Comparative research concerning clinical efficiency of three surgical methods of periodontium recessions treatment in five-year observations

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Abstract

Purpose: The aim of this study was a comparative analyses of clinical treatment efficiency of periodontium recessions after the application of double pedicle bilateral flap (DPBF), coronally repositioned flap in combination with connective tissue graft (CRF-CTG), coronally advanced flap in combination with guided tissue regeneration using collagen membranes (GTR-CM).

Material and methods: Research material consisted of 37 people (71.2% of initial patient number), including 27 women at the age from 17 to 53. All those people had single or multiple recessions, in I or II Miller's class, with the depth more than 2 mm. There were estimated 98 covered recessions of which 33 after DPBF, 41 after CRF-CTG and 24 after GTR-CM.

The clinical estimation of recession level before surgeries and after 12, 24, 60 months was done with the usage of the following parameters: recession depth (RD), recession width (RW), clinical attachment level (CAL) and keratinized tissue hight (HKT). There was also done an ultrasonic measurement of keratinized tissue thickness (TKT) in two groups of patients who had undergone surgeries CRF-CTG and GTR-CM. After 12, 24 and 60 months there were measured: an average percentage of a root coverage (%ARC), a percentage index of the complete root coverage (%CRC) and the percentage of complete coverage (CRC).

Results: Five-year inter group analyses of three surgical methods of recession treatment did not show any significant differences among surgeries for the following parameters: RD, CAL and TKT. The value of RD after DPBF was 0.85 mm, after CAF-CTG was 0.83 mm and after GTR-CM 0.38 mm.

There was a substantial difference of values such as ARC the best result of which was for the method GTR-CM (90%) and next for CRF-CTG (82%), CRC% and CRC with the best result for the methods GTR-CM (90%; 87.5%) and CRF-CTG (82.8%; 61%).

Conclusions: The authors' observations show that methods GTR-CM and CRF-CTG are mostly predictable and enable the stable coverage of periodotium recession during five-year observations.

Introduction

One of the main assumptions of periodontium plastic surgery is to guarantee aesthetics of the red complex. This can be gained with the application of recession coverage and gingival augmentation [1,2]. The variety of surgical methods used during recession coverage enables to choose the most efficient method which in turns allows to gain the best therapeutic and aesthetic effect depending on the operated area condition [1-4]. Treatment with the usage of pedicle flaps allows to get a high percentage of average and complete recession coverage generally without an influence on width and thickness of keratinized gingiva, on condition that there is an appropriate amount of recipient tissue in the nearest recession area and an appropriate height of an oral cavity vestibule. Treatment with free gingival grafts results in no aesthetic healing effect described in science literature as the healing of scarf characteristics [1,2]. However, connective tissue grafts which can be made with the minimal amount of tissue in recipient place result in aesthetic rebuilt of the biological width and thickness of gingival and generally do not influence periodontium recession in the treated area. That is why there

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developed methods combining treatment applying pedicle flaps and connective tissue grafts with the alternative factors causing periodontium regeneration such as barrier membranes (GTR) and bioactive protein – enamel matrix protein and polypeptide growth factors [1,2]. The assessment of the recession coverage stability in a long-term evaluation should also be an important criteria to choices of treatment method [5].

The aim of this study was a five-year comparative assessment of periodontium recessions treatment efficiency after the application of: double pedicle bilateral flap acc. to Marggraf [6] (DPBF), coronally repositioned flap in combination with connective tissue graft acc. Bruno [7] (CRF-CTG), coronally advanced flap in combination with guided tissue regeneration with the usage of collagen membranes (GTR-CM) acc. Pini Prato [8] taking into consideration recommendations of Shieh and his co-operators [9].

Material and methods

37 people were assessed, at the age between 17 and 53 (the average age 30,31) including 27 women. Patients came for the medical check-up 5 years after the surgical treatment of periodontium recession coverage. It was 71.2% of the initial patient number. 98 covered recessions were tested 33 of which were after DPBF treatment, 41 after CRF-CTG and 24 after GTR-CM. The treatment was applied to 64 teeth in maxilla including 12 incisors, 33 canines and premolars, 34 teeth in mandibula including 10 incisors, 10 canines and 14 premolars. There were covered 38 singular recessions, 28 double recessions and a four-ply one.

The recessions qualified for the treatment were in I and II Miller's class, with height more than 2 mm occurring only on front teeth and premolars of maxilla and mandibula without fillings in the neck area which exceed the cemento-enamel junction. The initial keratinized gingival width of more than 3 mm and keratinized gingival thickness of more than 0.75 were recommendations for treatment DPBF or GTR-CM, whereas the smaller values for CRF-CTG.

