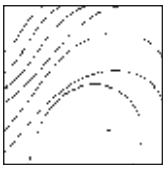
Comparative Evaluation of the Effectiveness of Coronally Positioned Flap With or Without Acellular Dermal Matrix Allograft in the Treatment of Multiple Marginal Gingival Recession Defects



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Gingival recession remains an important problem in dental esthetics. Various surgical techniques have been proposed for treating multiple gingival recessions. The objective of this study was to evaluate and compare the effectiveness of a coronally positioned flap (CPF) with or without acellular dermal matrix allograft (ADMA) in the treatment of multiple marginal tissue recession. Twenty patients with a mean age of 31.6 years presented with 43 buccal/labial multiple recession defects (Miller Class I/II). Ten patients each were randomly assigned to one of two treatment groups: group 1 (ADMA) or group 2 (CPF). The clinical parameters gingival recession (GR), probing pocket depth (PD), clinical attachment level (CAL), and width of the keratinized gingiva (KG) were recorded before surgery and 6 month postsurgery. The mean baseline recession defect was 3.0 mm for group 1 and 2.8 mm for group 2. After 6 months, both treatments resulted in significant root coverage (P < .01), reaching an average of 2.7 mm (90%) in group 1 and 1.8 mm (66%) in group 2. The difference in recession reduction between treatments was statistically significant. There were no statistically significant differences between the treatments in PD and KG. CAL gain (3.0 mm) was significantly higher in group 1 compared with group 2 (2.0 mm). The results of this study demonstrate that ADMA with a CPF is an effective procedure for the treatment of multiple gingival recessions. (Int J Periodontics Restorative Dent 2013;33:e88–e94. doi: 10.11607/prd.1371)

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The displacement of the gingival margin apical to the cementoenamel junction (CEJ) with oral exposure of the root surface is a common feature in populations with high and low standards of oral hygiene. Patients are increasingly conscious of personal appearance and much attention has been focused on unesthetic denuded roots that are exposed during smiling.[1] The main indications for root coverage procedures are esthetic and/or cosmetic demands,[1] management of root hypersensitivity,[2] or to improve oral health maintenance. Obtaining predictable root coverage has been an important component of periodontal therapy, and various techniques have been proposed to achieve root coverage.

Pedicle flaps have been used successfully for root coverage with different surgical modifications.[3–5] A coronally positioned flap (CPF) is frequently used to achieve root coverage in the treatment of Miller Class I and II gingival recession defects.[6,7] However, the root coverage obtained with this procedure is associated with thin marginal

soft tissue,[3] which makes it vulnerable to future recession and thus reduces the long-term predictability of a CPF in the treatment of multiple gingival recessions.[8]

The autogenous subepithelial connective tissue graft (SCTG) covered by a CPF is a predictable technique for root coverage and gingival augmentation.[9] However, this procedure requires a second surgical site and may cause discomfort and increase the risk for postoperative complications. The need for a second surgical procedure to harvest donor tissue is a disadvantage of SCTG because only a limited amount of donor tissue is available for multiple recession defects.

The use of acellular dermal matrix allograft (ADMA) has become increasingly popular as a substitute for SCTG in treating marginal tissue recession.[10] An in-vitro study suggested that ADMA is an acellular, non-immunogenic scaffold that heals by repopulation and revascularization rather than through a granulation process that matures to form a scar.[11] The use of ADMA has favorable reported outcomes in root coverage procedures, with a range of mean root coverage from 86% to 99%.[12–15] It was found that the use of ADMA combined with a CPF was a predictable procedure in the treatment of isolated gingival recession.[12] Therefore, this randomized controlled clinical study was undertaken to evaluate the effectiveness of ADMA in combination with a CPF in the treatment of multiple marginal tissue recession compared with a CPF alone.

Method and materials

Twenty systemically healthy patients (16 men and 4 women) aged between 23 to 43 years (mean age, 31.6 years) were selected from the Department of Periodontology and Implantology, Sharad Pawar Dental College, Maharashtra, India.

The inclusion criteria were *(1)* presence of multiple gingival recession defects classified as either Miller Class I or II on the labial or buccal aspects of maxillary or mandibular teeth,[6] *(2)* presence of > 2 mm gingival recession depth, *(3)* presence of > 2 mm width of keratinized gingiva apical to recession, and *(4)* clinical indication and/or a patient's request for root coverage.

The exclusion criteria included *(1)* patients who were smokers, *(2)* uncooperative patients, *(3)* patients with a plaque score > 1 after periodontal therapy, *(4)* patients with a history of periodontal surgery, and *(5)* patients with endodontically treated or restored teeth.

