich fibrin membrane (PRFm) with CAF and connective tissue graft (CTG).

MATERIALS AND METHODS

The clinical study was conducted at the Department of Oral Surgery in the Faculty of Dental Medicine of Medical University – Plovdiv. The duration was from January 2013 to November 2015. The study included 30 people (23 women and 7 men) at the age of 23 to 70 years (average age – 37.93 years) with a total of 118 symmetrical Miller's Class I and Class II gingival recessions on different places of the jaws. All of the patients' gingival recessions were treated surgically and the results were monitored for six months postoperatively. On one side of the jaw was held a plastic covering of 59 gingival recessions with CAF and PRFm (test group) – (Fig. 1 a, b), and on the other side – plastic covering of 59 gingival recessions with CAF and CTG (control group) – (Fig. 1 c, d). The method was randomly on the day of the surgery.



Fig. 1. a)13, 14- before treatment b)13, 14 after treatment with CAF + PRFm c) 22 and 23 - before treatment d) 22 and 23 after treatment with CAF + CTG

Inclusion criteria

Class I and Class II Miller recessions; Age of 18 and above; Patients without contraindications for surgery and good oral hygiene (plaque index < 20%).

Exclusion criteria

Presence of severe chronic diseases or immunodeficiency; Reception of anticoagulants and antiaggregants; Pregnant with contraindications for surgical interventions; Known allergies to drugs used in the treating process; Bad oral hygiene (plaque index > 20%); Patients wearing fixed or removable prostheses; Patients smoking over 10 cigarettes a day or taking drugs.

Clinical measurements

Gingival recession depth (GRD); keratinized gingival width (KGW) in millimeters; mean percent of root coverage (RC %). These measurements were monitored prior to the surgery and on the 1st, 3rd and 6th month afterwards. Before the surgery and on the 6th month after it we also monitored: probing pocket depth (PPD); clinical attachment level (CAL); the value of the creeping attachment (CA); gingival thickness (GTH). GTH was measured 2-3 mm below the edge of the gingiva with a sterile endodontic tool #15 with silicone stopper. (Paolantonio, 2002)

After the local anesthesia the tool is stuck into the mucous membrane at right angle all the way to the bone while the silicone stopper moves in tightly – (Fig. 2 a). The distance from the stopper to the tip of the tool is measured with a micrometer accurate to two decimal places - (Fig. 2 b).

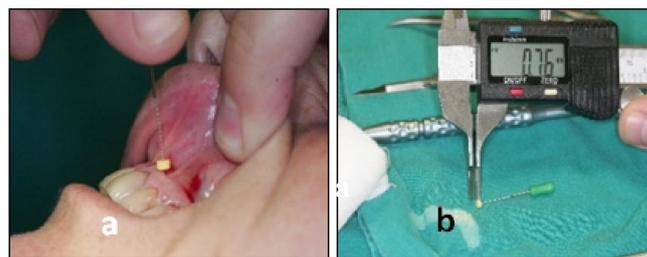


Fig. 2. Measurement of gingival thickness

Surgical treatment

After the application of local anesthesia a horizontal incision is made with a scalpel, beginning from the middle part of the gingival papilla, medially from the affected by the recession tooth, a little above the cemento-enamel junction (CEJ). The incision goes intrasulcular along the marginal edge of the affected by the recession teeth and ends in the middle of the papilla, distally from the affected tooth a little above the CEJ. The vertical incisions start from the endings of the horizontal ones and diverge apically, reaching the mucogingival junction. The formed mucoperiosteal flap is carefully removed with a small periosteal elevator and the periosteum is cut the entire length at the base of the flap - (Fig. 3 a).

The gingival papillae are deepithelized coronally above the horizontal incisions. The exposed root surfaces are thoroughly cleaned and polished with hand and machine tools - (Fig. 3 b). The cleaned and polished root surface is then conditioned with a prepared by us ex tempore solution of tetracycline in concentration of 125mg/ml for 3 minutes. At this moment for the test group on the treated surface is put the then prepared PRFm, while for the control group is used a CTG. CTG and PRFm are stitched a little above the CEJ with an absorbable suture 0000 - (Fig. 3 c). The stitched CTG and PRFm are then covered with the mucoperiosteal flap which is also stitched with an absorbable suture 0000 – (Fig. 3 d). The sutures are removed 12-14 days after the surgery.



