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Effectiveness of local and topical anesthesia during gingival retraction

Eficácia da anestesia local e tópica durante a retração gingival

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ABSTRACT

Objective: To compare the effectiveness of local and topical anesthesia during gingival retraction in prepared abutment teeth. **Material and Methods:** 72 patients desiring full mouth rehabilitation or bilateral fixed partial denture in the same arch were selected based on the inclusion criteria framed and were randomly allocated into Groups A and B of 36 each. Patients in Group A received gingival retraction with topical anesthesia and Group B received gingival retraction with infiltration anesthesia. All the patients were tested for pain, discomfort and bleeding during gingival retraction. **Results:** There was no significant difference in pain, discomfort and gingival bleeding (P >.05) during gingival retraction using topical and local anesthetic agents. **Conclusion:** Topical anesthesia was equally effective as infiltration anesthesia in managing the pain, discomfort and bleeding during gingival retraction by cord packing in prepared abutment teeth.

KEYWORDS

Gingival retraction techniques; Topical administration; Infiltration; Pain.

RESUMO

Objetivo: Comparar a eficácia da anestesia local e tópica durante a retração gengival previa a moldagem em dentes pilares preparados. **Material e Métodos:** Foram selecionados 72 pacientes indicados para reabilitação bucal total ou prótese parcial fixa bilateral na mesma arcada com base nos critérios de inclusão formulados e alocados aleatoriamente nos Grupos A e B com 36 pacientes cada. Os pacientes do Grupo A receberam retração gengival com anestesia tópica e no Grupo B receberam retração gengival com anestesia infiltrativa. Todos os pacientes foram testados para dor, desconforto e sangramento durante o procedimento. **Resultados:** Não houve diferença significativa na dor, desconforto e sangramento gengival (P>. 05) durante a retração gengival com anestésicos tópicos e locais. **Conclusão:** A anestesia tópica foi tão eficaz quanto a anestesia de infiltração no controle da dor, desconforto e sangramento durante a retração gengival com fio retrator gengival em dentes pilares preparados.

PALAVRAS-CHAVE

Técnicas de retração gengival; Anestésicos locais; Infiltração; Dor.

INTRODUCTION

A successful fixed dental prosthesis is largely dependent upon the long-term health and stability of the surrounding periodontal structures and requires appropriate impression taking of the prepared finish line [1,2]. This is critical in tooth supported fixed prosthesis which includes both, crowns and bridges or implant supported fixed prosthesis. Gingival displacement or gingival retraction is defined as the deflection of marginal gingiva away from the tooth [3]. The goal of gingival retraction is to atraumatically displace gingival tissues to allow access for impression material to record the finish line and provide sufficient thickness of gingival sulcus so that the impression does not tear off during removal [4]. Gingival retraction technique should be used if the finish line is adjacent to the gingival sulcus to increase the results. Accurate marginal positioning of the restoration in the prepared finish line of the abutment is required for therapeutic, preventive and aesthetic purposes [5].

The techniques used to accomplish gingival deflection can be classified as mechanical, chemical mechanical and surgical. The surgical techniques can be further broken down into rotary curettage and electrosurgery [6]. The surgical retraction methods are rapid but destructive and involve excision of tissue. Gingival displacement paste which contains kaolin and aluminum chloride has been recently introduced. The chemicals used along with retraction cords can be broadly classified into vasoconstrictors and astringents. Vasoconstrictors are epinephrine; Astringents are aluminum potassium sulfate, aluminum chloride, ferric sulfate etc. The mechanical method of gingival displacement using plain retraction cord has been a standard for several years [7]. It acts by physically pushing the gingiva away from the finish line [8,9]. Enlargement of gingival sulcus, as well as control of fluids seeping from the walls of gingival sulcus, is readily accomplished by combining chemical action with pressure packing. The chemical mechanical method using retraction cords impregnated with hemostatic agents and astringents is the most commonly used method.