The clinical assessment of recession progress before treatment and after 12, 24 and 60 months was done with the usage of the following parameters: recession depth (RD) and recession width (RW), clinical attachment level (CAL), keratinized tissue height (HKT, the distance measured between gingival margin and mucogingival junction). All measurement was done using periodontometer of Williams, scale calibrated at 1mm. There was also done the ultrasonic mesured of keratinized tissue thickness (TKT) in a group of patients who had undergone treatment CRF-CTG and GTR-CM. The description of examination method was presented in a previous publication [10]. After 12, 24 and 60 months there were measured: average percentage of root coverage (%ARC), percentage index of complete root coverage (%CRC) and the percentage of complete root coverage (CRC).

During pre-surgical treatment the influence of potential aetiological factors of recession was lowered or eliminated. Special attention was paid to the appropriate technique of tooth cleaning and the proper hardness of a toothbrush. The correction of occlusal disturbances and premature contacts in centric occlusion and non-centric occlusion was done with a help of

selective teeth grinding. Getting zero values of oral cavity hygiene was the condition of treatment application.

Before the treatment the surface of tooth roots was prepared by curette and diamonds of the lowest granularity.

A detailed description of treatment techniques was published earlier [11,12]. All surgical treatment was done by the same operating person whereas the clinical assessment by the different doctor.

During post-surgical treatment patients had avoided injuries of an operated place for 10 days. In that time they covered operated places with a paste Solcoseryl. Mouth rinsing with 0.12% chloredixine gluconate twice a day was ordered. After treatment GTR-CM it was ordered to use 1g of amoxicilinum once a day for 5 days which was in accordance with treatment protocols of other authors [8,13,14].

Statistical analyses

Average values, standard deviations and medians of all examined parameters were calculated for variables before treatment and after 12, 24 and 60 months. Verification of a hypotheses about equality of continual average parameters in particular groups was done using the t-Student test for couples. Verification of a hypothesis about equality of continual average parameters among treated groups was done with the usage of method of variance analyses (ANOVA) for groups of homogenous variance or with non-parametric Wilcox test (homogeneity was examined with Bartlett test). The level of significance $p \leq 0.05$ was assumed. During statistical analyses there was used a set of statistical computer programs EPINFO Ver. 3. 2, 2004.

Results

The average percentage of complete root coverage (%ARC), the value of a percentage index of complete recession coverage (%CRC) and the percentage of complete coverage in observations during 12, 24 and 60 months, in different treatment groups (in-group analyses) was illustrated in *Tab. 1-3* and comparison of values on inter-group analyses in the *Tab. 4*.

The highest average percentage of root coverage in 60-month observations was noticed for the method GTR-CM (90%, median 100%) next CRF-CTG (82,8%, median 100%) and DPBF (68.9%, median 75%). Consequently, the percentage index of complete recession coverage was 90% for GTR-CM, 82,8% for CRF-CTG and 71.2% for DPBF. Similarly, the percentage of complete coverage was the highest for the method GTR-CM (87.5%) next 61% for CRF-CTG and 45.5% for DPBF. During inter-group analyses for all mentioned parameters there existed significant differences among treatment in 60-month observation. Such a relation was not noticed after 12 and 24 months since treatment.

During in-group analyses for GTR-CM and CRF-CTG comparing the percentage values of an average and complete recession coverage with the percentage of complete coverage there were not noticed any crucial changes between yearly and two-year or five-year observation and between two-yar and five-year

Table 1. **Changes of average (ARC) and complete (CRC) percentage of recession coverage and the percentage index of complete recession treatment (%CRC) in 12- (1), 24- (2), 60- (5) month observation after the application of DPBF. Changes of recession width (RW) and depth (RD), clinical attachment level (CAL), keratinized tissue height (HKT), cemento-enamel junction to mucogingival junction distance (CEJ-MGJ) in pre-treatment observations (0), 12- (1), 24- (2), 60- (5) month observation after the application of DPBF**

