Management of inadequate keratinized gingiva and millers class III or IV gingival recession using two-stage free gingival graft procedure

Jacqueline Jacinta Dias, Mohinder Panwar, Manab Kosala

Abstract:
Background: Prognosis in the management of Millers Class III or IV gingival recession is often fair to poor, which is further decreased by factors such as inadequate keratinized gingiva. Very few modalities show long-term success in the management of gingival recession with inadequate keratinized gingiva, free gingival graft (FGG) being one such technique. Materials and Methods: Ten individuals with Millers Class III or IV recession and inadequate keratinized gingiva were recruited for the study. The first surgical procedure involved the FGG procedure to increase the width of keratinized gingiva (WOKG). Patients were recalled after 3 months for the second surgical procedure, where the flap was coronally advanced. They were recalled 9 months after the second surgical procedure. Recession depth (RD) and clinical attachment level (CAL) was examined at baseline, at 3 months (before the second surgical procedure) and at 12 months (9 months after the second surgical procedure). The percentage of root coverage was measured at 12 months from baseline. Results: Significant increase in WOKG was seen at 3 months. Significant decrease in RD and CAL was observed at 12 months from baseline. The percentage of root coverage was 76.4%. Conclusion: Two-stage FGG procedure can be a successful modality in the management of Millers Class III or IV recession with inadequate keratinized gingiva. This technique improves the prognosis of such compromised cases.

Key words: Free gingival graft, gingival recession, inadequate keratinized gingiva, two stage

INTRODUCTION

Periodontal disease is an infectious inflammatory disease that involves attachment or alveolar bone loss or both. One of the most common esthetic concerns associated with periodontal disease is the gingival recession. Gingival recession is defined as the location of the marginal tissue apical to the cementoenamel junction with exposure of the root surface. Gingival recession may be associated with numerous factors such as anatomic factors, trauma, and faulty tooth brushing, to mention a few. It is often complicated by inadequate keratinized gingiva. Gingival recession, along with inadequate keratinized gingiva, causes not only esthetic concern but also affects the functioning of the supporting periodontal tissue. They often result in increased sensitivity to hot and cold food, poor esthetics, and difficulty in proper plaque removal, which further deteriorates the condition.

Periodontal therapy aims at the elimination of disease and maintenance of healthy periodontal tissue. The most important aspect of any periodontal treatment, including that of gingival recession, is to eliminate the etiologic factor. This is followed by improving the esthetic appearance. Recession defects limit proper plaque removal and also affect the confidence of an individual due to esthetic concern. These indications support the use of periodontal plastic surgical procedures that aim at not only root coverage but also increasing keratinized tissue so as to aid in the maintenance of healthy tissues.

Numerous modalities are available to manage the gingival recession. However, the prognosis of Millers class III or IV gingival recession is often...
fair to poor due to interdental soft tissue or bone loss. More so, the management of Class III or IV gingival recession is often complicated by various factors such as inadequate keratinized tissue, thin gingival biotype, and inadequate vestibular depth to mention a few. One of the oldest treatment modality to manage such a complicated clinical scenario is free gingival graft (FGG). [3] With the advent of new treatment modalities, FGG as root coverage technique has become obsolete due to its limitations such as second surgical site and color. Even so, certain clinical situations such as inadequate keratinized gingiva and vestibular depth may still benefit from such age-old technique of FGG. [4]

Very few cases have demonstrated the success of two-stage FGG procedure in Millers Class III or IV recession. This study thus aims at determining the success of management of inadequate keratinized gingiva and Millers Class III or IV gingival recession by FGG procedure followed by the coronal advancement of flap (CAF).

**MATERIAL AND METHODS**

**Ethical clearance and preparation**
Ethical clearance was taken from the ethical committee of the institute. All patients were informed about the procedure, and informed consent was obtained.

**Patient selection and preparation**
Ten patients (4 males and 6 females) having Millers Class III or IV gingival recession in mandibular anterior region with inadequate keratinised gingiva were recruited for the study. Patients within the age group of 20–45 years having recession depth (RD) more than or equal to 2 mm, keratinized gingiva equal to or <2 mm and difficulty in maintenance of oral hygiene were included in the study [Figure 1]. Smokers, individuals with systemic diseases, pregnant and lactating women were excluded. At the baseline, the gingival recession was evaluated using the following parameters [Figures 2 and 3]:

i. RD and clinical attachment level (CAL)
ii. Width of the keratinized gingiva (WOKG).

Oral prophylaxis was carried out, and patients were planned for two-stage surgery, i.e., FGG procedure followed by CAF after 3 months.

**Surgical procedure**
The surgical site was anesthetized with buccal and lingual infiltration using local anesthesia of 2% lignocaine with 1:80,000 adrenaline. Horizontal incision was given bilaterally without involving gingival margins of the adjacent healthy teeth. Care was given to preserving interdental papilla to provide blood supply to the graft. Vertical incisions were given extending beyond the mucogingival junction [Figure 12]. The partial thickness flap was elevated [Figure 13] and the flap was coronally repositioned and sutured using 4-0 prolene sutures [Figure 14]. The site was protected using a tin foil and periodontal dressing. Similar postoperative instructions were given as before, and the sutures were removed after 7 days.

