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Wojciech Bednarz[1, A, C–E], Jacek Żurek[2, A–D], Thomas Gedrange[3, C–F], Marzena Dominiak[4, C–F]

A Preliminary Clinical Comparison of the Use of *Fascia Lata* Allograft and Autogenous Connective Tissue Graft in Multiple Gingival Recession Coverage Based on the Tunnel Technique

[1] Specialistic Outpatient Medical Clinic MEDIDENT, Gorlice, Poland
[2] Specialist Medical Practice, Tarnowskie Góry, Poland
[3] Dresden University of Technology, Germany
[4] Department of Oral Surgery, Wroclaw Medical University, Poland

A – research concept and design; **B** – collection and/or assembly of data; **C** – data analysis and interpretation; **D** – writing the article; **E** – critical revision of the article; **F** – final approval of article

Abstract

Background. The most effective method for treating gingival recessions (GR) is with an autogenous connective tissue graft (CTG) *via* flap surgery. Often, however, the amount of CTG that can be grafted is insufficient to cover all of a patient's gingival recessions at one time.
Objectives. The objective of this study was to provide a 6-month comparative assessment of the results of covering multiple Miller Class I and II gingival recessions with a *Fascia Lata* Allograft (FL) and a CTG harvested from palatal mucosa.
Material and Methods. The study comprised a total of 30 people who underwent multiple gingival recession (GR) procedures using a modified, coronally advanced tunnel technique (MCAT). The patients were divided into two groups of 15 according to the type of materials used for gingival augmentation purposes: FL for the test group and CTG for the control group. A clinical assessment was made at baseline, as well as 3 and 6 months following surgery. The following factors were assessed: recession depth, recession width, probing depth, clinical attachment level, height of keratinized tissue (HKT), distance between the cemento-enamel junction and the muco-gingival junction (CEJ-MGJ), API, SBI. The following values were calculated: average root coverage (ARC), complete root coverage (CRC).
Results. No statistically significant differences were observed between the groups in terms of clinical parameters assessed after 6 months, apart from CRC, which was 94.87 ± 0.14 mm in the control group and 94.24 ± 0.20 mm in the study group ($p = 0.034$). The average HKT in the control group after 6 months amounted to 2.86 ± 1.60 mm, and in the test group to 3.09 ± 0.95 mm, which translates into an increase in comparison to the baseline values of 0.73 mm ($p < 0.001$) and 0.48 mm ($p = 0.017$), respectively.
Conclusions. FL Allografts may serve as an alternative to autogenous CTG in multiple gingival recession coverage procedures based on the tunnel technique (**Adv Clin Exp Med 2016, 25, 3, 587–598**).

Key words: gingival recession, connective tissue, autograft, allograft, *fascia lata.*

Comprehensive treatment of gingival recessions primarily involves eliminating as many known recession risk factors as possible, in particular through optimal oral hygiene, then surgical coverage of recessions and long-term maintenance of results achieved during the maintenance phase. The techniques employed to cover gingival recessions are surgical-based and include coronal or lateral flap displacement, tunnel methods, autogenous (FGG, CTG), allogenous, and xenogenous grafts as well as guided tissue regeneration [1]. The best and most documented gingival recession coverage method involves the grafting of autogenous connective tissue harvested from hard palate

mucosa [2, 3]. Over a 5-year observation period the technique achieved statistically significantly higher complete (CRC) and average (ARC) root coverage percentages than procedures involving the exclusive use of various flaps and/or an acellular dermal matrix (ADM), platelet rich fibrin (PRF) or a resorbable membrane [2, 4].

While the grafting of autogenous connective tissue ensures predictability, it also entails the need for two operating fields in both the donor and recipient sites. For anatomic-histological reasons graft donor sites are restricted to the area between the canine and the second molar, the clinical attachment on the palatal side of these teeth and the position of the palatine neurovascular bundle [5]. Therefore, the scope of the procedure in the recipient site must correspond to the potential size of the graft which can be harvested from the donor site. In the case of multiple gingival recession coverage, a multi-stage procedure is necessary, one that involves harvesting multiple grafts from the same donor sites. According to Harris [6], the minimum thickness of palatal mucosa in the donor site to ensure optimal coverage of the subepithelial connective tissue must be 3 mm. If the thickness is less than this, the epithelial tissue, by forming characteristic rete pegs, penetrates deep into the stromal connective tissue, thereby making it impossible to harvest a graft without the presence of keratinocytes. The presence of a larger volume of epithelial cells in a connective tissue graft placed in the supraperiosteal space of recipient sites increases the risk of it becoming separated or even of cysts forming [7, 8].

