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Evaluation Of the Effects of Antioxidant Gel on The Palatal Graft Donor Site - A Randomised Controlled Clinical Trial

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ABSTRACT

Background: FGG is the most effective way to increase the attached gingiva. However, the donor site morbidity is a serious issue following it. Hence to decrease donor site morbidity and promote faster healing a novel antioxidant blue®m gel was used.

Aim: To compare the in vivo effects of the blue®m gel with slow release of oxygen on the healing of donor site.

Materials And Methods: 60 patients undergoing free gingival surgery were included and randomly divided into 2 groups, group 1 (control group) - palatal donor site was covered with AbGelTM alone and, in group 2 (test group)- blue®m gel was applied to the palatal donor site and covered with AbGelTM. Postoperative pain and Wound healing index were calculated at one week and one month.

Results: Immediately After 2 h (immediately after the effect of anesthesia was resolved), no significant difference was found between both groups ($p > 0.05$). The pain was significantly reduced in both the groups from baseline to 1 week and 1 month ($p < 0.05$). At one week and After 1 month, there was a significant difference between both groups ($p < 0.05$). Values from one week to one month (within the groups) in group 1 and group 2 showed a significant difference ($p < 0.05$). At the 1-week follow-up, there was a statistically significant difference between the groups ($p < 0.05$). Even at 1 month, a significant difference was found between the groups ($p < 0.05$).

Conclusion: According to the findings of the present study, using the blue®m oxygen gel as an adjunct to an AbGelTM improves wound healing, stimulates rapid re-epithelization, and relieves postoperative pain compared with the conventional dressing with AbGelTM alone.

Keywords: *Evaluation, Clinical, study, conventional*

INTRODUCTION

The most effective way to increase the attached gingiva is thought to be a free gingival grafting procedure, which is also one of the most popular procedures 1. Increased keratinization of the gingiva is used to treat and prevent gingival recession, enhance aesthetics, lessen or completely eliminate root hypersensitivity, deepen the vestibule, and treat pigmented and pathological oral mucosa2. The recipient site may receive a complete free gingival graft (FGG) or a subepithelial connective tissue graft by de-epithelializing the graft obtained from the palate (SCTG) 3. Both methods can be utilized to thicken tissue, hide gingival recession, and/or stop gingival recession from beginning and progressing 4.

Palatal keratinized gingiva is the most common site for obtaining a free soft-tissue graft for gingival augmentation procedures. After harvesting a palatal-free gingival graft, an open wound devoid of epithelium is created, extending deep into the connective tissue and/or bone. This wound type requires a significant amount of new tissue formation with the secondary intention of healing. Postsurgical mechanical plaque control may be difficult to perform, thus compromising the healing process. It often leads to high postoperative morbidity because of the open wound5. Disadvantages like pain, post-surgical bleeding, and necrotizing tissue may occur after harvesting the palatal graft; therefore, when the palatal donor site is required for repeated procedures, healing time must be increased6.

Recently, patients' subjective assessment of medical procedures has gained importance in healthcare; thus patients' expectations might be crucial in the selection of treatment measures 7. Currently to optimize the tissue healing process of surgical beds and with the aim of reducing discomfort caused by surgery, the use of active oxygen gels and mouthwashes is being discussed. Bluem® oral gel formula is one such gel that is developed for oral problems with the following ingredients: Aqua, Alcohol, Glycerin, Silica, Sodium Saccharin, Sodium Perborate, Citric Acid, PEG-32, Sodium Gluconate, Lactoferrin, Xanthan Gum, Cellulose Gum with their specific functions. Literature evidence highlights the beneficial effects of antioxidant gels and mouthwashes in the management of gingivitis and periodontitis. Also, there was a significant reduction in gingival inflammation after the usage of Bluem® oral gel8. Our team has extensive knowledge and research experience that has translated into high quality publications.99–25

Oxygen is an essential nutrient for cellular metabolism, especially energy production. The substance is involved in multiple processes including oxidative killing of bacteria, reepithelialization, angiogenesis, and collagen synthesis 2,26. Maybe the main function attributed to oxygen is energy production, both in eukaryotic cells and in eukaryotic cells; however there is a paradox since oxygen is indispensable for the maintenance of cell life and on the other hand, it can cause cell death when the cell is exposed to high concentrations of it 27. A team of dental surgeons led by Dr. Peter Blijdorp in the Netherlands, developed a product based on active oxygen (blue®m), with the intention of putting all the desirable properties of mouthwashes in just one product. blue®m has in its composition sodium perborate, the glucose oxidase enzyme derived from honey, xylitol and lactoferrin. For dental applications, a new product that releases oxygen has recently been brought to market. The company’s main products are oral gel, toothpaste, mouthwash and mouth foam. Inclusion in everyday hygienic oral care of toothpaste and mouthwash blue®m reduced the severity of inflammatory changes and improved the hygienic condition of the oral cavity in cardiology patients suffering from periodontal disease 28. A Randomized Controlled Clinical Trial showed that toothpastes containing active oxygen and lactoferrin have comparable antiplaque and antigingivitis efficacies with triclosan-containing toothpastes 8. However, there is a lack of evidence regarding oxygen therapy for topical antibacterial treatment in periodontitis in the scientific community.