Gingival retraction is a technique-sensitive procedure and requires expertise. The problems associated with cord packing is gingival bleeding, patient discomfort and sensitivity in the tooth, especially the root region [10]. And when inappropriately manipulated varying degrees of tissue trauma may result, it can lead to epithelial attachment damage and/or exacerbating gingival recession, bleeding and bone resorption [11-14]. Histological study also shows that there is trauma to sulcular epithelium and connective tissue attachment on placement of retraction cords. Also, inflammation of the sulcus can be exacerbated because of contamination of the sulcular area by the fibres of the cord [15]. Application of an inappropriate amount of force while placing retraction cords can also add to gingival inflammation and shrinkage of marginal tissues [13]. All these lead to patient pain and discomfort. Hence, anaesthetizing the area during cord packing is necessary to reduce all these complications.

The addition of local anesthesia during dental cord packing has some potential benefits like decreased postoperative pain, improved hemorrhage control etc. An injectable anesthetic is considered the best technique and may or may not be used in conjunction with a topical anesthetic. The disadvantages of injectable anesthesia are many patients report fear of the needle, long-lasting effects and the prolonged numbness of adjacent tissues, such as the lips and tongue. The need for painless, noninvasive, fast-acting anesthetics with effectiveness only during the procedure has led to the investigation of the use of substances with topical application during SRP and periodontal maintenance. Topical anesthetics act on the peripheral nerves and reduce the sensation of pain at the site of application. During dental procedures, topical anesthetics are used to control local pain caused during giving injection, placement of orthodontic band and rubber dam clamp placement. Topical anesthetics mostly contain lidocaine or benzocaine as one of the main ingredients and can be used in the form of solutions, creams, gels, and sprays. A local anesthetic is a drug that causes reversible loss of nociception. It causes effects such as analgesia that is loss of pain and paralysis that is loss of muscle. It allows patients to undergo surgical and dental procedures with reduced pain and distress. It is also used for relief of non-surgical pain and to enable diagnosis of the cause of some chronic pain conditions.

There are many studies which have been conducted with respect to gingival retraction and the different methods used in gingival retraction. But none of the studies are showing evidence that topical anesthesia reduces the patient's pain and

discomfort during gingival retraction. Hence this study is conducted to compare the effectiveness of topical and local anaesthetic solutions in reducing pain, discomfort and bleeding during gingival retraction during gingival retraction procedures.

MATERIALS AND METHODS

Ethical considerations

The present study was presented before the institutional ethical and scientific review board and permission was obtained. The study protocol conformed to the ethical guidelines prescribed by the WHO and Helsinki declaration. The present study is an in vivo randomized control trial involving human subjects.

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Sample size estimation

The sample size was estimated to be 36 patients in each group using G power with inputs fed from a pilot study done with five samples with Type I error of 0.05, test power of 90%, and effect size of 0.8.

Selection of subjects

204 patients who underwent tooth preparation were assessed and 76 patients satisfying the following inclusion and exclusion criteria were randomly allocated to two groups, A and B respectively (Figure 1).

Inclusion criteria

Patients with healthy periodontal status undergoing tooth preparation and gingival retraction for full mouth rehabilitation or