**Parameters measured**
Patients were recalled every 3 months for reinforcing oral hygiene instructions. All patients were recalled 9 months after the second surgery (12 months from baseline) to record the parameters. Clinical parameters such as RD, CAL, and WOKG were measured at baseline, 3 months, and 9 months after the second surgical procedure (12 months from baseline) [Figures 15-17]. The percentage of root coverage was measured at 12 months from baseline.

Data were analyzed using computer software, Statistical Package for the Social Sciences (SPSS) version 22.0 IBM version SPSS 22 (IBM Corp, Armonk, NY). Data were expressed in its mean and standard deviation. Student’s t-test was used to compare the parameters. For all statistical evaluations, a two-tailed probability of value <0.05 was considered statistically significant.

**RESULTS**
A total of 10 individuals were managed with FGG, followed by CAF. Healing was uneventful in all the cases with no complications.

Statistical analysis also showed a significant increase in the width of keratinized gingiva at 3 months after FGG in comparison to the baseline value. Mean WOKG at baseline was 1.5 ± 0.50 mm, which statistically increased to 6.1 ± 0.70 mm after 3 months.

There was no significant decrease in RD between 3 months (after FGG and before CAF) and baseline. However, a significant decrease in RD and CAL was noted between 3 months (after FGG and before CAF) and 12 months (9 months after CAF) [Table 1]. Statistical analysis also showed a significant decrease in RD and CAL at 12 months (9 months after CAF) from baseline.
Statistical analysis also showed mean root coverage of 76.4% after 12 months.

**DISCUSSION**

Periodontal plastic surgery includes surgical procedures that prevent, correct or eliminate defects in gingiva or alveolar mucosa.

Numerous periodontal plastic surgery approaches have been proposed for the management of gingival recession. These treatment approaches include the augmentation of the soft tissues to cover the exposed roots surfaces such as grafting procedures like connective tissue graft (CTG), FGG and CAF to mention a few.\cite{5-7} These procedures have numerous merits as well as demerits associated with them. Some are more predictable than others, and some provide more esthetically pleasing results.\cite{8}

The predictability of root coverage procedure is associated with numerous factors such as donor factors, recipient factors, and surgical techniques, to mention a few. Blanes and Allen demonstrated that the success of root coverage is more in cases with the presence of interproximal soft tissue integrity.\cite{9} Hence, root coverage is often less in Millers Class III or IV recession. Lang and Löe showed that the presence of adequate attached gingiva is required for maintenance of oral hygiene and long-term success of the treatment.\cite{10} Thus, inadequate keratinized gingiva further reduces the success rate of Millers Class III or IV recession. In this study, cases selected were
both Millers Class III/IV recession and inadequate keratinized gingiva, which compromises the success rate of any treatment modality significantly.

AAP proposed a decision making tree for the management of Millers Class III or IV gingival recession where significant importance was given to CTG, emdogain, and xenogenic collagen matrix (XCM) to provide the predictable outcome.\[11\] Most of these treatment modalities such as CTG, EMD, and XCM require CAF, which is not possible in cases of inadequate gingiva. Matter and Cimasoni demonstrated that only 65% of root coverage occurs in cases with inadequate attached gingiva.\[12\] Hence, there has been a constant need to find an apt treatment modality to increase the success rate of root coverage procedure in such clinical scenarios. Alternative treatment modalities have to be adopted, which aim at first increasing the keratinized gingiva and then advancing the flap. FGG plays a significant role in such compromised cases of Millers Class III or IV gingival recession to provide the long-term success of root coverage and maintenance of oral hygiene.

Procedures such as FGG help in increasing the predictability of treatment by increasing the WOKG.\[13\] The present study showed a statistical increase in WOKG. This is in accordance with the study by Popova et al. who showed a significant increase in WOKG, resulting in successful root coverage up to 1 year.\[14\]

In the current era, FGG is not much accepted for root coverage due to the second donor site and poor esthetics at the recipient site. However, in compromised cases with
inadequate keratinized gingiva, where priority is saving the tooth, periodontium, and helping patient in maintaining oral hygiene, it can often be a boon to the clinician.

This study showed that two-stage procedure results in a significant reduction in RD due to CAF after the FGG procedure. However, some studies, such as by Jahnke et al., have shown FGG not to be an effective technique for root coverage. He demonstrated an average root coverage percentage of 43% with FGG. This could be attributed to the difference in the surgical technique. Wennström demonstrated that the average percentage of root coverage was 72% in cases of inadequate keratinized gingiva, where priority is saving the tooth, periodontium, and helping patient in maintaining oral hygiene, it can often be a boon to the clinician.

The present study showed root coverage with 76.4% after CAF. Deo et al. in a systematic review, stated that FGG provides beneficial results in the management of Millers Class I and II gingival recession; however, it depends highly on patient selection and operator skills. The decrease in RD and satisfactory root coverage a few months after the surgery could be attributed to creeping attachment seen in FGG.

