

Evaluation of Extent of Root Coverage and Clinical Parameters using Subepithelial Connective Tissue Graft with Coronal Advanced Flap in The Treatment of Gingival Recession.

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Abstract

Introduction: Demand for esthetics has been increasing in today’s lives. Coronally advanced flap techniques result in the best clinical results with time in terms of complete root coverage, esthetics and gain in width of keratinized gingiva etc. Sub epithelial connective tissue graft with coronally advanced flap technique is the best choice for root coverage, as the technique is less invasive for the patient, requires less chair-time, resulting in double blood supply from the graft as well as overlying tissue and the resultant increase in the width of keratinized gingiva, thus providing high success rate.

Aim: To evaluate the extent of root coverage and clinical parameters for treatment of Miller’s Class I and Class II gingival recession

Material and Methods: It is a hospital based interventional follow up study.

Results: The mean recession depth, mean recession width at baseline, mean pocket depth, mean width of keratinized gingiva and mean relative attachment level were statistically significant in the patients during the two follow-ups at 3months and 6 months.

Conclusion: Coronally Advanced Flap with Sub-epithelial Connective Tissue Graft is an effective and minimally invasive modality for treating Miller’s Class I and Class II Isolated gingival recession defects.

Keywords: Coronally Advanced Flap, Sub-epithelial Connective Tissue Graft, Gingival recession defects, Miller’s Class I and Class II

Introduction

Dental esthetics, in addition to maintaining dental and periodontal health, has become an inseparable part of today's oral health therapy which is a great concern for both dental practitioner and patients^{1,2,3,4}. More recently

periodontal therapy is increasingly directed at aesthetic outcomes for patients^{5,6}. The ability to cover unsightly exposed and sensitive roots has undergone a rapid explosion with goals of the treatment aimed to achieve prevention of gingival recession and its further progression by increasing the amount of gingival tissue apical to the recession margin, to achieve predictable root coverage and to solve patient's esthetic demands⁷.

Treatment of gingival recession has become an eminent part of periodontal health⁸. The most significant factors causing gingival recession are considered to be periodontal disease and improper oral hygiene measures. Additionally, some predisposing factors such as thin gingiva, buccally positioned teeth, frenum pull and bone dehiscence's have also been found to play an important role as one of the risk factors. Gingival recession usually creates an aesthetic problem and may also lead to root sensitivity, cervical caries or abrasion⁹⁻¹³.

The various modifiable factors involved in the etiopathogenesis of gingival recessions pushed the scientific community forward in an attempt to design and evaluate surgical procedures that ensured predictable clinical outcomes, high esthetic value, and minimal invasiveness like:

- Laterally sliding flap¹⁴
- Double papillae flap,¹⁵
- Coronally Advanced flap (CAF)¹⁶
- Free gingival graft (FGG),
- Semilunar flap,¹⁷
- Guided Tissue Regeneration (GTR) and
- Sub epithelial Connective Tissue Grafts (SCTG)¹⁸.

Procedures like SCTG, GTR, FGG and laterally positioned flaps can achieve complete root coverage. However, the SCTG has proved to be superior to all other procedures when comparing complete root coverage with individual baseline recession of >2mm⁷.

Coronally advanced flap (CAF) procedure is a very common approach for root coverage. This procedure is based on the coronal shift of the soft tissues on the exposed root surface¹⁹. Norberg (1926) introduced Coronally positioned flap procedure²⁰. Later the term "Coronally Positioned Flap" was coined by Pini Prato et al in 1999²¹. The Coronally Advanced flap is one of the valid surgical options in the treatment of Millers class I and class II gingival recession. Coronally Advanced Flap is more commonly used as a means of gaining root coverage but its success and predictability is low. Therefore, modifications to the CAF technique lead to success and higher predictability rates by the use of CTG²².

Connective tissue grafts are an important treatment options for periodontal and implant reconstructive plastic surgery. Connective tissue graft was first used by Edal (1974)²³, to increase the width of keratinized gingiva. The use of connective tissue grafts for treatment of gingival recession began in 1985 when Langer and Langer described SCTG technique for covering gingival recession of both single and multiple adjacent teeth. They described a technique in which the overlying partial thickness flap with two vertical incisions covered the transplanted connective tissue graft. SCTG plus Coronally advanced flap seems to be the gold standard because of its favorable outcome for root coverage, pleasing results esthetically, recommended for wide defects, attributed to the double blood supply, the resultant increase in the width of keratinized gingiva, thus providing high success rate in an attempt to increase the success rate of root coverage²⁴.

