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Original Article

The Connective Tissue Graft Wall Technique for treating Patients with Cairo's RT3 Gingival Recession and Intrabony defects: A Case Series

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Abstract

Aim: The purpose of this trial was to assess the potential of connective tissue graft wall technique to improve the clinical and radiographic outcomes of intra-bony defects and root coverage outcomes simultaneously.
Subjects and methods: Ten patients with Cairo's RT3 gingival recession associated with intrabony defects were treated with this technique. The recession defects were treated with a coronally advanced envelope flap and simplified papilla preservation at the site of the defect. A de-epithelialized free gingival graft was harvested and positioned buccal to the defect creating a buccal wall at the defect. Clinical parameters including; recession depth, probing depth and clinical attachment level were measured at baseline and 6 months. The radiographic bone gain was evaluated at 6 months.
Results: At 6 months, this study reported mean±SD in recession depth reduction of 2±0.62 mm at 6 months and mean±SD absolute reduction in probing depth of 2±0.7 mm. regarding clinical attachment level, a mean±SD gain of 2±0.67 mm was achieved after 6 months. The radiographic mean±SD depth of intrabony defect showed a statistically significant reduction of 0.20±0.24 mm at 6 months ($P \leq 0.05$).
Conclusion: This study suggests that the connective tissue graft wall technique might improve root coverage and regeneration of intrabony defects simultaneously.
Keywords: Periodontitis; gingival recession; intrabony defect; connective tissue graft wall.

I. INTRODUCTION

Periodontitis is a multifactorial inflammatory disease that causes destruction of the periodontal ligaments and the surrounding alveolar bone. Clinically, the destruction of the periodontium is represented with clinical attachment loss, periodontal pockets, gingival recession, alveolar bone loss, or a combination of these defect (Caton et al, 2018). Each of these deficiencies, individually, can be successfully managed, but when these defects exist in combination, treatment becomes challenging (Cairo et al, 2011).

An innovative technique aimed at treating both gingival recession and intra-bony defects simultaneously using a connective tissue graft wall was proposed by Zucchelli et al (2014). Where, a de-epithelialized free gingival graft

(DFGG) was used to create a buccal wall at the intra-bony defect forming a rigid barrier, preventing soft tissue collapse.

While the published literature on this technique seems promising, it is still limited with a handful of case reports. The current trial aimed to investigate the connective tissue graft wall technique, assessing both the esthetic and the regenerative aspects. To the best of the author's knowledge, this is the first case series trial assessing this technique in terms of recession defects reduction and radiographic bone gain.

II. SUBJECTS AND METHODS

The current trial was designed as a case series and registered in clinicaltrials.gov (ID: NCT04514055) after being approved by the Research Ethics Committee of Faculty of Dentistry, Cairo University. The patients were recruited from outpatient clinic of the Department of Periodontology, Faculty of Dentistry, Cairo University between November 2021 and July 2022. Ten healthy non-smoker patients, aged between 23 and 50 years with Stage III and IV periodontitis were currently recruited.

The inclusion criteria were patients with an anterior or premolar tooth showing a Cairo's RT3 gingival recession where the recession is associated with loss of interproximal attachment that is more than the buccal attachment loss (Cairo et al, 2011), and stage III or IV periodontitis with 2-3 wall intra-bony defect, where stage III is severe periodontitis with potential for additional tooth loss while stage IV is severe periodontitis with potential for loss of dentition (Caton et al, 2018). Exclusion criteria included pregnant/lactating women, patients with Stage IV Grade C periodontitis, and grade III mobility. Written informed consent was signed by all patients.

Initial periodontal therapy including supragingival scaling using an ultrasonic device[1] followed by using Gracey's Mini Five curettes[2] for subgingival debridement was done for the study population and re-evaluated after 4-6 weeks. Two coronal composite stops for sutures were placed in the interproximal region bridging the teeth to prevent apical relapse of marginal tissue during the initial healing stages (Rajeswari et al, 2020).

The surgical procedure of the connective tissue graft wall technique as described by Zucchelli et al (2014) is illustrated in Figure 1. After achieving adequate anesthesia, an envelope flap was created through oblique para-marginal incisions. The incisions were joined with intra-sulcular cuts along the recession defects and a simplified papilla preservation flap (SPPF) was created and the anatomic papillae was de-epithelized to create a connective tissue bed for the surgical papillae. At the defect site, a full-thickness buccal flap was reflected and the remainder of the supra-crestal tissue was pushed palatally/lingually until the tip of the interdental papilla was shifted to the most coronal position to gain access to the defect. Harvesting of the graft from the palate was completed by creating two horizontal and vertical incisions 1.5 mm into the palatal soft tissue using a 15c blade (Zucchelli et al, 2010). Once the outline of the free gingival graft was complete, mobilizing the graft was achieved by moving the blade parallel to the surface of the mucosa. Following harvesting, de-epithelialization was done using a sharp 15c blade held parallel to the external graft surface to render a uniform 1 mm connective tissue graft thickness. The DFGG was then sutured coronally to the anatomical papillae using interrupted sutures and apically to the periosteum using vicryl suture[3]. The graft was pulled taut to act as a wall for the intra-bony defect. The flap was advanced until the margin passively reached a level coronal to the CEJ and till the buccal papilla contacted the coronally shifted supra-crestal soft tissue.