For this very reason, alternative methods that make use of connective tissue graft substitutes are increasingly being sought. Most studies have focused on acellular dermal matrix [9–13], while recently xenogenous Mucograft has also been considered [14–17].

Admittedly, connective tissue grafting remains the gold standard procedure. However, when multiple gingival recession coverage is required, the acellular dermal matrix technique may offer an alternative approach to harvesting autogenous connective tissue [11–13, 18]. To date, the available literature does not include any study on the use of a different allogenous material as coverage for multiple gingival recessions.

The objective of the study was to provide a 6-month comparative assessment of the results of covering multiple Miller Class I and II gingival recessions with both *Fascia Lata* Allografts (FL) and CTGs harvested from palatal mucosa.

Material and Methods

A total of 30 people of both sexes took part in the study, 27 of whom were women. They were aged 18–60 and had at least two Miller Class I and II gingival recessions neighboring one another. The patients were divided at random into two 15-person groups. In the Test Group the gingival recessions were covered with *Fascia Lata* Allografts using a modified coronally advanced tunnel technique – (MCAT/FL), while in the Control Group MCAT recessions were covered with connective tissue grafts – (MCAT/CTG).

Consent for the study was obtained from the Bioethics Committee of Medical University of Silesia in Katowice (No KNW/0022/KB1/107/12) and from the Bioethics Committee of Wroclaw Medical University (No. KB-104/2014). All the patients were informed of the details of the experimental treatment and gave their consent to take part in it.

The biostatic *fascia lata* grafts were harvested in compliance with Polish law (The Harvesting and Grafting of Cells, Tissue and Organs Act – Journal of Laws 2005, no. 169, item 1411) and the European Union Directive 2004/23/WE of 23.03.2004 which set the standards for the quality, safety, commissioning, grafting, testing, processing, preservation, storage and distribution of human tissues and cells.

Directly after the tissue was harvested it was frozen and deposited in the Tissue Bank at the Regional Blood Donation and Hemotherapy Centre in Katowice (Poland), where it underwent a histopathological examination. The donor's blood serum was tested with the aim of detecting any antigens against Treponema Pallidum was also subject to screening tests for HCVAb, HBsAg, HBcAb total HBsAg, HIV1.2Ab/Ag.

After appropriate preparation, conservation and sterilisation with gamma radiation the allograft can be stored for 18 months at a temperature of 16–25°C.

Patient Selection

To participate in the study a patient had to be at least 17 years of age, have at least two neighboring Miller Class I or II gingival recessions, a gingival recession height of ≥ 2 mm and the following indicators: API no greater than 25% and SBI no greater than 15% (Fig. 1).

The following criteria excluded patients from the study: pregnancy, breast feeding, systemic diseases (diabetes, autoaggression diseases, primary and secondary immunodeficiency diseases, severe infectious diseases), no identifiable CEJ (fillings

Fig. 1. Patient Ś-G.A. Multiple gingival recessions before MCAT/CTG surgery

present, non-carious lesions), earlier gingival recession coverage procedures, smoking (over 10 cigarettes a day).

Clinical Parameters

The state of the gingival recessions was assessed prior to the procedure as well as 3 and 6 months later, using the following parameters:

1. RD – height of gingival recession – distance between the gingival margin and CEJ measured midbuccally (mm);
2. RW – width of gingival recession – mesiodistal distance of gingival margins measured at the CEJ level of tooth (mm);
3. HKT – height of keratinized gingiva (mm);
4. PD – probing depth (mm);
5. CAL – clinical attachment level measured on midbuccal side (mm);
6. Gingival recession class – according to the Miller scale;
7. ARC – mean percentage of vertical coverage of gingival recessions measured after 3 and 6 months (%);
8. CRC percentage of total gingival recession coverage measured after 3 and 6 months (%);
9. CEJ – MGJ – distance of cemento-enamel junction from muco-gingival junction (mm).

The RD, RW HKT, PD and CAL parameters were measured with a periodontal probe calibrated every 1 mm (UNC 15 Hu-Friedy USA).

In addition, Aproximal Plaque Index (API) and Sulcus Bleeding Index (SBI) were assessed at baseline as well as 3 and 6 months after the surgery.

The results were recorded on a special test card that a member of the study team filled out at different observation periods.