Hence, the predictability of Coronally Advanced Flap is reportedly increased by the application of a subepithelial connective tissue graft, although considering the treatment option, early detection of these defects is an

important parameter in deciding the esthetic outcome of any procedure for root coverage.

Thus, the present study was conducted in Himachal Dental College, Sunder Nagar to evaluate the extent of root coverage and clinical parameters using subepithelial connective tissue graft with Coronally advanced flap in the treatment of gingival recessions.

Aims and objectives

1. To clinically evaluate the extent of root coverage obtained by Sub epithelial Connective Tissue Graft with Coronally advanced flap in treatment of Miller's Class I and Class II gingival recession.
2. To comparatively evaluate clinical parameters for treatment of Miller's Class I and Class II gingival recession treatment by Sub epithelial Connective tissue graft with Coronally advanced flap after 3 and 6 months of treatment.

Materials and methods

This is a hospital based interventional prospective study with duration of three years. A total of fifteen participants within the age group of 18- 55 years with Miller's Class I and II isolated gingival recession gave consent to participate in this study at Himachal Dental College Sunder Nagar, Himachal Pradesh. The approval for this study was obtained from the Institutional Ethical committee. Each participant was given a detailed verbal and written description of the risks and benefits of the proposed procedure were also explained. Patients who agreed voluntarily were required to sign a written consent form prior to their inclusion in the study. Only those participants who satisfied the following criteria were included in study.

Criteria for selection of case

Inclusion criteria

1. Patients exhibiting Miller's Class I or Class II isolated gingival recession sites in the anterior or posterior teeth.
2. The selected teeth presenting with Probing Depth (PD) of ≤ 3 mm, having width of keratinized tissue (WKT) ≥ 2 mm and exhibiting an identifiable Cemento-Enamel Junction (CEJ).
3. Collegial patients, exhibiting satisfactory oral hygiene during Phase I therapy.
4. Absence of irregularities, caries and restorations in the designated areas to be treated.

Exclusion criteria

1. Patients with history of any systemic disease or medication which would alter the results of this study.
2. Patients who have undergone any type of periodontal therapy six months prior to initial examination.
3. Patients who were smokers or alcoholics.
4. Pregnancy and lactating women.
5. Patients who lack linguistic skills or have psychiatric disorders or who decline to sign the informed consent.

Pre-surgical therapy

Each individual underwent a full diagnostic work up which included

- Detailed medical and dental history.
- Routine Blood Investigations - Total Leukocyte Count, Bleeding Time, Clotting Time, Hemoglobin, Enzyme Linked Immune-sorbent Assay test for HIV, Hepatitis B surface antigen (HbsAg) for hepatitis, Hepatitis C (HCV) and Fasting Blood Sugar.
- Complete oral prophylaxis was done and oral hygiene instructions were given to the patients. One week before surgical procedure alginate impression was taken to fabricate an individual acrylic stent that was used as a reference point for all measurements (Plate: 2 and 3).

Following Phase I therapy the subjects were re-evaluated, and those who still satisfied the inclusion criteria were selected for the study.

Study design

It is an interventional follow-up study in which 15 participants were included and were surgically treated with Coronally advanced flap technique using Sub – Epithelial connective tissue graft for Miller’s Class I and Class II gingival recessions.

All the participants were subjected to the recording of following clinical parameters assessed at baseline, 3 months and 6 months post – operatively.

Clinical measurements recorded using stent

Stent preparation: Study models were used for fabrication of customized acrylic occlusal stents. The stent was made using self-cured pink acrylic which covered the occlusal as well as the coronal 1/3rd of the labial or buccal and lingual or palatal surfaces of the tooth involved and one tooth mesial and distal to the involved tooth. Separating media was applied over the area on the crest where the stent was to be made. Monomer and polymer were mixed together in a Dappen dish. When the mixture attained dough stage, the material was placed over the teeth where the stent was required and then adapted over the cast using digital pressure. Excess material was cut using a Bard Parker blade before the material was set. After the material was set the stent was removed, sharp edges were smoothed and trimmed. Vertical grooves were made to guide the placement of the probe in the same plane and direction repeatedly during measurements to avoid any variation. The lower/apical limit of the vertical groove was used as the fixed reference point²⁵.

