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ORIGINAL ARTICLE

Comparative study of the effect of BlueM active oxygen gel and coe-pack dressing on postoperative surgical depigmentation healing

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KEYWORDS

Gingival pigmentation;
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Abstract *Introduction:* Black colored gingiva is an esthetic concern, especially when accompanied by a high lip line or gummy smile.

Surgical depigmentation with a scalpel is still considered the golden standard in gingival pigmentation management although it causes an area of open wound, which needs a special management with dressing.

This study aimed to comparatively evaluate the effectiveness of reactive oxygen gel species (BlueM gel) and the traditional Coe-Pack dressing on gingival healing and pain after surgical depigmentation.

Materials and Methods: This split-mouth randomized clinical trial was conducted on 20 non-smoking individuals aged 20–38 years with maxillary physiologic gingival pigmentation classes (III) and (IV) according to the Dummett–Gupta Oral Pigmentation Index (40 treated sites) who had requested an esthetic treatment for gingival hyperpigmentation of the maxillary gingiva.

The maxilla was randomly divided into two symmetrical parts—from the right second premolar to the midline and from the midline to the left second premolar—to receive either BlueM gel or Coe-Pack as a dressing after surgical depigmentation with a scalpel. Various indices were assessed, such as pain and reepithelization index with toluidine blue, and the follow-up period was 1 month.

Results: A total of 20 patients were included in this study. There were statistically significant differences in the pain index after 1, 2, 3, 4, and 5 days. The BlueM gel group showed a higher significant difference after 1, 2, and 3 weeks in the reepithelization index.

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Conclusion: Hence, BlueM gel can be considered as a good alternative for the Coe-Pack dressing after gingival depigmentation owing to its pain reduction properties, acceleration of wound healing, and postoperative reepithelization.

1. Introduction

The smile is an essential factor in social communication and has a significant influence on leaving a good first impression among people as it reflects their feelings and self-confidence. Therefore, the cosmetic aspect has become one of the most important goals of dentistry and plays a major role in improving it to achieve a healthy and attractive smile.

Gingival pigmentation is a cosmetic problem that cannot be ignored, especially for those with a gummy smile, where a large part of the gum is seen while smiling (excessive gingival display). This problem limits the possibility of spontaneous smiles for them and results in shyness and loss of self-confidence.

Dark pigmentation usually occurs because of excessive melanin deposition in the gingival epithelium. Melanin pigmentation of the gingiva is a physiologic process that occurs in all ethnicities (Dummett, 1945), and its appearance is not an indication of any danger (Suragimath et al., 2016).

Various techniques and methods have been employed to manage gingival hyperpigmentation, including surgical removal with scalpel or burs (Karydis et al., 2012). Gingivectomy (Tamizi and Taheri, 1996), free gingival graft, cryotherapy, electrosurgery, and laser (Li et al., 2002) are also used.

Although every technique has its advantages and disadvantages, applying the scalpel technique is a conventional and relatively simple approach that is still considered the golden standard as it can be easily performed under local anesthesia. In addition, it is low in cost compared with other techniques and does not need any additional sophisticated equipment (Roshna and Nandakumar, 2005).

The entire pigmented layer of the gingival epithelium, in addition to an underlying layer of the connective tissue, is removed by abrasion with the surgical scalpel (Ghalhar et al., 2014).

This procedure should be performed with caution and attention to protect the marginal gingiva from damage as a result of improper use, which may lead to gingival recession and damage to the periosteum and bone (Sharmila et al., 2013).

Since the exposed bleeding tissues heal by secondary intention, this requires the application of a periodontal dressing to minimize unpleasant bleeding, pain, and the probability of postoperative infection (Pera et al., 2012).

The objective of this study was to evaluate the effectiveness of conventional dressing Coe-Pack and BlueM oxygen gel on pain, the healing of the gingival tissue, and reepithelization acceleration.

2. Materials and methods

2.1. Study description

A split-mouth randomized comparative clinical trial study was conducted between March 2020 and September 2021 at the Department of Periodontology, Damascus University, Syria.