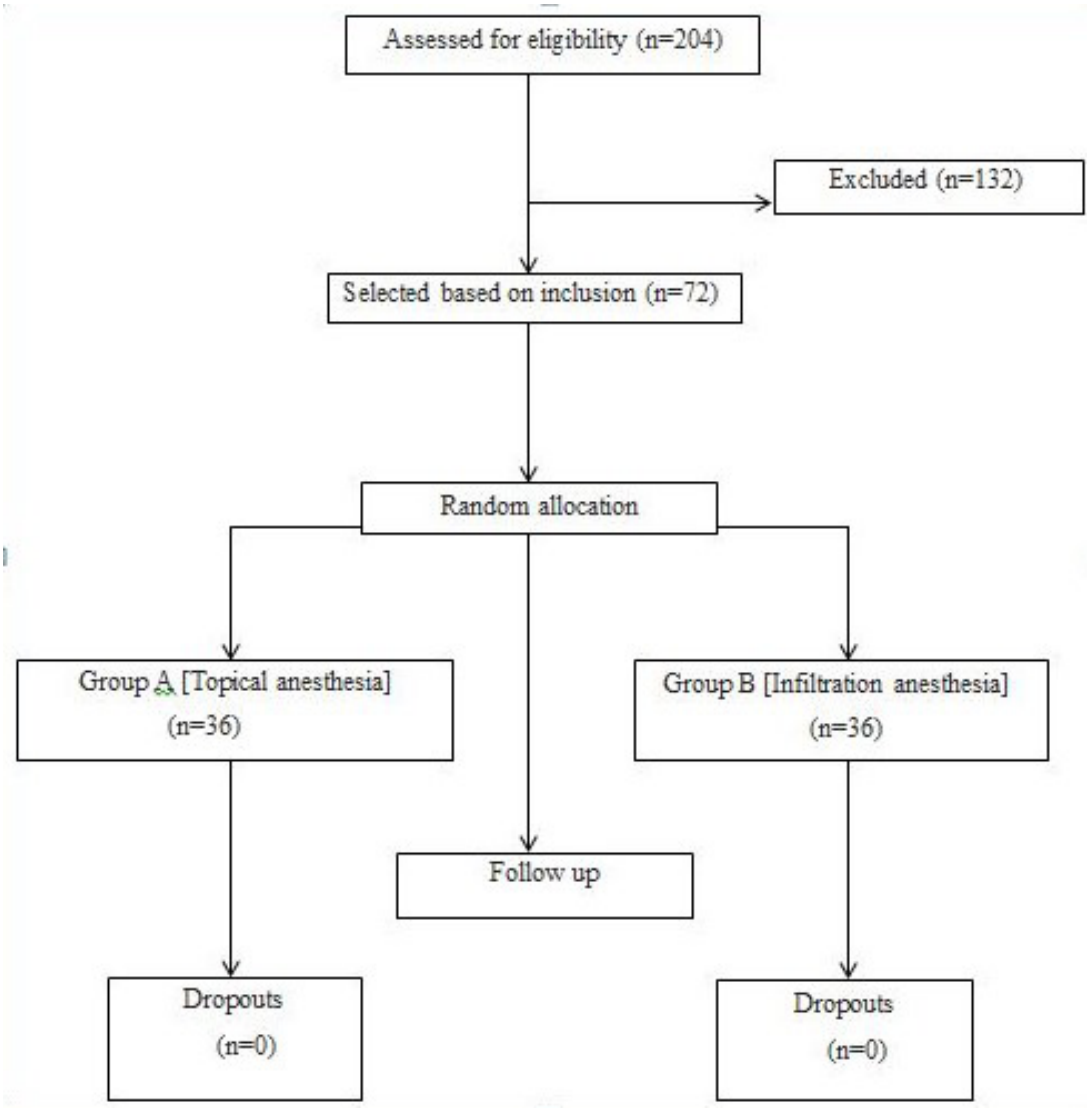

Figure 1 - Consort flow chart.

bilateral fixed partial denture in the same arch, age within 25 to 70 years, both male and female, nonsmokers and non alcoholics, with willingness to participate in the study.

Exclusion criteria

Patients allergic to local anesthetics, patients who are having a thin gingival, biotype, smokers, patients already on antibiotics.

Informed consent

The selected subjects were clearly explained about the study protocols and informed consent was obtained from them for participation.

Random allocation

The included patients were categorized into group A and group B using the coin flip method. Patients in group A received gingival retraction with topical anesthesia and group B received gingival retraction with infiltration anesthesia. Allocation concealment was done for the participants using SNOSE method.

Intervention

After tooth preparation was done, the patient was prepared for gingival retraction. For Group A topical anesthesia was secured with 5% benzocaine gel applied over the gingival sulcus of prepared abutments for five minutes followed by gingival retraction. For Group B patients, infiltration anesthesia was administered with 2% lignocaine and the cord was packed with gentle pressure into the gingival sulcus of prepared abutments after five minutes. After 5 minutes of packing the cord, the patient was asked to rate pain and discomfort and bleeding was checked. The dosages of local anesthetics administered were standardized based on the age and body mass index of the subjects.

Outcome measure

Pain, patient discomfort and bleeding were the primary outcome measures evaluated. Pain was measured according to Visual Analog Scale (VAS) with scale ranging from 0-10. 0 denoted no pain and 10 denoted maximum pain. Discomfort was measured according to the Discomfort Behavioral Scale (DBS) with scale ranging from 1-5. 1 denoted mild discomfort and 5 denoted severe discomfort. The bleeding was calculated using the Gingival bleeding index. The reliability coefficient of this VAS tool was estimated as ICC = 0.86 using the test–retest reliability coefficient and Cronbach's $\alpha = .89$. A single blinding of the operator assessing the outcomes was ensured.