1. Clinical recession depth (RD): This was measured with University of North Carolina 15 periodontal probe

(UNC-15) in a vertical dimension from Cemento Enamel Junction to gingival margin.

2. Recession width (RW): It was a horizontal measurement with University of North Carolina 15 periodontal probe (UNC-15) across the buccal surface at the CEJ

3. Probing depth (PD): This was measured with University of North Carolina 15 periodontal probe (UNC-15) from the crest of gingival margin to base of pocket on the facial surface.

4. Relative attachment level (RAL): This was measured by adding the pocket depth and the distance from the gingival margin to the designated apical border of acrylic stent. The recordings were made using University of North Carolina 15 periodontal probe (UNC-15).

Width of keratinized gingiva (WKG) - This was the distance from the gingival margin to Mucogingival Junction measured with the help of University of North Carolina 15 periodontal probe (UNC-15).

Surgical procedure

After completion of Phase I therapy and assessment of clinical parameters at baseline, extra-oral disinfection was performed with beta diene, intraoral asepsis was performed with 0.2% Chlorhexidine digluconate rinse. Surgical procedure was performed under local infiltration with 2% lignocaine hydrochloride containing adrenaline at a concentration of 1:200,000.

Preparation of donor site

The donor area on the Palatal aspect was anesthetized by block anesthesia. The Graft dimension was calculated according to recession defect at the recipient site using UNC – 15 periodontal probe and the harvest of sub epithelial connective tissue graft was performed prior to recipient site. A # 15 scalpel blade is used to make a single horizontal incision to the bone 2 mm from the gingival margin (Plate 6). The length of this incision

corresponds to the purpose for which the graft is intended. The angle of the blade was 90 degrees to the bone. After the first incision the blade is angled to approximately 135 degrees, and an undermining preparation towards the median is started within the first incision. The partial-thickness preparation was observed from the outside without trying to elevate the tissue. The underlying CTG was separated from the surrounding connective tissue by making incisions to bone on the mesial, distal, and medial sides of the graft (Plate 7). The graft was then removed by detaching it from the bony surface with a Periosteal elevator. After its removal from the palate, the CTG was placed on to the saline-soaked gauze and kept wet until it's been transferred to the recipient site. The palatal flap was sutured using non-resorbable 4-0 silk reverse cutting perpendicular cross sutures (Plate 10).

Preparation of recipient site

Coronally advanced flap procedure along with subepithelial connective tissue graft was done. Two horizontal incisions were made, mesial and distal adjacent to the recession defects, preserving the interdental papilla. Following which a crevicular incision was given along with two vertical releasing incisions at the adjacent mesial and distal aspects of the defect (Plate 8). The resulting trapezoidal-shaped flap was elevated with a split–full–split approach in the coronal–apical direction: The surgical papillae comprised between the horizontal incisions and the probable sulcular area apical to the root exposure were elevated split thickness keeping the blade almost parallel to the root, and the soft tissue apical to the root exposure was elevated full thickness inserting a small periosteum elevator in to the probable sulcus and proceeding in the apical direction up to exposing 3–4 mm of bone apical to the bone dehiscence. A horizontal releasing incision was

made in the periosteum, at the base of the flap, to facilitate tension-free coronal displacement²⁶. The harvested connective tissue graft was then placed on the recession defect and sutured with resorbable Vicryl 5.0 suture at the recipient site and flap was then coronally advanced with simple interrupted non-resorbable 4-0 silk suture (Plate 9). Periodontal dressing was placed over the surgical site for 10 days.

Post-operative instructions

Patients were prescribed an antibiotic and anti-inflammatory post-operatively comprising of (Tab) Amoxicillin and Clavulanic acid 625mg thrice daily for 5 days and (Tab) Combi flam 325mg twice daily for 5 days respectively. Patients were also advised to be on soft and cold liquid diet for first 24 hours and avoid brushing on the operated site for next 10 days post-operatively. They were instructed to rinse the oral cavity with 0.2% Chlorhexidine digluconate mouthwash for 1 minute starting after 24 hour of surgery for 14 days. All the patients were asked to report after 10 days for removal of the sutures and periodontal dressing. The patients were then recalled after 3 months (Plate 11) and 6 months (Plate 12) for the recording of clinical parameters postoperatively.