	X	M	SD	0 vs 1	1 vs 2	2 vs 5	0 vs 2	0 vs 5	1 vs 5
ARC 1	86.7	100.0	24.2						
ARC 2	76.0	100.0	31.4		0.026*	0.208			0.011*
ARC-5	68.9	75.0	35.3						
%CRC1	85.7	100.0	24.9						
%CRC2	75.5	100.0	31.4		0.039*	0.363			0.031*
%CRC5	71.2	75.0	33.2						
CRC 1	0.697	1.000	0.467						
CRC 2	0.515	1.000	0.508		0.083	0.488			0.043*
CRC 5	0.455	0.000	0.506						
RD-0	2.88	3.00	0.78						
RD-1	0.394	0.000	0.659	0.00000*	0.019*	0.189	0.00000*	0.00000*	0.01*
RD-2	0.682	0.000	0.864						
RD-5	0.848	0.500	1.019						
RW-0	3.73	4.00	1.23						
RW-1	0.667	0.000	1.190	0.00000*	0.042*	0.255	0.00000*	0.00000*	0.010*
RW-2	1.35	0.00	1.55						
RW-5	1.61	1.25	1.71						
CAL-0	3.94	4.00	0.90						
CAL-1	1.33	1.00	0.65	0.00000*	0.0083*	0.296	0.00000*	0.00000*	0.0086
CAL-2	1.70	1.00	0.88						
CAL-5	1.88	2.00	1.02						
HKT-0	3.36	3.00	1.64						
HKT-1	3.88	4.00	2.01	0.101	0.182	0.182	0.389	0.802	0.036*
HKT-2	3.67	3.00	2.31						
HKT-5	3.45	3.00	2.37						
CEJ-MGJ-0	6.15	6.00	1.50						
CEJ-MGJ-1	4.30	4.00	1.83	0.00000*	0.564	0.444	0.00001*	0.00001*	0.821
CEJ-MGJ-2	4.41	4.00	2.26						
CEJ-MGJ-5	4.24	4.00	2.28						

DPBF – double pedicle bilateral flap; x – average; SD – standard deviation; M – median; * – statistical significance

observations. However, there appeared significant differences among yearly and five-year results for DPBF. Such a relation was not noticed between yearly and two-year observations and between two-year and five-year observations.

After the treatment with separate treatment methods, changes of recession depth and width, clinical attachment level, width and thickness of keratinized gingiva and the distance between cemento-enamel junction and mucogingival junction were illustrated in *Tab. 1-3*. The initial recession depth was significantly different in separate treatment groups. The deepest recessions were noticed in a group CRF-CTG (4.54 mm), and the lowest in a group DPBF (2.88 mm). During 5-year observation there appeared a big reduction of RD and RW in all treatment groups. However, there were no significant changes between yearly and two-year or five-year observations and between two-year and five-year observations for GTR-CM and CRF-CTG. Nevertheless, it should be emphasized that 5 years after the recession coverage treatment with the method of guided tissue regeneration with the usage of collagen membranes there was noticed a small decrease of an average recession depth comparing with two-year observation (by 0.21 mm). It was still the value

not significantly higher then the one noticed during 12-month observations. The similar relation concerned recession width which average value decreased by 0.46 mm. However, an application of method DPBF resulted in a big increase of recession depth and width between 12, 24 and 60 months, still this value was significantly smaller in comparison to results before treatment. There were no big differences of recession depth and width between 2-year and 5-year observations. In inter-group analyses, 12 and 24 months after the treatment, there were no big changes of recession depth and width among examined groups (*Tab. 4*). 60 months after the treatment there were no big changes of RD but the significant one of RW. The smallest recession width was in GTR-CM group (0.54) and the biggest in DPBF (1.61).

There appeared significant changes in the position of clinical attachment level among examined groups before the treatment. The initial average loss of CAL was the biggest in a group of patients for which there was planned CRF-CTG (5.59 mm) and next GTR-CM (5.00 mm). The rebuilt of the attachment was crucial for all examined groups during 12-, 24- and 60-month observations. In addition, there appeared a significant increase of CAL after 24 and 60 months in comparison to initial

Table 2. **Changes of average (ARC) and complete (CRC) percentage of recession coverage and the percentage index of complete recession treatment (%CRC) in 12- (1), 24- (2), 60- (5) month observation after the application of CRF-CTG. Changes of recession width (RW) and depth (RD), clinical attachment level (CAL), keratinized tissue height (HKT), cemento-enamel junction to mucogingival junction distance (CEJ-MGJ) in pre-treatment observations (0), 12- (1), 24- (2), 60- (5) month observations after the application of CAF-CTG. Changes of keratinized tissue thickness (TKT) in pre-treatment observation (0) and 12- (1), 24- (2) and 60- (5) month observations after the application of CAF-CTG**