Surgical Procedures

Surgical procedures were performed in outpatient conditions under local anesthesia using a 4% articaine solution with adrenaline (Ubistesin Forte® 3M Germany). In both groups the tunnel was formed in the recipient site in the same way. The tunnel was created by connecting together individual supraperiosteal envelopes formed by each of the teeth covered by the procedure. Only groove incisions (microsurgery blade no 69) were made, while a tunneling tool (Tunnelling Knives®, Helmut Zepf, Germany) was used for further delamination of the flap on the alveolar ridge surface as well as under the interdental papillae (Fig. 2). After appropriate mobilization of the split thickness flap the CTG or FL was inserted in the space thus formed (Fig. 3, 4). After it has been removed from the packaging, the Allograft was placed in a physiological saline solution for approximately 5–10 min. Then it was cut down to the necessary size and inserted in the supraperiosteal tunnel using 2 lace sutures. To ensure the graft is placed at CEJ level and the split thickness flap is advanced to a height of 2 mm more coronally than CEJ level, individual sling sutures were used for each tooth (Fig. 5). The flap was advanced coronally in a similar way in the control group and the CTG inserted and stabilized in the recipient site (Fig. 6). It was harvested from the palatal masticatory mucosa by making a single incision running parallel to the

Fig. 2. Creating the supraperiosteal tunnel in the recipient site

Fig. 3. Insertion of connective tissue graft in the tunnel thus formed

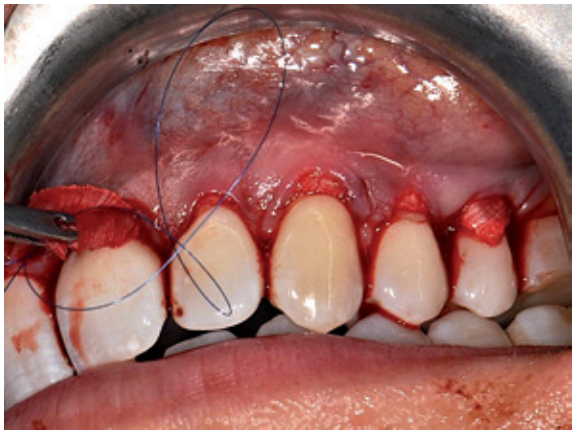

Fig. 4. Insertion of *Fascia Lata* Allograft in the supra-periosteal tunnel

Fig. 5. Stabilisation of allograft and split thickness flap using single sling sutures

Fig. 6. The clinical situation direct after multiple gingival recession coverage using modified coronally advanced tunnel technique with connective tissue graft

dental arch from the canine up to the second molar and no closer than 2 mm from the gingival margin (Fig. 7). A lyophilized collagen sponge was placed in the wound in the donor site and closed primarily with cross mattress sutures (Fig. 8). Soft surgical dressings (Reso-pac®, Hager&Werken, Duisburg, Germany) were applied to all the operating sites

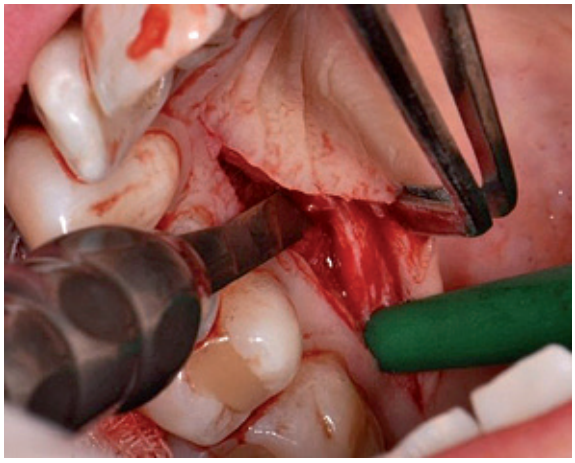

Fig. 7. Harvesting of connective tissue graft from the palatal masticatory mucosa

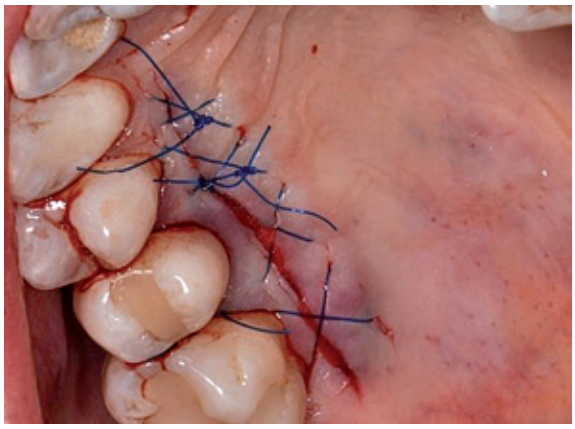

Fig. 8. Primarily closure of the wound in the donor site using cross mattress sutures

Post-Surgical Management

The control group sutures were removed 14 days after the operation while the study group sutures were removed 3 weeks after the operation. The healing process was checked 1, 7 and 14 days after the procedure. Post-operative instructions for the study group included taking 500 mg of amoxicillin orally three times a day for 7 days, starting 24 h before surgery, as well as pain killers if a patient experienced any discomfort.

