Scholars Journal of Dental Sciences (SJDS) **ISSN 2394-4951 (Print)**
Abbreviated Key Title: Sch. J. Dent. Sci. **ISSN 2394-496X (Online)**

A Unit of Scholars Academic and Scientific Society, India
www.saspublishers.com DOI:10.36347/sjds.2018.v05i09.004

Evaluation of Effectiveness of Guided Tissue Regeneration (GTR) for the Treatment of Multiple Gingival Recession Defects in Humans- A Case Series

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Original Research Article

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Article History
Received: 25.08.2018
Accepted: 04.09.2018
Published: 30.09.2018

DOI:
10.21276/sjds.2018.5.9.4

Abstract: GTR therapy appears to be a legitimate approach towards managing the problem of root coverage. Therefore, the present case series study was undertaken to evaluate the effectiveness of Guided Tissue Regeneration (GTR) with respect to root coverage, gain in clinical attachment level and to improve the width of the keratinized gingiva in multiple gingival recession defects in human. Five systemically healthy patients (3 males and 2 females) aged between 18 to 25 years with multiple gingival recession (more than one) defects on the labial/ buccal surfaces of the teeth either in maxilla or mandible were treated by using guided tissue regeneration. The selected patients had Miller class I or II multiple gingival recession defects on the labial or buccal surface of teeth at baseline. Mean gingival recession (REC) at baseline was 2± 0.94 mm with a range of 2-3mm, which at 3 months postoperatively was reduced to 0.6± 0.48 mm ranging from 0-1mm with a mean reduction of 1.4±0.46 mm (Table-2) that corresponds with 85.32% mean root coverage. Use of GTR is a good option in cases where the patients are not willing for second surgical intervention as in SCTG.
Keywords: Root coverage, Guided tissue regeneration, gingival recession, periodontal regeneration, Membrane, Barrier.

INTRODUCTION

The treatment of gingival recession is a common request in daily periodontal practice mostly due to aesthetic reasons. As aesthetics represent an inseparable part of today's clinical practice, the surgical coverage of recession is mainly indicated for aesthetic improvement rather than functional aspect [1].

Gingival recession is the exposure of the root surface resulting from migration of the gingival margin apical to the cementoenamel junction (CEJ). It may be localised or generalised and may be associated with one or more tooth surfaces [2]. Besides plaque-induced periodontal inflammation, toothbrushing trauma is considered a major cause of this condition [3].

Several surgical procedures such as pedicle flaps, free soft tissue graft, combination of pedicle flaps and grafts or barrier membranes may be indicated to improve the coronal level to the gingival margin on the root surface 4-6. A recent systematic review showed that coronally advanced flap (CAF) is a safe and predictable approach for root coverage and it is often associated with the complete coverage of the root surface [6]. However, the root coverage obtained with this procedure was associated with thin marginal soft tissue [7], which makes it vulnerable to future recession at the treated sites, and thus questions the long term predictability of coronally positioned flap in the treatment of multiple gingival recession defects [8].

The association of a connective tissue graft with a pedicle graft (bilaminar technique) is currently considered the surgical technique yielding the more predictable results when the endpoint is the maximum percentage of root coverage [9]. This technique offers a dual blood supply, a better colour match, and a high degree of predictable success. However, this autotransplantation procedure requires harvesting the graft from the donor area, most often located in the palate, which results in an additional wound site with postsurgical bleeding and patient discomfort as a common sequelae [10,11]. Furthermore, conventional mucogingival techniques do not seem to result in a new connective tissue attachment over the previously exposed root surface [12,1].

The introduction of guided tissue regeneration in the treatment of recession type gingival defects has allowed clinicians to avoid a second surgical site and to achieve a predictable new connective tissue attachment over the exposed dental root [14]. The success rate with this technique has been reported to be between 54% to 92% of root coverage [15,16]. The aim of regenerative

procedures is to displace the epithelial attachment at a more coronal position than before treatment, allowing cells from periodontal ligament and bone to repopulate the root surface and to form a new periodontal attachment. The placement of a barrier membrane (i.e. GTR) over the denuded root surfaces and the debrided periodontal defect has been shown to exclude epithelial down growth and allow periodontal ligament and alveolar bone cells to repopulate the isolated space selectively [17,18]. Controlled clinical trials have shown that GTR based root coverage procedures respond well especially in deep and narrow defects [19]. Thus it appears that GTR therapy is a legitimate approach towards managing the problem of root coverage.