	X	M	SD	0 vs 1	1 vs 2	2 vs 5	0 vs 2	0 vs 5	1 vs 5
ARC 1	88.8	100.0	20.7						
ARC 2	85.3	100.0	20.2		0.207	0.340			0.101
ARC-5	82.8	100.0	24.0						
%CRC1	86.4	100.0	24.9						
%CRC2	85.5	100.0	20.2		0.810	0.312			0.423
%CRC5	82.8	100.0	24.0						
CRC 1	0.732	1.000	0.449						
CRC 2	0.610	1.000	0.494		0.096	1.00			0.133
CRC 5	0.610	1.000	0.494						
RD-0	4.54	4.00	1.50						
RD-1	0.610	0.000	1.070	0.00000*	0.473	0.421	0.00000*	0.00000*	0.277
RD-2	0.732	0.000	1.073						
RD-5	0.829	0.000	1.202						
RW-0	4.32	4.00	1.06						
RW-1	1.02	0.00	1.78	0.00000*	0.570	0.897	0.00000*	0.00000*	0.555
RW-2	1.15	0.00	1.75						
RW-5	1.17	0.00	1.66						
CAL-0	5.59	5.00	1.47						
CAL-1	1.49	1.00	1.03	0.00000*	0.048*	0.098	0.00000*	0.00000*	0.006*
CAL-2	1.77	1.00	1.10						
CAL-5	2.02	2.00	1.23						
HKT-0	1.32	1.00	1.25						
HKT-1	4.61	4.00	1.28	0.00000*	0.920	0.921	0.00000*	0.00000*	0.832
HKT-2	4.63	5.00	1.61						
HKT-5	4.66	5.00	1.33						
CEJ-MGJ-0	5.90	6.00	1.69						
CEJ-MGJ-1	5.12	5.00	1.68	0.009*	0.478	0.417	0.05*	0.248	0.136
CEJ-MGJ-2	5.29	5.00	1.83						
CEJ-MGJ-5	5.51	5.00	1.45						
TKT-0	0.649	0.640	0.166						
TKT-1	1.48	1.26	0.51	0.00000*	0.014*	0.0201*	0.00000*	0.00000*	0.0007*
TKT-2	1.26	1.35	0.37						
TKT-5	1.17	1.20	0.32						

CAF-CTG – coronally repositioned flap in combination with connective tissue graft; x – average; SD – standard deviation; M – median; * – statistical significance

condition and a year after the treatment, all this for DPBF and CRF-CTG. There was no big increase between 2-year and 5-year observations. However, the method GTR-CM did not result in any significant changes of the position of clinical attachment level between yearly and 2-year observations and between 2-year and 5-year ones. During in-group analyses there were no big differences among groups in all examined periods.

The average distance between cemento-enamel junction and mucogingival junction was the biggest in a group treated with GTR-CM (7.17 mm) and the smallest in CRF-CTG (5.90 mm). There was no significant change of this parameter in comparison of three treatment methods before the treatment. For DPBF and GTR-CM the distance increased significantly during 12, 24 and 60 months after the treatment compared to the initial state. For CRF-CTG method the relation in 12- and 24-month observations was similar, and after 5 years the average value of

that parameter did not differ much from before-treatment state. In inter-group analyses there were big differences among treatment during 5-year observations. The biggest noticed value was for GTR-CM, the smallest for DPBF.

The average initial width of keratinized gingiva was significantly different in examined treatment groups what was the consequence of pre-treatment qualifications. The smallest value was in recession group treated with CRF-CTG (1.32 mm). For methods DPBF and GTR-CM those values were quite similar (3.36 mm and 3.38 mm). Taking into consideration the comparison of results of pre-treatment results and those after 12, 24 and 60 months it should be emphasized that only methods CRF-CTG and GTR-CM resulted in big increase of HKT one year after the treatment. This relation stayed the same during two years after the treatment only for CRF-CTG method. The significant increase of keratinized gingiva width was noticed again for CRF-

Table 3. **Changes of average (ARC) and complete (CRC) percentage of recession coverage and the percentage index of complete recession treatment (%CRC) in 12- (1), 24- (2), 60- (5) month observation after the application of GTR-CM.. Changes of recession width (RW) and depth (RD), clinical attachment level (CAL), keratinized tissue height (HKT), cemento-enamel junction to mucogingival junction distance (CEJ-MGJ) in pre-treatment observations (0), 12- (1), 24- (2), 60- (5) month observations after the application of GTR-CM. Changes of keratinized tissue thickness (TKT) in pre-treatment observation (0) and 12- (1), 24- (2) and 60- (5) month observations after the application of GTR-CM**

