IOSR Journal of Dental and Medical Sciences (IOSR-JDMS)
e-ISSN: 2279-0853, p-ISSN: 2279-0861.Volume 20, Issue 9 Ser.3 (September. 2021), PP 53-58
www.iosrjournals.org

A Comparative Evaluation of Gingival Tissue Response Following A Non Eugenol Dressing And A Light Cure Dressing After Periodontal Flap Surgery- A Randomized Split Mouth Clinical Trial

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Abstract
Introduction- Periodontal dressings have been used for several years as a protection over injured tissue to shield the area from further insult. Several dressings are commercially available. A recently introduced light - cured resin, claimed to be more biocompatible and esthetic, needs a critical evaluation.
Aim- The aim was to compare the gingival tissue response following placement of a non-eugenol periodontal dressing (Coe-Pak) and a light cure dressing (Barricaid) after periodontal flap procedure.
Materials and Methods- A total of 10 patients with chronic generalized periodontitis requiring surgery in atleast two different quadrants were enrolled for this split mouth study. After periodontal flap surgery, Coe-Pak was placed in the quadrant assigned to Group I and Barricaid was placed in the other quadrant assigned to Group II. Evaluation was carried out by Plaque index, Modified Gingival index and healing response. Patient comfort, pain levels and patient preference by VAS were also evaluated. Clinical parameters were recorded on day 7th and 14th day.
Results- Group II showed better results than Group I when plaque scores, bleeding scores, modified gingival index scores, and pain and discomfort scores were compared though the differences were not statistically significant. Subjects found no unpleasant taste/smell and perceived the light‐cured dressing to be better. A significantly higher number of patients preferred light‐cured resin as a post‐surgical dressing over Coe‐Pak.
Conclusion-The light‐cured dressing showed better patient acceptability and proves to be a better alternative to Coe‐Pak as a dressing material.

Date of Submission: 25-08-2021 Date of Acceptance: 09-09-2021

I. Introduction

Periodontal surgery involves the surgical manipulation of the oral mucosa and the tooth supporting structures to alleviat a variety of problems. The sequelae of periodontal surgery are commonly pain swelling, inflammation, bleeding; and many periodontists advocate that some form of protection should be applied over the surgical traumatized tissue so that it is shielded from further insult.[1] Blanquie suggested that the purpose of dressing was to control post-operative bleeding, decrease postoperative discomfort, splint loose teeth, allow for tissue healing under aseptic conditions, prevent reestablishment of pockets, and desensitize cementum.[2] However, Bernier and Kaplan insisted that the primary purpose of a periodontal dressing is physical wound protection, and the constituents which may aid in healing are of secondary importance.[3] Periodontal dressings provide postoperative patient comfort and are known to reduce dead space beneath the periodontal flap. For this reason, they continue to be widely used to cover and protect the wound surface from the external environment, although their application or omission is a matter of individual preference based on clinical

experience.[4]Introducing periodontal dressings in 1923, Ward advocated the use of a packing material, Wondrpak, around teeth following periodontal flap surgery.[5] Traditionally, periodontal dressings were based on zinc oxide eugenol system. Due to the various side- effects of eugenol, latest periodontal dressings are usually formulated without it.[6]

Coe- Pak™ (GC America Inc., IL, USA) is one of the most widely used dressings today and offers a standard to which new dressings can be compared. It is a two- component noneugenol dressing, also containing bacteriostatic agents. Apart from having the effects common to all periodontal dressings, it is free from tissue irritating properties of eugenol dressings. It is known to possess good adhesive properties[7] and adapts closely to the teeth and soft tissue, preventing detachment of postsurgical flap from the root surface.[8] Although widely accepted, Coe- Pak™ has a number of disadvantages such as poor appearance, ill- defined setting time and poor flow properties during manipulation.[9] Particularly, its bulky nature and poor esthetics have always been a concern for patients after surgery.

Visible light- cured periodontal dressing material, commercially available as Barricaid® (DENTSPLY International Inc., Milford, DE, USA), based on polyether urethane dimethacrylate resin is stated to be an advanced concept in the protection of periodontal wound sites.[10] Its superior physical properties such as easy manipulation, better surface smoothness, interdental retention, and translucent pink color have been claimed to favor its clinical application. Due to these superior properties, this material is gaining wide popularity among periodontists and patients.