Statistical analysis

All analyses were conducted using SPSS 21 (SPSS Inc., Chicago, IL). Mann Whitney U test was performed to assess the statistical significance at 95% confidence level and 5% significance ($\alpha = .05$).

RESULTS

36 patients were enrolled in both the experimental groups with a median age of 35.5 years in Group A with (20 males and 16 females) and 36.5 years in Group B (22 males and 14 females). All the patients completed the study and no adverse effects were observed. Group A has a mean value of pain 2.54 ± 1.03, whereas group B has a mean value of pain 2.72 ± 1.38 (Figure 2). Group A has a mean value of discomfort 1.29 ± 0.52, whereas group B has a mean value of discomfort 1.47 ± 0.69 (Figure 3).

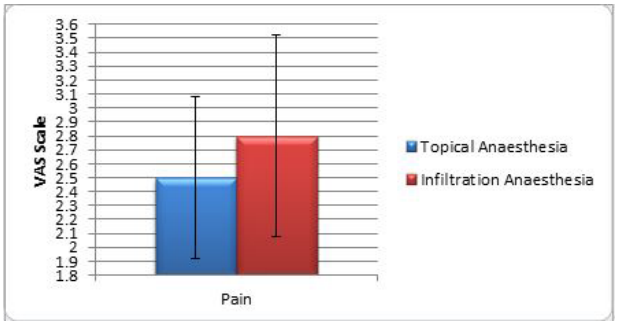

Figure 2 - Graph showing the score of pain according to Visual Analogue Scale (VAS) with topical anesthesia and infiltration anesthesia.

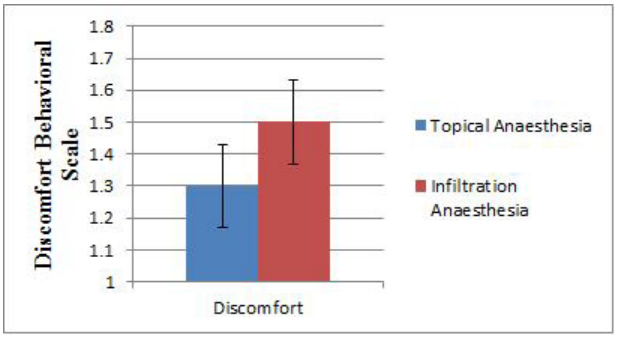

Figure 3 - Graph showing the score of discomfort according to Discomfort behavioral scale (DBS) with topical anesthesia and infiltration anesthesia.

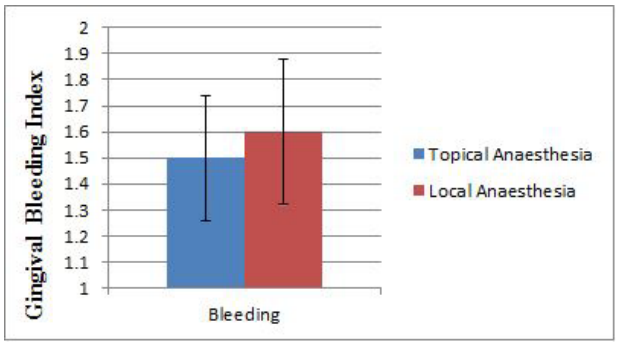

Figure 4 - Graph showing the score of bleeding according to gingival bleeding index with topical anesthesia and infiltration anesthesia.

Table I - Depicts pain, discomfort and gingival bleeding in the experimental and control groups

Variables	Group A (Topical anesthesia) n=36	Group B(Infiltration anesthesia) n=36	P value
Pain	2.54±1.03	2.72±1.38	0.674
Discomfort	1.29±0.52	1.47±0.69	0.138
Bleeding	1.51±0.58	1.65±0.68	0.250

Group A has a mean value of bleeding 1.51±0.58, whereas group B has a mean value of bleeding 1.65 ± 0.68 (Figure 4). The results show that there is no significant difference (P > .05) between local infiltration and topical anesthesia with respect to pain, discomfort and gingival bleeding.(Table I)

DISCUSSION

Gingival retraction is an important step in the field of prosthetic restoration [16]. Effective gingival retraction before taking an impression without damaging periodontal tissues is an important step for a successful prosthesis [17,18]. Gingival retraction's three main goals are to have adequate bulk flow of material into the sulcus, to accurately record margin details, and to prevent impression material tear on retrieval from the gingival sulcus. The forces which have a role in displacing the periodontal tissue are retraction, relapse, collapse and displacement [19,20].