Interrupted sutures were created using

[1] Woodpecker UDS-P with LED, China.

[2] Hu-Friedy Mini Five Gracey's curette; Hu-Friedy, Chicago, USA.

[3] AssuCryl, 6-0 Polyglycolic acid (PGA) absorbable braided suture, Switzerland.

polypropyelene[4] sutures, followed by a sling suture suspended around the composite stops to suspend the surgical papilla. Finally the central part of the flap was secured using sling sutures followed by a vertical mattress suture to complete soft tissue closure.

Post-operative analgesics[5] and systemic oral antibiotics[6] were prescribed t.d.s. for 5 days to minimize infection and pain. Patients were instructed to rinse twice daily with 0.12% chlorhexidine HCL[7] for two weeks, then to gently brush the area with a soft tooth brush using roll technique for one month. After 2 months of the surgery, they returned to using a soft toothbrush.

Recession depth (RD) was the primary outcome of the current study, recorded at baseline and 6 months post-operatively using a UNC periodontal probe[8]. Secondary outcomes including; probing depth (PD) and clinical attachment level (CAL) were also recorded at baseline and 6 months. Radiographic bone gain was monitored after 6 months.

Digital x-rays were recorded[9] and image standardization was achieved using a KCP X-Ray Holder kit with a customized bite block for each site. Radiographic images were captured using a parallel-angle technique, then scanned using VistaScan DBSWIN software[10]. The depth of the intra-bony defect was measured radiographically from the CEJ to the base of the defect to detect the amount of bone fill. The CEJ and the base of the intra-bony defect were located and marked on the radiographic image and a line was drawn from CEJ to the base of the defect and the length of the line was measured and recorded. The same procedure was then repeated to obtain the distance between CEJ and alveolar crest. To estimate the amount of radiographic bone fill, the depth of osseous defect at baseline was subtracted from the depth of osseous defect after 6 months (Mahajan & Kedige, 2015) (Figure 2).

Data was explored for normality using Kolmogorov Smirnov test and Shapiro Wilk test. Comparison between follow-up periods for continuous data was performed using repeated measures ANOVA followed by tukey post-hoc test or paired t-test when appropriate. While Friedman test followed by Dunn post-hoc test were performed for non-parametric data. Data was analyzed using MedCalc software, version 19 for windows[11].

III. RESULTS

All patients completed the follow up period after 6 months with no drop outs. The results of the clinical parameters are illustrated in Table 1, while Table 2 the raw data of the outcomes. The RD showed a mean±SD of 3.4±0.84 mm at baseline and 2±0.62 mm at 6 months which was statistically significant ($P \leq 0.05$). PD showed a mean±SD absolute reduction of 2±0.7 mm demonstrating a statistically significant reduction ($P \leq 0.05$). A mean±SD absolute gain in CAL of 2±0.67 mm was observed which was also statistically significant ($P \leq 0.05$). The observed radiographic outcomes showed a statistically significant bone gain between the baseline and 6 months follow-up ($P \leq 0.05$). The mean linear depth redution measured was 0.20±0.24 mm in the intrabony defects after 6 months.

[4] AssuCryl, 6-0 Polypropyelene non-absorbable monofilament suture, Switzerland.
[5] Catafast sachets, 50mg, Novartis Pharm, Egypt.
[6] E-mox 500 mg Cap., E.I.P.I.C.O., Egyptian Int. Pharmaceutical Industrial Co., A.R.E.
[7] Hexitol: Chlorhexidine HCL mouthwash, The Arab Drug Company for pharmaceutical & CHEM. IND. CO. Cairo-Egypt.
[8] 15 UNC graduated periodontal probe No. 1003640, Premier Clear-View, USA.
[9] DÜRR DENTAL VistaScan Phosphor Plate/Dental Image Plate, Germany.
[10] DBSWIN 5.11 Dental Imaging Software, DÜRR DENTAL. Germany.
[11] MedCalc Software Ltd, Ostend, Belgium

