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Blue-M gel, barricaid and coe-pak as periodontal dressings: A randomized interventional study

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Abstract:

Periodontal dressings protect surgical wounds and improve comfort, but evidence for bioactive Blue-M gel remains limited. This randomized study included 40 patients with Stage II-III Grade A periodontitis, equally assigned to four groups (n=10). Plaque Index, OHI-S, Gingival Index, Bleeding Index, Wound Healing Index and pain scores were assessed at baseline, 7 days and 3 months. Blue-M showed greater reductions in plaque, inflammation and bleeding, faster healing (WHI: 4.8 ± 0.42) and lower pain than conventional dressings. Thus, Blue-M gel may be an effective alternative to conventional periodontal dressings after flap surgery.

Keywords: Periodontal dressing, blue-m gel, barricade, coe-pak, wound healing, periodontal flap surgery, Kirkland flap

Background:

The oral cavity presents a uniquely challenging wound-healing environment compared with extraoral tissues. Continuous salivary flow, a diverse microbial milieu, masticatory mechanical stress, speech-related muscle movements and temperature fluctuations collectively compromise wound stability following periodontal surgery. Periodontal dressings applied as protective coverings over surgical sites aim to reduce these risk factors, providing mechanical protection from clot dislodgement, minimizing patient discomfort and reducing plaque accumulation at the wound margin [1, 2]. Non-eugenol Coe-Pak has been widely adopted as a periodontal dressing. Composed of two paste components that chemically set to form a protective barrier, it is cost-effective and easy to manipulate. However, mechanical interlocking at interproximal areas creates risk of dislodgement and its relatively rough surface promotes plaque accumulation—significant limitations in postoperative wound management [3]. Barricaid is a light-cured urethane dimethacrylate (UDMA)-based resin dressing supplied as a single paste that is directly applied and polymerized with visible light to form a stable protective layer. Its superior mechanical strength, smoother surface and translucent aesthetics offer advantages over conventional dressings [4]. However, neither Barricaid nor Coe-Pak actively stimulate cellular repair or modulate the wound environment, prompting interest in bioactive dressings capable of enhancing biological healing. Blue-M Gel is a therapeutic adjunct formulated to release active oxygen in a controlled manner via sodium perborate, combined with glycerol and cellulose-based carriers to ensure sustained tissue contact. This controlled oxygen release promotes fibroblast proliferation, collagen synthesis and microbial resistance, offering the potential for enhanced biological wound healing [5]. Therefore it is of interest to compare the healing properties of Blue-M Gel with Barricaid and Coe-Pak as periodontal dressing materials following Kirkland flap surgery.

Materials and Methods:

The present study was conducted in the Department of Periodontics and Implantology, Maitri College of Dentistry and

Research Centre, Anjora, Durg, Chhattisgarh, following institutional ethical committee approval (IEC).

Study design and patient allocation:

Forty systemically healthy patients diagnosed with Stage II-III, Grade a periodontitis (2017 AAP classification) were selected following detailed clinical examination and periodontal assessment. Patients were randomly allocated into four groups of ten each:

- [1] **Group I (Control):** Kirkland flap surgery with sutures only, no periodontal dressing.
- [2] **Group II (Coe-Pak):** Kirkland flap surgery with sutures and Coe-Pak periodontal dressing.
- [3] **Group III (Barricaid):** Kirkland flap surgery with sutures and Barricaid light-cured periodontal dressing.
- [4] **Group IV (Blue-M Gel):** Kirkland flap surgery with sutures and Blue-M oxygen gel dressing.

Inclusion and exclusion criteria:**Inclusion criteria:**

Patients aged above 18 years diagnosed with Stage II-III Grade A periodontitis; systemically healthy; requiring periodontal flap surgery in the mandibular arch; willing and able to comply with the follow-up schedule; provided written informed consent.

Exclusion criteria:

Systemic diseases affecting periodontal healing (diabetes, cardiovascular disease, immunocompromised conditions); pregnant or lactating women; patients on medications influencing healing (antibiotics, corticosteroids, immunosuppressants); tobacco consumption in any form; periodontal therapy received within the preceding 6 months; unwillingness or inability to attend follow-up visits.

