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ORIGINAL ARTICLE

Long-term predictability of allogenic dermal matrix for root coverage: Three years observation period on 15 consecutive cases ☆



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KEYWORDS

Gingival recession;
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Abstract Gingival recession is an apical migration of gingival margin that is a common finding on patients with meticulous oral hygiene and periodontitis patients. Several surgical treatment techniques of gingival recession have been described. The most challenging situation is the presence of multiple adjacent recession defects. 15 patients with total of 53 recession defects have been treated with Acellular Dermal Matrix (ADM). The following clinical parameters were evaluated recession depth (RD), probing depth (PD); and the width of the keratinized tissue (KT). Upon completion of the study; there was statistically significant (P -value = 0.00) reduction in recession depth from baseline, one and three years after the surgery (2.6 mm, 0.32 mm, and 0.17 mm, respectively). There was statistically significant (P -value = 0.00) increase in the width of keratinized tissue from baseline to one year and three years (3.47 mm, 5.02 mm, and 5.40 mm, respectively). Based on this study the use of ADM with the coronally advanced flap resulted in a significant increase in keratinized tissue and percentage of root surface coverage.

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1. Introduction

Gingival recession is defined as the exposure of the root by apical migration of the gingiva. The primary causes of gingival recessions are faulty tooth brushing, abnormal frenum attachment, improper restorations, tooth malpositioning, and aging. Gingival recessions may result in hypersensitivity, impaired esthetics, and root caries (Periodontology, 2001; Tözüm TF, 2005).

Numerous techniques have been used for root coverage, such as free gingival grafts, lateral sliding flaps, double papilla

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flaps, subepithelial connective tissue grafts, coronally positioned flaps, and guided tissue regeneration. Among these procedures, the subepithelial connective tissue grafts (SECT graft) is considered the gold standard because of its high predictability for root coverage and increasing the width of keratinized tissue (Felipe ME, 2007; Alghamdi et al., 2009; Sameera et al., 2018).

The main disadvantage of the SECT graft is the need to harvest from another surgical site (Aichelmann-Reidy et al., 2001). In addition; the palatal harvesting of the graft tissue has its potential risk of damaging the greater palatine artery due to the variation in the anatomy of the palatal vault (Alghamdi et al., 2009).

The search for a predictable alternative source of donor tissue, with less surgery is therefore necessary and the potential morbidity will be reduced.

Cadaveric donor tissues resurfaced in the late 1990s. Acellular dermal matrix graft (ADM) [Alloderm®] was introduced to the dental practice as a source of donor material for soft tissue grafting and a substitute for autogenous connective tissue graft material in various periodontal and peri-implant surgical techniques. This allograft goes under a special skin preparation from which the cell component (the target of rejection response) is removed. ADM exhibits undamaged collagen and elastin matrices and does not trigger any inflammatory reaction by the recipient tissues (McGuire and Nunn, 2005; Gapski et al., 2005; Fu et al., 2012).

Since the introduction of ADM to modern clinical dentistry, a variety of clinical situations has been investigated to determine its clinical predictability such as accelerated orthodontic tooth movement (Alghamdi, 2010), and soft tissue ridge augmentation around natural teeth or dental implants (Al-Hamdan, 2011).

Clinical case studies have suggested that ADM is a useful substitute for autogenous connective tissue grafts in root coverage procedures (RJ, 2000; Henderson RD and MJ, 2001; Novaes AB Jr, 2001). It affords increased keratinized tissue, particularly in the treatment of challenging cases that involve gingival recession defects on several teeth in multiple quadrants, thin palatal donor tissues, a limited treatment period and patients who demonstrated a low discomfort threshold (Paolantonio M and G, 2002; RJ, 2002; Tal H, 2002; Cortes Ade Q, 2004; RJ, 2004; Woodyard JG, 2004).

Multiple gingival recessions defects are usually more challenging than single recession defects because the surgical field is larger with higher anatomical variability that may include prominent roots, shallow vestibules, enamel-root abrasions and unevenness in residual keratinized tissue. Added to it is that the treatment of multiple recessions must consider the total number of surgical procedures, the amount of donor tissue that can be obtained from the palate and the patients' esthetic requests.

