Modified coronally advanced flap design in management of isolated gingival recession: Saddle flap technique

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Abstract:
Saddle flap technique, a modified coronally advanced flap approach for isolated gingival recession management was introduced and assessed in terms of clinical efficacy and patient satisfaction. A total of 10 systemically healthy subjects with isolated gingival recession defect (Miller Class I and II) were enrolled in the study. The primary endpoint measure was patient satisfaction in terms of esthetics and percentage root coverage. The secondary outcome measures comprised clinical attachment level change, gingival thickness variation, width of keratinized tissue alteration, and postoperative healing. At 1 year postoperative, 80% of the treated sites achieved 100% root coverage. Based on clinical results, saddle flap technique could be considered as one of the possible treatment options for isolated gingival recession with good esthetic and patient satisfaction.

Key words:
Gingival recession, reconstructive surgical procedures, surgical flaps, treatment outcome

INTRODUCTION

Dental aesthetic dissatisfaction and dentinal hypersensitivity are some of the frequent patient related concerns, especially with the management of gingival recession. Considering the treatment possibilities, numerous modalities have been proposed. With the patient’s keen demands on esthetic outcomes, selection of appropriate technique plays a crucial role.[1] Coronally advanced flap (CAF) is the treatment of choice in the presence of adequate width of keratinized gingiva (WKG), exhibiting good color blending and optimal coverage. It is based on the principle of coronal shifting of the gingiva over the previously denuded root surface, improving the clinical attributes with enhanced outcome.[2]

A split–full-thickness envelope flap elevation was presented as a modification of CAF in multiple GR management, with 97% coverage.[3] Subsequently, a laterally repositioned, trapezoidal designed CAF raised using two horizontal beveled and two oblique vertical releasing incisions was also introduced to bring about complete root coverage in isolated GR defect.[4] However, the limitations of these techniques include placement of vertical incision, which may compromise the esthetic result obtained. Although this technique was superior in its treatment outcomes, esthetics is an integral part of periodontal therapy which is becoming increasingly essential from patient point of view. Hence, the need for newer and ever-evolving surgical techniques is deemed necessary. Considering above and to avoid soft-tissue trauma to uninvolved adjacent teeth, the objective of the present study was to report a new flap design for treating isolated recession defects: saddle flap and to clinically assess its efficacy in terms of clinical variables and esthetic outcome.

MATERIALS AND METHODS

Ten patients (6 males and 4 females), aged 25–40 years, were recruited from the outpatient department of periodontics of Bapuji dental college and hospital in Karnataka, India. Patient
selection, surgical management, and postsurgical follow-up were done from August 2017 to September 2018. The inclusion criteria comprised isolated Miller’s Class I and II recession defects (≥2 mm), with adequate WKG on adjacent teeth, no occlusal interferences, and nonsmoker. Exclusion criteria for the surgical procedure involved: tooth with caries, restoration and pulp pathalogy, uncontrolled systemic conditions, compromised healing potential (diabetes), history of intake of steroid medications in the past 2 years, presence of active infections (tuberculosis and hepatitis), pregnant women or attempting to become pregnant, and lactating mothers. After initial screening consultation, Phase I therapy was instituted to obtain optimal plaque control.

Oral hygiene instructions, ultrasonic scaling, and coronal polishing were done 1 month before the surgery. To assess the gingival health during the course of the study, the gingival index by Loe and Silness and the plaque index by Silness and Loe were employed. A single examiner performed all the measurements, with a UNC-15 probe. The clinical measurements were observed to the nearest millimeter in the mid-buccal region of the treatment tooth and included: probing depth (PD), GR depth (GRD), GR width (GRW) 1 mm apical to the cementoenamel junction (CEJ), WKG, and gingival thickness (GT) measured at the midpoint of apico-coronal WKG. The GT was assessed using a digital Vernier caliper and an endodontic finger spreader with an rubber stop, inserted perpendicular to the gingival tissue, rounded to nearest 0.1 mm. Clinical attachment level (CAL) was computed as the sum of PD and GRD. Wound healing was recorded at 1 month postsurgically with wound healing index. Scoring criteria comprised Score 1 – uneventful wound healing with no gingival erythema, edema, suppuration, flap dehiscence, or patient discomfort, Score 2 – uneventful wound healing with mild gingival changes but no suppuration, and Score 3 – poor wound healing with significant gingival changes. The esthetic outcome of the procedure in regard to patient’s opinion was recorded dichotomously, as satisfactory or nonsatisfactory, 1 year postoperatively.

