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Original Article

Periodontal plastic pioneering procedures revisited

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ABSTRACT

Background: Various periodontal plastic procedures are available for treatment of localized gingival recessions. However, in the mirage of newer techniques and materials available, it is difficult for clinicians to decide on the treatment modality. Pioneering techniques provide a cost effective and effective means of maintaining esthetics in recession cases.

Materials and methods: Twenty-two subjects with localized gingival recessions were divided in equal groups and treated with lateral pedicle graft (Group A) and Free mucosal graft (Group B). Clinical parameters of length and width of recession and apico coronal length of keratinized gingiva (ACKG) was measured at baseline, 30 and 90 days. Root coverage percentage was calculated.

Results: Both groups were effective in recession coverage and gain in ACKG. Root coverage gained in Group A was $65.0 \pm 25.2\%$ and for Group B was $61.6 \pm 20.5\%$.

Conclusion: Lateral pedicle graft and Free mucosal graft provide not only effective means of gaining in root coverage of localized gingival recession cases but also result in gain of ACKG. These techniques remain an important part of periodontal plastic surgery.

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1. Introduction

In current periodontal therapy, mucogingival surgery is an almost routine procedure. Mucogingival surgery is defined by the American Academy of Periodontology as “plastic surgical procedures designed to correct defects in the morphology, position and/or amount of gingivae surrounding the teeth”.¹ In the normal periodontium the attached gingiva functions as a fixed, immovable mat of tissue separating two movable tissues, the alveolar mucosa and the free gingiva. In a healthy and intact periodontium the attached gingiva extends from

the level of gingival crevice coronally to the mucogingival junction apically.^{2,3}

Surgical techniques thus evolved which either preserved or augmented the attached gingiva. These included the contiguous soft tissue autograft introduced by Grupe and Warren⁴ as the lateral sliding flap in 1956 and the free soft tissue autograft introduced by King and Pennel⁵ in 1964. As the pendulum shifted toward more attached gingiva, more and more soft tissue grafting was done, until in the late 1970s the adequate width of attached gingiva was questioned.

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The emphasis later shifted from the amount of attached gingiva toward the treatment of marginal tissue recession.⁶ Exposed roots presented a totally different set of problems including root sensitivity, esthetic concerns, predilection to root caries, cervical abrasion, and compromising of restorative efforts.⁷ Recession remained a problem even if the marginal tissue was maintained free of inflammation. Actually, the treatment of localized gingival recessions may be the only surgical procedure in periodontics that is performed for esthetics reasons entirely.

Gingival recessions are usually associated with a minimal band of attached gingiva and thus the technique of using the lateral pedicle flap and free mucosal graft allows for an increase in the width of attached gingiva. However these have inherent limitations and with the newer techniques and materials available, these pioneering procedures have lost their sheen.

Following is an attempt to revisit these techniques for their effectiveness and predictability in treating localized gingival recessions.

2. Materials and methods

Twenty-two subjects with no gender bias were selected from the patients undergoing periodontal therapy in the Periodontics Clinic of a single institute in India. The patients were selected in the age group of 18–45 years with Miller's Class I or II gingival recession. Exposed root surfaces free of restorative margins or caries and teeth with no clinical mobility were included in the study. Phase I therapy was carried out for all cases. Patients were observed for 2 weeks after initial therapy on their ability to achieve adequate plaque control and if deemed fit, were only then considered in the study. A written consent was taken from all the selected patients before the surgery.

The selected 22 subjects were randomly divided in two groups of 11 patients each: Group A and Group B. Patients of Group A were treated with lateral pedicle flap and that of Group B with autogenous free mucosal grafts for coverage of denuded roots.

Surgical techniques are as follows: in brief, adequate anesthesia of the surgical site was achieved through local infiltration or bilateral mental nerve blocks of lidocaine containing adrenaline in ratio of 1:100,000 for both groups. For Group A, after removing the tissue lining, mesial margin of the defect was beveled externally and distal beveled internally; so that when the repositioned flap was transposed and secured, it overlaid over the beveled recipient site. The dimensions of the pedicle graft were determined by measuring the coronal width of the receptor site at the level of the cemento enamel junction with a probe. The donor width was kept one and a half times greater than the width of the defect. An incision was made paralleling the incision made on the mesial side of the defect. This incision was made to extend several millimeters apical to the mucogingival junction (MGJ) to provide adequate mobility to the flap. Corn's cut back incision was placed at the base to further relieve the flap. Full thickness flap was raised and laterally repositioned to drape passively over the defect site. Pressure was applied against the flap for 2–3 min prior to

suturing. Sling suture with 5.0 silk suture materials was placed at the coronal margin of the flap and interrupted sutures along the lateral margins. Periodontal dressing was then applied.