The data thus collected was subjected to statistical analysis

Statistical analysis

The study was put for statistical analysis to know extent of root coverage obtained by Sub epithelial Connective Tissue Graft with Coronally advanced flap in treatment of Miller's Class I and Class II gingival recession. Statistical analysis was done using Statistical package for social sciences 22.0

1. t – test was used for comparison of 3 months and 6 months with the baseline
2. The level of significance was fixed at $p < 0.05$.

Results

The present study was undertaken to clinically evaluate the clinical parameters for the treatment of Miller's class I and class II gingival recession Using Subepithelial Connective Tissue Graft with Coronally Advanced Flap. 15 patients were treated with sub epithelial connective tissue graft with Coronally advanced flap.

The clinical parameters assessed at day 0 (baseline) i.e., at the day of periodontal surgery, 3 and 6 months subsequently were

- 1) Clinical Recession depth (RD)
- 2) Recession width (RW)
- 3) Probing depth (PD)
- 4) Width of keratinized gingiva (WKG)
- 5) Relative attachment level (RAL)

The data thus collected was subjected to statistical analysis and following results were observed at different time intervals.

Clinical recession depth (RD)

The mean recession depth at baseline was 2.90 ± 0.79 mm. It was 1.13 ± 0.64 mm at 3 months showing a mean difference of 1.77 ± 0.68 mm with p value <0.001 which was statistically significant ($p < 0.05$).

At 6 months, the mean recession depth was 0.40 ± 0.53 mm showing mean difference of 2.50 ± 0.79 mm with p value <0.001 which was statistically significant ($p < 0.05$).

A significant difference was observed in recession depth between baseline to 3 months and 6 months respectively ($p \leq 0.05$).

Recession width (RW)

The mean recession width at baseline was 2.80 ± 0.56 mm which was 1.20 ± 0.71 mm at 3 months showing a mean difference of 1.60 ± 0.64 mm with p value <0.001 which was statistically significant ($p < 0.05$).

At 6 months, the mean recession width was 0.47 ± 0.65 mm showing mean difference of 2.43 ± 0.63 mm with p value <0.001 which was statistically significant ($p < 0.05$).

The recession width between baseline to 3 months and 6 months in each group was found to be significant ($p \leq 0.05$).

Probing depth (PD)

The mean pocket depth at baseline was 1.72 ± 0.37 mm which was 0.67 ± 0.33 mm at 3 months showing a mean difference of 1.05 ± 0.49 mm with p value <0.001 which was statistically significant ($p < 0.05$).

At 6 months, the mean pocket depth was 0.53 ± 0.47 mm showing mean difference of 1.19 ± 0.48 mm with p value <0.001 which was statistically significant ($p < 0.05$).

A significant difference was observed in probing depth on comparing baseline to 3 months and 6 months values ($p \leq 0.05$).

Width of keratinized gingiva (WKG)

The mean width of keratinized gingiva at baseline was 2.00 ± 0.38 mm which was 3.00 ± 0.38 mm at 3 months showing a mean difference of -1.00 ± 0.38 mm with p value <0.001 which was statistically significant ($p < 0.05$).

At 6 months, the mean width of keratinized gingiva was 3.07 ± 0.26 mm showing mean difference of 1.07 ± 0.26 mm with p value <0.001 which was statistically significant ($p < 0.05$).

The width of keratinized gingiva between baseline to 3 months and 6 months was found to be significant ($p \leq 0.05$).

Relative attachment level (ral)

The mean Relative attachment level at baseline was 11.07 ± 1.28 mm which was 5.67 ± 0.90 mm at 3 months showing a mean difference of 5.40 ± 0.00 mm with p

value <0.001 which was statistically significant ($p<0.05$).

At 6 months, the mean Relative attachment level was 4.67 ± 0.62 mm showing mean difference of 6.40 ± 0.83 mm with p value <0.001 which was statistically significant ($p<0.05$).

A significant difference was observed in relative attachment level in between baseline to 3 months and 6 months respectively ($p\text{-value} \leq 0.05$).