Hence, the aim was to compare the gingival tissue response following placement of a non-eugenol periodontal dressing (Coe-Pak) and a light cure dressing (Barricaid) after periodontal flap procedure.

II. Materials And Methods

A total of 10 patients having moderate to severe periodontitis were selected from the outpatient department of periodontology and implantology, SMBT dental college and hospital, Sangamner. Ten adult patients of either sex aged 30–60 years with generalized pocket probing depth (PD) of ≥ 5 mm, requiring periodontal flap surgery in at least two different quadrants were selected randomly for the study. Ethical clearance was obtained from the Institutional Ethics Committee of SMBT Dental College, Sangamner, India. Written informed consent was obtained from each subject after an explanation of the proposed study design, treatment outcome, potential risks, and benefits. Patients with systemic diseases, smokers and pregnant and lactating women, individuals with unacceptable oral hygiene, patients contraindicated for periodontal surgery and patients undergone periodontal therapy for past 6 months were excluded from the study. A detailed history and examination were carried out along with complete hemogram and panoramic radiographs.

PRESUGICAL PHASE

A total of 10 selected patients were subjected to nonsurgical periodontal treatment that included thorough supragingival and subgingival scaling and root planing. They were placed on strict oral hygiene maintenance program. Re- evaluation was done after 4–6 weeks of completion of phase I therapy and baseline clinical parameters, i.e., plaque index (PI) [11] modified Sulcular Bleeding Index (mSBI) [12] and pocket PD were recorded. Only those subjects with a PI of <1 and residual pocket probing depth ≥5 mm in all the teeth of at least two quadrants were finally included in the study. After applying these criteria at the end of nonsurgical therapy, these patients underwent flap surgery of two different quadrants with an interval of 4 weeks. Quadrants were randomly assigned to Group I (Coe- Pak™) and Group II (Barricaid®).

SURGICAL PHASE

In Group I, following sulcular incisions, a full thickness mucoperiosteal flap was reflected both facially and lingually. After thorough debridement and root planing of the exposed root surface, the flap was placed in its original position and sutured using non- resorbable silk thread. Thereafter, in Group I, Coe- Pak™ was placed at the surgical sites. Equal lengths of base and catalyst paste of this dressing were mixed on a glass slab according to manufacturers' instructions (Figure 1). It was applied and pushed well into the embrasure spaces using moist gloved hands so that it is molded to the required contour. It was extended from one tooth mesial to the first suture to one tooth distal to the last suture of the surgical segment, extending from the cervical third of teeth to mucogingival junction.

Photocured dressing, i.e., Barricaid® was placed in Group II. It was dispensed directly through syringe on the cervical third of teeth and gingival margin after drying the site. The material was muscle molded, contoured with a plastic instrument, carver, or finger pressure with lubricated gloved hands (Figure 2). It was light cured for 10 s per tooth per side and additional material was added wherever required and cured incrementally. One side (buccal or lingual) was covered before proceeding to the opposing side. Occlusal clearance over the dressing was also checked. The extent of the dressing was same as described above with Coe- Pak™. In both cases, patients were given postoperative instructions and advised to rinse with 10 ml of

0.2% chlorhexidine gluconate solution twice daily for 1 week for assistance in plaque control. They were also prescribed ibuprofen tablets 400 mg three times daily for 3 days. The periodontal dressing was removed on the 7th day after surgery in two parts (buccal and lingual) using a dental tweezer and a blunt probe.

Patients were asked to fill an assessment questionnaire and rate the preferred dressing based on pain and discomfort experienced, taste, appearance, retention, burning sensation and sensitivity experienced with each type of dressings.

Following clinical parameters were also evaluated at the surgical site on the 7th day and 14th day after surgery in both groups: Wound healing index (WHI), [13] Plaque index (PI) on tooth surfaces (Silness and Löe) [11] and modified sulcular bleeding index (mSBI). [12]

Evaluation of wound healing was based on the parameters of tissue color, bleeding in response to palpation, the presence of granulation tissue and condition of incision margin. Each of these four parameters was separately assessed on the scale of 1 (very poor) to 5 (excellent), and the total score was finally divided by 4 to get the WHI score.