Twenty patients between 20 and 38 years of age with gingival hyperpigmentation 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. Maxillary labial pigmentation between both second premolars was divided into two symmetrical halves (from the left second premolar to the midline and from the midline to the right second premolar). Surgical depigmentation with the scalpel was performed for each half with 1 week interval to observe the pain index accurately. Subsequently, the divided areas were randomly allotted for receiving Coe-Pack or Blue gel as a postoperative dressing.

2.2. Dummet–Gupta Oral Pigmentation (DOP) index (Dummett, 1946)

This index was used to grade the level of gingival hyperpigmentation.

Scoring criteria for DOP:
One: No clinical pigmentation
Two: Mild clinical pigmentation
Three: Moderate clinical pigmentation
Four: Heavy clinical pigmentation (Fig. 1: A)

2.3. Exclusion criteria

Smokers, pregnant and lactating women, medically compromised patients, those with a history of periodontal surgery in < three months, those with gingival pigmentation associated with other syndromes and lesions, those with a score of > one for plaque and gingivitis indices, and those with a score of < three for DOP index were excluded.

All enrolled patients underwent oral prophylaxis and were asked to follow oral hygiene instructions. Follow up was after 3 months.

2.4. Conventional scalpel technique

The depigmentation procedure was performed using a conventional scalpel. Subsequently, one of the two dressings was applied, and an interval of one week was maintained between the two halves to assess the pain and reepithelization indices.

Each half underwent the following steps:

Topical anesthesia was applied with 2% lidocaine, and the entire pigmented layer of gingival epithelium in addition to an underlying layer of connective tissue was removed by abrasion with a no. 15 surgical blade. The depigmentation procedure was performed from the mucogingival junction to the base of the interdental papilla. Direct pressure was applied with a

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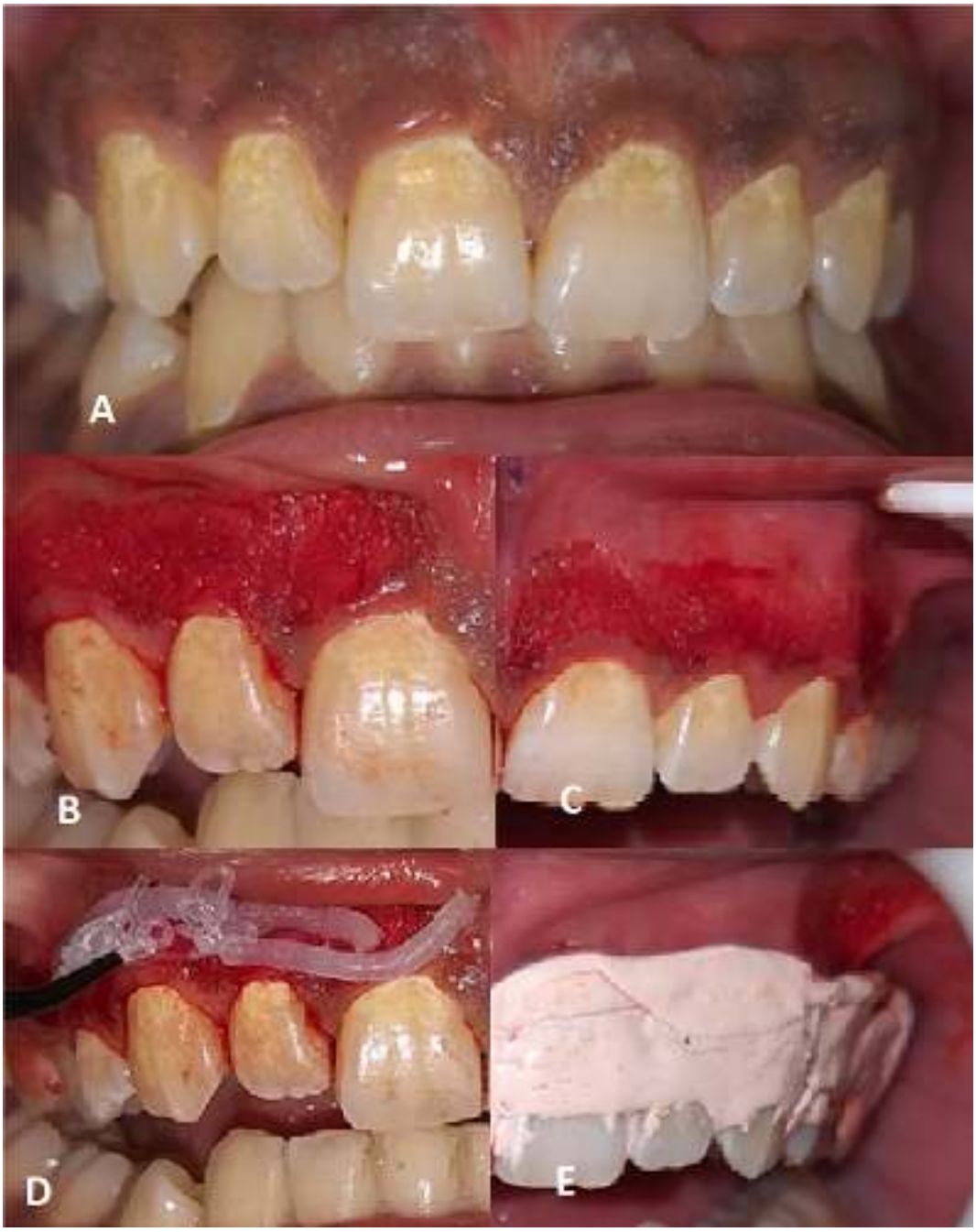