Considering the benefits that slow oxygen release seems to induce in wound healing 8,29–32 and its beneficial effects in the few clinical studies related to periodontal diseases, more studies are needed to investigate the effect of this new gel on

wound healing and periodontitis. This study aims to test and compare the in vivo effects of the product in gel with slow release of oxygen (blue®m) on the healing of donor site.

MATERIALS AND METHODS

This study was conducted with 30 subjects selected from the outpatient clinic, the , between March 2022 and September 2022.

A randomized controlled clinical trial study was conducted between March 2022 and September 2022 at Department of Periodontology, Saveetha University, Chennai. Thirty patients between 20 and 65 years of age with decreased width of attached gingiva were selected for the study. The sample size was determined using G power analysis at a confidence interval of 95 and statistical power of 90. The patients were informed about the objectives of the study, and informed consent was obtained before enrolling them. The study protocol was approved by the Ethics Committee of Scientific Research, Saveetha University.

Inclusion criteria included the following: patients with mucogingival defects scheduled for free gingival graft with minimum of 1-2mm of attached gingiva present, systemically healthy patients.

Exclusion criteria included the following: patients with any uncontrolled local or systemic disease where periodontal plastic surgery might be contraindicated, history of recent periodontal surgery at the donor site, smokers, pregnancy and lactation, patients allergic to the used agents, severe gagging reflex, and inability or unwillingness to provide informed consent.

Patients were assigned randomly by the co-supervisor(JR) using computer-generated random number method, into two equal groups; in group 1 (control group)- palatal donor site was covered with AbGelTM alone and, in group 2 (test group)- blue®m gel was applied to the palatal donor site and covered with AbGelTM.

Surgical Technique

Preparation OfRecipient Site

Full-mouth supragingival and subgingival debridement was performed using ultrasonic device and Gracey's curettes. Proper oral hygiene instructions were given to the patients including brushing teeth 2 times daily by soft toothbrush.

Chemical plaque control with 0.125% Chlorhexidine HCL mouthwash was prescribed to be used twice daily for 2 weeks.

Preparation Of Recipient Site

In both the groups, preparation of the recipient site was performed according to Zucchelli and Mounssif33 as follows: Two horizontal incisions were performed, being traced 1 mm coronal to the cementoenamel junction (CEJ) and extending 3 mm mesiodistally. Two vertical incisions diverging slightly in a corono-apical direction and extending 4 to 5 mm beyond mucogingival junction were performed. The trapezoidal area thus outlined was dissected using split-thickness incision to expose 3 to 4 mm of the apical periosteum to bone dehiscence. The soft tissue consisting mainly of alveolar mucosa that covered the recipient bed was removed with surgical scissors.

Harvesting Fgg

In both groups, FGG was harvested from the palate as described by Zucchelli et al.34 as follows: Two horizontal incisions were performed, where the coronal incision was 2 mm apical to the gingival margin of the adjacent teeth and two vertical incisions were traced to delineate the area to be grafted. The blade was inserted along the coronal horizontal incision at one edge perpendicular to the bone and once the adequate thickness of the graft was obtained which was 1–1.5 mm, the direction of the blade was changed to be parallel to the hard palate and moved in mesiodistal direction elevating the graft at one side until the graft became completely detached from the palate. The thickness of the graft was maintained uniform while proceeding apically with the blade. Care was taken to avoid removing the palatal periosteum. Once the graft was harvested, it was placed on a sterile gauze with saline to avoid the shrinkage of the graft.

The FGG was positioned and firmly adapted to the recipient area and stabilized with two simple interrupted periosteal sutures and a criss-cross sling suture using 5–0 Vicryl suture material and Castroviejo Needle Holder 33.

Management Of Palatal Wound

After harvesting the FGG, the bleeding was controlled by application of pressure using sterile gauze for 5 min until it stopped.

Group 1

The palatal wound was immediately covered by an AbGelTM (absorbable gelatin sponge) (Sri Gopal Krishna Labs, Pvt.Ltd, Mumbai - 80mm x 50mm x 10mm). Seven days postoperatively, the patients were recalled, and the collagen plug was removed for evaluating the healing of the palatal wound and then repacked with AbGelTM.