**Surgical procedures**

With strict aseptic precautions, 24% ethylenediaminetetraacetic acid was applied over the exposed root surface to condition the root and rinsed with saline. Two coronal stops for sutures were placed in the interproximal region bridging the teeth with light-cure composite without primer application. This is to facilitate easy composite clearance at suture removal stage and to prevent apical relapse of marginal tissue during initial stages of healing.

Local anesthesia using 2% xylocaine hydrochloride with adrenaline (1:80,000) was injected. All the surgical procedures were carried out by a single operator, thus avoiding surgeon-related bias. The saddle flap design began with an intrasulcular incision on the recession site, which was followed by the horizontal saddle incision in the adjacent teeth [Figure 1]. Teeth on either side of the recession site were included to facilitate tension-free coronal repositioning. The submarginal part of the incision on the recession site was planned keeping the depth of recession in mind. It was accomplished by marking GRD on both mesial and distal surfaces, starting from proximal CEJ of the recession site, extending over the attached gingiva of adjacent teeth in a saddle-like fashion. A split-thickness oblique incision was given from this point extending 2 mm submarginally over the adjacent teeth [Figure 2]. Both the oblique incisions were connected with the full-thickness sulcular incision over the recession site. The wing of the flap now demarcates the surgical and anatomical papillae.

Coronal to the denuded root surface, the elevation was carried out with a blunt elevator, to raise a full-thickness flap. Over the oblique incisions, scalpel held parallel to the long axis of the tooth was used to dissect the tissue in split-thickness technique, to avoid unnecessary bone exposure. Beyond the MGJ, split-thickness elevation was done. Once the coronal mobility was deemed adequate (flap being passively adapting coronal to CEJ), each surgical papilla was exactly repositioned in the interdental area over the previously de-epithelialized anatomical papilla, and the sling sutures were given with 5–0 expanded polytetrafluoroethylene over the composite stop in the interproximal region [Figure 3].

All the above mentioned steps have been illustrated clinically in case number 1 [Figures 4-8]. An adequate dose of analgesics (tablet ibuprofen 400 mg, BD – 3 days) was prescribed to the patients for postoperative comfort. Patients were advised to use chlorhexidine mouthrinse (0.12%) twice daily for 1 min and to abstain from brushing in the surgical area for 2 weeks. On the 14th postoperative day, sutures and composite stops were removed. Mechanical plaque control using soft toothbrush and roll technique was recommended. The patients were reviewed every 15 days for the first 2 months, followed by every 2 months as part of the study protocol. The preoperative and postoperative of another case have been depicted [Figures 9 and 10].

**RESULTS**

All the clinical parameters pre and postsurgery at 1 year were recorded [Figures 4, 8, 9 and 10] and tabulated [Table 1]. The statistical analysis was conducted using the Wilcoxon signed rank test and Chi square test with SPSS Version 20, IBM, Newyork, USA. At the end of study period, the PD (P < 0.01), CAL (P < 0.01), WKG (P < 0.01), GRD (P < 0.01), KT (P < 0.01), and GT (P < 0.01) were found to be statistically significant, while GI (P = 0.79) was deemed nonsignificant [Table 2].

**DISCUSSION**

GR is a common entity and a major esthetic concern observed throughout the population. In the present era of minimally invasive dentistry, surplus techniques are available to manage GR to obtain better esthetic results. Among which, some of them are better suited for the management of isolated defects. CAF technique is one such surgical option used commonly in recession coverage, based on the principle of coronal shifting of the gingiva over the previously denuded root surface, leading to coverage. Saddle flap technique, presented in this article, was termed so, as the incision design resembled the “saddle of horse,” raising a split–full-split thickness flap, releasing a portion of attached gingiva. Another advantage of saddle design noted by the authors is the maintenance of the papillary integrity.
and associated critical interdental arterial plexus. The modified CAF design presented contributes a number of unique and distinctive advantages for achieving maximum root coverage. The full-thickness flap was elevated coronal to the recession site in order to compensate for the thin biotype present in the gingival marginal area, whereas on the adjacent tooth and the area apical to the mucogingival junction, a split-thickness flap was raised, thereby preventing unnecessary denudation of bone. This technique not only allows improved visualization and access of the treated site but also judicious flap elevation. In addition, an oblique incision extending 2 mm submarginally over the adjacent teeth was given to avoid vertical incision, in view of esthetic concern. The incisions were placed in such a manner that the chances of bleeding would be less as they were...
in accordance with the craniocaudal orientation of the branches of the anterior superior alveolar artery. After rendering the flap tension free, the flap was coronally positioned and sling sutures were placed to stabilize the surgical papillae over the