Fig. 1 A: severe gingival pigmentation score of 4 DOPI, B: {T} Group immediately postoperative, C: {C} Group immediately postoperative, D: After application of BlueM gel, E: After application of Coe-Pack.

sterile gauze to control hemorrhage during the surgical procedure (Fig. 1: B, C).

The depigmented area was covered with the conventional Coe-Pack periodontal dressing in the control group, whereas the BlueM oxygen gel was applied to cover the depigmented area in the test group (Fig. 1: D, E).

2.5. Benefits of periodontal dressing

1-Protects the surgical site from external factors

2-Enhances the patients' comfort after surgery

3-Protects the area of work from food debris

4-Protects the offset slides and secures them additionally after securing them with sutures

5-Protects the newly exposed root surfaces and sutures from thermal changes (Rubinoff and Greener, 1985)

2.6. The Coe-Pack dressing

It is the most widely used non-eugenol containing periodontal dressing and is manufactured by Coe Laboratories (Alsip, IL, USA). It consists of two pastes—a base and a catalyst—and

has a physical role in protecting the surgical sites (Embery et al., 2000). Postoperatively, the denuded sites in Group C were covered with Coe-Pack dressing, which was removed at the first recall visit after 1 week.

2.7. BlueM oxygen gel

A team of dental surgeons in Netherlands recently developed an active oxygen formula (BlueM gel), with impressive results via the interaction of its active ingredients honey enzymes and sodium perborate. It has the particularity to release oxygen at a therapeutic concentration in the affected tissues (Eisenbud, 2012).

In addition to its oxygen-releasing components, BlueM gel contains other substances with an antibacterial effect (Han et al., 2005).

2.8. The therapeutic effects of BlueM

- Neovascularization
- Removal of toxins
- Stimulation and formation of new blood cells
- Increasing the production of stem cells, which leads to more rapid healing
- Antibacterial effect
- Antihistamine effect
- Antimycotic effect (Rodriguez et al., 2008)

Postoperatively, the denuded sites in Group T directly received BlueM oxygen gel, where the patients received the BlueM oral gel for topical home use 3 times/day for 1 week.

2.9. Data management and statistical analysis

The data were coded and entered in a Microsoft Excel sheet, imported, and analyzed using SPSS (IBM, USA) v. 25.

Table 2 Mann–Whitney *U* test.