Group 2

Blue®m gel was applied using sterile cotton pellet, and the palatal wound was immediately covered by AbGelTM. Three days postoperatively, the patients were recalled, and the AbGelTM was removed for evaluating the healing of the palatal wound. Then Blue®m gel was reapplied again, and the palatal donor site was repacked with AbGelTM.

Post Surgical Protocol

The AbGelTM was finally removed after 1 week. Patients received 600 mg Ibuprofen on surgery day for pain control, and they were instructed to take Ibuprofen 600 mg only if needed and to count the number of pills taken for the purpose of indirect pain measurement via mean consumption of analgesics (mg). Patients were advised to rinse with antiseptic mouth rinse (0.12% Chlorhexidine HCL) twice daily for 1 minute for a period of two weeks after the surgery. Patients were instructed to avoid any hard brushing and trauma to the surgical site for 3 weeks. Three weeks postsurgically, the patients were instructed to gently brush the operated area with a soft toothbrush using circular scrub technique. The sutures were removed fourteen days after the surgery from the recipient site that was augmented by the FGG. Clinical photographs were taken for the palatal wound after 1 week, and finally on day 42 postsurgically for evaluation of the healing of the palatal wound at different time intervals.

RESULTS

A total of 60 patients (12 women and 18 men in group 1 and 10 women and 20 men in group 2) aged between 18 to 65 years (mean age, 38.67 ± 8.88 and 38.67 ± 9.61 in group 1 and 2 respectively) were included in this study (Table 1). 60 free gingival graft cases with minimum attached gingiva of 1-2mm were distributed in the lower anterior region. All patients completed the study and no dropouts were reported. Healing was uneventful in all the patients.

Post Operative Pain

Pain score was reported by the patient directly through Visual Analogue Scale (VAS) score (between 0 and 10; 0: no pain, 1: minimal pain, 5: moderate pain, and 10: severe pain) (Steigmann, 1965). VAS was recorded at 3 different intervals till 1 month.

Immediately After 2 h (immediately after the effect of anesthesia was resolved), no significant difference was found between both groups ($p > 0.05$). The pain was significantly reduced in both the groups from baseline to 1 week and 1 month ($p < 0.05$). At one week and After 1 month, there was a significant difference between both groups ($p < 0.05$) (see Table 2).

Wound Healing Index (Laundry Et Al, 2005)

Values from one week to one month (within the groups) in group 1 and group 2 showed a significant difference ($p < 0.05$) (see Table 3). At the 1-week follow-up, there was a statistically significant difference between the groups ($p < 0.05$). Even at 1 month, a significant difference was found between the groups ($p < 0.05$) (see Table 4).

Healing index	Criteria
Very poor - 1	Tissue color: more than 50% of gingivae red Tissue color: more than 50% of gingivae red. Response to palpation :bleeding Granulation tissue: present Incision margin: not epithelialised, with loss of epithelium beyond margins Suppuration: present
Poor - 2	Tissue color: more than 50% of gingivae red Tissue color: more than 50% of gingivae red. Response to palpation: bleeding Granulation tissue: present Incision margin: not epitheliased with connective tissue exposed.
Good - 3	Tissue color: less than 50% of gingivae red Tissue color: more than 50% of gingivae red. Response to palpation: no bleeding Granulation tissue: none Incision margin: no connective tissue exposed
Very good - 4	Tissue color: less than 25% of gingivae red Response to palpation: no bleeding Granulation tissue: none Incision margin: no connective tissue exposed
Excellent - 5	Tissue color: all gingivae pink Response to palpation: no bleeding Granulation tissue: none Incision margin: no connective tissue exposed

TABLE 1: Demographic details of group 1 and 2

Parameters		Group 1	Group 2
Age		38.67 ± 8.88	38.67 ± 9.61
Gender	Male	18	20
	Female	12	10

TABLE 2 : Comparison of Pain score from baseline and postoperative values in group 1 and 2

Parameters	Duration	Immediate	Postoperative	p value
Pain score (Within group 1)	One week	7.70 ± 1.36	2.47 ± 1.27	0.001*
			0.50 ± 0.63	0.007*
Pain score (Within group 2)	One week	7.57 ± 1.27	1.50 ± 0.77	0.000*
			0.13 ± 0.34	0.001*

* – Statistically significant ($p < 0.05$)

TABLE 3 : Comparison of wound healing index from one week and one month postoperatively in group 1 and 2

Parameters	One week	One month	p value
Wound healing Index (Within group 1)	2.47 ± 0.97	4.30 ± 0.79	0.000*
Wound healing Index (Within group 2)	2.30 ± 0.70	4.87 ± 0.34	0.000*

* – Statistically significant ($p < 0.05$)