Therefore, the present case series study was undertaken to evaluate the effectiveness of Guided Tissue Regeneration (GTR) with respect to root coverage, gain in clinical attachment level and to improve the width of the keratinized gingiva in multiple gingival recession defects in human.

MATERIALS AND METHODS

Five systemically healthy patients (3 males and 2 females) aged between 18 to 25 years with multiple gingival recession (more than one) defects on the labial/ buccal surfaces of the teeth either in maxilla or mandible classified as either Miller's Class I or II, Presence of ≥ 2 mm gingival recession depth, Radiographic evidence of sufficient interdental bone (the distance between the crestal bone and cementoenamel junction as ≤ 2mm), Presence of width of keratinized gingiva apical to recession ≥ 3mm were included in the study. Un-cooperative patients, Patients with plaque score ≥ 1 after faze I therapy, History of periodontal surgery in selected sites, Endodontically treated or restored teeth were excluded from the study.

Prior to initiating this study, the purpose and design of this clinical trial was explained to the patients and informed consent was signed by every patient. This study was approved by the ethical committee of the institution.

Clinical Parameters

The following clinical parameters were measured for assessment of the results in all the treated cases: probing pocket depth (PPD), clinical attachment level (CAL), gingival recession (GR) and width of keratinized gingiva (WKG) by using a periodontal probe (Hu-Friedy). All the probing measurements were recorded at maximum depth recession (Mid-facially per tooth). These measurements were recorded only on teeth to be treated at baseline and at 3 months postoperatively. Baseline clinical parameters were recorded 6 weeks after initial therapy.

SURGICAL PROCEDURE

Prior to the surgical procedure, the patients were instructed to rinse with 0.2 % Chlorhexidine gluconate (Hexidine-ICPA Health Product Ltd., India) for one minute. The surgical protocol would emphasize complete asepsis and infection control. After induction of local Anaesthesia (2% Lidocaine, epinephrine 1: 100,000), the exposed root surfaces were carefully planned with ultrasonic instruments followed by curettes.

Preparation of recipient site

Intra-sulcular incision was made at the buccal/labial aspect of the involved teeth and the incision was extended horizontally into the adjacent interdental areas, at the level slightly coronal to the cemento-enamel junction without interfering with the gingival margin of the neighbouring teeth. Two oblique vertical incisions mesial and distal to the selected sites were given extending beyond the mucogingival junction and a trapezoidal mucoperiosteal flap was raised upto the mucogingival junction. After this point a split thickness flap was extended apically releasing the tension and favouring the coronal positioning of the flap. The epithelium from the adjacent papillae was stripped away so as to create a connective tissue bed for suturing the coronally positioned flap. The root surface was instrumented with curettes and washed with saline solution.

Use of GTR membrane

Prior to placement of the polylactic polyglycolic acid membrane, a surgical template with dimensions equal to the recession defect site was made. Using the surgical template as a guide the membrane (Biomesh) was cut in order to accurately cover the defect site. The polylactic polyglycolic acid membrane (Biomesh) was placed on the root surface from the CEJ extending 2-3 mm apical to the bone dehiscence margin, and sutured in place. The flap was positioned 1 to 2mm coronal to CEJ to achieve primary coverage over the de-epithelialized papilla region and to compensate for the postoperative shrinkage. Continuous sling sutures using 4-0 resorbable vicryl were used to hold the flap to the recipient bed, and interrupted sutures closed the oblique releasing incisions.

Post-operative care

Immediately after surgery, periodontal dressing (Coe-Pak, TM, GC, America Inc, ALSIP, IL, USA) was placed on surgical site. NSAID's Tab. Ibugesic Plus (Ibuprofen 200 mg + Paracetamol 400 mg), t.i.d and systemic antibiotic Cap. Mox (Amoxicillin 500 mg), t.i.d was prescribed for 5 days during post-surgical period. Patients were instructed not to brush the teeth for first 30 days after surgery at the treated sites. All patients were instructed to rinse with 0.2% chlorhexidine gluconate (Hexidine- ICPA) twice daily, for 2 weeks. They were instructed not to disturb the pack and to avoid undue trauma to the treated sites.

