

ROOT COVERAGE USING THE SUBEPITHELIAL CONNECTIVE TISSUE GRAFT OR THE ACELLULAR DERMAL MATRIX FOR THE TREATMENT OF GINGIVAL RECESSION: A CLINICAL STUDY

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ABSTRACT

Objective: This study aims to evaluate periodontal clinical conditions after treatment for gingival recession (GR) using subepithelial connective tissue graft (SCTG) and acellular dermal matrix (ADM).

Methods: Ten patients with Miller's Class I and II recessions that had been treated with SCTG or ADM at the Periodontics Outpatient Department at Universitas Indonesia were selected for this study. The pre-operative data for GR, clinical attachment levels (CAL), and attached gingiva (AG) were retrieved from the patients' medical records. The patients were recalled and the post-operative data were recorded.

Results: The application of SCTG and ADM yields significant changes to GR, CAL, and AG levels. A comparison of two groups at the post-operative assessment stage showed no statistically significant differences, in terms of GR, CAL, and AG.

Conclusion: SCTG and ADM yield similar outcomes in the treatment of GR. As such, ADM may be suggested as an alternative to SCTG for root coverage.

Keywords: Gingival recession, Root coverage, Subepithelial connective tissue graft, Acellular dermal matrix.

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INTRODUCTION

Gingival recession (GR) can be defined as the apical migration of the gingival margin away from the cemento-enamel junction (CEJ) [1]. GR is a highly prevalent condition that causes inconvenience to patients, in terms of both tooth sensitivity and esthetics [2]. These days, treatment of GR is focused on the esthetic aspect, and various surgical procedures have been developed to achieve complete root coverage as well as the perfect integration of the graft and recipient areas [3].

The subepithelial connective tissue graft (SCTG) is considered the gold standard procedure for the management of GR [4]. This technique offers higher levels of root coverage than other techniques due to the dual blood supply is given to the graft; better esthetics and good post-operative healing at the donor site are other benefits [5,6]. SCTG has also been found to increase the width of keratinized gingiva significantly [7]. However, the graft needs to be harvested from the palate, meaning that the technique demands an intricate second surgical procedure, which adds to patient morbidity levels and surgical chair time [3]. Moreover, the amount of donor tissue that can be obtained is very limited [5].

The limitations of SCTG have prompted clinicians to develop alternate biomaterials for root-coverage procedures. Recently, the use of the acellular dermal matrix (ADM) has become popular in root-coverage surgery. ADM is derived from human skin that has been chemically processed to remove the cells completely, while preserving the bioactive matrix (comprised collagen, elastin, blood vessel channels, and bioactive proteins) [8].

A number of studies have compared the clinical efficacy of SCTG and ADM, leading to contradictory results. In certain experiments, ADM has been shown to yield similar results to SCTG, but with less defect coverage, lower keratinized gingival widths, and lower clinical attachment levels (CAL) [9].

Moslemi *et al.* found that over 5 years, ADM-treated sites did not achieve stable gingival width, while SCTG-treated sites did [10].

Conversely, however, another case report showed that ADM-based root coverage remained stable after 12 years in a patient undergoing orthodontic treatment, with the width of keratinized gingiva also having increased [11].

The aim of this study is the clinical evaluation and comparison of SCTG- and ADM-based root coverage in the treatment of Miller's Class I and II GR.

METHODS

Ten systemically healthy patients with a total of 22 recession defects, all of which were treated either with SCTG or ADM between 2012 and 2016, were selected from the Periodontics Outpatient Department at Universitas Indonesia, Jakarta, Indonesia.

The surgical procedures were conducted by periodontics residents under the supervision of lecturers. The follow-up period ranged from 3 to 52 months (median recall period: 22 months). The patients were divided into two groups: The first group received SCTG-based treatment (11 recession defects) and the second group received ADM-based treatment (11 recession defects). The inclusion criteria were Miller's Class I and II GR and chronic periodontitis, and the ability to attend a follow-up examination. The exclusion criteria were aggressive periodontitis and the use of tobacco products.

The following pre-operative data were collected from the patients' medical records: GR levels, CAL, and the width of attached gingiva (AG). All the participants were invited to follow-up examinations, and the post-operative GR, CAL, and AG figures were recorded. The patients were asked to give informed consent to participate, and they all signed consent forms. All the measurements were taken with a 15 mm calibrated periodontal probe (UNC-15, Osung MND, Seoul, Korea).

The variables were recorded in a database. Statistical analysis was performed using SPSS.

Statistical analysis

The differences between the pre- and post-operative measurements for the patients were analyzed using the Wilcoxon signed-rank test. Comparisons between the SCTG group and the ADM group were made through the Mann-Whitney U test. The results were considered significant at the 5% critical level ($p < 0.05$) (Figs. 1 and 2).