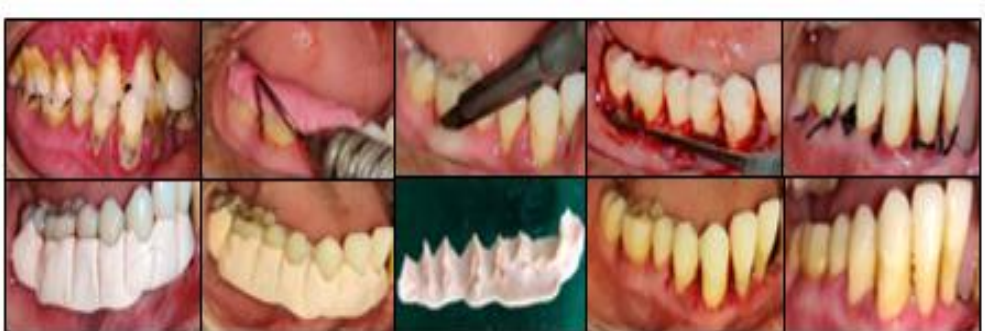

Figure 1.Placement of Coe Pack Dressing

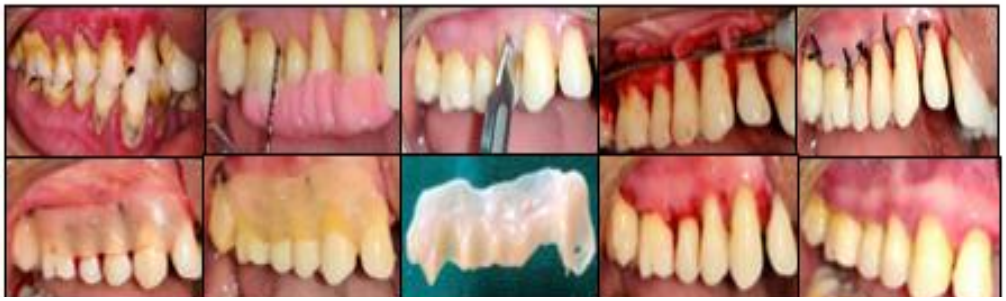

Figure 2. Placement of Barricaid Dressing

III. Statistical Analysis

A total of 20 surgical quadrants were evaluated in 10 patients who underwent periodontal flap procedure. Mean and standard deviation values of each parameter were calculated for both groups, and an inter- group comparison was established statistically on day 7 and day 14. The intra- group mean values of clinical parameters on day 7 and day 14 were compared statistically. Change in intra-group values from day 7 to day 14 for each parameter was then also compared between both the groups. Statistical analysis was performed using Statistical package for social science version 21 for Windows (Armonk,NY:IBM Corp). Descriptive quantitative data was expressed in mean and standard deviation respectively. Data normality was checked by using Shapiro Wilk test. Confidence interval was set 95% and probability of alpha error (level of significance) set at 5%. Power of the study at 80%. Intergroup comparison of gingival and periodontal parameters (parametric) between Group A and Group B was done using unpaired t test. Intergroup comparison of burning and hypersensitivity levels (non –parametric) between Group A and Group B was done using Mann Whitney U test. Intragroup comparison of gingival and periodontal parameters (parametric) in Group A and Group B at different time intervals was done using t test.

IV. Results

The present study included five females and five males with the mean age of 44.25 ± 9.55 years. There was no statistically significant difference in clinical parameters (PI, mSBI) between two groups at baseline. All 10 patients reported on both 7th and 14th postoperative day after each surgery. Clinical parameters included PI, WHI, mSBI.

Plaque index

No statistically significant differences were observed between the two groups on day 7 and 14 for PI on the tooth surfaces. Intragroup comparisons showed a significant decrease in PI from day 7 to day 14 [Table 1]. This implies that both the dressings influence the plaque deposition or its regression over time on the tooth surfaces in a similar manner.

mSBI

There was no statistically significant difference observed between two groups at both 7 days and 14 days' time points [Table 2]. Mean values decreased significantly over time from day 7 to 14 in both groups. This difference was also not statistically significant on the inter‐ group comparison. This implies that inflammatory status of soft tissue at the surgical site and improvement of clinical gingival parameters from 7th to 14th day was influenced by both the dressings in a similar manner.