Fig-1: A-Preoperative view, B-Baseline measurement, C-Incision, D- Split thickness flap raised, E- Recipient site with surgical template, F-GTR Placed and sutured, G-Coronally placed flap, H- COE pack, I- Post operative view at 3 months

RESULTS

A total of five systemically healthy patients (three males, one female) with mean age 21.04±0.43 years, with Miller's Class I or II multiple gingival recession defects on labial or buccal surface of the teeth were treated with guided tissue regeneration (GTR) membrane along with coronally advanced flap (CAF).

During the course of the study, wound healing was uneventful. There were no post-operative complications in any patients. None of the selected patients dropped out before the termination of the study and all the patients were satisfied with the results. There was no significant postoperative discomfort experienced by the patients and none of the patients reported exposure of the membrane, nor was this observed at the follow up visits. The selected patients had Miller class I or II multiple gingival recession defects on the labial or buccal surface of teeth at baseline. The mean probing pocket depth (PPD) at baseline was 1.3±0.48 mm which was decreased to 0.5± 0.52 mm at 3 months post-surgery.

Mean gingival recession (REC) at baseline was 2± 0.94 mm with a range of 2-3mm, which at 3 months postoperatively was reduced to 0.6± 0.48 mm ranging from 0-1mm with a mean reduction of 1.4±0.46 mm that corresponds with 85.32% mean root coverage. 1 defect showed 66.6% root coverage, 2 defects showed 80% root coverage while 2 defects showed 100% root coverage.

A significant reduction was seen in the mean clinical attachment level at 3 months post surgically. The CAL shifted from 3± 1.05 mm with a range of 2-4mm presurgery to 1.1± 0.99 mm with a range of 1-2mm at 3 months postsurgery. The mean CAL gain at 3 months postoperatively was 1.9mm.

The mean width of keratinized gingiva showed a increase at the 3 months post-operative period. At baseline the WKG was 3± 0.66 mm which increased to 4.3± 0.67 mm with a gain in WKG of 1.3±0.01 mm

Table-1: Comparison of Clinical Parameters between Baseline and 3 Months follow up

Sr. no	Clinical Parameters	Baseline	3 Months	Difference
1	Gingival Recession (REC)	2± 0.94mm	0.6± 0.48mm	1.4±0.46 (Reduction)
2	Probing Pocket Depth (PPD)	1.3±0.48mm	0.5±0.52mm	0.8 ±0.04 (Reduction)
3	Clinical attachment level (CAL)	3± 1.05mm	1.1± 0.99mm	1.9±0.06 (CAL Gain)
4	Width of keratinized gingiva (WKG)	3± 0.66mm	4.3± 0.67mm	1.3±0.01 (Increase)

Table-2: Mean Reduction of Gingival Recession with Mean Root Coverage in 5 Individual Patients

Patient No.	Mean Recession defect depth	Mean recession reduction (mm)	% root coverage
1.	3mm	2mm	66.6%
2.	2.5mm	2mm	80%
3.	1mm	1mm	100%
4.	2.5mm	2mm	80%
5.	1mm	1mm	100%
Mean	2mm	1.6mm	85.32%

DISCUSSION

Gingival recession may be a major concern of the dentally aware patient with a high standard of oral hygiene, who asks the dentist for treatment of a perceived unacceptable condition. His or her main reasons may be the visible sign of aging, unaesthetic appearance, or tooth hypersensitivity. When multiple recession defects affecting adjacent teeth in esthetic areas of the mouth are present, they should all be treated at the same time to help ensure the best esthetic results. The present case series was carried out to evaluate the effectiveness of guided tissue regeneration (GTR) in treating multiple gingival recession defects in humans.