TABLE 4 : Comparison of outcome parameters postoperatively between group 1 and 2

Parameters	Duration	Group 1	Group 2	p value
Pain score	Immediate	7.70 ± 1.36	7.57 ± 1.27	0.698
	One week	2.47 ± 1.27	1.50 ± 0.77	0.019*
	One month	0.50 ± 0.63	0.13 ± 0.34	0.000*
Wound healing Index	One week	2.47 ± 0.97	2.30 ± 0.70	0.041*
	One month	4.30 ± 0.79	4.87 ± 0.34	0.000*

* – Statistically significant ($p < 0.05$)

DISCUSSION

Unlike the healing within the skin surface, wounds located in the oral cavity are surrounded by a different environment for the healing of oral epithelial wounds that occurred during various periodontal surgeries, since it is impossible for the oral environment to be sterilized from oral bacteria/plaque formation. Therefore, it is important to protect the wound surface from the external bacteria or infection after periodontal surgery. Regenerative periodontal surgeries comprises procedures that are specially designed to regain/restore the parts of soft and hard tissue structures that have been lost due to periodontitis 5. Gingival recession is one such condition that is commonly seen in dental practices. Its presence can be due to aesthetic and functional problems like dentinal hypersensitivity, cervical wear, bone loss underneath, root caries, abrasion and tooth mobility because of the exposure of the root surface to the oral environment34. In recent decades, various surgical procedures were proposed which include, coronally advanced flaps(CAF), laterally repositioned flaps(LRF), free gingival grafts(FGG) and subepithelial connective tissue grafts(CTG) etc which seem to be novel approaches to show improvements in clinical parameters like recession depth, clinical attachment level, and width of keratinized tissue34. Previous studies on the FGG and its donor sites have shown that the palatal wound requires at least 2–4 weeks to heal with a secondary intention 35 which in turn results in a longer healing time, and patients reporting more discomfort mainly in the first 2 postoperative weeks36. Many methods like using growth factors, collagen membranes and gelatin plugs were used previously to enhance the healing process. Bluem® oral gel formula is developed for oral problems such as improving healing and reducing bacterial colonization. Literature evidence highlights the beneficial effects of antioxidant gels and mouthwashes in the management of gingivitis and periodontitis. Also, there was a significant reduction in gingival inflammation after the usage of Bluem® oral gel 37. Hence, the employment of Bluem® oral gel as palatal bandage can not only enhance the healing at donor site but also reduce patient discomfort.

This study evaluated the influence of Bluem® oral gel on the early wound healing of donor sites of FGG, along with the application of a gelatin sponge. The results of this trial showed no statistically significant difference between groups at one week, and 1 month when VAS scores were analyzed. More pain was encountered in group 1 after 1 week postoperatively, and there was a statistically significant difference. This may be attributed to the finite properties of the gelatin sponge dressing as a physical barrier without any biological or chemical positive effect on the wound healing process or antibacterial activity 38,39. On the contrary, the blue®m oxygen gel group exhibited a reduction effect of pain and

inflammation. Although the differences were significant between both groups at 1 and 4 weeks postoperatively, regarding wound healing all patients had a normal pink gingival appearance after 4 weeks. At 1 and 4 weeks postoperatively, the blue®m oxygen gel showed significantly faster healing (re-epithelization). This may be attributed to the ability of the oxygen gel to promote neovascularization, stimulation, and formation of new blood cells and the increase in the production of stem cells to form new fibroblasts 40,41.

Also, although it may be argued that the presence of sutures might influence VAS scores in the 1st week timepoint, a statistically significant difference between groups was observed at one month follow-up. Similarly to this RCT, previous studies have assessed VAS based on the type suture technique39 application of tissue adhesive40, and use of platelet-rich fibrin41. For instance, Lektemur Alpan & Torumtay 42 evaluated the use of platelet-rich fibrin in palatal tissue donor sites after harvesting SCTG with the SIT. They found no differences between groups on the 14th and 30th day of EHI scores; however differences were obtained at 3rd and 7th day favoring the platelet-rich fibrin group 41. Maino et al.39 using different suturing techniques with the single incision approach found that 25% of the sample showed partial or complete necrosis of the palatal tissue at 1 week (EHI 4 and 5). Our study agrees with those results obtaining 30-33% of EHI 4 and 5. Recently, Stavropoulou et al.40 examined early wounds. There was no irritation or allergy with regards to Blue M gel. Previous studies presented that using a Coe-Pack dressing caused severe tissue reaction and irritation 37,43,44. Further randomised, multi-centered studies are required for the generalisability of our results,

CONCLUSION

According to the findings of the present study, using the blue®m oxygen gel as an adjunct to an AbGelTM improves wound healing, stimulates rapid re-epithelization, and relieves postoperative pain compared with the conventional dressing with AbGelTM alone.

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