	X	M	SD	0 vs 1	1 vs 2	2 vs 5	0 vs 2	0 vs 5	1 vs 5
ARC 1	91.3	100.0	23.2						
ARC 2	85.8	100.0	27.5		0.314	0.341			0.769
ARC5	90.0	100.0	28.9						
%CRC1	95.0	100.0	14.4						
%CRC2	85.8	100.0	27.5		0.108	0.341			0.441
%CRC5	90.0	100.0	28.9						
CRC 1	0.792	1.000	0.415						
CRC 2	0.750	1.000	0.442		0.664	0.082			0.328
CRC 5	0.875	1.000	0.338						
RD-0	3.79	4.00	1.41						
RD-1	0.250	0.000	0.737	0.00000*	0.201	0.170	0.00000*	0.00000*	0.632
RD-2	0.583	0.000	1.213						
RD-5	0.375	0.000	1.135						
RW-0	4.38	4.50	1.38						
RW-1	0.750	0.000	1.567	0.00000*	0.398	0.126	0.00000*	0.00000*	0.512
RW-2	1.00	0.00	1.82						
RW-5	0.542	0.000	1.474						
CAL-0	5.00	5.00	1.32						
CAL-1	1.33	1.00	0.82	0.00000*	0.072	0.082	0.00000*	0.00000*	0.616
CAL-2	1.67	1.00	1.20						
CAL-5	1.42	1.00	1.08						
HKT-0	3.38	3.50	2.04						
HKT-1	4.25	4.00	1.07	0.020*	0.089	0.111	0.110	0.040*	0.777
HKT-2	3.96	4.00	1.12						
HKT-5	4.31	4.50	0.93						
CEJ-MGJ-0	7.17	7.50	2.65						
CEJ-MGJ-1	4.58	4.00	1.50	0.00007*	0.426	0.339	0.00000*	0.0003*	0.654
CEJ-MGJ-2	4.42	4.50	1.56						
CEJ-MGJ-5	4.69	5.00	1.35						
TKT-0	0.743	0.750	0.110						
TKT-1	1.27	1.20	0.31	0.00000*	0.264	0.00006*	0.00000*	0.00000*	0.007*
TKT-2	1.18	1.14	0.34						
TKT-5	1.05	1.04	0.25						

GTR-CM – guided tissue regeneration using collagen membranes, x – average, SD – standard deviation, M – median, * – statistical significance

CTG and GTR-CM in 5-year observation. 24 months after the treatment there was no crucial change of HKT in a recession group covered with guided tissue regeneration using collagen membranes. However, the next three years showed the average (not significant) growth of gingival width by 0.35 mm 60 months after the treatment and usage of the method DPBF that parameter did not changed much in comparison with an initial state and after 12 and 60 months HKT got much smaller. Application of CRF-CTG and GTR-CM, comparing results after 12 months with 24 months and 24 with 60 months, did not change significantly the value of that parameter. Big changes of keratinized gingiva width were noticed after 24 and 60 months in inter-group analyses. The highest values were noticed for the method CRF-CTG (4.63 mm and 4.66 mm). The smallest values (and continually getting smaller) for DPBF (3.67 mm and 3.45 mm).

The initial average thickness of keratinized gingival of the recessions treated with CRF-CTG and GTR-CM was much smaller in patients qualified for treatment CRF-CTG (0.65 mm) which resulted from conditions of qualifications before treatment. There was noticed a small decrease of keratinized gingiva thickness in comparison between examination results before treatment and after 12, 24 and 60 months. In addition, 5 years after the treatment with both methods the average thickness increase still remained compared with the initial state, bigger for CRF-CTG (1,17 mm) than for GTR-CM (1.05 mm). Usage of connective tissue graft method resulted in the significant decrease of that value compared with observations between 12, 24 and 60 months and between 24 and 60 months. For GTR-CM the situation was stable between 12 and 24 months, next the value of that parameter decreased significantly. There were no big changes of average TKT values in inter-group analyses during 12, 24 and 60 months (*Tab. 4*).

Table 4. **Inter-group analysis of average (ARC) and complete (%CRC) percentage of recession coverage and the percentage of complete recession treatment (CRC), recession width (RW) and depth (RD), clinical attachment level (CAL), keratinized tissue height (HKT), cemento-enamel junction to mucogingival junction distance (CEJ-MGJ) in pre-treatment observations (0), 12- (1), 24- (2), 60- (5) month observations. Changes of keratinized tissue thickness (TKT) in pre-treatment observation (0) and 12- (1), 24- (2) and 60- (5) month observations after the application of DPBF, CAF-CTG and GTR-CM**