Statistics

The *t*–Student test for paired samples was used to determine similarities between the mean continuous parameters in particular groups. To determine whether the study groups had similar parameters we used ANOVA variance analysis for groups with homogeneity of variance or the Wilcoxon non-parametric test (homogeneity of variance measured using the Bartlett test). The statistical analysis of the API and SBI indices was based

on the Mann–Whitney *U* test. Statistical significance was set at $p < 0.05$. The statistical analysis was performed with STATISTICA 10 v. 10.0.1011 statistical software (14-12-2011).

Results

The gingival recession distribution for both groups, taking into account the sex of the patients and location in the mandible or maxilla, is presented for individual groups of teeth in Tables 1 and 2. Table 3 shows the division (number, percentage) into classes of gingival recession based on the Miller scale, taking into account sex and topography in both groups.

A total of 97 gingival recessions were covered in the study group, all in women patients, of which 75 were located in the maxilla and 22 in the mandible (Table 1). On the other hand, a total of 40 gingival recessions were covered in the control group, including 34 in women patients. Of this total, 23 were located in the maxilla and 17 in the mandible (Table 2). In total 137 gingival recessions were covered, including 125 Miller Class I and 12 Miller Class II recessions (Table 3). The smaller number of gingival recessions covered in the control group was due to problems with harvesting the correct amount of autogenous connective tissue graft from the palatal mucosa (Fig. 9).

An assessment of the clinical parameters revealed that the mean baseline values in an intergroup comparison did not differ in any statistically significant way, apart from RD and PD (Table 4).

The average RD at baseline in the control group was significantly higher than in the test group. After six months the height of the recession in both groups was comparable.

Table 1. Number of gingival recession at particular groups of teeth by gender in the test group

Test group				
groups of teeth	**No.**	**maxilla**	**mandible**	**females**
I	11	10	1	11
C	21	17	4	21
P	48	34	14	48
M	17	14	3	17
Amount	97	75	22	97

I – incisors; C – canines; P – premolars; M – molars.

Table 2. Number of gingival recession at particular groups of teeth by gender in the control group

Control group					
groups of teeth	**No.**	**maxilla**	**mandible**	**females**	**males**
I	14	5	9	10	4
C	11	7	4	10	1
P	14	10	4	13	1
M	1	1	0	1	0
Amount	40	23	17	34	6

I – incisors; C – canines; P – premolars; M – molars.

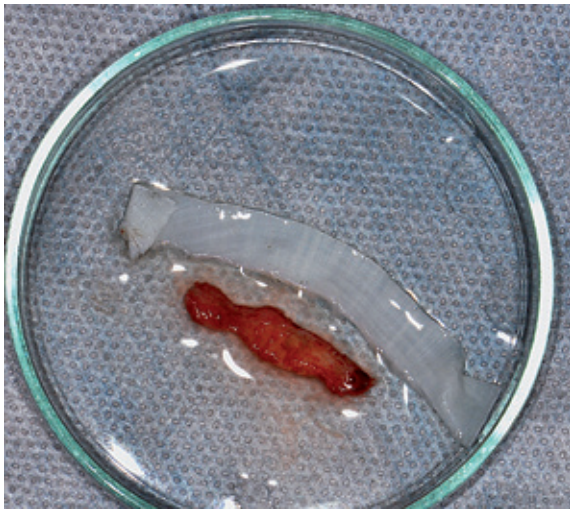

Fig. 9. Comparing the size of the autogeuous connective tissue graft and *Fascia Lata* Allograft

Table 3. Miller's class division of gingival recession defects (number, percentage) in both groups, by gender and topography

Miller's class	Test group				Control group				
	in all	**maxilla**	**mandible**	**females**	**in all**	**maxilla**	**mandible**	**females**	**males**
I	92 94.85%	74 98.67%	18 81.82%	92 94.85%	33 85.50%	23 100%	10 58.82%	29 85.29%	4 66.67%
II	5 5.15%	1 1.33%	4 18.18%	5 5.15%	7 17.50%	0 0.00%	7 41.18%	5 14.71%	2 33.33%
Amount	97	75	22	97	40	23	17	34	6

Table 4. The comparison beetwen control group and test group in values of clinical parameters at baseline, 3- and 6-month after surgery