Based on these introductory facts this study aimed to evaluate the long-term stability of ADM with the coronally advanced flap for treating multiple-type gingival recession defects.

2. Materials and methods

A total of 15 patients (9 females and 6 males, with an age range from 32 to 49 years) treated in a private clinic from the period

of 2013–2018 for generalized gingival recession on more than adjacent two teeth were evaluated.

The study protocol was in accordance with the Declaration of Helsinki on experimentation involving human subjects. All the subjects signed the informed consent prior initiating the surgical procedures.

Subjects were selected based on the following criteria: age at least 18 years; absence of any systemic conditions that may compromise or contraindicate periodontal surgery and no history of any medication in the previous 6 months that may possibly effect gingival tissues (e.g. Nifedipine, Phenytoin, Cyclosporin); Patients must have maxillary or mandibular multiple buccal recessions of at least 2 mm depth (measured from the CEJ to the gingival margin at midfacial surface). Defects must be Miller Class I, and II. Patients must demonstrate a modified O'Leary plaque Index of $\geq 85\%$ plaque free after initial therapy. The teeth must be vital and have no bleeding on probing at the proposed sites. Patients must not have had any previous surgery at the proposed study surgical sites. Absence of any restorations on the root surface of teeth to be grafted.

Prior to the surgical procedures, all patients received a prophylaxis and root planing, if needed, and oral hygiene instructions consisting of flossing and the use of modified' Stillman Technique with a soft toothbrush. This was directed at addressing habits related to the etiology of gingival recession and to demonstrate effectiveness of plaque control. Periapical and bitewing radiographs were taken to evaluate interproximal alveolar bone level to assist in gingival recession classification of teeth exhibiting recession defects. All teeth selected were pulp tested for the vitality with cold test.

The following clinical parameters were evaluated in mm on the midfacial aspect: recession depth (RD), defined as the distance from the cemento-enamel junction (CEJ) to the free gingival margin (FGM), probing depth (PD), defined as the distance from the FGM to the bottom of the sulcus; and the width of the keratinized tissue (KT), defined as from the FGM to the mucogingival junction (MGJ). All noted measurements were recorded at baseline (immediately before surgery), one year and 3 years after surgery using a periodontal probe (PCP UNC 15, Hu-Friedy, Chicago, IL). The clinical measurements were rounded to the nearest millimeter.

All gingival recession defects were treated surgically with the coronally advanced flap and the use of ADM. The root surfaces were thoroughly planed using curettes to remove contaminated cementum, and prepared using fine finishing bur to

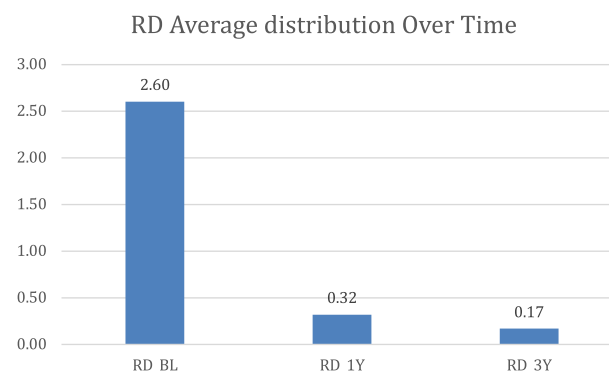


Fig. 1 Recession Depth (RD) distribution over time.

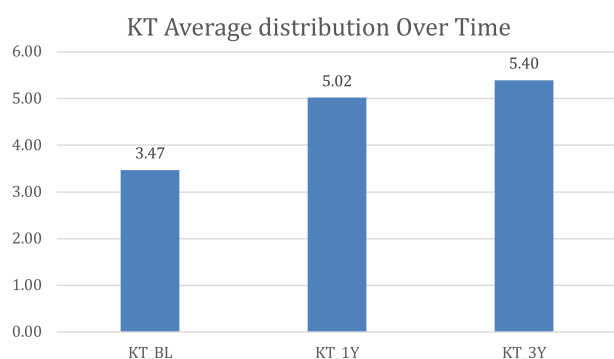


Fig. 2 Keratinized Tissue (KT) distribution over time.