![Figure 7: Coronally anchored suturing given](image)

![Figure 8: 1-year postoperative view](image)

![Figure 9: Case 2: Preoperative view – Isolated Miller’s Class I recession in relation to 14](image)

![Figure 10: Case 2: 1-year postoperative view](image)

Table 1: Clinical parameters pre and 1 year post operatively

| Patient No | GI Pre | GI Post | PD Pre | PD Post | CAL Pre | CAL Post | WKG Pre | WKG Post | GT Pre | GT Post | GRD Pre | GRD Post | GRW Pre | GRW Post | Esthetic outcome | Wound healing Index |
|------------|--------|---------|--------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|-----------------|-------------------|
| 1          | 0.24   | 0.26    | 2      | 2       | 4.5     | 2       | 1.4     | 2.2     | 0.92    | 1.15    | 2.5     | 0       | 1.5     | 0       | S                | 0                 |
| 2          | 0.31   | 0.35    | 1      | 1       | 3       | 1.5     | 1.8     | 2.6     | 1.02    | 1.21    | 2       | 0.5     | 1       | 0.5     | NS               | 2                 |
| 3          | 0.33   | 0.31    | 1      | 1       | 4       | 1       | 1.3     | 2.5     | 0.85    | 1.05    | 3       | 0       | 1.5     | 0       | S                | 1                 |
| 4          | 0.26   | 0.27    | 2      | 2       | 5.5     | 2.5     | 2.1     | 2.9     | 0.74    | 0.94    | 3.5     | 0.5     | 1.5     | 0       | S                | 1                 |
| 5          | 0.21   | 0.34    | 2      | 1       | 4       | 1       | 1.6     | 2.8     | 0.93    | 1.08    | 2       | 0       | 0.5     | 0       | S                | 1                 |
| 6          | 0.3    | 0.35    | 2      | 1       | 4       | 1       | 1.9     | 3.1     | 0.99    | 1.03    | 2       | 0       | 1       | 0       | S                | 1                 |
| 7          | 0.31   | 0.32    | 1      | 1       | 2.5     | 1       | 2.1     | 2.4     | 1.14    | 1.29    | 1.5     | 0       | 0.5     | 0       | S                | 0                 |
| 8          | 0.21   | 0.23    | 2      | 1       | 4.5     | 1       | 2.3     | 2.7     | 1.26    | 1.36    | 2.5     | 0       | 1.5     | 0       | S                | 1                 |
| 9          | 0.29   | 0.25    | 1      | 1       | 4       | 1.5     | 1.8     | 2.3     | 1.03    | 1.24    | 3       | 0.5     | 1       | 0.5     | S                | 2                 |
| 10         | 0.26   | 0.26    | 1      | 1       | 3.5     | 1       | 1.7     | 2.8     | 0.78    | 0.96    | 2.5     | 0       | 1.5     | 0       | S                | 1                 |

NS - Not satisfactory. S - Satisfactory

Table 2: Comparison of efficacy variables at baseline and 1 year postoperative

| GI        | PD | CAL | WKG | GT | GRD | GRW |
|-----------|----|-----|-----|----|-----|-----|
| Pre op    | 0.27 | 1.50 | 3.95 | 1.80 | 2.45 | 0.60 |
| Post op   | 0.29 | 1.20 | 1.35 | 2.63 | 0.15 | 0.24 |

| Mean | 0.28 | 1.58 | 3.98 | 1.82 | 2.48 | 0.61 |
| Standard deviation | 0.042 | 0.53 | 0.83 | 0.32 | 0.60 | 0.10 |
interdental connective tissue bed (anatomical papillae) which permitted precise flap adaptation.

The present surgical modification showed improvement in terms of both clinical parameters and esthetics. A reduction in mean GRD was observed from 2.45 ± 0.59 mm at baseline to 0.15 ± 0.24 mm 1 year postoperatively which represented mean root coverage of 98%. Furthermore, there was a statistically significant difference in the mean values of GRW from 1.15 ± 0.1 preoperatively to 0.41 ± 0.21 postoperatively.