Results obtained from the present study indicate that GTR can be successfully used to treat gingival recession defects. This finding is similar to that reported by Tatakis and Trombelli [20], who indicated that both subepithelial connective tissue graft (SCTG) and GTR can be used to achieve root coverage. A GTR technique could offer several advantages over SCTG, including elimination of the need for a second surgical site for harvesting graft and associated morbidity, less postsurgical trauma and discomfort, reduction in operatory time, and an increase in acceptance of the procedure by the patients.

Data from this study demonstrated that a significant improvement was found in all the clinical parameters with respect to baseline. The mean probing pocket depth (PPD) at baseline was 1.3±0.48 mm which decreased to 0.5± 0.52 mm at 3 months post-surgery. The mean gingival recession (REC) at baseline was 2± 0.94 mm with a range of 2-3mm, which at 3 months postoperatively reduced to 0.6± 0.48 mm ranging from 0-1mm with a mean reduction of 1.4±0.46 mm. At 3 months post-surgery the average root coverage was 85.32%. 1 defect showed 66.6% root coverage, 2 defects showed 80% root coverage while 2 defects showed 100% root coverage which indicates that GTR was successful in attaining more than 50% coverage at all the involved sites. The results of our study are comparable to those found in other studies, which have reported that the amount of root coverage with GTR technique ranges between 54% to 92% [15, 16]. Pini Prato *et al*. [21], reported that GTR offers the best results in gingival recessions >4.98 mm. However, one factor that may negatively influence the success of this procedure is tissue thickness. As described by Harris [9], when GTR-based root coverage was used to treat buccal recession defects, areas with thin (<0.5mm) tissue thickness gained only 26.7% root coverage as compared to 95.9% root coverage in thick (≥0.5mm) tissue. This is also in agreement with the suggestion by Allen and Miller [7], who proposed that 1mm of tissue thickness, may be important when a coronally positioned graft is used for root coverage. Observation from our study hints that GTR-based root coverage should be attempted only in areas with thick tissues (i.e., ≥0.5mm).

A significant reduction was seen in the mean clinical attachment level at 3 months post surgically. The mean CAL gain at 3 months postoperatively was 1.9mm. Considering that root coverage was achieved in all sites in this case series with the use of GTR membrane, this finding illustrates a gain in attachment and suggests the formation of new attachment on a portion of the covered root surface. In the absence of histologic evidence it is impossible to determine whether this gain in attachment is facilitated by formation of long junctional epithelium, a new connective tissue attachment or a combination of both types of healing. However, Parma-Benfenati and Tinti [14] using human histologic material have shown that root coverage utilizing the principle of GTR can be accompanied by formation of new fibrous periodontal attachment. Additional studies are needed to understand the interaction between the newly covered root surface and overlying gingival tissues.

The mean width of keratinized gingiva showed a increase at the 3 months post-operative period. At baseline the WKG was 3± 0.66 mm which increased to 4.3± 0.67 mm with a gain in WKG of 1.3±0.01 mm. The width of keratinized gingival epithelium is probably influenced by inductive stimuli from the underlying connective tissue as well as by the genetically determined phenotype of the epithelial cells [22]. The fact that a gain of keratinized tissue has almost consistently been reported following membrane procedures indicates that the newly formed connective tissue also possess the ability to induce formation of a keratinized tissue. However, there is no definite evidence that a narrow zone of keratinized tissue presurgery is a prerequisite for GTR procedures or for maintaining gingival health.

In the present study we have evaluated the effectiveness of bioabsorbable GTR membrane in the treatment of multiple gingival recession defects. Results from this study indicate that GTR membrane can be used with moderate amount of success in the treatment of multiple gingival recessions. An important advantage of the technique in comparison to SCTG in that it alleviates the need for a second donor site thus is obliterating the associated morbidity.

CONCLUSION

In this case series study, at 3 months follow up, 2 cases showed 100% root coverage and 3 case showed 66.6% root coverage. Suggesting that the use of bioabsorbable GTR membrane is a viable treatment option for multiple recession defects, without adverse clinical effects. Use of GTR is a good option in cases where the patients are not willing for second surgical intervention as in SCTG. Moreover the use of membranes leads to a reduction in the operatory time and acceptance of the procedure by the patients.

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