Clinical parameters	$\bar{x}$		SD		p-value
	Fascia Lata Allograft	Connective Tissue Graft	*Fascia Lata* Allograft	Connective Tissue Graft	
ARC3 (%)	97.99	94.28	0.09	0.11	0,059
ARC6 (%)	94.21	95.77	0.20	0.11	0.676
CRC3 (%)	97.34	90.00	0.11	0.18	0.004*
CRC6 (%)	94.24	94.87	0.20	0.14	0.034*
RD0 (mm)	2.19	2.50	0.51	1.01	0.017*
RD3 (mm)	0.06	0.25	0.24	0.44	0.002*
RD6 (mm)	0.13	0.13	0.47	0.33	0.912
RW0 (mm)	3.23	3.20	1.09	0.99	0.894
RW3 (mm)	0.21	0.40	0.92	0.81	0.250
RW6 (mm)	0.35	0.28	1.18	0.75	0.709
PD0 (mm)	1.46	1.13	0.50	0.35	< 0.001*
PD3 (mm)	1.27	1.03	0.45	0.25	0.002*
PD6 (mm)	1.21	1.05	0.41	0.30	0.030*
CAL0 (mm)	3.65	3.60	0.63	1.04	0.733
CAL3 (mm)	1.33	1.28	0.49	0.54	0.567
CAL6 (mm)	1.34	1.20	0.61	0.41	0.184
HKT0 (mm)	2.61	2.13	1.36	1.47	0.067
HKT3 (mm)	3.09	3.06	1.03	1.83	0.902
HKT6 (mm)	3.09	2.86	0.95	1.60	0.298
CEJ-MGJ0 (mm)	4.79	4.63	1.35	1.19	0.491
CEJ-MGJ3 (mm)	3.15	3.31	1.05	1.79	0.521
CEJ-MGJ6 (mm)	3.23	2.99	0.91	1.56	0.264

ARC – average root coverage; CRC – complete root coverage; RD – recession depth; RW – recession width; PD – probing depth; CAL – clinical attachment level; HKT – height of keratinized tissue; CEJ-MGJ – distance of cemento-enamel junction from muco-gingival junction, (0 – at baseline, 3 – 3-months, 6 – 6-months after surgery); $\bar{x}$ – average; SD – standard deviation; p – significance factor; * statistical significance

The initial mean value of PD in the control group was significantly less than in the study group. After 3 and 6 months the differences between the groups were also statistically significant. On the other hand, the intergroup analysis revealed that the mean PD value for the control group was not significantly higher either after 3 months or after 6 months in relation to the initial value. The mean PD value for the study group at baseline was significantly higher than after 3 months as well as after 6 months.

In the case of the other clinical parameters, no statistically significant differences were noted in the intergroup comparison (Table 4).

After 3 months the mean RW value for the control group had declined significantly, and in the case of the test group it had dropped (Table 4–6).

After 3 months average CAL had dropped and these results were statistically significant in both groups compared with the baseline.

After 6 months the average HKT was significantly higher, which represents a significant increase of 0.73 mm for the control group and 0.48 mm for the test group, compared to the baseline.

The mean CEJ-MGJ values after 6 months had declined significantly compared to the baseline about 1.64 mm in the control group and about 1.56 mm in the test group.

Table 5. Values of clinical parameters at baseline, 3- and 6-month after surgery in test group

Test group N = 97						
	$\bar{x}$	M	SD	0 vs. 3 (p)	0 vs. 6 (p)	3 vs. 6 (p)
ARC 3 (%)	97.99	100,0	0,92			0.021*
ARC 6 (%)	94.21	100	0,20			
CRC3 (%)	97.34	100.,0	0.11			0.054
CRC6 (%)	94.24	100.0	0.20			
RD0 (mm)	2.19	2	0.51	< 0.001*	< 0.001*	0.054
RD3 (mm)	0.06	0	0.24			
RD6 (mm)	0.13	0	0.47			
RW0 (mm)	3.23	3	1.09	< 0.001*	< 0.001*	0.028*
RW3 (mm)	0.21	0	0.92			
RW6 (mm)	0.35	0	1.18			
PD0 (mm)	1.46	1	0.50	< 0.001*	< 0.001*	0.067
PD3 (mm)	1.27	1	0.45			
PD6 (mm)	1.21	1	0.41			
CAL0 (mm)	3.65	4	0.63	< 0.001*	< 0.001*	0.433
CAL3 (mm)	1.33	1	0.49			
CAL6 (mm)	1.34	1	0.61			
HKT0 (mm)	2.61	2	1.36	< 0.001*	< 0.001*	0.500
HKT3 (mm)	3.09	3	1.03			
HKT6 (mm)	3.09	3	0.95			
CEJ-MGJ0 (mm)	4.79	4	1.35	< 0.001*	< 0.001*	0.150
CEJ-MGJ3 (mm)	3.15	3	1.05			
CEJ-MGJ6 (mm)	3.23	3	0.91			