Fig. 3. Treatment of the gingival recession – test group

Preparation of the PRF membrane

We prepare the PRFm just before the surgery, after drying the PRF clot, obtained by the centrifugation of the patient's blood by the method of Choukroun *et al.* (Choukroun *et al.*, 2001; Dohan *et al.*, 2006) 2-4 tubes of blood are taken from the

patient based on the current needs. The blood is immediately put to centrifugation at 1500 rpm for 8 minutes (PRF DUO – Processor PRF® - France). The PRFm is formed by putting two PRF clots on top of one another in a way that their parts which bordered with the red zone are at the opposite ends - (Fig. 4 a). We bend the PRFm in half and dry it for an additional 1-2 minutes in A-PRF Box® (Dohan Ehrenfest, 2010) - (Fig. 4 b-d).

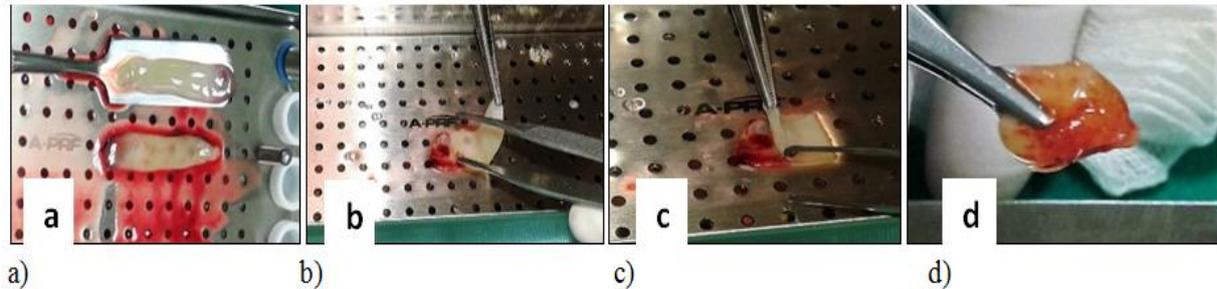


Fig. 4. Stages of the preparation of the PRFm

Results for the clinical parameters									
Parameter	CPF + CTG (control group)				CPF + PRFm (test group)				Statistical significance between groups
	Base	6 months	P value	Statistical significance	Base	6 months	P value	Statistical significance	
GRD	3.59±0.69	0.37±0.36	0.00	yes	3.59±0.79	0.70±0.41	0.00	yes	yes
PPD	1.78±0.28	1.63±0.22	0.00	yes	1.79±0.31	1.58±0.23	0.00	yes	no
KGW	1.33±1.01	2.26±0.61	0.00	yes	1.24±1.04	2.04±0.62	0.00	yes	yes
CAL	5.37±0.87	2.01±0.44	0.00	yes	5.38±1.00	2.28±0.50	0.00	yes	no
GTH	0.91±0.11	1.04±0.16	0.00	yes	0.89±0.08	0.92±0.09	0.00	yes	yes
CA		0.47±0.21				0.32±0.25			yes
RC%		90.29±9.05				80.48±10.1			yes

Key: GRD – gingival recession depth, KGW – keratinized gingival width, PPD - probing pocket depth, CAL – clinical attachment level, GTH - gingival thickness, RC% – root coverage rate, CA – creeping attachment, SD – standard deviation, statistical significance - P value < 0.05

Harvesting connective tissue graft

If possible we always apply the endo-incision technique for taking CTG from the palate of the patient, described by Hürzeler and Weng (Hürzeler and Weng, 1999) (Class I in the classification of Liu (Liu and Weisgold, 2002).

Postoperative care

After the surgery all patients were put on a 3 day therapy with NSAIDs and rinsing of the oral cavity with 0.12% solution of chlorhexidine for one minute three times a day every day for 14 days. The application of cold compresses in the area of the surgery was also recommended for the first 48 hours and a liquid food diet for the first seven days. The patients were called for examination on the first day after the surgery and the sutures were removed on the 14th day. They were all given instructions about proper personal oral hygiene techniques and to avoid brushing the teeth in the treated area for about 14 days.

Statistical methods

Statistical analysis was done with the system for data analysis R (version 3.2.1) working on the operation system Windows (7 and XP). The level of statistical significance which makes the null hypothesis false was chosen to be $p < 0.05$. The model used for our study is known as matched case-control study

design. We used the t-criterion of Student for dependent (paired) samples. In order to verify if the difference between the root coverage rates (RC %) was statistically significant we used the two sample test for equality of proportions.

RESULTS

All parameters monitored prior to the treatment showed no statistically significant difference between the two groups

(Table 1). The results on the sixth month after the surgery showed significant improvement for the parameters with statistically significant difference in comparison to the parameters before the surgery. At the end of the monitoring period the results demonstrated advantage in favour of the CAF + CTG method (control group) over the CAF+PRFm method (test group) with a statistically significant difference for the results of GRD, KGW, GTH, CA and RC% - Table 1. There was not statistically significant difference for the results of PPD and CAL between the two groups – Table 1.