Initial preparation:

Prior to surgical intervention, all patients underwent thorough Phase I periodontal therapy and oral hygiene reinforcement. Only patients demonstrating adequate plaque control and reduction in gingival inflammation were enrolled for surgical intervention.

Clinical measurements:

Clinical parameters were recorded at baseline, 7 days and 3 months by a single calibrated examiner under standardized conditions. Parameters assessed included: Plaque Index (PI, Silness and L  e, 1964); Oral Hygiene Index-Simplified (OHI-S, Greene and Vermillion, 1964); Gingival Index (GI, Silness and L  e, 1963); Bleeding Index (BI); Wound Healing Index (WHI, Landry *et al.*, 1988); and Verbal Rating Scale (VRS) for postoperative pain.

Surgical protocol:

All surgical procedures were performed under strict aseptic conditions by a single experienced operator. Following local anaesthesia, the Kirkland flap technique was executed with thorough removal of granulation tissue and root planing using Gracey curettes and hand instruments. The surgical area was irrigated with sterile saline; the flap was repositioned and stabilized with interrupted sutures. Periodontal dressings were then applied per group assignment. In Group I no dressing was placed. In Group II, Coe-Pak was mixed per manufacturer instructions and adapted over the wound. In Group III, Barricaid was applied and light-cured. In Group IV, Blue-M oxygen gel was applied to facilitate oxygen release and support wound healing. Dressings were adapted without interfering with occlusion.

Post-operative instructions:

Patients were advised to avoid disturbing the surgical site for the first 7 days and to maintain routine oral hygiene in non-operated areas. Gentle rinsing with 0.12% chlorhexidine

mouthwash twice daily was prescribed. Analgesics were prescribed for pain management as directed.

Statistical analysis:

Data were analyzed using SPSS version 25. Within-group changes over time were evaluated using the paired t-test and repeated-measures ANOVA. Between-group comparisons were performed using one-way ANOVA. Statistical significance was set at $p<0.05$.

Results:

Baseline clinical parameters were statistically comparable among all four groups, confirming adequate randomization. Progressive reduction in all clinical parameters was observed from baseline through the 3-month evaluation in all groups. Groups receiving periodontal dressings exhibited better wound healing outcomes and lower postoperative pain scores than the control group. Among tested materials, Blue-M Gel demonstrated the most favorable healing response and patient comfort, followed by Barricaid and Coe-Pak. **Table 1** presents the intergroup comparison of mean clinical parameters across all follow-up intervals. At 7 days, the Wound Healing Index was highest in Blue-M Gel (4.8 ± 0.42), followed by Barricaid (4.4 ± 0.52), Coe-Pak (4.0 ± 0.47) and the control group (2.3 ± 0.48), with statistically significant intergroup differences ($p<0.001$). By 3 months, all dressing groups achieved a WHI of 5.0, while the control reached 4.0. Pain scores on the Verbal Rating Scale at 7 days were lowest in Blue-M Gel (0.0 ± 0.00), followed by Barricaid (0.1 ± 0.31), Coe-Pak (0.8 ± 0.42) and the control group (1.6 ± 0.51), again with highly significant intergroup differences ($p<0.001$).

Table 1: Intergroup Comparison of Mean Clinical Parameters at All Follow-Up Intervals (Mean±SD)