While there are studies that discuss the effectiveness of two-stage FGG procedures in Miller’s Class I and II recession, very few studies on the use of FGG in Millers class III or IV recession have been conducted. A study on the efficacy of FGG in Millers Class III recessions demonstrated 41.25% ± 21.07% root coverage. This study was conducted as a single-stage FGG technique. However, our study has been conducted as a two-stage FGG technique that resulted in greater root coverage. A case report on two-stage FGG showed a significant increase in WOKG and 7 mm of root coverage. However, no study in our knowledge has been conducted previously for two-stage FGG techniques in Miller’s Class III or IV recession apart from few case reports. Furthermore, the mean root coverage in this study is quite appreciable, considering all the cases were Millers Class III or IV gingival recession (with fair to poor prognosis), further complicated FGG.
by inadequate keratinized gingiva, which often has a poor success rate.

**CONCLUSION**

This study has demonstrated that two-stage procedures give predictable results by increasing the width of keratinized gingiva in Miller’s Class III or IV gingival recession. Significant root coverage has been demonstrated in this study after FGG, followed by CAF. However, further long-term studies are required to substantiate this study.

_Acknowledgement_

The authors would like to thank Dr. Navneet Sheokand for assistance in surgical procedures.

_Financial support and sponsorship_

Nil.

_Conflicts of interest_

There are no conflicts of interest.

**REFERENCES**

1. Borghetti A, Gardella JP. Thick gingival autograft for the coverage of gingival recession: A clinical evaluation. Int J Periodontics Restorative Dent 1990;10:216-29.
2. Chambrone L, Tatakis DN. Periodontal soft tissue root coverage procedures: A systematic review from the AAP regenera tion workshop. J Periodontal Workshop 2015;86:8-51.
3. Sullivan HC, Atkins JH. Free autogenous gingival grafts. 3. Utilization of grafts in the treatment of gingival recession. Periodontics 1968;6:152-60.
4. Miller PD Jr. Root coverage using the free soft tissue autograft following citric acid application. III. A successful and predictable procedure in areas of deep-wide recession. Int J Periodontics Restorative Dent 1985;5:14-37.
5. Björn H. Free transplantation of gingiva propria. Odontol Revy 1963;14:323.
6. Zucchelli G, De Sanctis M. Modified two-stage procedures for the treatment of gingival recession. Eur J Esthet Dent Spring 2013;8:24-42.
7. Bernimoulin JP, Lüscher B, Mühlemann HR. Coronally repositioned periodontal flap. Clinical evaluation after one year. J Clin Periodontol 1975;2:1-13.
8. Camargo PM, Melnick PR, Kenney EB. The use of free gingival grafts for aesthetic purposes. Periodontol 2000 2001;27:72-96.
9. Blanes RJ, Allen EP. The bilateral pedicle flap-tunnel technique: A new approach to cover connective tissue grafts. Int J Periodontics Restorative Dent 1999;19:471-9.
10. Lang NP, Loe H. The relationship between the width of keratinized gingiva and gingival health. J Periodontol 1972;43:623-7.
11. Richardson CR, Allen EP, Chambrone L, Langer B, McGuire MK, Zabalegui I et al. Periodontal soft tissue root coverage procedures: Practical applications from the AAP regeneration workshop. Clin Adv Periodontics 2015;5:2-10.
12. Matter J, Cimasoni G. Creeping attachment after free gingival grafts. J Periodontol 1976;47:574-9.
13. Agudio G, Nieri M, Rotundo R, Cortellini P, Pini Prato G. Free gingival grafts to increase keratinized tissue: A retrospective long-term evaluation (10 to 25 years) of outcomes. J Periodontol 2008;79:587-94.
14. Popova C, Boyarova T. Free gingival autograft for augmentation of keratinized tissue and stabilization of gingival recessions. J of IMAB 2008;14:19-25.
15. Jahneke PV, Sandifer JB, Gher ME, Gray JL, Richardson AC. Thick free gingival and connective tissue autografts for root coverage. J Periodontol 1993;64:315-22.
16. Wennström JL. Commentary: Treatment of periodontitis: Effectively managing mucogingival defects. J Periodontol 2014;85:1639-41.
17. Rath A, Varma S, Paul R. Two-stage mucogingival surgery with free gingival autograft and biomend membrane and coronally advanced flap in treatment of class III Millers Recession. Case Rep Dent 2016;2016:9829634.
18. Deo SD, Shetty SK, Kolloli A, Chavan R, Dholakia P, Ligade S, et al. Efficacy of free gingival graft in the treatment of Miller Class I and Class II localized gingival recessions: A systematic review. J Indian Soc Periodontol 2019;23:93-9.
19. Remya V, Kishore Kumar S, Sudharsan S, Arun KV. Free gingival graft in the treatment of class III gingival recession. Indian J Dent Res 2008;19:247-52.
20. Muthu J, Muthanandam S, Mahendra J. Complete root coverage in millers class III isolated gingival recession using free gingival graft – A 12 month follow up report. J Basic Clin Appl Health Sci 2018;2:141-3.