Gingival retraction leads to pushing off the gingiva away from the tooth margins and hence there is sufficient space both vertically and horizontally to accommodate the impression material between the tooth margin and the gingiva [21-26]. The gingival sulcus should remain open unsupported long enough for the impression material to flow into it and completely fill the space provided by the retraction. After the gingival retraction is withdrawn the gingival tissue usually returns to their original position because of the gingival cuff elasticity and the rebound forces of the compressed adjacent attached gingiva [21,27]. During the procedure of gingival retraction, the gingival fibres get support from the periodontal fibres which will reduce the tissue collapse once the retraction is withdrawn [19,27].

There are mainly three methods for gingival retraction namely surgical, mechanical and chemical which can be used separately or in combination [28,29]. The most common mechanical method in gingival retraction is cord packing which is fast, simple and inexpensive and which can be used separately or in combination with hemostatic agent [30].The sulcular depth and the periodontal status determines the depth penetration of the cord. Cord packing is a very technique sensitive procedure and requires a lot of clinical skill. If cord filament remnants are left in the sulcus or improper technique and force is side during cord packing, it will result in inflammation of the gingival sulcus and contraction of the marginal gingiva [13]. In many cases cord pressure is not sufficient to control the bleeding and bleeding occurs after removal of the cord from the gingival sulcus [12]. One of the ways to control bleeding is dipping the cords in certain medicaments.

One of the key medicaments used during cord packing is local anesthetic agents. Local anesthetic agents have adrenaline in it which provides homeostasis and vasoconstriction during cord packing [31]. The vasoconstriction effect also helps in producing temporary gingival retraction effect [32,33]. It has a hemodynamic effect which activates alpha 1 receptors and causes ischemia. Epinephrine is contraindicated in patients who are on anti hypertensive drugs, beta blockers and monoamine oxidase [34]. Adrenaline overdose can cause symptoms like ventricular tachycardia, fibrillation, angina, and heart and brain infarction. Adrenaline should be used cautiously in a diabetic patient as it can increase the blood glucose level. The main advantage of adrenaline when compared to other astringents is its ability to control bleeding [35]. Kellam et al. [36] reported that the retraction cords absorb about 64% to 94% of adrenaline.

Local anaesthetic agents can be applied by different methods such as local infiltration or topical anesthesia etc. A local anaesthetic is a drug that causes transient and reversible loss of sensation in the localised area. When it is injected in certain areas, it causes analgesia that is loss of pain and paralysis that is loss of muscle power. A topical anesthetic is a local anesthetic that is used to numb the surface of a body part. It comes in many forms such as sprays, creams, gels, gargles etc. The type of topical anaesthetic will vary depending on which body part we want to use on. Both local and topical anaesthetic agents will have certain duration of onset, action, duration of action.

In the present study, all the observations were made by a single operator to avoid any inter operatory bias. The above mentioned results say that both local anesthesia and topical anesthesia are equally efficient in controlling the complications such as bleeding, pain, discomfort etc faced by the patients during the process of gingival retraction by cord packing. A study conducted by Anderson et al. [37] which compared topical Tetracaine (TAC) versus lidocaine in pediatric patients showed that there was no significant difference in the anaesthetizing property between topical anesthesia and lidocaine. A study conducted by Pryor et al. [38] which compared topical Tetracaine versus lidocaine infiltration in minor lacerations states that topical TAC is shown to have equal efficacy as lidocaine infiltration. Since this study was done in subjects with healthy periodontal status, its limitation might be slight variability with outcome measures in clinical situations with untreated gingival and periodontal disease and systemic or metabolic disorders causing periodontal disease.