The surgical procedures were explained, and all patients signed informed consent forms prior to treatment. The study's protocol was approved by the ethics committee of Sharad Pawar Dental College.

Prior to surgery, each patient received periodontal therapy and oral hygiene instructions in an effort to reduce behavior that may have contributed to the recession defects, and occlusal adjustment was performed where necessary. Patients were advised on plaque control until a plaque score of ≤ 1 was achieved.

Each patient's oral hygiene status was evaluated at baseline and 3 and 6 months postsurgery by means of the full-mouth Plaque Index (PI) and full-mouth Papillary Bleeding Index (PBI).

The following clinical parameters were measured with the use of a computerized pressure probe (Florida Probe) with a constant force of 15 g: probing pocket depth (PPD), clinical attachment level (CAL), gingival recession (GR), and width of keratinized gingiva (KG). The CEJ was used as a fixed reference point. In cases where the CEJ was not clearly visible, the lower border of the acrylic resin stent that covered the experimental teeth was used as a reference point. These parameters were recorded at maximum depth recession at baseline and 6 months postsurgery. Baseline clinical parameters were recorded 6 weeks after the initial therapy.

Patients were randomly assigned using a coin toss to one of two treatments: group 1, CPF alone (Fig 1) or group 2, CPF plus ADMA (Fig 2).

Surgical procedure

After administering localized anesthesia, the exposed root surface was planed with hand and ultrasonic instruments. Surgeries were performed according to a previously described method.[16]

ADMA (AlloDerm Life Cell) was adapted after being aseptically rehydrated in sterile saline, according to the manufacturer's instructions. The graft was trimmed in such a

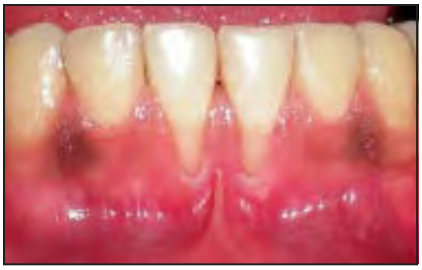

Fig 1a *Preoperative gingival recession on the mandibular right and left central incisors, group 1.*

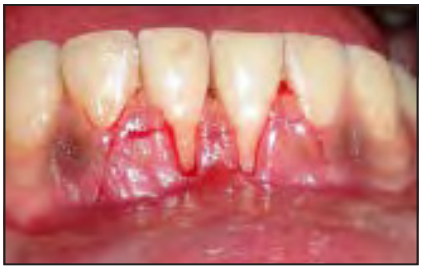

Fig 1b *Horizontal and vertical incisions.*

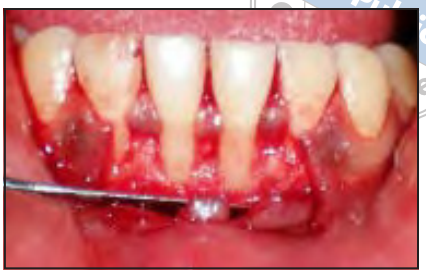

Fig 1c *Flap reflection with split thickness.*

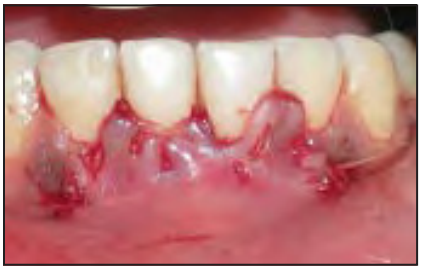

Fig 1d *Flap sutured coronally.*

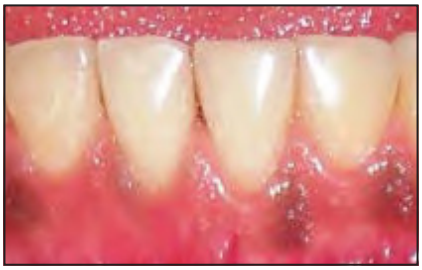

Fig 1e *Postoperative view after 6 months.*

way that coronally it was at the CEJ and apically it covered the alveolar bone at least 2 to 3 mm. The basement side was placed adjacent to bone and tooth, and the connective tissue side was placed facing the flap. The coronal lateral borders of the ADMA were sutured to the lingual gingival tissue with 4.0 ethicon resorbable sutures (Johnson & Johnson). The flap was then coronally positioned and sutured to completely cover the ADMA. Subsequently, periodontal dressing (Coe-Pak, GC America) was placed over the surgical site in both groups.