ARC – average root coverage; CRC – complete root coverage; RD – recession depth; RW – recession width; PD – probing depth; CAL – clinical attachment level; HKT – height of keratinized tissue; CEJ-MGJ – distance of cemento-enamel junction from muco-gingival junction, (0 – at baseline, 3 – 3-months, 6 – 6-months after surgery); $\bar{x}$ – average; M – median; SD – standard deviation; p – significance factor; * statistical significance.

CRC after 3 months was 90% in the control group and about 97% in the test group and it was significantly higher. After 6 months CRC had increased to above 94.24% for the control group, but had fallen to 94.87% for the test group and the difference between the groups was statistically significant.

The 3-month observation revealed an ARC of 94% for the control group and about 98% for the study group. After 6 months ARC had increased slightly in the control group to about 96%, but had fallen sharply to about 94% in the test group (Fig. 1, 10–12).

A comparison of the mean API and SBI values (Tables 7, 8) shows that the value of these indicators for both groups were similar and baseline and after 6 months.

Discussion

The allogeneic *fascia lata* used in the study is a highly cross-linked hydrated collagen matrix containing collagen types I and III. The *fascia lata* is built out of dense connective tissue, the main components of which are collagen fiber bundles surrounded by a small amount of loose connective tissue with elastin fibers. A small number of fibroblasts are linearly distributed between the collagen bundles. The *fascia* is weakly vascularized and in-

Table 6. Values of clinical parameters at baseline, 3- and 6-month after surgery in control group

Control group n= 40						
	$\bar{x}$	M	SD	p (0 vs. 3)	p (0 vs. 6)	p (3 vs. 6)
ARC3 (%)	94.28	100	0.11			0.095
ARC6 (%)	95.77	100	0.11			
CRC3 (%)	90.00	100	0.18			0.004*
CRC6 (%)	94.87	100	0.14			
RD0 (mm)	2.50	2	1.01	< 0.001*	< 0.001*	0.029*
RD3 (mm)	0.25	0	0.44			
RD6 (mm)	0.13	0	0.33			
RW0 (mm)	3.20	3	0.99	< 0.001*	< 0.001*	0.195
RW3 (mm)	0.40	0	0.81			
RW6 (mm)	0.28	0	0.75			
PD0 (mm)	1.13	1	0.35	0.113	0.113	0.059
PD3 (mm)	1.03	1	0.25			
PD6 (mm)	1.05	1	0.30			
CAL0 (mm)	3.60	3	1.04	< 0.001*	< 0.001*	0.155
CAL3 (mm)	1.28	1	0.54			
CAL6 (mm)	1.20	1	0.41			
HKT0 (mm)	2.13	3	1.04	0.001*	0.017*	0.287
HKT3 (mm)	3.06	3	1.83			
HKT6 (mm)	2.86	3	1.60			
CEJMGJ0 (mm)	4.63	4.75	1.19	< 0.001*	< 0.001*	0.192
CEJ-MGJ3 (mm)	3.31	3	1.79			
CEJ-MGJ6 (mm)	2.99	2	1.56			

ARC – average root coverage; CRC – complete root coverage; RD – recession depth; RW – recession width; PD – probing depth; CAL – clinical attachment level; HKT – height of keratinized tissue; CEJ-MGJ – distance of cemento-enamel junction from muco-gingival junction, (0 – at baseline, 3 – 3-months, 6 – 6-months after surgery); $\bar{x}$ – average; M – median; SD – standard deviation; p – significance factor; * statistical significance.

Table 7. Values of API, SBI in test group at baseline (0), 3 and 6 months after surgery

	$\bar{x}$	M	SD	p (0 vs. 3)	p (0 vs. 6)	p (3 vs. 6)
API 0 (%)	16.53	17	4.45	0.002*	0.883	< 0.001*
API 3 (%)	21.60	20	3.22			
API 6 (%)	16.80	17	2.68			
SBI 0 (%)	12.47	12	2.64	< 0.001*	0.121	< 0.000*
SBI 3 (%)	21.53	21	4.02			
SBI 6 (%)	14.07	13	2.96			

API – Approximal Plaque Index; SBI – Sulcus Bleeding Index, (0 – at baseline, 3 – 3-months, 6 – 6-months after surgery); $\bar{x}$ – average; M – median; SD – standard deviation; p – significance factor; * statistical significance.