The major clinical significance of this study is that Topical anesthesia is equally effective as regional infiltration anesthesia in managing the pain, discomfort and bleeding associated with gingival retraction. This can eliminate all the complications and side effects associated with regional infiltration techniques and thus enhances better patient compliance. The additional advantages of topical anesthesia application during gingival retraction include faster application, immediate onset of action, no wider and persistent numbness and no alterations in salivary secretions.

CONCLUSION

Topical anesthesia was equally effective as infiltration anesthesia in managing the pain, discomfort and bleeding during gingival retraction by cord packing in prepared abutment teeth. Hence this can be used as an alternative and a less invasive anesthetic regimen in gingival retraction for impression making in prepared abutment teeth.

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Conflict of Interest

The authors declare no conflict of interest.

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Regulatory Statement

None.

REFERENCES

1. Levartovsky S, Zalis M, Pilo R, Harel N, Ganor Y, Brosh T. The effect of one-step vs. two-step impression techniques on long-term accuracy and dimensional stability when the finish line is within the gingival sulcular area. J Prosthodont. 2014;23(2):124-33. http://dx.doi.org/10.1111/jopr.12062. PMid:23734561.
2. Beleidy M, Serag Elddien AM. Clinical comparative evaluation of different retraction systems in gingival displacement and their influence on periodontal health: a randomized clinical trial. Egypt Dent J. 2020;66(3):1667-78. http://dx.doi.org/10.21608/edj.2020.26079.1076.
3. Tabassum S, Adnan S, Khan FR. Gingival retraction methods: a systematic review. J Prosthodont. 2017;26(8):637-43. http://dx.doi.org/10.1111/jopr.12522. PMid:27465933.
4. Wang Y, Fan F, Li X, Zhou Q, He B, Huang X, et al. Influence of gingival retraction paste versus cord on periodontal health: a systematic review and meta-analysis. Quintessence Int. 2019;50(3):234-44. PMid:30773575.
5. Safari S, Ma VS, Mi VS, Hoseini Ghavam F, Hamedi M. Gingival retraction methods for fabrication of fixed partial denture: literature review. J Dent Biomater. 2016;3(2):205-13. PMid:28959744.
6. Benson BW, Bomberg TJ, Hatch RA, Hoffman W Jr. Tissue displacement methods in fixed prosthodontics. J Prosthet Dent. 1986;55(2):175-81. http://dx.doi.org/10.1016/0022-3913(86)90336-7. PMid:3514852.

7. Hansen PA, Tira DE, Barlow J. Current methods of finish-line exposure by practicing prosthodontists. J Prosthodont. 1999;8(3):163-70. http://dx.doi.org/10.1111/j.1532-849X.1999.tb00031.x. PMid:10740498.

8. Harrison JD. Effect of retraction materials on the gingival sulcus epithelium. J Prosthet Dent. 1961;11(3):514-21. http://dx.doi.org/10.1016/0022-3913(61)90234-7.

9. Woycheshin FF. An evaluation of the drugs used for gingival retraction. J Prosthet Dent. 1964;14(4):769-76. http://dx.doi.org/10.1016/0022-3913(64)90213-6.

10. Feng J, Aboyoussef H, Weiner S, Singh S, Jandinski J. The effect of gingival retraction procedures on periodontal indices and crevicular fluid cytokine levels: a pilot study. J Prosthodont. 2006;15(2):108-12. http://dx.doi.org/10.1111/j.1532-849X.2006.00083.x. PMid:16650011.

11. Porzier J, Benner-Jordan L, Bourdeau B, Losfeld R. Access to the intracrevicular space in preparations for fixed prosthesis. Cah Prothese. 1991;(73):6-20. PMid:2013007.

12. Ruel J, Schuessler PJ, Malament K, Mori D. Effect of retraction procedures on the periodontium in humans. J Prosthet Dent. 1980;44(5):508-15. http://dx.doi.org/10.1016/0022-3913(80)90069-4. PMid:7003108.

13. De Gennaro GG, Landesman HM, Calhoun JE, Martinoff JT. A comparison of gingival inflammation related to retraction cords. J Prosthet Dent. 1982;47(4):384-6. http://dx.doi.org/10.1016/S0022-3913(82)80085-1. PMid:6951037.

14. Azzi R, Tsao TF, Carranza FA Jr, Kenney EB. Comparative study of gingival retraction methods. J Prosthet Dent. 1983;50(4):561-5. http://dx.doi.org/10.1016/0022-3913(83)90581-4. PMid:6355446.