Time	Dressing	Rank average	P value
After 2 h	Bluem gel	18.5	289
	Coe-pack	22.5	
After 24 h	Bluem gel	16	**0.014**
	Coe-pack	25	
After 2 days	Bluem gel	14.2	**0.000**
	Coe-pack	26.8	
After 3 days	Bluem gel	11.5	**0.000**
	Coe-pack	26.7	
After 4 days	Bluem gel	13.5	**0.000**
	Coe-pack	27.5	
After 5 days	Bluem gel	16.5	**0.030**
	Coe-pack	24.5	
After 6 days	Bluem gel	18.5	0.289
	Coe-pack	22.5	
After 7 days	Bluem gel	20.5	1.000
	Coe-pack	20.5	

Table 1 Pain index frequencies and percentages of BlueM gel and Coe-Pack groups.

Time	Pain index	Bluem gel		Coe-pack	
		Frequency	%	Frequency	%
After 2 h	No pain	10	50%	6	30%
	Mild	10	50%	14	70%
	moderate	0	0%	0	0%
After 24 h	No pain	10	50%	4	20%
	Mild	10	50%	10	50%
	moderate	0	0%	6	30%
After 2 days	No pain	18	90%	6	30%
	Mild	2	10%	8	40%
	moderate	0	0%	6	30%
After 3 days	No pain	18	100%	4	20%
	Mild	0	0%	12	60%
	moderate	0	0%	4	20%
After 4 days	No pain	20	100%	6	30%
	Mild	0	0%	14	70%
	moderate	0	0%	0	0%
After 5 days	No pain	20	100%	12	60%
	Mild	0	0%	8	40%
	moderate	0	0%	0	0%
After 6 days	No pain	20	100%	16	80%
	Mild	0	0%	4	20%
	moderate	0	0%	0	0%
After 7 days	No pain	20	100%	20	100%
	Mild	0	0%	0	0%
	moderate	0	0%	0	0%

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Table 3 Reepithelization index frequencies and percentages of BlueM gel and Coe-Pack groups.

Time		Re-epithelization index Frequency	Bluem gel %	Frequency	Bluem gel %	P value
	Score 1	0	30%	6	30%	**0.002**
After 1 week	Score 2	2	30%	6	30%	
	Score 3	16	40%	8	40%	
	Score 4	2	0%	0	0%	
	Score 1	0	0%	0	0%	**0.001**
After 2 weeks	Score 2	0	20%	4	20%	
	Score 3	2	50%	10	50%	
	Score 4	18	30%	6	30%	
	Score 1	0	0%	0	0%	**0.001**
After 3 weeks	Score 2	0	0%	0	0%	
	Score 3	0	60%	12	60%	
	Score 4	20	40%	8	40%	
	Score 1	0	0%	0	0%	**1.000**
After 1 month	Score 2	0	0%	0	0%	
	Score 3	0	0%	0	0%	
	Score 4	20	100%	20	100%	

Table 4 Mann–Whitney *U* test.

Time	Dressing	Rank average	P value
After 1 week	**Bluem gel**	**26.2**	**0.002**
	Coe-pack	14.8	
After 2 weeks	Bluem gel	26.7	**0.001**
	Coe-pack	14.3	
After 3 weeks	Bluem gel	26.5	**0.001**
	Coe-pack	14.5	
After 1 month	Bluem gel	20.5	**1.000**
	Coe-pack	20.5	

The level of significance between both groups regarding pain and reepithelization indices was investigated using Mann–Whitney *U* test. A *p* value of ≤ 0.05 was considered significant for all tests.

3. Results

3.1. Study of pain index

All patients were asked to mark the level of pain (0–10) experienced on each side based on the numeric pain rating scale (Visual Analog Scale, VAS), with the left end (0) marked "no pain" and the right end (10) marked "severe pain".