For Group B, the recipient bed area was demarcated by first placing horizontal incisions, at the level of the cemento enamel junction, in the interdental tissues on each side of the tooth with the recession defect. Subsequently, two vertical incisions, extending from the incision line were placed in the interdental tissue to the level approximately 4–5 mm apical to the recession. A horizontal incision was then made, connecting the vertical incisions at their apical termination. Starting from an intracrevicular incision, a split incision was made to sharply dissect the epithelium and the outer portion of the connective tissue within the demarcated area. To ensure that a graft of adequate size and proper contour was obtained from the donor area, a foil template of the recipient site was prepared and transferred to the donor area. Free mucosal graft was obtained from the premolar-molar region of the hard palate. Once the graft was outlined undermining dissection of the graft was done using a 15 No. Bard Parker blade and Mead elevator. A free mucosal graft of approximately 1.0–1.5 mm thickness was removed. After washing the recipient site with saline, the graft was immediately placed on the prepared recipient bed. Sutures were placed interproximally and at the lateral margins with 5.0 silk suture materials.

Following recording of demographic data for each subject, clinical measurements for length and width of the exposed root and apico coronal length of the keratinized gingiva (ACKG) was measured using University of Michigan 'O' probe with William's markings at baseline, just prior to surgery and 30 and 90 days postoperatively. Length of the exposed root (RL) was measured as the vertical distance from the cemento enamel junction (CEJ) to the free gingival margin (FGM) and width (RW) as the horizontal dimension of the gingival defect at the CEJ. ACKG is the distance measured from the crest of gingival margin to the pre surgical mucogingival junction. Percentage of root coverage was calculated as $\text{Root Coverage} = \frac{(\text{baseline RL} - 90 \text{ days follow up RL})}{\text{baseline RL}} \times 100$

2.1. Statistical analysis

The statistical analysis was done using SPSS (Statistical Package for Social Sciences) Version 15.0. The values were represented in Number (%) and Mean $\pm$ SD. Chi square test, paired and unpaired student "t" test was applied to assess the data.

3. Results

Twenty-two patients with even number of recession defects were included in the study. Group A comprised of 11 patients; 5 males and 6 females within age range of 31.36 ± 4.67 years; and Group B also of 11 patients; 3 males and 8 females aged 25.91 ± 6.38 years; with one defect each. Analysis of the width of recession distribution in the two groups using chi square test showed no significant difference ($\chi^2 = 0.18$) ($p > 0.05$).

Group A: Preoperative view

Group B: Preoperative

Group A: Immediate Post operative

Group B: One week Postoperative

Group A: 90 days postoperative

Group B: 90 Days Postoperative

Patients in the two groups were equally divided into Miller's Class I and Class II recession defect groups ($\chi^2 = 0.18$). Mean root coverage as evaluated by chi square test showed no statistically significant difference between the two groups ($\chi^2 = 0.45$).

Comparison of measurements between Group A and Group B for apparent recession preoperatively ($t = 1.55$) and at an interval of 30 ($t = -1.11$) and 90 days ($t = 0.00$) showed no

significant difference ($p > 0.05$) (Table 1). Evaluation of root coverage in the two groups showed similar results. No statistically significant difference was observed in the root coverage achieved between the groups ($t = 0.345$) ($p > 0.05$) (Table 2). However, maximum of 80% root coverage in 6 patients, and minimum of 0% in one patient was observed in Group A. Group B had maximum of 100% root coverage in one patient and minimum of 33.3% in 2 patients (Table 2).

The apico coronal length of keratinized gingiva showed a significant difference statistically between measurements preoperatively and at 30 days and 90 days duration for Group A and Group B ($p < 0.05$). Measurements taken at 30 days and 90 days showed no significant difference statistically ($p > 0.05$). On comparing the measurements for Group A and Group B using an unpaired student 't' test no statistically significant difference was observed between the measurements preoperatively ($t = 0.86$) and at 30 ($t = -1.18$) and 90 ($t = -0.51$) days ($p > 0.05$) (Table 3).

4. Discussion

In periodontal practice, root coverage after marginal soft tissue recession requires an in depth knowledge of the various surgical techniques, clinical skills for their implementation and an insight in correct patient selection. At both the first European Workshop on Periodontology⁸ in 1994 and the AAP World Workshop in Periodontics⁸ in 1996, comprehensive reviews between techniques indicated that there were no significant differences in efficacy and reported results showed a high variability. Reasons for this variability could depend on factors including the selection of the defects, the magnitude of the defects according to the Miller's classification, location of the recession, the mean initial depth and the operator skill.