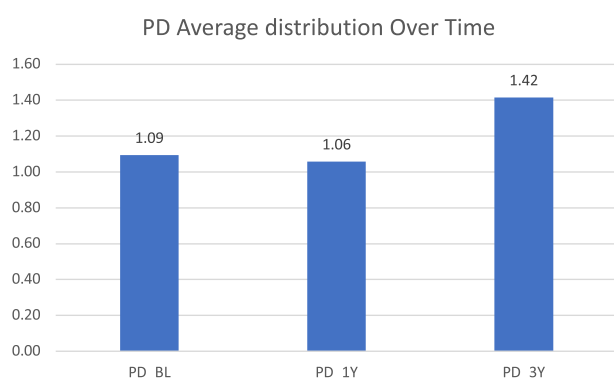


Fig. 3 Probing Depth (PD) distribution over time.

flatten the prominent root surface as necessary. The papillae were then de-epithelized to ensure the exposed vascular bed of connective tissue (Fig. 4). Rehydration of the ADM with sterile saline was prepared according to the manufacturer's guidelines for ADM, and was subsequently trimmed to fit the recession area. The ADM graft was adjusted to completely cover the defect and was positioned at the CEJ, while the apical and lateral borders of the graft was extended at least 3 mm beyond the alveolar bone margin (Fig. 5). All ADM grafts were oriented with the basement membrane towards the root surface or connective tissue surface. The ADM was sutured using resorbable suture in an interrupted or continuous suture configuration. The flaps were coronally advanced to cover the entire ADM graft and were sutured using a non-resorbable



Fig. 4 Pre-operative.



Fig. 5 ADM placement.



Fig. 6 Flap suturing.

multifilament Silk suture in a double sling suture configuration (Fig. 6).

All patients were advised to discontinue mechanical oral hygiene measures for 4 weeks, and avoid any trauma to the surgical sites. A cold liquid diet was recommended for the first 24 h. A soft diet was recommended for the following 6 days. Listerine mouthwash was prescribed and the patients were instructed to rinse 2 times a day for a four week period. A systemic antibiotic (Amoxicillin 500 mg, TID 7/days) was prescribed to the patient as well. Ibuprofen 400 mg to control pain. The sutures were removed at 14 days. The patients were instructed to resume gentle mechanical tooth brushing on the treated sites using a soft tooth brush and a roll technique after 4 weeks. Professional plaque control consisting of scaling and oral hygiene instruction was performed weekly during the first 4 weeks and at the 3 months and on 6 months recall period.

2.1. Statistical analysis

Descriptive statistics were performed using means and standard deviations for quantitative variables. A multiple comparison test was used to analyze the differences ($P < 0.05$)



Fig. 7 One year follow-up.



Fig. 8 3 years follow-up.

between the baseline, 1 year follow-up (Fig. 7) and three years follow-up (Fig. 8).

3. Results

All surgical sites had uneventful healing with no significant post-operative complications. There was statistically significant (P -value = 0.00) reduction in recession depth from baseline, one and three years after the surgery (2.6 mm, 0.32 mm, and 0.17 mm, respectively).

There was statistically significant (P -value = 0.00) increase in the width of keratinized tissue from baseline to one year and three years (3.47 mm, 5.02 mm, and 5.40 mm, respectively). The clinical results are summarized in Tables 1–3 and Figs. 1–3.

4. Discussion

The objective of mucogingival plastic surgeries was the successful coverage of exposed root surfaces, assuming patient esthetic and function. Many surgical techniques have been evaluated in an attempt to achieve a more effective and predictable root recession coverage, while minimizing surgical complications.

Zucchelli and De Sanctis (2000) evaluated the effectiveness of a new surgical approach to the coronally advanced flap procedure in the treatment of multiple Miller Class I and II recession defects in patients with esthetic demands. At the 1-year examination, on average, 97% of root surface was covered with soft tissue and 88% showed complete root coverage. Without vertical releasing incisions, blood supply to the flap was adequate, a factor deemed critical to the success of the surgery and avoidance of an unesthetic visible white scar. This proposed surgical technique has proven to be very effective for the treatment of multiple gingival recessions.