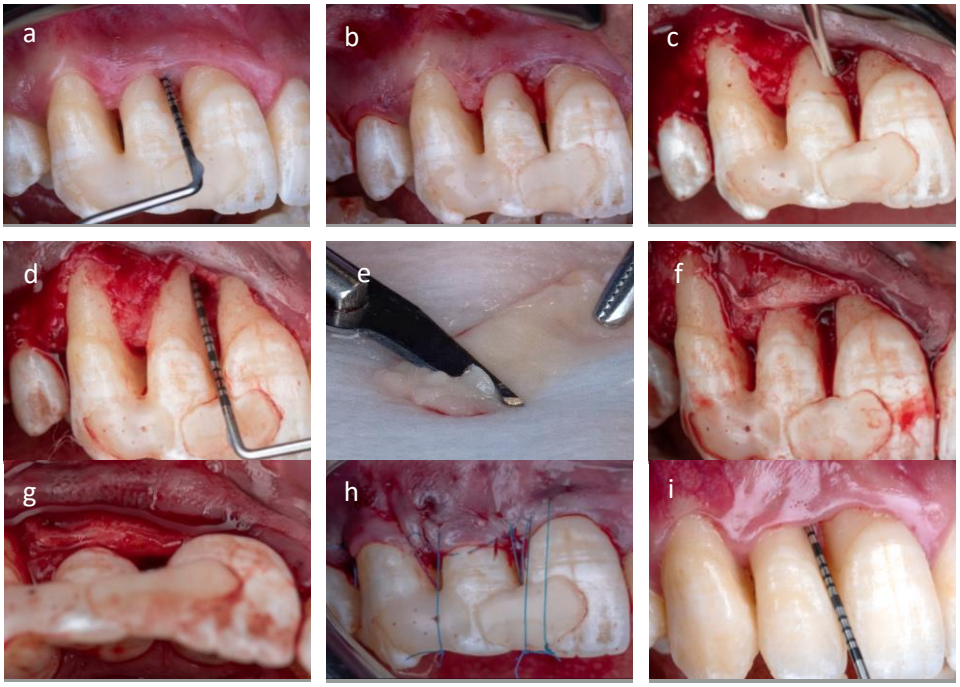

Figure (1): The connective tissue graft wall between an upper central and lateral. a. Pre-operative clinical photograph showing gingival recession and PD of 5 mm mesial to the upper lateral. b. Clinical photograph showing oblique para-marginal incisions converging towards the canine and simplified papilla preservation between the upper right central and lateral. c. Pushing the supracrestal tissues palatally using a papilla elevator. d. The depth of the de-granulated intra-bony defect. e. De-epithelialization of the free gingival graft. f. Frontal view and g. Occlusal view of the graft sutured to the anatomical papillae and apically to the periosteum. h. Suturing of the flap using sling sutures and vertical mattress suture at the base of the simplified papilla. i. Six-month post-operative photograph showing partial root coverage and PD of 3 mm.

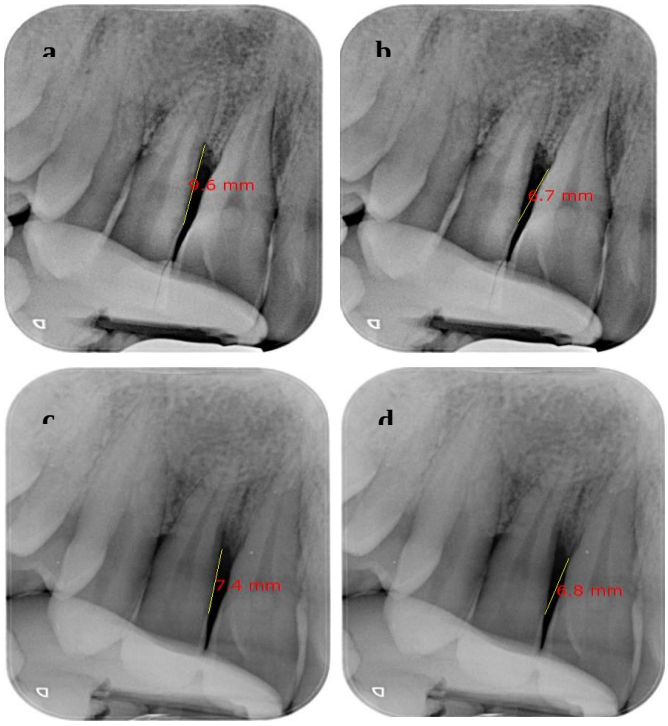

Figure (2): A periapical radiograph showing an intrabony defect between an upper central and lateral. a. pre-operative linear measurement of the distance from the CEJ to the depth of the intrabony defect. b. Pre-operative linear measurement of the distance from the CEJ to the alveolar crest. c. Six months post-operative linear measurement of the distance from the CEJ to the depth of the intrabony defect. d. Six months post-operative linear measurement of the distance from the CEJ to the alveolar crest.