	DPBF			CRF-CTG			GTR-CM			P
	X	M	SD	X	M	SD	X	M	SD	
ARC 1	86.7	100.0	24.2	88.8	100.0	20.7	91.3	100.0	23.2	0.744
ARC 2	76.0	100.0	31.4	85.3	100.0	20.2	85.8	100.0	27.5	0.240
ARC-5	68.9	75.0	35.3	82.8	100.0	24.0	90.0	100.0	28.9	0.01*
%CRC1	85.7	100.0	24.9	86.4	100.0	24.9	95.0	100.0	14.4	0.239
%CRC2	75.5	100.0	31.4	85.5	100.0	20.2	85.8	100.0	27.5	0.199
%CRC5	71.2	75.0	33.2	82.8	100.0	24.0	90.0	100.0	28.9	0.044*
CRC 1	0.697	1.000	0.467	0.732	1.000	0.449	0.792	1.000	0.415	0.732
CRC 2	0.515	1.000	0.508	0.610	1.000	0.494	0.750	1.000	0.442	0.202
CRC 5	0.455	0.000	0.506	0.610	1.000	0.494	0.875	1.000	0.338	0.005*
RD-0	2.88	3.00	0.78	4.54	4.00	1.50	3.79	4.00	1.41	0.000*
RD-1	0.394	0.000	0.659	0.610	0.000	1.070	0.250	0.000	0.737	0.274
RD-2	0.682	0.000	0.864	0.732	0.000	1.073	0.583	0.000	1.213	0.859
RD-5	0.848	0.500	1.019	0.829	0.000	1.202	0.375	0.000	1.135	0.222
RW-0	3.73	4.00	1.23	4.32	4.00	1.06	4.38	4.50	1.38	0.0627
RW-1	0.667	0.000	1.190	1.02	0.00	1.78	0.750	0.000	1.567	0.829
RW-2	1.35	0.00	1.55	1.15	0.00	1.75	1.00	0.00	1.82	0.740
RW-5	1.61	1.25	1.71	1.17	0.00	1.66	0.542	0.000	1.474	0.025*
CAL-0	3.94	4.00	0.90	5.59	5.00	1.47	5.00	5.00	1.32	0.000*
CAL-1	1.33	1.00	0.65	1.49	1.00	1.03	1.33	1.00	0.82	0.684
CAL-2	1.70	1.00	0.88	1.77	1.00	1.10	1.67	1.00	1.20	0.922
CAL-5	1.88	2.00	1.02	2.02	2.00	1.23	1.42	1.00	1.08	0.112
HKT-0	3.36	3.00	1.64	1.32	1.00	1.25	3.38	3.50	2.04	0.000*
HKT-1	3.88	4.00	2.01	4.61	4.00	1.28	4.25	4.00	1.07	0.091
HKT-2	3.67	3.00	2.31	4.63	5.00	1.61	3.96	4.00	1.12	0.018*
HKT-5	3.45	3.00	2.37	4.66	5.00	1.33	4.31	4.50	0.93	0.001*
CEJ-MGJ-0	6.15	6.00	1.50	5.90	6.00	1.69	7.17	7.50	2.65	0.100
CEJ-MGJ-1	4.30	4.00	1.83	5.12	5.00	1.68	4.58	4.00	1.50	0.112
CEJ-MGJ-2	4.41	4.00	2.26	5.29	5.00	1.83	4.42	4.50	1.56	0.088
CEJ-MGJ-5	4.24	4.00	2.28	5.51	5.00	1.45	4.69	5.00	1.35	0.006*
TKT-0				0.649	0.640	0.166	0.743	0.750	0.110	0.018*
TKT-1				1.48	1.26	0.51	1.27	1.20	0.31	0.077
TKT-2				1.26	1.35	0.37	1.18	1.14	0.34	0.344
TKT-5				1.17	1.20	0.32	1.05	1.04	0.25	0.135

DPBF – double pedicle bilatreral flap; CAF-CTG – coronally repositioned flap in combination with connective tissue graft; GTR-CM – guided tissue regeneration using collagen membranes; x – average; SD – standard deviation; * – statistically significance

Discussion

Authors' observations show that methods GTR-CM and CRF-CTG are the most predictable and guarantee the stable recession coverage in 5-year observation. All parameters describing recessions and mucogingival parameters in a group treated with guided tissue regeneration with the usage of collagen membranes improved one year after the treatment keeping such an important level for 5 years. The only exception is keratinized gingiva thickness which after 2-year stable increase got significantly lower but still by the value much higher in comparison with the initial state. Although keratinized gingival width decreased a little two years after the treatment it

increased during next three years reaching the value similar to the one noticed one year after the treatment. The average distance CEJ-MGJ observed in time is significantly different in comparison with the initial state (decrease by 2.48 mm in 5-year observation) but during all that time it kept increasing slightly. On the one hand, this process may be caused by genetic determination of mucogingival junction location [15], on the other hand by the existence of an increase of keratinized gingival width in that time. The obtained increase of HKT in 24-60-month observation (0.35 mm) and the increase of CEJ-MGJ by 0.27 in the same time are close which in that case can point at complicated

aetiology of that process. In addition the increase of keratinized gingival width may also result from the phenomena of creeping attachment (CA). During 24-60-month observation there was CA of an average value of 0.21 mm for recessions treated with GTR-CM. The decrease of CAL in the same time may also be the result of that process. However, tissue regeneration process is responsible for rebuilt of CAL in GTR-CM method. From the histological point of view it is observed that there exists the rebuilt of root cement with the set connective tissue fibres and limited regeneration of cortical lamina of alveolar process [16-18]. Such support of soft tissues can improve the stability of a therapeutic effect even in a long-term observations [19].