In group 1, the surgical procedures were identical, except for the placement of the graft.

After surgery, nonsteroidal anti-inflammatory drugs (ibuprofen 200 mg, paracetamol 400 mg, Tab Ibugesic Plus, Cipla, three times a day) and systemic antibiotic (amoxicillin 500 mg, Cap Novamox, Cipla, three times a day) were prescribed for 7 days postsurgery. All patients were instructed not to brush the surgical sites for 30 days postsurgery. During this period, plaque control was achieved with a 0.12% chlorhexidine gluconate rinse (Colgate Palmolive) used twice daily. Periodontal dressing and sutures were removed after 14 days. Patients were recalled weekly for supragingival scaling and oral hygiene instructions for the first month and then once a month until the end of the study. All patients were recalled after 6 months and clinical parameters were recorded.

Statistical analysis

Means and standard deviations (SDs) were calculated for all parameters and analyzed for statistical significance. A Student paired *t* test was used to compare baseline and 6-month data for each group, including PI and PBI, with a Student unpaired *t* test used for comparisons between treatment groups. If the probability value was less than .05, it was considered statistically significant.

Results

Healing was uneventful for all 20 patients (43 recession defects), and no patients were excluded from the study.

Table 1 shows PI and PBI scores at baseline and at the 3- and 6-month follow-ups for groups 1 and 2. Baseline dimensions of the defects were similar for both groups. There were no statistically significant differences

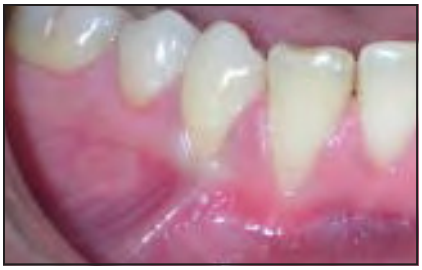

Fig 2a *Preoperative gingival recession on mandibular right canine and first premolar.*

Fig 2b *Horizontal and vertical incisions.*

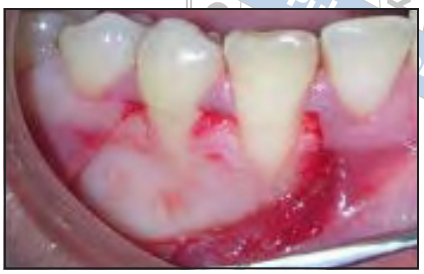

Fig 2c *Flap reflection with full thickness.*

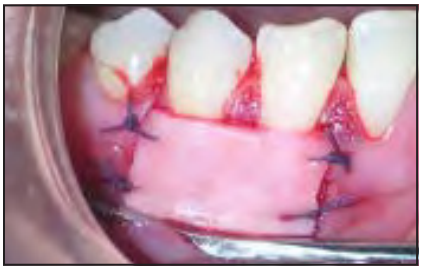

Fig 2d *ADMA sutured in place.*

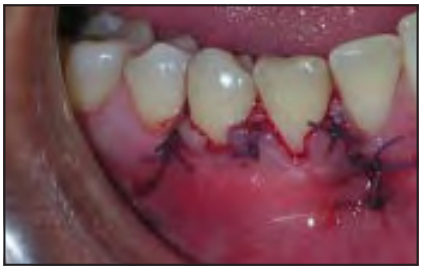

Fig 2e *Flap sutured coronally covering the entire ADMA area.*

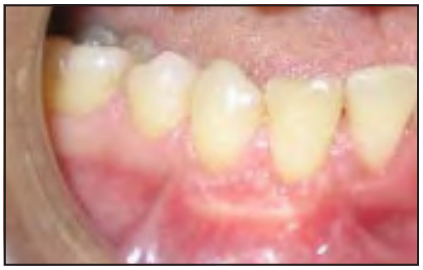

Fig 2f *Postoperative view at 6 months.*

between the two groups ($P > .05$), indicating that the randomization process was effective with regard to mean GR, PPD, CAL, and KG. There was a statistically significant reduction in GR, gain in CAL, reduction in PPD, and increase in KG.

For groups 1 and 2, the mean GR at baseline was 2.8 ± 0.7 mm and 3.0 ± 0.9 mm, respectively. At the 6-month follow-up, mean GR had decreased to 1.0 ± 1.0 mm for group 1 and 0.3 ± 0.5 mm for group 2, with a mean reduction of 1.8 ± 0.9 mm and 2.7 ± 1.0 mm, respectively (Table 2).