RESULTS

In each group, 11 recession defects were treated. Both groups had similar clinical measurements preoperatively. Table 1 summarizes that the following figures were statistically significant in both the SCTG and ADM groups postoperatively: Reduction in GR (SCTG group: $p = 0.02$, ADM group: $p = 0.00$), gain in CAL (SCTG group: $p = 0.00$, ADM group: $p = 0.00$), and increase in the width of AG (SCTG group: $p = 0.00$, ADM group: $p = 0.01$).

Table 2 summarizes that when comparing the two groups at the pre- and post-operative stages, there were no statistically significant differences

in terms of GR ($p = 0.79$ and $p = 0.56$, respectively), CAL ($p = 0.17$ and $p = 0.36$, respectively), or AG ($p = 0.24$ and $p = 0.17$, respectively).

Table 3 summarizes that there were no statistically significant differences in GR, CAL, and AG between the two groups postoperatively ($p = 0.56$, $p = 0.36$, and $p = 0.17$, respectively), although the post-operative measurements for the SCTG group were numerically greater than for the ADM group.

DISCUSSION

The results presented in this study show that both SCTG and ADM yield significant reductions in GR, gains in CAL, and increases in AG width. These findings are in accordance with previous studies by Shori *et al.* and Guan *et al.* [7,12]. SCTG has been known to provide the best root-coverage outcomes; its predictability is as high as 95% for Miller's Class I and II cases [13,14]. ADM has also been proven effective in root-coverage therapy. The mean root coverage obtained in studies of ADM is 81% (range 50-99%) [15]. Histologic examinations have revealed

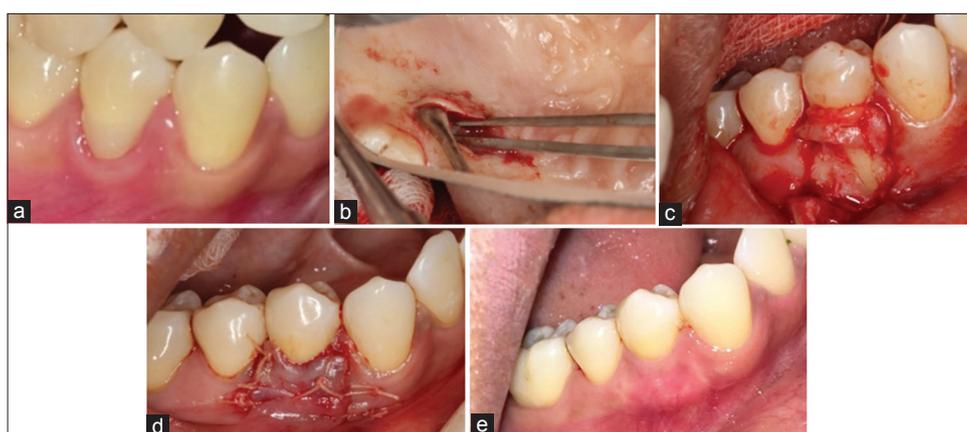


Fig. 1: (a) Pre-operative view showing 2 mm gingival recession on buccal side of 44, (b) retrieval of subepithelial connective tissue graft (SCTG) from the palate, (c) placement of SCTG on the recession site, (d) suturing of coronally advanced flap over SCTG, (e) post-operative healing after 6 months

Table 1: Analysis of gingival recession, clinical attachment level, and attachment gingiva figures before and after treatment with subepithelial connective tissue graft and acellular dermal matrix

Treatment	Gingival recession (mm)			Clinical attachment level (mm)			Attachment gingiva (mm)		
	Mean±SD	Median (min-max)	p	Mean±SD	Median (min-max)	p	Mean±SD	Median (min-max)	p
SCTG			0.02			0.00			0.00
Before	2.77±1.03	2 (2-5)		4.95±1.52	4 (4-9)		4.36±2.87	4 (0-8)	
After	0.81±0.98	1 (0-3)	2.72±1.42	3 (1-6)	6.72±2.68	8 (1-9)			
ADM			0.00			0.00			0.01
Before	2.50±0.54	2.5 (2-3.5)		4.13±0.67	4 (3-5.5)		3.00±1.78	3 (0-5)	
After	0.59±0.91	0 (0-2)	2.13±1.18	2 (1-4)	5.18±2.27	5 (3-9)			

Wilcoxon signed-rank test, $p < 0.05$ significant difference. SCTG: Subepithelial connective tissue graft, ADM: Acellular dermal matrix

Table 2: Analysis of gingival recession, clinical attachment level, and attachment gingiva figures in subepithelial connective tissue graft and acellular dermal matrix groups, before and after treatment