The present study was conducted to compare and evaluate the efficacy of two pioneering root coverage procedures in mucogingival surgery i.e. the lateral pedicle flap and the free mucosal graft. Variability with regards to defect selection was minimized by randomly assigning the recession defects in the two groups. Miller's Class I and Class II defects only were considered in the study. No significant difference with regard to their distribution was done in between the two groups. The location of the defect was restricted to mandibular incisors and thus similar environment for recession coverage was provided for both the groups. The mean initial length and

Table 2 – Evaluation of root coverage.

Case no.	Group A	Group B
1.	80%	66.6%
2.	0%	33.3%
3.	40%	40%
4.	80%	71.4%
5.	60%	100%
6.	80%	66.6%
7.	80%	66.6%
8.	80%	75%
9.	80%	75%
10.	75%	33.3%
11.	60%	50%
$\mu \pm \sigma$	65.0 ± 25.2	61.6 ± 20.5
t 0.05, 20 (=2.09)	0.345	
p value	>0.05	

width of the defect showed no variability in between groups. No significant difference with regard to length of apparent recession existed preoperatively between the two groups. Mean recession length for Group A was 4.73 ± 0.647 and that for Group B was 4.00 ± 1.41 (Table 1).

Both groups were well matched for the initial width of recession. Recessions were defined as 'narrow' and 'wide' on the basis of the width of the defect. Matter and Cimasoni⁹ observed that root coverage obtained with narrow defects (<3 mm) on lower incisors was much more than with wider defects (>3 mm). They reported 100% root coverage in 2 of the 3 defects in the narrow category. Jahnke et al¹⁰ found no correlation between the mesiodistal widths of the defect and the amount of root coverage achieved. In the present study bias in recession coverage based on the width of the defect was removed by equal distribution of patients in both groups based on the width of the defect. Variability with regards to operator skill did not exist in the present study as a single operator performed all the surgeries.

The present study found that the apparent gingival recession was significantly reduced in both the groups at 90 days (Table 1). A mean gain of 3.5 mm of soft tissue coverage was obtained at the end of 3 months for Group A. At the end of 90 days the gain was 3.2 mm, which was comparable with that of 30 days. In a study by Guinard and Caffesse¹¹ a mean gain of 2.69 mm of soft tissue coverage was obtained 6 months postoperatively after a lateral pedicle flap. The values were stable after 30 days. The authors had suggested that 1-month

Table 1 – Apparent recession – statistical analysis.

Group A vs Group B	$\mu \pm \sigma$	t 0.05, 20 (=2.09)	p value
Pre operative			
Group A	4.73 ± 0.647	1.55	>0.05
Group B	4.00 ± 1.41		
At 30 days			
Group A	1.27 ± 1.01	-1.11	>0.05
Group B	1.73 ± 0.905		
At 90 days			
Group A	1.55 ± 0.820	0.00	>0.05
Group B	1.55 ± 0.934		

Table 3 – Apico coronal length of keratinized gingiva – statistical analysis.

Group A vs Group B	$\mu \pm \sigma$	t 0.05, 20 (=2.09)	p value
Pre operative			
Group A	1.18 ± 1.17	-0.86	>0.05
Group B	1.73 ± 1.74		
At 30 days			
Group A	4.91 ± 1.04	-1.18	>0.05
Group B	5.45 ± 1.13		
At 90 days			
Group A	4.64 ± 1.43	-0.51	>0.05
Group B	4.91 ± 1.04		

postoperative results permit an evaluation of the long-term results for the lateral pedicle flap. The results of the present study agree with their observation. The same workers reevaluated the results after 3 years. After first postoperative month, their results were found to be stabilized. These findings lend credence to the fact that an accurate assessment of the long-term success of the procedure could be done at 30 days.

Root coverage achieved was 65.0% at the end of 90 days for lateral pedicle graft (Table 2). Guinard and Caffesse¹¹ achieved the root coverage of 69.16% at the end of 6 months.

For Group B mean decrease in length of the apparent recession was 3.27 mm at the end of 90 days. Root coverage achieved was 61.6% (Table 2). The results of the present study are comparable with the studies carried out by Ibbott et al¹², with mean root coverage of 55.70% at the end of 3 months. The present root coverage outcomes are not in agreement with those by Laney et al¹³ and Jahnke et al.¹⁰ Root coverage of 50% and 43% respectively was achieved. The reason for marked improvement in the results may be due to the utilization of grafts of intermediate thickness in the present study as per the principles of successful grafting by Sullivan and Atkins.^{14,15} In contrast, the above mentioned studies utilized thick grafts of 2–3 mm thickness. Mormann et al¹⁶ through angiographic analysis revealed that thick grafts are associated with prolonged period of revascularization and delayed healing. Primary contraction type shrinkage is associated with thicker grafts due to more elastic tissue present. Primary contraction causes vascular contraction and collapse, which may retard revascularization. Soehren et al¹⁷ recommended the graft thickness of 0.75–1.25 mm.