Examination results for CRF-CTG method show similar values. During 60 months the following values were maintained: the significant decrease of recession depth and width, the significant increase of keratinized gingiva width and thickness and the rebuilt connective tissue attachment level. Only the value of CEJ-MGJ was close to the initial state after 60 monts. The second parameter which changed during 5-year observations was clinical attachment level. The second year after treatment was a critical moment at the end of which the significant decrease of CAL appeared. Next this value maintained on a little lower level until 60 months after the treatment. During that time (between 12, 24 and 60 months, between 24 and 60 months) TKT decreased much, however, reaching twice bigger value compared with the initial one (1.17 mm). In addition, the increase of keratinized gingival width tripled (4.61 mm) during the first year and remained on that level throughout a year of study. It seems that this process is caused by grafted tissue from palate chewing area which by keeping the ability to induce epithelial cells of a covering flap to keratinization, decides on vastness of keratinized gingival rebuilt [20]. That is why it is possible to reach the increase of HKT in a yearly observation and to keep it stable due to the rebuilt of mucogingival complex. However, the way of tissue healing can be responsible for changes of CAL for CRF-CTG method. The results of histological research in this case are controversial. Some authors claim that only tissue reparation is possible [21] whereas the others talk about partial regeneration [22,23].

But the usage of DPBF, a year after the treatment, resulted in significant improvement of all parameters except for HKT. Keratinized gingival width increased a little by 0.52 mm and during 60 months slowly decreased reaching the averaged value only 0.09 mm bigger than the initial one. The comparison of examination results during 12-60-month observation shows the significant changes of all parameters except for CEJ-MGJ. This value (0.17 mm) decreased a little between 24 and 60 months what can be responsible for the decrease of HKT (0.22 mm) in that time. It seems to be crucial that during 24-60-month observation all analyzed results changed only a little which can prove the stability of therapeutic effect obtained two years after the treatment.

Doing the inter-group analyses of three surgical methods of recession treatment it should be noted that there were no significant differences among surgical treatment concerning only recession height, clinical attachment level and keratinized gingiva thickness. The significant differences apply to average recession coverage with the best result for GTR-CM method

and next CRF-CTG, the value of the percentage index of complete recession treatment and the percentage of complete coverage, also with the best results for GTR-CM and CRF-CTG. It is possible that such results are due to smaller number of patients that attended controlling examinations compared with the initial group. After treatment with DPBF the number of assessed recessions decreased by 12, after CRF-CTG it decreased by 13 and after GTR-CM there were assessed only 5 recessions. In addition, in CRF-CTG group 3 persons with recognized progressive recession (Miller II class) in long-term observations have undergone orthodontic treatment due to occlusion abnormalities. It is difficult to say whether this factor could be responsible for the significant decrease of recession depth in those patients. Nevertheless only long-term assessment after orthodontic treatment can confirm or exclude this aetiological factor. Soon after the treatment, in one patient of this group there appeared disordered in-healing of connective tissue graft. The early age of the patient and lack of tooth abnormalities which could be responsible for occlusion abnormalities forced the detailed analyses of this case. The additional diagnostic examinations proved the existence of ascending character of movement system, because of changes in muscle tension in bio-cinematic chain, led to incorrect relation between maxilla and mandibula (flat occlusion plane) and consequently to overload responsible for the development of multiply gingival recessions. The detailed description of that case was presented in different research publication [24]. As we can see there are many factors deciding on the success of a given treatment method, including an effective elimination of modifying aetiological factors, keeping to qualification conditions before treatment characteristic for a given operating technique [25], treatment procedure (both tools, used material and the way of treatment application) [26,27], operating doctor experience and patient monitoring during the longest possible time after the treatment [3,4,28-29].

References

1. Roccuzzo M, Bunino M, Needleman I, Sanz M. Periodontal plastic surgery for treatment of localized gingival recession: a systematic review. J Clin Periodontol, 2002; 29: 178-94.

2. Dominiak M, Konopka T. Gingival aesthetics in periodontology. eDentico, 2005; 2, 6: 6-16.

3. Harris RJ. The connective tissue and partial thickness double pedicle graft: a predictable method of obtaining root coverage. J Periodontol, 1992; 63: 477-86.

4. Miller PD. Root coverage grafting for regeneration and aesthetics. Periodontol 2000, 2003; 1: 118-27.

5. Dominiak M, Konopka T. 2-year comparative study of clinical effectiveness of three methods used for surgical gingival recession treatment. Czas Stomat, 2004; 57: 304-18.

6. Marggraf E, Wachtel H, Bernimoulin J-P. Langzeitergebnisse nach einzeitiger bilateral gestielter koronaler Verschiebeplastik. Dtsch Zahnärztl Z, 1987; 42: 480-5.