DISCUSSION

All techniques used to treat gingival recessions aim to be as predictable as possible, to fully cover the exposed root surfaces, to eliminate the increased sensitivity of the affected teeth and to meet aesthetic criteria of the patients. According to most studies the procedures involving CAF in combination with CTG have the highest predictability with excellent aesthetic results and are considered as “gold standard”. (Baccini *et al.*, 2013; Baccini *et al.*, 2013; Pini-Prato *et al.*, 2014) A disadvantage that is directly linked to the usage of the autogenous CTG is the presence of a second operative wound which is often the cause of complications during and after the surgery. (Drudi *et al.*, 2008) Nowadays different regenerative materials other than CTG are used in the treatment of gingival

recessions, but the search for the most suitable such material is still going. PRF is the second generation platelet concentrate (Dohan et al., 2006) with a lot of advantages compared to the alternatives. The usage of PRF is simple, does not require expensive equipment or consumables, it is prepared in clinical conditions, it is completely autogenous and does not contain any additional supplements.

Our results for RC % for the control groups are 90.29%±9.05% and 80.48%±10.19% for the test group and are similar to those of other studies. (Aroca et al., 2009) The results for the CAF + PRFm group in the study conducted by Aleksić Z et al. (Aleksić et al., 2010) are similar. They treat 19 gingival recessions using the CAF + PRFm method and another 19 recessions on the same patients with the CAF + CTG method, monitoring results for 12 months. The root coverage rate (RC %) is great for both groups with values of 79.94% for the group with PRFm and 88.56% for the group with CTG and no statistical difference between the two groups. Our results for the keratinized gingival width are in contradiction with those presented by Arosa S. et al. (Aroca et al., 2009) in a comparative study about the treatment of gingival recessions with modified CAF alone and modified CAF + PRFm. In their papers they report a slight drop in the values for the keratinized gingival width six months postoperatively in comparison to the values before the treatment. Better results for KGW for the control group have been shown in our report as well as in reports from other similar studies. (Aleksić et al., 2010; Uraz et al., 2013; Padma et al., 2013; Thamaraiselvan et al., 2015) Our results for GTH support the results of other studies (Aroca et al., 2009; Thamaraiselvan et al., 2015) comparing the effect of PRFm with CAF alone in the treatment of gingival recessions and CAF + PRFm.

All these studies explain the increase in GTH for the group treated with PRFm are due to its biological qualities. The increase in GTH according to Thamaraiselvan M. et al. (Thamaraiselvan et al., 2015) for the group with PRFm is most probably due to the proven biological qualities of PRF to stimulate the proliferation of the gingiva, periodontal fibroblasts and the space effect of the membrane. Our good results about the GTH for the test group (CAF + PRFm) we think are not only due to the qualities of the PRFm but also due to the preparation method. It is known that the highest concentration of platelets is in proximity to the red border. (Dohan et al., 2006; Dohan et al., 2006; Dohan et al., 2006) Based on this fact we prepare the PRF membrane utilizing two A-PRF clots in the method described above.

The purpose is to increase the concentration and the moderate distribution of platelets and leukocytes (Dohan Ehrenfest et al., 2010) in the resulting PRF membrane. The results of our study for the clinical attachment level are confirmed by the studies of other authors. (Aleksić et al., 2010; Uraz et al., 2013; Padma et al., 2013; Thamaraiselvan et al., 2015) The higher reduction of the clinical attachment level for the control group (from 5.37±0.87mm to 2.01±0.44 mm) compared with the test group (from 5.38±1.00 mm to 2.28±0.50 mm) shows no statistically significant difference. Our results coincide with the ones published in the studies of Janakovic S. et al. (Jankovic et al., 2012) and Aleksić Z et al. (Aleksić et al., 2010) while they are

in contradiction with the results of some other authors. (Padma et al., 2013; Thamaraiselvan et al., 2015) The average values we measured for the creeping attachment (CA) on the sixth month after the surgery of the gingival recessions are 0.47±0.21 mm for the control group and 0.32±0.25 mm for the test group. These results show a higher reduction in the width of the gingival recession for the control group with a significant difference (p value < 0.05). Our results are similar to the ones reported in other studies (Thamaraiselvan et al., 2015; Girouard Marie-Eve, 2011; Pini-Prato et al., 2014) about the treatment of recessions with CAF + CTG and other CTG techniques.

Conclusions

Based on our final results we get to the conclusion that both the compared methods for the treatment of gingival recessions show good results in terms of all measured clinical parameters. The group treated with CAF + CTG showed better results with significant difference in terms of RC%, GRD, GTH and CA compared to the other group. The results for all other clinical parameters have no significant difference when comparing the two groups. The results of our comparative study show a good potential for PRFm used in the treatment of Miller's Class I and Class II gingival recessions.

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