WHI

The mean values of WHI on day 7 and day 14 for both groups are given and compared in Table 3. The intra‐ group difference from day 7 to day 14 (ΔWHI) was found to be statistically significant ($P < 0.05$) for both the groups indicating an improvement in wound healing. Inter‐ group comparison of this difference (ΔWHI) was also found statistically significant ($P = 0.045$) with Group II showing greater improvement in wound healing between day 7 and day 14 than Group I.

Patient reported parameters

These parameters included pain assessment based on the verbal rating scale, and patient's preference based on burning sensation, hypersensitivity, appearance, and taste and retention
of dressings.

Pain assessment

Mean pain score was recorded in the postoperative questionnaire given to patients and compared between the two groups [Table 4]. On statistical analysis, it was found that no particular dressing significantly influenced the general pain perception after surgery more than the other.

Discomfort assessment

Discomfort to patients was assessed using a questionnaire asking specifically about burning sensation and hypersensitivity in the operated area, during the first postoperative week. Few patients reported the incidence of mild burning sensation in the case of Coe‐ Pak™ (Group I). Five patients in Group I and three patients in Group II experienced hypersensitivity [Table 5].

Patient's preference

All 12 patients were in favor of Barricaid® when asked about esthetic appearance and taste. Their opinion was equally divided when asked about retention of dressing to the operated area. However, 75% of patients (9 out of 10) showed an overall preference for Barricaid® than Coe‐ Pak™ [Table 6].

V. Discussion

The rationale for the use of periodontal dressings has always been debatable as their effects on periodontal wound healing have been questioned over the years, and they are said to be associated with more plaque accumulation when compared to no dressing.[14] Therefore, the effect of various dressings on wound healing, the amount of plaque accumulation beneath dressings, their biocompatibility with postsurgical tissue, are the most important parameters, based on which these materials can be critically assessed and a preference established. [15]

Visible light cure periodontal surgical dressing available by the brand name of Barricaid®, is based on a polyether urethane dimethacrylate resin which claims to be an advanced concept in the protection of periodontal surgical sites.[10]

It is said to have the advantage of possessing a translucent pink color, that simulates gingiva and a rate of curing, which is easily controlled by illumination with visible light. It is easily applied, tinted and its translucency permits clinical observation without removal of the dressing. Furthermore, histologic studies have shown that extracts and solid specimens of polymerized light cure dressing are exceedingly biocompatible. This study was planned to compare the effect on healing and patient acceptance of light‐ cure dressing with age‐ old standard,

i.e., non-eugenol pack. A split‐ mouth study design was used which has the advantage of allowing each patient to act as his/her own control and removing a lot of inter‐ individual variability from the estimates of the treatment effect.

The results showed significantly less plaque attached underneath the dressings in Group II, as was also observed by Richard *et al.* in 1989.[19]The rough and flint‐ like surface texture of hardened non-eugenol pack attract more plaque on its irregular surface. Since, the light‐ cure dressing has a smooth and shiny surface forming a firm, nonbrittle, elastic covering when set, it accumulates less plaque as compared to

Coe- Pak™.Within both the groups, following the removal of dressing, the PI scores decreased from day 7 to day 14. This is in accordance with the findings of many clinicians, who also reported slightly greater accumulation of plaque beneath the periodontal dressings initially, but not to a detrimental level to retard the healing process.[20, 21]

The difference in the WHI between the two groups was not significant at both time points, but the mean values indicated improvement in healing over time from day 7 to day 14 within each group. This is in accordance with the findings of Madan *et al.*[23] and Smeekens *et al.*[24]who reported satisfactory healing of surgically treated oral tissues after application of a photocuring periodontal dressing material based on the histological evaluation.

After removal of the dressing on day 7, Group II showed greater improvement in healing score on day 14 as compared to Group I (seen by WHI). This was because initial mean value of WHI on day 7 for Group II was lower than Group I (although not statistically significant). This initial low score of WHI in Group II, implying slower healing may be attributed to partly- cured material in the depth of dressing, containing residual free monomer that impedes healing of gingiva in contact. Similar results were reported by Gilbert *et al.* in their *in vitro* study who suggested that uncured material produces a surrounding zone of growth inhibition and cell toxicity, however, this growth inhibition last for only 5 days. The fully- cured material has been reported to cause no such effect on cells.[17] After removal of the light cure dressing, healing progressed uneventfully and was found comparable with Group I on day 14.