- 0 = no pain
- 1–3 = mild pain
- 4–6 = moderate pain
- 7–10 = severe pain (Steigmann, 1965)

As shown in Table 1:

3.1.1. After 2 h (immediately after the effect of anesthesia was resolved)

It was observed that 50% of the patients experienced mild pain and 50% had no pain 2 h postoperatively in the BlueM group, whereas 30% had no pain and 70% had mild pain 2 h postoperatively in the Coe-Pack group. No significant differences were found between both groups 2 h after the surgery ($p = 0.289$) (see Tables 2, 3 and 4).

3.1.2. After 24 h

It was observed that 50% of the patients had no pain and 50% had mild pain in the BlueM group, whereas 20% had no pain, 50% had mild pain, and 30% had moderate pain in the Coe-Pack group. No significant differences were found between both groups 24 h after the surgery ($p = 0.014$).

3.1.3. After 2 days

It was observed that 90% of the patients had no pain and 10% had mild pain in the BlueM group, whereas 30% had no pain, 40% had mild pain, and 30% had moderate pain in the Coe-Pack group. There was a statistically significant difference between the groups in the pain index after 2 days ($p < 0.001$).

3.1.4. After 3 days

All the patients had no pain in the BlueM group, whereas 20% of the patients had no pain, 80% had mild pain, and 20% had moderate pain in the Coe-Pack group. There was a statistically significant difference between the groups in the pain index after 3 days ($p < 0.001$).

3.2. Reepithelization index study (Sridharan and Shankar, 2012)

At the 1-week follow-up, in the BlueM group, 10% of the patients showed complete epithelization, whereas 0% showed complete epithelization in the Coe-Pack group (Fig. 2: A, B).

The difference between the groups at the 1 week follow-up was statistically significant ($p = 0.002$).

At the 2-week follow-up, in the BlueM group, 90% of the patients showed complete epithelization, whereas 30% showed complete epithelization in the Coe-Pack group (Fig. 2: C, D).

A statistically significant difference was found between the groups at the 1-week follow-up ($p = 0.019$).