Cortellini et al. (2009) reported greater postoperative comfort with CAF alone when compared to CAF with connective tissue graft method. The above observation held valid in this study also, as there was no need for a second surgical site to harvest connective tissue.[15] Thus, saddle flap technique may be regarded as a predictable, effective, time, and cost-effective root coverage procedure. However, further investigation through randomized controlled trials to prove its plausibility is imperative.

**CONCLUSION**

In contemporary periodontal practice, the unremitting pursuit is not only at the reconstruction of biological and functional aspect of the periodontium but also the patient-oriented esthetic acceptance. Considering this, the saddle technique successfully achieved patient satisfaction in terms of both esthetics and complete root coverage. Isolated GR is a common clinical entity creating such a dilemma, with an array of surgical options proposed. Saddle technique, a modified CAF, provides good root coverage using a simple modification in the incision design. This, in turn, was seen to affect the overall treatment outcome in terms of related clinical parameters such as CAL, WKG, GT, and GRD along with satisfactory patient-oriented outcomes.

**Financial support and sponsorship**

Nil.

**Conflicts of interest**

There are no conflicts of interest.

**REFERENCES**

1. Löe H, Anerud A, Boysen H. The natural history of periodontal disease in man: Prevalence, severity, and extent of gingival recession. J Periodontol 1992;63:489-95.
2. Cairo F, Pagliaro U, Nieri M. Treatment of gingival recession with coronally advanced flap procedures: A systematic review. J Clin Periodontol 2008;35:136-62.
3. Zucchelli G, De Sanctis M. Treatment of multiple recession-type defects in patients with esthetic demands. J Periodontol 2000;71:1506-14.
4. Zucchelli G, Cesari C, Amore C, Montebognoli L, De Sanctis M. Laterally moved, coronally advanced flap: A modified surgical approach for isolated recession-type defects. J Periodontol 2004;75:1734-41.
5. Silness J, Loe H. Periodontal disease in pregnancy. II. Correlation between oral hygiene and periodontal condition. Acta Odontol Scand 1964;22:121-35.
6. Loe H. The gingival index, the plaque index and the retention index systems. J Periodontol 1967;38:Suppl: 610-6.
7. Joly JC, Carvalho AM, da Silva RC, Ciotti DL, Cury PR. Root coverage in isolated gingival recessions using autograft versus allograft: A pilot study. J Periodontol 2007;78:1017-22.
8. Huang LH, Neiva RE, Wang HL. Factors affecting the outcomes of coronally advanced flap root coverage procedure. J Periodontol 2005;76:1729-34.
9. Modaressi M, Wang HL. Tunneling procedure for root coverage using acellular dermal matrix: A case series. Int J Periodontics Restorative Dent 2009;29:395-403.
10. Blomlöf JP, Blomlöf LB, Lindskog SF. Smear removal and collagen exposure after non-surgical root planing followed by etching with an EDTA gel preparation. J Periodontol 1996;67:841-5.
11. de Sanctis M, Zucchelli G. Coronally advanced flap: A modified surgical approach for isolated recession-type defects: Three-year results. J Clin Periodontol 2007;34:262-8.
12. Chambrone L, Tatakis DN. Periodontal soft tissue root coverage procedures: A systematic review from the AAP Regeneration Workshop. J Periodontol 2015;86:8-51.
13. Amarante ES, Leknes KN, Skavland J, Lie T. Coronally positioned flap procedures with or without a bioabsorbable membrane in the treatment of human gingival recession. J Periodontol 2000;71:989-98.
14. Aroca S, Molnár B, Windsch P, Gera I, Salvi GE, Nikolidakis D, et al. Treatment of multiple adjacent Miller class I and II gingival recessions with a Modified Coronally Advanced Tunnel (MCAT) technique and a collagen matrix or palatal connective tissue graft: A randomized, controlled clinical trial. J Clin Periodontol 2013;40:713-20.
15. Cortellini P, Tonetti M, Baldi C, Francetti L, Rasperini G, Rotundo R, et al. Does placement of a connective tissue graft improve the outcomes of coronally advanced flap for coverage of single gingival recessions in upper anterior teeth? A multi-centre, randomized, double-blind, clinical trial. J Clin Periodontol 2009;36:68-79.