In group 1, the mean PPD decreased from 1.1 ± 0.3 mm at baseline to 0.8 ± 0.3 mm at 6 months and from 1.1 ± 0.3 mm at baseline to 0.7 ± 0.3 mm at 6 months for group 2, which was statistically significant. Mean PPD reduction in group 2 (0.4 ± 0.2 mm) at 6 months when compared with group 1 (0.3 ± 0.3 mm) was not significantly different ($P > .05$) (Table 2).

Table 1 **PI and PBI scores (mean ± SD) at baseline and 3 and 6 months**

Parameter	Baseline	3 mo	6 mo
PI			
Group 1	0.78 ± 0.31	0.46 ± 0.12	0.54 ± 0.31
Group 2	0.93 ± 0.23	0.53 ± 0.12*	0.67 ± 0.15
PBI			
Group 1	0.85 ± 0.19	0.72 ± 0.21	0.64 ± 0.15
Group 2	0.89 ± 0.14	0.62 ± 0.13	0.70 ± 0.14

PI = Plaque Index; PBI = Papillary Bleeding Index; SD = standard deviation.
*Statistically significant ($P < .05$).

In group 1, the mean CAL was 3.9 ± 0.9 mm at baseline and 1.9 ± 1.1 mm at 6 months. For group 2, it was 4.1 ± 0.9 mm at baseline and 1.0 ± 0.7 mm at 6 months. The mean CAL gain was 2.0 ± 0.9 mm for group 1 and 3.1 ± 1.0 mm for group 2, which was statistically significant. When the mean CAL gain was compared between groups 1 and 2, CAL gain was significantly higher in group 2 (ADMA) (Table 2).

Mean KG for group 1 was 2.9 ± 0.9 mm at baseline and 3.9 ± 1.0 mm at 6 months. For group 2, it was 2.7 ± 0.9 mm at baseline and 4.0 ± 1.0 mm at 6 months. The mean

Table 2 Clinical parameters for groups 1 and 2 at baseline and 6 months

Parameter	Baseline (mean ± SD)	6 mo (mean ± SD)	Difference (mean ± SD)	Within groups *(P)*
GR (mm)				
Group 1	2.8 ± 0.7	1.0 ± 1.0	1.8 ± 0.9	< .05*
Group 2	3.0 ± 0.9	0.3 ± 0.5	2.7 ± 1.0	< .05*
Between groups			0.9 ± 0.3	< .05*
PPD (mm)				
Group 1	1.1 ± 0.3	0.8 ± 0.3	0.3 ± 0.3	< .05*
Group 2	1.1 ± 0.3	0.7 ± 0.3	0.4 ± 0.2	< .05*
Between groups			0.1 ± 0.1	> .05
CAL (mm)				
Group 1	3.9 ± 0.9	1.8 ± 1.1	2.1 ± 0.9	< .05*
Group 2	4.1 ± 0.9	1.0 ± 0.7	3.1 ± 1.0	< .05*
Between groups			1.0 ± 0.3	< .05*
KG (mm)				
Group 1	2.9 ± 0.9	3.9 ± 1.1	–1.0 ± 0.6	< .05*
Group 2	2.7 ± 0.9	4.0 ± 1.0	1.3 ± 0.4	< .05*
Between groups			0.3 ± 0.2	> .05

*Indicates statistical significance.

Table 3 Mean percentage of defects with 100% root coverage

	Defects with 100% root coverage (n)	Teeth with complete root coverage (mean)	*P*
Group 1 (n = 21)	5	24%	< .05*
Group 2 (n = 22)	14	64%	< .05*

*Indicates statistical significance.

increase in KG was –1.0 ± 0.6 mm (group 1) and 1.3 ± 0.4 mm (group 2) at 6 months, which was statistically significant compared to baseline but not between the two groups (Table 2).

On average, 66% (group 1) and 90% (group 2) of the root surfaces initially exposed were covered with soft tissue 6-months postsurgery. At this point, 5 of 21 (24%, group 1) and 14 of 22 (64%, group 2) treated recession defects showed complete root coverage (Table 3). The number and mean percentages of the defects with complete root coverage were statistically significant in both groups at the 6-month follow-up.

With the use of ADMA, mean percent defect coverage was 90% and the predictability was 68% for root coverage (> 90%, ie, 15 of 22 defects), whereas mean percent defect coverage for CPF alone was 66% and the predictability for root coverage was 29% (> 90%, ie, 6 of 21 defects).

Discussion

In the present study, a total of 43 buccal/labial recession defects in 20 patients were treated. Twenty-two defects were treated with ADMA in combination with a CPF and 21 recession defects were treated with a CPF alone. There were no signs of allergy, infection, or any other complication in any patient after the use of ADMA, which indicates that the product was well tolerated. Overall, patients were generally satisfied with both treatment modalities.