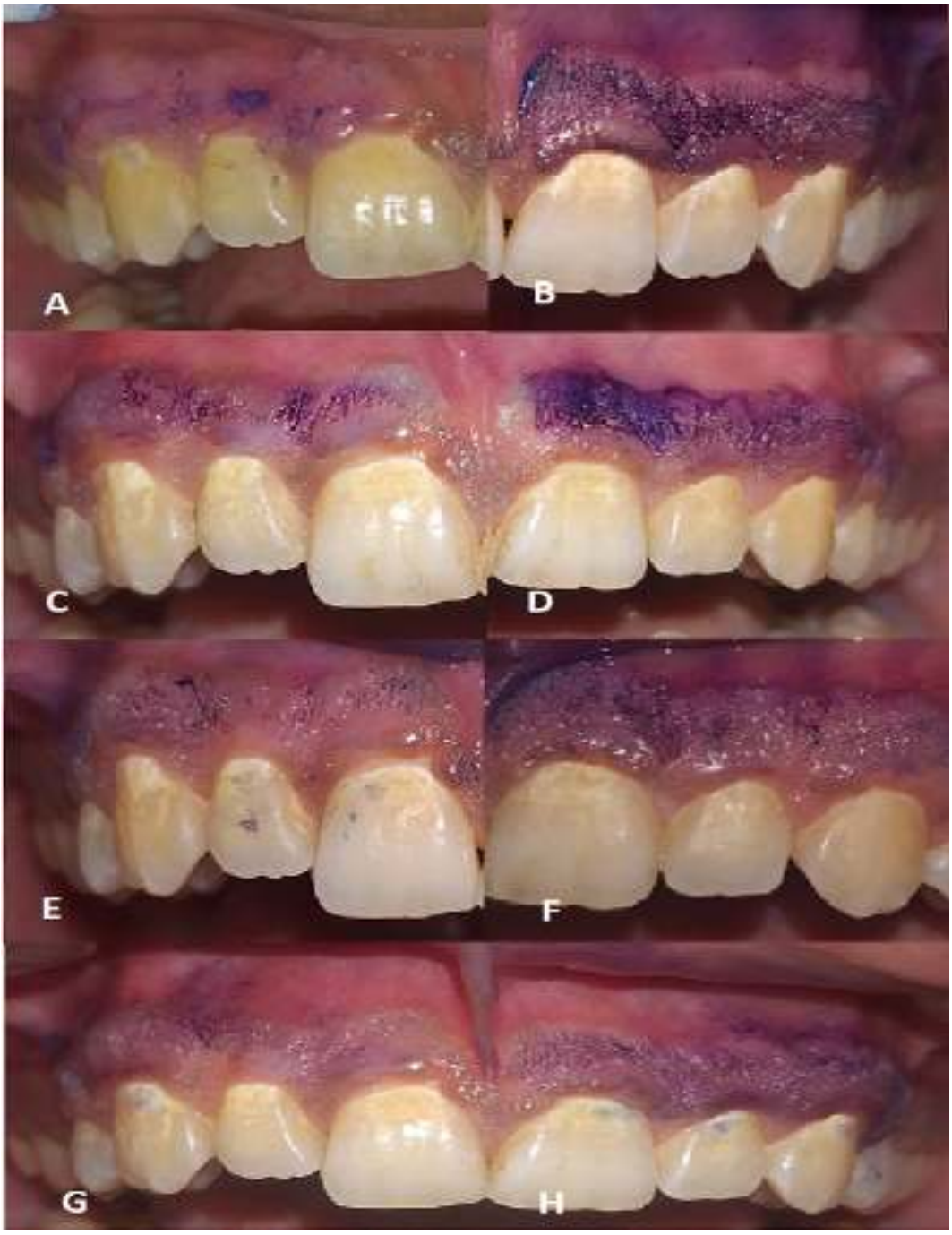

Fig. 2 A: The BlueM gel group 1 week postoperatively, B: The Coe-Pack group 1 week postoperatively, C: The BlueM gel group 2 weeks postoperatively, D: The Coe-Pack group {C} 2 weeks postoperatively, E: The BlueM gel group 3 weeks postoperatively, F: The Coe-Pack group 3 weeks postoperatively, G: The BlueM gel group 1 month postoperatively, H: The Coe-Pack group 1 month postoperatively.

At the 3-week follow-up, 100% of the patients showed complete reepithelization in the BlueM group, whereas 40% in the Coe-Pack group showed complete reepithelization (Fig. 2: E, F).

A statistically significant difference was found between the groups at the 1-week follow-up ($p = 0.023$). At the 4-week follow-up, 100% of the patients in the Coe-Pack group showed complete reepithelization (Fig. 2: G, H).

4. Discussion

Both dressings (BlueM oxygen gel and Coe-Pack) exhibited various effects on the gingival healing process after surgical depigmentation.

Regarding the pain perception, the BlueM oxygen gel group showed slightly less pain score than the Coe-Pack group

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2 h postoperatively, but there was no statistically significant difference.

More pain was encountered in the Coe-Pack group after 24 h, 2 days, and 3 days postoperatively, and there was a statistically significant difference. This may be attributed to the finite properties of the Coe-Pack dressing as a physical barrier without any biological or chemical positive effect on the wound healing process or antibacterial activity (O'Neil, 1975) (Jorkjend and Skoglund, 1990). On the contrary, the BlueM oxygen gel exhibited an effect on pain and inflammation reduction.

Although the differences were clear between both groups at 1, 2, and 3 weeks postoperatively, regarding wound healing and reepithelization, all patients had a normal pinky gingival appearance after 4 weeks.

At 1, 2, and 3 weeks postoperatively, the BlueM oxygen gel showed significantly faster reepithelization. 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 (Han et al., 2005). On the contrary, the Coe-Pack dressing caused severe tissue reaction and irritation (Nezwek et al., 1980; Grant and Bernick, 1972).

5. Conclusion

According to the findings of the present study, using the BlueM oxygen gel after surgical depigmentation with the scalpel technique improves wound healing, stimulates rapid reepithelization, and relieves postoperative pain compared with applying the conventional Coe-Pack dressing.