Treatment	Gingival recession (mm)			Clinical attachment level (mm)			Attachment gingiva (mm)		
	Mean±SD	Median (min-max)	p	Mean±SD	Median (min-max)	p	Mean±SD	Median (min-max)	p
Before			0.79			0.17			0.24
SCTG	2.77±1.03	2 (2-5)		4.95±1.52	4 (4-9)		4.36±2.87	4 (0-8)	
ADM	2.50±0.54	1 (0-3)	4.13±0.67	4 (3-5.5)	3.00±1.78	3 (0-5)			
After			0.56			0.36			0.17
SCTG	0.81±0.98	2.5 (2-3.5)		2.72±1.42	3 (1-6)		6.72±2.68	8 (1-9)	
ADM	0.59±0.91	0 (0-2)	2.13±1.18	2 (1-4)	5.18±2.27	5 (3-9)			

Mann-Whitney U test, $P < 0.05$ significant difference. SCTG: Subepithelial connective tissue graft, ADM: Acellular dermal matrix



Fig. 2: (a) Pre-operative view showing 2 mm gingival recession on buccal side of 34, (b) application of acellular dermal matrix (ADM), (c) suturing of coronally advanced flap over ADM, (d) post-operative healing after 5 months

Table 3: Comparative changes in gingival recession, clinical attachment level, and attachment gingiva figures after treatment with subepithelial connective tissue graft or acellular dermal matrix

Change of Clinical Conditions	Mean±SD (mm)		p
	SCTG	ADM	
Gingival recession	1.95±0.65	1.90±0.91	0.56
Clinical attachment level	2.22±1.53	2.00±1.16	0.36
Attachment gingiva	2.36±1.91	2.18±2.27	0.17

Mann-Whitney U test, $p < 0.05$ significant difference. SCTG: Subepithelial connective tissue graft, ADM: Acellular dermal matrix

that SCTG and ADM promote new cementum formation, as well as a combination of long junctional epithelium development and connective tissue adhesion to the root [16].

The reduction in GR, the gain in CAL, and the increase in AG width were slightly better for the SCTG group than the ADM group. Nevertheless, these differences were not statistically significant, indicating that SCTG and ADM are equally effective in the treatment of GR. These findings are in accordance with previous studies by Thomas *et al.*, Taiyeb Ali *et al.*, and Guan *et al.* [5,12,17]. Thomas *et al.* reported a greater increase in the width of keratinized gingiva in the SCTG group 90 days postoperatively; at 180 days, however, the difference between the two groups was not statistically significant [5]. This result suggests that the ADM-based procedure may lead to a longer healing time [12].

In this study, complete root coverage was achieved postoperatively for only 9 of the 22 defects. Factors such as the type of defect, tooth root surface characteristics, the surgical technique, and the host conditions (e.g., muscle pulls and smoking habits) have all been shown to influence root-coverage success [18,19].

Wound healing plays a key role in determining root-coverage predictability, so graft vascularization and the surgical technique must be given special considerations. As ADM is an avascular and acellular material, the healing process differs slightly from that with SCTG. Where SCTG is concerned, preexisting blood vessels anastomose with those in the gingival corium with ADM. However, cells and blood vessels from the recipient site are relied on completely to facilitate incorporation [20].

As such, for ADM, complete coverage by the flap is required to achieve optimal vascularization, while for SCTG, the site can be left partially covered [9,20]. A flap thickness of more than 0.8 mm and the suturing

of the gingival margin at 2.5 mm coronal to the CEJ will increase root-coverage potential. On the other hand, greater flap tension and a recession depth of more than 4 mm will decrease root-coverage potential [19]. Wound stabilization during the 1st week of healing is a critical factor in the improvement of the root-coverage outcome [21]. In addition, the elimination of the causative agent and compliance with regular periodontal maintenance seems to be associated directly with the long-term stability of root coverage [22].

In this study, numerically greater changes in GR, CAL, and AG were found with SCTG, when compared with ADM, although these differences were not statistically significant ($p > 0.05$). These findings are in accordance with previous systematic reviews, in which SCTG has been called the “gold standard” in the treatment of GR; its superiority has not been surpassed by other types of grafts [23-25]. SCTG is recommended, especially for the thin gingival biotype (with a thickness of < 1 mm) [26]. ADM can be used in the treatment of single or multiple GRs with a gingival thickness of more than 1 mm and may be suggested as an alternative to SCTG when there is minimal palatal donor tissue or when patients refuse additional surgery [9,22].

CONCLUSION

This study has demonstrated that SCTG and ADM yield similar outcomes in the treatment of GR. It can be concluded, therefore, that ADM may be suggested as an alternative to SCTG to minimize the complexity of root-coverage procedures.

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