7. Bruno JF. Connective tissue graft technique assuring wide root coverage. Int J Periodontics Restorative Dent, 1994; 14: 126-37.

8. Pini Prato GP, Tinti C, Vincenzi G, Magnani C, Cortellini P, Clauser C. Guided tissue regeneration versus mucogingival surgery in the treatment of human buccal gingival recession. J Periodontol, 1992; 63: 919-28.

9. Shieh AT, Wang HL, O'Neal R, Glickman GN, MacNeil L. Development and clinical evaluation of a root coverage procedure using a collagen barrier membrane. J Periodontol, 1997; 68: 770-8.

10. Konopka T, Dominiak M, Ćwirko M. Influence of surgical methods of gingival recession treatment on gingival tissue thickness. Czas Stomat, 2002; 55(10): 626-33.

11. Dominiak M, Konopka T. Comparison of clinical effectiveness concerning surgical methods of gingival recession treatment. Czas Stomat, 2002; 55: 428-41.

12. Dominiak M, Konopka T. Gingival recessions. References review. Wroc Stomat, 2001; 41-54.

13. Clauser C, Nieri M, Franceschi D, Pagliaro U, Pini Prato G. Evidence-based mucogingival therapy. Part 2: Ordinary and individual patient data met-analyses of surgical treatment of recession using complete root coverage as the outcome variable. J Periodontol, 2003; 74: 741-56.

14. Trombelli L, Tatakis DN, Scabbia A, Zimmerman GJ. Comparision of mucogingival changes following treatment with coronally positioned flap and guided tissue regeneration procedures. Int J Periodont Restorative Dent, 1997; 17: 449-55.

15. Ainamo A, Bergenholz A, Hugson A, Ainamo J. Location of the mucogingival junction 18 years after apically repositioned flap surgery. J Clin Periodontol, 1992; 19: 49-52.

16. Cortellini P, Clauser C, Pini Prato G. Histologic assessment of new attachment following the treatment of a human buccal recession by means of a guided tissue regeneration procedure. J Periodontol, 1993; 64: 387-91.

17. Parma-Benfenati S, Tinti C. Histologic evaluation of new attachment utilizing a titanium-reinforced barrier membrane in a mucogingival recession defect. A case report. J Periodontol, 1998; 69: 834-9.

18. Vincenzi G, de Chiesa A, Trisi P. Guided tissue regeneration using a resorbalble membrane in gingival recession-type defects: a histologic case report in human. Int J Periodont Restorative Dent, 1998; 18: 25-32.

19. Pini Prato GP, Clauser C, Cortellini P, Tinti C, Vincenzi G, Pagliaro U. Guided tissue regeneration versus mucogingival surgery in the treatment of human buccal recessions. A 4-year follow-up study. J Periodontol, 1996; 67: 1216-23.

20. Karring T, Lang NP, Löe H. The role of gingival connective tissue in determining epithelial differentiation. J Periodontol, 1978; 10: 1-11.

21. Harris RJ. Human histologic evaluation of root coverage obtained with connective tissue with partial thickness double pedicle graft. Case report. J Periodontol, 1999; 70: 813-21.

22. Pasquinelli KL. The histology of new attachment utilizing a trick autogenus soft tissue graft in a area of deep recession: a case report. Int J Periodont Restorative Dent, 1995; 15: 248-57.

23. Harris RJ. Succesful root coverage: a human histologic evaluation of a case. Int J Periodont Restorative Dent, 1999; 19: 439-47.

24. Kalecińska E, Dominiak M, Dominiak P, Anwajler J. Postura disturbances in the presence of the dysfunction of the masticatoty system. Case report. Dent Med Probl, 2004; 41: 305-13.

25. Wennström JL, Zucchelli G: Increased gingival dimensions. A significant factor for successful outcome of root coverage procedures? A 2-year prospective clinical study. J Clin Periodontol, 1996; 23: 770-7.

26. Rachlin G, Koubi G, Dejou J, Franquin JC. The use of a resorbable membrane in mucogingival surgery. Case series. J Periodontol, 1996; 67: 621-6.

27. Müller H-P, Stahl M, Eger T. Dynamics of mucosal dimensions after root coverage with a bioresorbable membrane. J Clin Periodontol, 2000; 27: 1-20.

28. Harris RJ. GTR for root coverage: a long-term follow-up. Int J Periodontics Restorative Dent, 2002; 22: 55-61.

29. Zahedi S, Bozon C, Brunel G. A 2-year clinical evaluation of a diphenylphosphorylazide-crosslinked collagen membrane for the treatment of buccal gingival recession. J Periodontol, 1998; 69: 975-81.