Clinical outcomes of various forms of surgical interventions are influenced by the general quality of oral hygiene. In the present study, both PI and PBI scores remained low. The results indicate that the treatment modalities for

groups 1 and 2 showed significant improvement in the studied clinical parameters with respect to baseline. At 6 months, a statistically significant improvement was found in gingival recession in both groups (1.8 mm for group 1 and 2.7 mm for group 2). A larger and statistically significant reduction of recession depth was observed in group 2 (0.9 mm) compared with group 1.

GR defect in group 1 decreased from 2.8 mm (range, 2.0 to 4.2 mm) to 1.0 mm (range, 0.0 to 2.8 mm) and in group 2 from 3.0 mm (range, 2.0 to 5.4 mm) to 0.3 mm (range, 0.0 to 1.8 mm), corresponding to a mean recession defect coverage of 90% for group 2 and 66% in group 1.

The results of the present study confirm those from previous studies reporting on the use ADMA in combination with a CPF for the treatment of multiple gingival recessions. Previous studies[13,15,17,18] achieved > 90% mean recession defect coverage for multiple gingival recession defects using ADMA and a CPF. In this study, the predictability of root coverage > 90% was 68%, ie, 15 of 22 defects in group 2. This may be attributed to the increased flap thickness that was obtained because of the ADMA graft. Studies have shown that sites with a flap thickness of > 0.8 mm tend to heal with complete coverage after a CPF procedure.[19] In the present study, the recession defect depth (up to 5.4 mm) was completely covered and has increased to 6 and 11 mm in earlier studies.[13,15] These data suggest that the key to success may be increased marginal tissue thickness produced by the ADMA graft. In the present study, the mean root coverage obtained with the use of a CPF alone was 66%, and > 90% defect coverage occurred in only 29% of cases. Complete resolution of the gingival recession defect was observed in 24% of defects, indicating that this procedure was the least predictable. These findings are comparable with other reports that achieved a mean root coverage of 66.8%,[20] 61%,[21] and 67%.[15] Differences in the percentage of root coverage using a CPF may be due to several factors, including depth and amount of keratinized tissue,[22] postsurgical position of the gingival margin,[23] and flap tension at the time of suture.[24]

Allen and Miller reported a high percentage of defect coverage using a CPF alone; however, only sites with > 3 mm of keratinized tissue and defects with < 4 mm of recession were included.[3] This indicates that a CPF alone may not produce complete defect coverage unless initial site characteristics conform to the restrictions proposed by Allen and Miller.

Based on ADMA reports, the matrix revascularizes via preserved vascular channels and then integrates into host tissue.[25–27] The observed clinical changes probably represent a combination of new connective tissue attachment in the apical half of the defect and the presence of a long junctional epithelium attachment in the coronal half.[28]

A significant increase in the KG was observed in both groups 1 (0.4 mm) and 2 (1.3 mm). The difference between the groups was not significant. The increase in group 1 has been justified due to the genetically determined position of the mucogingival line, which with time reaches its original position and consequently causes an increase in keratinized gingiva.[29]

Previous studies reported an increase of 1.2 mm of keratinized gingiva after 6 months.[30–32] However, the possibility of the ADMA graft increasing the amount of keratinized tissue needs further investigation. Studies suggested that on histologic evaluation the nonvital dermal matrix of ADMA lacked the capability of directing cytodifferentiation of the covering epithelium.[33]

The use of ADMA covered by a CPF is a relatively new approach that allows for coverage of multiple sites and does not require autogenous donor tissue. The ability to cover an unlimited number of sites without the need for the second site to obtain donor tissue is a significant advantage.[13,15,17,30,31]

Very often, the most coronal millimeter(s) of root exposure is the only visible part of recession when a patient smiles. Thus, the residual recession seen on most defects treated with the use of a CPF alone may be an esthetic problem.

Limitations of this study include the lack of a follow-up period longer than 6 months (since creeping attachment is highest during the 9 to 12 months postsurgery, which may further improve root coverage) and the lack of histologic evaluation.

Conclusions

The use of ADMA, when compared with a CPF alone, is a relatively new approach that allows for coverage of multiple recession sites, does not require autogenous tissue, and may contribute to a significant reduction in patient morbidity. The root coverage obtained by both procedures, while statistically significant, also had clinical relevance in terms of patient satisfaction, especially with the use of ADMA, as most patients requested an improved esthetic result.

Acknowledgment

The authors reported no conflicts of interest related to this study.

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