In the present study, the mean percentage of root coverage over the respectively one and three-year period was 71.70% and 83%. This study provided an additional evidence that the proposed surgical technique modification of the coronally advanced flap is an effective treatment modality for multiple recession defects.

The results of the present study compare favorably with previous studies reporting a long term evaluation following ADM grafting including an increase in keratinized tissue (Griffin TJ, 2002; Novaes AB Jr, 2001; Paolantonio M, 2002; Tal H, 2002; Woodyard JG, 2004; Cortes Ade Q, 2004; Henderson RD, 2001), predictable root coverage (Tal H, 2002; RJ, 2002; Griffin TJ, 2002; Aichelmann-Reidy et al.,

Table 1 Recession Depth (RD) analysis.

Descriptive Statistics				GLM p-value	95% Confidence Interval		Multiple comparison test		
Time	Mean	SD	N		Lower Bound	Upper Bound	Baseline	1-year	3-years
RD-BL	2.60	0.840	53	0.000	2.372	2.835	1		
RD-1Y	0.32	0.547	53		0.170	0.471	0.000	1	
RD-3Y	0.17	0.379	53		0.065	0.274	0.000	0.093	1

Table 2 Keratinized Tissue (KT) analysis.

Descriptive Statistics				GLM p-value	95% Confidence Interval		Multiple comparison test		
Time	Mean	SD	N		Lower Bound	Upper Bound	Baseline	1-year	3-years
KT-BL	3.47	1.716	53	0.000	2.999	3.945	1		
KT-1Y	5.02	1.434	53		4.624	5.414	0.000	1	
KT-3Y	5.40	1.511	53		4.980	5.813	0.000	0.000	1

Table 3 Probing depth analysis.

Descriptive Statistics				GLM p-value	95% Confidence Interval		Multiple comparison test		
Time	Mean	SD	N		Lower Bound	Upper Bound	Baseline	1-year	3-years
PD-BL	1.09	0.295	53	0.000	1.013	1.176	1		
PD-1Y	1.06	0.233	53		0.992	1.121	0.991	1	
PD-3Y	1.42	0.497	53		1.278	1.552	0.000	0.000	1

2001; Novaes AB Jr, 2001; Paolantonio M, 2002; Woodyard et al., 2004), gain in clinical attachment levels (Griffin TJ, 2002; Novaes et al., 2001; Paolantonio M, 2002).

Previous studies have shown that ADM grafts will increase marginal tissue thickness histologically (Cummings LC, 2005; RJ, 2004b); as well as clinically (Aichelmann-Reidy et al., 2001; Paolantonio M, 2002; Woodyard JG, 2004; Cortes Ade Q, 2004). It has been suggested that a thin gingival phenotype and delicate marginal tissues could be a factor in increasing the risk for gingival recession (Muller HP, 1997, 1998). Therefore, an increase in gingival thickness resulting from the ADM graft may prevent further recession in patients with a thin periodontal phenotype.

Harris (2004a) reported that 32.0% of cases treated with ADM demonstrated stability or improvement over long-term period. Similarly; this study observed that 25% of the sites showed improvement over a 3 year observational period.

From a clinical point of view, ADM is a better indication for multiple recession defects. In a 2-year prospective study, Wennström and Zucchelli (Wennström and Zucchelli, 1996) concluded that changes in toothbrushing habits may be of greater importance than the increased gingival thickness for long-term maintenance of the surgically established position of the soft tissue margin. Modifications in oral hygiene instruction consisting of the roll technique using a soft toothbrush, meticulous oral hygiene maintenance, and flossing by the patient may help minimize trauma to treated areas and improve long-term stability.

Within the limitation of this study, ADM with the use of the coronally advanced flap resulted in a significant increase in keratinized tissue and percentage of root surface coverage. Multicenter studies are highly recommended to investigate these findings.

Ethical statement

The work has been approved by the appropriate ethical committee and that subjects gave informed consent to the work.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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