Discussion

Gingival recession is defined as the apical migration of junctional epithelium with the exposure of root surfaces which can result in unfavorable esthetics, increased root caries susceptibility, and dentin hypersensitivity²⁷. The exposure of root surface may be due to numerous etiological factors as the etiology of gingival recession is complex. It can be caused by traumatic injuries (excessive or inadequate teeth brushing) and by destructive periodontal disease^{28,29-31}.

The selection of appropriate surgical treatment for gingival recession is according to Miller's classification. Before implementation of surgical procedure, a width of keratinized gingiva should be considered as well. According to patient's age and recession activity, appropriate treatment should be implemented.

Surgical procedures that ensure predictable clinical outcomes, high esthetic value, and minimal invasiveness in isolated gingival recession defects include Laterally sliding flap, Double papillae flap, Semilunar flap, Guided tissue regeneration (GTR)²⁶. But, due to several limiting factors like adequate gingival thickness, required width of keratinized tissue, dehiscence and fenestration etc. in the following techniques, they are not a predictable treatment choice for root coverage. Therefore, CDF is considered a valid treatment option for root coverage in isolated type of gingival recessions.

Coronally positioned flap technique is the most reliable and predictable treatment modality for obtaining root coverage in isolated types of gingival recession defects. This technique was first described by Norberg (1926). Later, the term was coined by Pini Prato et al in (1999)²¹. It is one of the most effective techniques that results in the best long term clinical outcomes³². Coronally positioned flap technique is based on the coronal shift of soft tissue apical to the denuded root surface Allen & Miller (1989)³³; Pini Prato et al. (2000)³⁴. But it's often result in limited or no periodontal regeneration in gingival recession defects which can contribute to apical relapse and result in subsequent recession. So, to overcome this disadvantage a modification of coronally positioned flap technique named coronally advanced flap was introduced by Zucchelli and de Sanctis in (2007)³⁵ for treating Miller's class I and II isolated recession defects. This procedure guarantees anchorage and blood supply in the inter-proximal areas mesial and distal to the root exposure; the full-thickness portion, by including the periosteum, confers more thickness, and thus better opportunity to achieve root coverage, to that portion of the flap residing over the previously exposed avascular root surface. However, coronally advanced flap doesn't offer promising results in recession defects when used alone as mucogingival line has the capacity to relapse apically to its genetically determined position when they are used alone. So, to overcome this disadvantage it can be used in combination with connective tissue graft which is being called as Subepithelial connective tissue graft as it is being inserted beneath the epithelial surface Wennström & Zuchelli (1996)³⁶, barrier membranes Pini Prato et al (1992)³⁷, enamel matrix derivatives Rasperini et al (2000)³⁸, acellular dermal matrix Harris (1998)³⁹, or platelet-rich plasma. But Coronally advanced flaps with

the interposition of a Sub epithelial connective tissue graft is considered to be gold standard technique as it enhances the probability of complete root coverage, thereby reducing recession depth in Miller's class I and class II gingival recession defects. The use of Sub epithelial connective tissue graft was introduced by Langer and Langer (1985)¹⁸ combine the advantages of the pedicle flap procedure and guarantees a double blood supply from both the overlying pedicle flap and the underlying periosteum resulting in good color blending, good esthetic outcome, predictable root coverage in areas of thin gingiva and alveolar bone.

Within the limits of this study, Coronally Advanced Flap showed comparable results in terms of periodontal clinical parameters. In the present study, it has been felt that the long-term period of follow up of results was required. Hence more researches with an extensive study period needed to be carried out to assess the long-term stability of the results.

Summary and conclusion

In conclusion, the use of Coronally Advanced Flap with Sub-epithelial Connective Tissue Graft is an effective and minimally invasive modality for treating Miller's Class I and Class II Isolated gingival recession defects. However, it is imperative that further long-term clinical and histological studies are performed to validate the effectiveness of these techniques.

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Legends Figures



Figure 1: Surgical Armamentarium.

Pre-Operative with Measurement

Coronally advanced flap with sub-epithelial connective tissue graft)



Figure 2: clinical recession depth.



Figure 3: Recession width.

Surgical Procedure



Figure 4: incision outline



Figure 7: Procured connective tissue graft.



Figure 5: Flap reflected



Figure 8: Connective tissue graft placed.



Figure 6: Single palatal incision



Figure 9: Flap Advanced coronally and sutures given.



Figure 10: palatal sutures.

Post – operative measurements



Figure 11: Three months post- operatively



Figure 12: Six months post- operatively