Fig. 10. Patient Ś-G.A. Clinical situation 6 months after surgery with CTG

Fig. 11. Patient L.E. Multiple gingival recessions before MCAT/FL surgery

Fig. 12. Patient L.E. Clinical situation 6 months after surgery using *Fascia Lat*a Allograft

nervated. The limited immunogenicity of this tissue is due to its histological structure. The right conservation methodology makes a further reduction of the immunogenicity of the allogeneic material possible while preserving the physiochemical parameters [19, 20]. The local immune response, although visible, has no effect on the incorporation of the allogeneic graft. A commonly applied conservation method is irradiation of the *fascia* in a physiological salt solution with 33 kGy [21].

Based on nine randomized clinical studies featuring 208 subjects and 858 gingival recessions Graziani et al. [22] discussed the effectiveness of periodontal plastic procedures in covering multiple gingival recession defects. The restorations assessed in their study had to have had a minimum observation period of no less than 6 months. CRC ranged between 24% and 89%, depending on the operating technique assessed, and the average root coverage percentage was 86.27%. Based on their meta-analysis the authors claim that it is not possible to state which is the best method for treating multiple gingival recessions. However, in their opinion the most predictable method appears to be the coronally positioned flap and tunnel technique with simultaneous placement of a connective tissue graft.

Dembowska and Drozdzik [23] employed the tunnel technique with a connective tissue graft to cover 48 multiple Miller Class I and II gingival recessions in 18 patients. Complete root coverage 6 months after surgery was achieved in 78.6% of all Class I gingival recessions and in 60% of all Class II recessions according to the Miller scale, and the mean root coverage was 97% and 96.6%, respectively.

Modaressi et al. [24] used the tunnel technique with ADMA to cover Miller Class I and II multiple gingival recessions. After 6 months the mean root coverage was equal to 58.67%.

The multiple gingival recession coverage technique employed in the present study was based on

Table 8. Values of API, SBI in control group at baseline (0), 3 and 6 months after surgery

	$\bar{x}$	M	SD	p (0 vs. 3)	p (0 vs. 6)	p (3 vs. 6)
API 0 (%)	15.20	16	3.21	< 0.001*	0.404	< 0.001*
API 3 (%)	22.07	20	3.49			
API 6 (%)	14.40	14	2.56			
SBI 0 (%)	11.67	11	2.06	< 0.001*	0.033	< 0.001*
SBI 3 (%)	21.13	20	5.22			
SBI 6 (%)	13.40	13	2.53			

API – approximal plaque index; SBI – sulcus bleeding index, (0 – at baseline, 3 – 3-months, 6 – 6-months after surgery); $\bar{x}$ – average; M – median; SD – standard deviation; p – significance factor; * statistical significance.

the tunnel method devised by Azzi et al. [25] together with autogenous connective tissue harvested from palatal masticatory mucosa and *fascia lata* Allografts. No vertical incisions were made. Instead, access to the tunnel was achieved via groove incisions. In this way the graft was inserted by the tooth with the greatest gingival recession or by the tooth located in the center of the operating field. The *fascia lata* Allograft was positioned at the margin of the CEJ, while the flap itself was positioned 2 mm coronally in relation to the CEJ. At each treated tooth single sling mattress sutures were placed. They were removed 2 weeks afterwards in the case of the control group just as in Ayub et al. [26], Koudale et al. [27], and after 3 weeks in the case of the test group.

A comparison of multiple gingival recession coverage procedures performed with the tunnel method using *fascia lata* Allograft as well as autogenous connective tissue graft indicates that similar clinical results were achieved at the end of a 6-month observation period. The mean API and SBI values for both groups at baseline and in the study after 3 and 6 months were similar and confirmed that the hygiene measures prior to procedures were correct and periodontal maintenance care was optimal.

After 6 months CRC was 94.87 ± 0.14% for the control group and 94.24 ± 0.20% for the study group and the difference was statistically significant. In the case of the other clinical parameters assessed after 6 months no significant differences between the groups were evident. ARC was 95.77 ± 0.11% for the control group and 94.21 ± 0.20% for the test group. These observations are in accordance with other papers comparing the use of ADMA and CTG in cases of both individual and multiple gingival recession coverage using different operating techniques [27–29]. On the other hand, they contradict other studies which showed statistically better results when a connective tissue graft was applied [11, 30]. Rahmani et al. [30] observed mean root coverage of 70% for SCTG and 70% for the ADMA group. Similarly, Koudale et al. [27] did not observe any statistically significant differences 6 months after multiple gingival recession coverage procedures using CPF with ADMA and CTG. In this case, the mean percent root coverage achieved was 94% and 97%, respectively. Hirsch et al. [30] reported 97.8% root coverage for an SCTG group and 95.9% for an ADMA group and the difference between the groups was statistically significant.