Parameter	Time Point	Control	Coe-Pak	Barricaid	Blue-M Gel	p-value
Plaque Index	Baseline	1.95±0.16	2.11±0.32	1.99±0.19	1.99±0.18	0.415
	7 Days	1.80±0.14	1.68±0.13	1.36±0.12	1.42±0.10	<0.001
	3 Months	1.62±0.11	1.35±0.13	1.18±0.10	1.05±0.09	<0.001
OHI-S	Baseline	2.02±0.20	2.15±0.30	2.01±0.18	2.00±0.17	0.960
	7 Days	1.80±0.14	1.68±0.13	1.49±0.11	1.43±0.10	<0.001
	3 Months	1.62±0.11	1.36±0.12	1.18±0.10	1.06±0.08	<0.001
Gingival Index	Baseline	2.01±0.20	2.15±0.30	2.05±0.18	2.01±0.17	0.939
	7 Days	1.81±0.14	1.65±0.13	1.44±0.11	1.44±0.10	<0.001
	3 Months	1.61±0.11	1.37±0.12	1.12±0.10	1.00±0.08	<0.001
Bleeding Index	Baseline	2.03±0.20	2.13±0.30	2.07±0.18	2.10±0.17	0.940
	7 Days	1.83±0.14	1.67±0.13	1.42±0.11	1.33±0.10	<0.001
	3 Months	1.64±0.11	1.30±0.12	1.11±0.10	1.02±0.08	<0.001
Wound Healing Index	7 Days	2.3±0.48	4.0±0.47	4.4±0.52	4.8±0.42	<0.001
	3 Months	4.0±0.80	5.0±0.90	5.0±0.90	5.0±0.70	<0.001
Verbal Rating Scale (Pain)	7 Days	1.6±0.51	0.8±0.42	0.1±0.31	0.0±0.00	<0.001

Discussion:

Periodontal dressings were introduced by Ward in 1923 to protect periodontal wounds from mechanical trauma. Earlier zinc oxide-eugenol formulations were associated with tissue irritation, allergic reactions and delayed healing, leading to the development of non-eugenol alternatives including Coe-Pak and Barricaid, which offer improved biocompatibility and clinical handling [6]. Watts and Combe (1982) reported that Coe-Pak exhibits poor flow properties and limited adaptability, which

may compromise patient comfort and promote plaque accumulation. In the present study, Barricaid showed favorable results for patient comfort and wound healing, consistent with findings by Alpar *et al.* (1999) [7] and Gilbert *et al.* (1994) [8], who reported excellent biocompatibility and favorable tissue response with light-cured Barricaid specimens. A reduced post-operative pain and improved patient acceptance with Barricaid, attributed to its smoother surface and better adaptability, has also been reported in the literature [9]. Blue-M oxygen gel,

developed by Dr. Peter Blijdorp and colleagues, contains sodium perborate combined with glycerol and cellulose carriers to allow controlled, sustained oxygen release [10]. This antimicrobial oxygen activity helps control pathogenic microorganisms associated with periodontal infections. In the present study, Blue-M gel showed superior healing outcomes, likely attributable to its oxygen-releasing and antimicrobial properties. Similar findings were reported by Shaheen *et al.*, who observed improved healing and reduction in peri-implant inflammation when Blue-M oxygen therapy was used as a surgical adjunct [11]. Some investigators have questioned the necessity of periodontal dressings following flap surgery. Stahl *et al.* (1969) reported that periodontal dressings may not significantly influence gingival healing following gingivectomy [12]. Similarly, other researchers have suggested that healing may proceed uneventfully without dressings when adequate plaque control and proper surgical technique are maintained [13, 14]. Despite these contradictory findings, clinicians continue to advocate periodontal dressings for their role in wound protection, flap stabilization, reduction of post-operative discomfort, prevention of food impaction and patient psychological comfort.

Conclusion:

Blue-M Gel showed the most favorable improvement in all clinical parameters and patient comfort following Kirkland flap surgery, followed by Barricaid and Coe-Pak, with the control group showing the least improvement. Blue-M Gel may be considered a viable and superior alternative to conventional periodontal dressings owing to its inherent wound healing and antimicrobial properties. Further multicenter, longer-term randomized controlled trials are warranted to validate and extend these findings.

Limitations:

The study was limited by a relatively small sample size and single-centre design, which may restrict generalizability. The follow-up period of 3 months does not capture long-term outcomes. Histological analysis, which could have provided

deeper insight into biological healing at the cellular level, was not feasible due to ethical considerations.

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Conflict of interest: The authors declare no conflict of interest.

Ethical approval:

The study was approved by the Institutional Ethics Committee, Maitri College of Dentistry and Research Centre, Anjora, Durg, Chhattisgarh.

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