mSBI was used to assess the bleeding tendency of the gingival margin. This index requires a periodontal probe to be passed along the gingival margin instead of probing the depth of sulcus as done in commonly used Gingival Index. Since bleeding tendency was evaluated at one and 2 weeks after surgery, it was necessary to avoid probing of gingival sulcus so that reattachment of newly formed junctional epithelium was not disturbed. Light cure dressing was not associated with any significant increase in bleeding as seen in mSBI scores thus reflecting its acceptable biocompatibility. This finding is supported by a study of Petelin *et al*. who evaluated the effects of periodontal dressings on fibroblasts and gingival wound healing in dogs[24.] Alpar *et al.* and Gilbert *et al.* also showed similar results.[16, 17] Baghani and Kadkhodazadeh reviewed various periodontal dressings in 2013. They stated that Barricaid® is cytocompatible when its polymerization is complete.[25] The mSBI scores were higher on day 7 than day 14 after surgery within each group. This could be due to the normal inflammatory response of tissues after surgical manipulation or the tissue reaction to the presence of silk sutures as also reported by previous studies.[26, 27]

Considering patients' subjective and objective evaluation of the dressings, there were no significant differences in pain and discomfort experienced by them in both the groups. A review of periodontal dressings by Sachs *et al.* in 1984 states that the degree of pain and discomfort and the tissue healing is majorly attributed to the nature of the surgical technique itself, amount of surgical trauma, tissue management, and duration of the operation rather than the presence or type of dressing.[15] However, despite similar pain and discomfort with both the dressings, 75% of subjects preferred light cure dressing over non-eugenol pack due to its better appearance, the absence of annoying taste and reduced bulk.

It is worth to mention a study of Jorkend and Skoglund (1990)[28] who reported a higher incidence of pain following the use of Coe- pak as a periodontal dressing when compared to eugenol- containing dressings. This was attributed to the fact that Coe- pak lacks eugenol that exerts local anesthetic effect. But, eugenol- containing dressings have their own demerits, due to which they are no more in vogue. Lower pain scores with Barricaid seem to have influenced the better acceptance of the dressing. Another important consideration is the preference of the operator in terms of handling, manipulation as well as the working time of each dressing. Light cure dressing includes a single paste, therefore eliminating the time required for mixing as with non-eugenol pack. However, direct application technique by syringe could also raise issues of cross infection, unless the syringe is discarded after every surgery. Light cure dressing has the advantage of total control over the placement and setting time as well as incremental additions, whereas setting time of non-eugenol dressing is fixed, limiting the working time. While manipulation, both of these dressings need to be handled with moistened gloves, however after complete setting, light- cured dressing has an advantage of being firm in consistency, whereas non-eugenol dressings become brittle.

Translucency of Barricaid® allow for superior esthetics as well as monitoring of surgical site without removal of dressing. As far as cost- effectiveness is concerned, non-eugenol dressing is more economically- viable option. Therefore, both the clinician's personal preference as well as the patient acceptance are important while deciding the periodontal dressing of choice for specific clinical situations. The clinical performance of both the dressings in terms of healing, plaque and bleeding scores were found to be acceptable.

A double- blind study with a larger sample can establish more accurate evidence. Histological evaluation of gingival tissue and scanning electron microscopy of the removed dressing would have further shed light on the healing response. The microbial analysis would clarify the nature of plaque under each dressing.

VI. Conclusion

Within the scope of this study, it was found that the clinical gingival tissue response following placement of periodontal dressings after periodontal flap surgery was similar with both light cure and non-eugenol dressings. Although non-eugenol dressing retained more plaque on its under surface than light- cure dressing, this did not have much influence on the healing outcome and clinical gingival parameters, which were acceptable and comparable in both groups, suggesting that both dressings have similar effects on gingival healing after periodontal surgery.

However, a greater number of patients showed a preference for light- cure dressing, based on its superior aesthetics and taste. With due consideration to the above, it could be said that Barricaid proves to be a better alternative to Coe- pak as a dressing material, as it overcomes the limitations of Coe- pak.

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Saumya Saxena, et. al. "A Comparative Evaluation of Gingival Tissue Response Following A Non Eugenol Dressing And A Light Cure Dressing After Periodontal Flap Surgery- A Randomized Split Mouth Clinical Trial.'' *IOSR Journal of Dental and Medical Sciences (IOSR-JDMS)*, 20(09), 2021, pp. 53-58.