Table (1) Clinical parameters throughout the experimental period.

	Mean(±SD)	mm reduction/gain	%reduction/gain
RD mm			
Baseline	3.4^{a}±0.84		
3 months	2.3^{b}±0.82		
6 months	2^{b}±0.62		
P-value	<0.001*		
PD mm			
Baseline	4.8^{a}±0.42	NA	NA
3 months	3.6^{b}±1.2 mm	1.20^{a} ±0.92	26^{a} % (±20.66)
6 months	2.8^{b}±0.8 mm	2^{b} ± 0.7	42^{b} % (±13.98)
P-value	<0.001*	0.02*	0.02*
CAL mm			
Baseline	7^{a} ±2	NA	NA
3 months	5.8^{b} ± 2.3	1.40^{a} (±0.52)	20.79^{a} % (±10.85)
6 months	5^{b} ± 2.16	2^{b} (±0.67)	30.44^{b} % (±12.26)
P-value	<0.001*	0.005*	0.01*
Depth of infrabony defect mm			
Baseline	3.97^{a} ±1.39		
6 months	3.77^{b} ± 1.29		
Linear bone change	0.20±0.24		
P-value	0.03		

Significant at P ≤0.05, Different superscripts in the same column are statistically significantly different. NA: Not applicable.

Table (2) Demographic and raw data in mm.

Case	Age	Sex	Tooth No.	RD at baseline	RD at 6 months	PD at baseline	PD at 6 months	CAL at baseline	CAL at 6 months	Depth of the intrabony defect at baseline	Depth of the intrabony defect at 6 months
1	46	F	5	4	2	5	2	6	3	3	2.5
2	24	F	7	4	2	4	2	6	4	4	3.9
3	36	F	10	5	3	5	3	6	4	3.4	3.4
4	49	M	12	3	1.5	5	2	7	4	3	2.8
5	23	F	13	4	2	5	2	6	4	3	3.2
6	47	M	7	3	3	5	4	9	8	6.2	6
7	45	F	5	3	2	4	2	5	3	3.4	3.1
8	39	M	10	3	1.5	5	3	11	9	3.9	3.6
9	47	M	12	3	2	5	3	9	7	6.8	6.2
10	50	F	5	2	1	5	4	5	4	3	3

IV. DISCUSSION

Treating gingival recessions with intra-bony defects remains a challenge in our practice. Despite that the connective tissue wall technique was designed to overcome such challenges, yet there are limited studies in the current literature to investigate this technique. Hence, the current study was conducted to investigate the esthetic and regenerative potentials of this technique in treating patients with RT3 gingival recession as well as intrabony defects.

The present results showed PD reduction, CAL gain. However, there was limited improvement in the root coverage outcomes. This might be attribute to several factors; where all cases suffered from RT3 gingival recession, with limited interdental soft tissue. Also the location of the recession defects was another factor, where 40% of the present defects were located in the mandible. Nevertheless, these findings were consistent with previous studies investigating this technique (Zucchelli et al, 2014; Santoro et al, 2016).

The PD and CAL showed improvements at 6 months which were statistically significant. These findings were consistent with previous case reports using the same technique in treating intra-bony defects (Zucchelli et al, 2014; Zucchelli et al, 2017). There was a noticeable difference in the range of the CAL gain and PD reduction between the current trial and previous reports. These discrepancies might be attributed to the different methodologies, where previous studies used other regenerative materials to improve the outcomes namly; the use of EMD in the intra-bony defect as a root bio-modifier (Zucchelli et al, 2014) and the application of bone graft material (Santoro et al, 2016). In the current trial there was no regenerative material used beside the connective tissue wall technique in order to allow investigating the regenerative potential of the technique alone without adding any potential cofounders (Sculean et al, 2011).

The observed radiographic outcomes showed a statistically significant bone gain (0.20±0.24 mm) after 6 months compared to baseline values. However, it was not clinically signficant. The previous cases reports demonstrated higher bone fill, however, they did not mention the method of radiographic standardization nor the exact amount of bone fill (Zucchelli et al, 2014; Zucchelli et al, 2017).

The main limitations of this technique were difficulty of application in one wall and very deep defects. It was also a technique-sensitive, time-consuming procedure and the learning curve required to perform this technique may discourage practitioners with limited experience.

V. CONCLUSION

Within the limitations of this trial, this technique proved beneficial in reducing PD, increasing CAL and partial root coverage. However, further randomized controlled clinical trials with longer follow up periods and larger sample size are warranted to investigate the potential of this technique.

Conflict of Interest:

The authors declare no conflict of interest.

Funding:

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Ethics:

This study protocol was approved by the ethical committee of the faculty of dentistry-Cairo university on: June, 2020 approval number: 2520.

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