Miller¹⁸ achieved a decrease in recession defect of 3.56 mm, with mean root coverage of 83.82%. The results do not correlate with the findings of the present study. Miller¹⁹ suggested several factors resulting in failure of complete root coverage. They included class of recession defect according to Miller's classification, inadequate size of interdental papillae and inadequate graft thickness. Root coverage was analyzed on the basis of Miller's classification. No significant difference was observed in the amount of root coverage achieved on the basis of Miller's Class I or II defects in both the groups. This is in agreement with Miller.¹⁸ He anticipated 100% root coverage in both the classes. However, 100% root coverage was achieved only in one case in this study. Zuccheli et al²⁰ stated the importance of papilla height in root coverage. A tooth with gingival recession and with no loss of interdental attachment and bone requires a definite papilla height so that complete root coverage can be accomplished; if some amount of papilla is lost, coverage up to the CEJ could not be achieved. Loss of periodontal height can be caused by inflammatory periodontal disease due to bacterial plaque with no concomitant loss of interdental periodontal attachment and bone. During surgery, the interdental papillae act as the most coronal vascular beds to which the soft tissues covering the root exposure are anchored. In the present study, interdental papillae height was not evaluated. They might be one of the reasons for incomplete root coverage.

Variable opinions regarding the thickness of the grafts exist for free mucosal grafts. In the present study graft thickness of 1–1.5 mm was utilized for Group B. Sullivan and

Atkins¹⁴ recommended the use of grafts of intermediate thickness. According to them, the thickness of the graft would determine its behavior during healing and its final character. A thick graft showed greater primary contraction, which retarded revascularization and impeded bridging. The graft thickness used in this study is also supported by Soehren et al.¹⁷ They recommended graft thickness of 0.75–1.25 mm.

In contrast, Miller¹⁸ suggested a graft thickness of 2 mm or more. He suggested that by the use of thicker grafts wound healing would be enhanced and deep wide recessions could be successfully and predictably treated. He also speculated that a thin layer of vascularized submucosa in the graft may serve as a barrier membrane to separate the root from the graft connective tissue allowing for the ingrowth of cells from the periodontal ligament. Laney et al¹³ and Jahnke et al¹⁰ utilizing the graft thickness of 2 mm found root coverage of only 50% and 43% respectively. Root coverage achieved in the present study is 61.6%, which is much higher than above mentioned studies. Thus the above discussion leads to the inference that the use of grafts of more than 1–1.5 mm is not justified.

For Group A full thickness flap was raised. Pfeiffer and Heller²¹ in their study evaluated the full thickness flap to be associated with connective tissue attachment. Partial thickness pedicle was associated with long epithelial attachment with no connective tissue attachment.

The present study showed an increase in the apico coronal length of keratinized gingiva of 3.46 mm in Group A and 3.18 mm in Group B at the end of 90 days (Table 3). This increase was 3.73 mm and 3.19 mm respectively at the end of 30 days. Slight decrease was noted after 30 days; however this difference was not significant statistically. The minimal fluctuation in the length of keratinized gingiva at different postoperative intervals could be attributed to the process of healing and tissue maturation according to Guinard and Caffesse.¹¹ They found 3.15 mm of increase in the apico coronal length of keratinized gingiva with lateral pedicle flap at the end of 6 months. This increase is in agreement with the findings of the present study. Similarly, the results of the present study are comparable to that of Jahnke et al¹⁰ who found an increase of 3 mm in the apico coronal length of keratinized gingiva at the end of 6 months following the placement of free mucosal graft for recession coverage.

Within the limits of this study, it can be safely said that both these procedures are equally effective in treating localized gingival recession and increasing width of keratinized gingiva. Root coverage techniques differ with regard to success and predictability. Success relates to the average percentage of root coverage achieved, whereas predictability describes the percent of the treated teeth in which complete root coverage is achieved. Success rates for free mucosal grafts range between 68% and 91% and for lateral pedicle flaps it ranges between 41% and 74%. However predictability for the two procedures is 57% (0–90%) and 43% respectively.²² In the present study only one case of Group B had complete root coverage. Rocuzzo et al⁸ reviewed that the predictability for both these procedures is low. If patient selection is right, and surgical techniques are performed with clinical skills based on thorough knowledge and expertise, predictability of both these procedures can be increased.

From the present study, it can be concluded that the pioneering techniques in pure mucogingival surgeries still remain the cornerstone of periodontal plastic surgery. Besides being cost effective, they provide adequate recession coverage and increase in width of keratinized gingiva.

Conflicts of interest

All authors have none to declare.

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