Appendix A. Supplementary material

Supplementary data to this article can be found online at https://doi.org/10.1016/j.sdentj.2022.04.005.

References

Dummett Sr., C.O., 1945. The prevention of endodontal pathosis. Am. J. Orthod. Oral. Surg. 31, 725–730.
Suragimath, G., Lohana, M.H., Varma, S., 2016. A split mouth randomized clinical comparative study to evaluate the efficacy of gingival depigmentation procedure using conventional scalpel technique or diode laser. J. Lasers Med. Sci. 7 (4), 227–232.
Karydis, A., Bland, P., Shiloah, J., 2012. Management of oral melanin pigmentation. J. Tenn. Dent. Assoc. 92 (2), pp. 10–5; quiz 16–7.
Tamizi, M., Taheri, M., 1996. Treatment of severe physiologic gingival pigmentation with free gingival autograft. Quintessence Int. 27 (8), 555–558.
Li, Y. et al, 2002. Protective mechanism of reduced water against alloxan-induced pancreatic beta-cell damage: scavenging effect against reactive oxygen species. Cytotechnology 40 (1–3), 139–149.
Roshna, T., Nandakumar, K., 2005. Anterior esthetic gingival depigmentation and crown lengthening: report of a case. J. Contemp. Dent. Pract. 6 (3), 139–147.
Ghalhar, M.G. et al, 2014. Comparison of inhibitory effects of 17-AAG nanoparticles and free 17-AAG on HSP90 gene expression in breast cancer. Asian Pac. J. Cancer Prev. 15 (17), 7113–7118.
Sharmila, V. et al, 2013. A rare case of bilateral ovarian fibroma presenting as Meigs syndrome. J. Obstet. Gynaecol. 33 (6), 636–637.
Pera, C. et al, 2012. Double-masked randomized clinical trial evaluating the effect of a triclosan/copolymer dentifrice on periodontal healing after one-stage full-mouth debridement. J. Periodontol. 83 (7), 909–916.
Dummett, C.O., 1946. Physiologic pigmentation of the oral and cutaneous tissues in the Negro. J. Dent. Res. 25 (6), 421–432.
Rubinoff, C.H., Greener, E.H., 1985. Physical properties of an experimental periodontal dressing material. Dent. Mater. 1 (1), 3–6.
Embery, G. et al, 2000. Connective tissue elements as diagnostic aids in periodontology. Periodontol 2000 (24), 193–214.
Eisenbud, D.E., 2012. Oxygen in wound healing: nutrient, antibiotic, signaling molecule, and therapeutic agent. Clin. Plast. Surg. 39 (3), 293–310.
Han, S.J. et al, 2005. Xylitol inhibits inflammatory cytokine expression induced by lipopolysaccharide from Porphyromonas gingivalis. Clin. Diagn. Lab. Immunol. 12 (11), 1285–1291.
Rodriguez, P.G. et al, 2008. The role of oxygen in wound healing: a review of the literature. Dermatol. Surg. 34 (9), 1159–1169.
Steigmann, S., 1965. The relationship between physiologic pigmentation of the skin and oral mucosa in yemenite jews. Oral. Surg. Oral. Med. Oral. Pathol. 19, 32–38.
Sridharan, G., Shankar, A.A., 2012. Toluidine blue: a review of its chemistry and clinical utility. J. Oral. Maxillofac. Pathol. 16 (2), 251–255.
O'Neil, T.C., 1975. Antibacterial properties of periodontal dressings. J. Periodontol. 46 (8), 469.
Jorkjend, L., Skoglund, L.A., 1990. Effect of non-eugenol- and eugenol-containing periodontal dressings on the incidence and severity of pain after periodontal soft tissue surgery. J. Clin. Periodontol. 17 (6), 341–344.
Nezwek, R.A. et al, 1980. Connective tissue response to periodontal dressings. J. Periodontol. 51 (9), 521–529.
Grant, D., Bernick, S., 1972. The periodontium of ageing humans. J. Periodontol. 43 (11), 660–667.

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