In a randomized controlled study, Thombre et al. [12] compared the clinical effects of 43 multiple gingival recession coverage procedures in 20 patients who were divided into 2 groups that underwent coronally positioned flap procedures either with or without ADMA. Average gingival recession coverage 6 months after the procedures was 90% for the ADMA group and in the group without ADMA the percentage was 66% for the group without ADMA. Complete root coverage after 6 months was 64% and 24%, respectively. These differences were statistically significant. Significantly higher growth in the keratinized gingiva zone was noted in both groups in relation to the baseline – 1.3 ± 0.4 mm in the test group, compared with 1.0 ± 0.6 mm in the control group (CPF alone).

In the authors' own research the keratinized gingiva zone was widened by just under 0.5 mm in the MCAT/FL group. Perhaps a different location for the allograft would have improved this result. This is because Ayub et al. [26] showed that the positioning of the acellular dermal matrix allograft (ADMA) 1mm apically and the flap 1 mm coronally in relation to the CEJ results in statistically better widening of the keratinized gingiva than when the allograft is positioned at CEJ level.

The significant reduction in CEJ-MGJ observed in relation to baseline is due to the coverage of the gingival recession *via* coronal repositioning of the flap together with its muco-gingival junction. The position of MGJ is genetically determined. If the displacement is too great it may result in it returning to its original position and thus in relapse of gingival recessions. In view of this fact it is especially important, therefore, to achieve a stable position for the MGJ after the procedure, as the authors noted in their own observations after 3 and 6 months. In a 5-year study Dominiak et al. [2] reported a stable reduction in the CEJ-MGJ distance and this reduction was greater in the case of coronally advanced flap procedures, namely a double lateral bridging flap (DLBF) and guided tissue regeneration with collagen membrane (GTR-CM), than it was for CPF-CTG. The latter study also noted the biggest increase in keratinized gingiva width, which may be explained by the fact that this group had the most stable value throughout the entire 5-year observation period, i.e. 5 mm. The values for the other two groups increased marginally, which is also in line with the findings of the authors' own study. For the FL group this value increased slightly by 0.07 mm in the 3–6 month observations and for the CTG group by 0.02 mm. Longer observation periods are vital for assessing this parameter.

Thombre et al. (2013) reported a mean CAL of 3. 9 ± 0. 9 mm at baseline and 1.9 ± 1.1 mm after 6 months (the mean CAL gain was 2.0 ± 0.9 mm) in CPF alone and 4.1 ± 0.9 mm at baseline and 1.0 ± 0.7 mm after 6 months, respectively, for the group with ADMA (the mean CAL gain was

3.1 ± 1.0 mm) and the difference between the groups was statistically significant.

In the authors' own study the absence of any significant differences between the CTG group and *fascia lata* in terms of CAL indicates similar possibilities for its effective reconstruction using both grafts, with PD values not increasing at the same time.

Ahmedbeyli et al. [18] compared clinical and aesthetic results 12 months after multiple gingival recession coverage procedures using a coronal flap displacement method alone and CPF as well as an acellular dermal matrix allograft in 48 patients. ARC in the ADM group was 94.84% and in the CPF alone group ACR was 74.99%. CRC was equal to 83.33% and 50.00%, respectively. The differences between the groups were statistically significant. The situation was similar with regard to the increase in the height of the keratinized tissue and the GT value. A positive correlation was also observed between GT and average root coverage. The authors stress that ADM may be used successfully in both cases of multiple gingival recession coverage and in cases where the periodontal biotype is thin.

The results of the study confirm that *fascia lata* Allografts and autogenous connective tissue grafts harvested from palatal mucosa are similarly effective in covering multiple gingival recession defects. The unlimited amount of this allogeneic material can make it an interesting alternative to the multistage application of CTG harvested from the same palatal masticatory mucosa sites during extensive gingival augmentation procedures. Not creating a second operating field should shorten the operating time, reduce post-operative pain and in this way help increase the patient's comfort. Further studies should be carried to confirm these observations.

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Address for correspondence:

Wojciech Bednarz
Specialistic Outpatient Medical Clinic MEDIDENT
ul. Okulickiego 19
38-300 Gorlice
Poland
E-mail: wojcie_ch@poczta.onet.pl

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