15. Ferrari M, Cagidiaco MC, Ercoli C. Tissue management with a new gingival retraction material: a preliminary clinical report. J Prosthet Dent. 1996;75(3):242-7. http://dx.doi.org/10.1016/S0022-3913(96)90479-5. PMid:8648569.

16. Anasane NS, Qureshi SM, Kakade D. Comparative evaluation of the amount of gingival displacement using three recent gingival retraction systems: in vivo study. Contemp Clin Dent. 2020;11(1):28-33. http://dx.doi.org/10.4103/ccd.ccd_311_19. PMid:33110305.

17. Banerjee R, Gajbhiye V, Jaiswal P, Chandak A, Radke U. Comparative evaluation of three gingival displacement materials for efficacy in tissue management and dimensional accuracy. J Indian Prosthodont Soc. 2019;19(2):173-9. http://dx.doi.org/10.4103/jips.jips_285_18. PMid:31040552.

18. Rathi A, Mehra N, Sharma R, Kaushik M, Sood T. Evaluation of alpha-adrenomimetic agents for gingival retraction: a randomized crossover clinical trial. J Conserv Dent. 2019;22(6):533-7. http://dx.doi.org/10.4103/JCD.JCD_76_19. PMid:33088060.

19. Prasad KD, Agrawal G, Hegde C, Shetty M. Gingival displacement in prosthodontics: a critical review of existing methods. J Interdiscip Dent. 2011;1(2):80-6. http://dx.doi.org/10.4103/2229-5194.85023.

20. Livaditis GJ. The matrix impression system for fixed prosthodontics. J Prosthet Dent. 1998;79(2):208-16. http://dx.doi.org/10.1016/S0022-3913(98)70217-3. PMid:9513108.

21. Al Hamad KQ, Azar WZ, Alwaeli HA, Said KN. A clinical study on the effects of cordless and conventional retraction techniques on the gingival and periodontal health. J Clin Periodontol. 2008;35(12):1053-8. http://dx.doi.org/10.1111/j.1600-051X.2008.01335.x. PMid:19040582.

22. Baharav H, Kupershmidt I, Laufer BZ, Cardash HS. The effect of sulcular width on the linear accuracy of impression materials in the presence of an undercut. Int J Prosthodont. 2004;17(5):585-9. PMid:15543916.

23. Donovan TE, Chee WW. Current concepts in gingival displacement. Dent Clin North Am. 2004;48(2):433-44. http://dx.doi.org/10.1016/j.cden.2003.12.012. PMid:15172609.

24. Lampé I, Marton S, Hegedüs C. Effect of mixing technique on shrinkage rate of one polyether and two polyvinyl siloxane impression materials. Int J Prosthodont. 2004;17(5):590. PMid:15543917.

25. Laufer BZ, Baharav H, Langer Y, Cardash HS. The closure of the gingival crevice following gingival retraction for impression making. J Oral Rehabil. 1997;24(9):629-35. http://dx.doi.org/10.1046/j.1365-2842.1997.00558.x. PMid:9357742.

26. Laufer BZ, Baharav H, Ganor Y, Cardash HS. The effect of marginal thickness on the distortion of different impression materials. J Prosthet Dent. 1996;76(5):466-71. http://dx.doi.org/10.1016/S0022-3913(96)90002-5. PMid:8933434.

27. Livaditis GJ. Comparison of the new matrix system with traditional fixed prosthodontic impression procedures. J Prosthet Dent. 1998;79(2):200-7. http://dx.doi.org/10.1016/S0022-3913(98)70216-1. PMid:9513107.

28. Kostić I, Najman S, Kostić M, Stojanović S. Comparative review of gingival retraction agents. Acta Med Medianae. 2012;51(1):81-4. http://dx.doi.org/10.5633/amm.2012.0114.

29. La Forgia A. Mechanical-chemical and electrosurgical tissue retraction for fixed prosthesis. J Prosthet Dent. 1964;14(6):1107-14. http://dx.doi.org/10.1016/0022-3913(64)90180-5.

30. Mehta S, Virani H, Memon S, Nirmal N. A comparative evaluation of efficacy of gingival retraction using polyvinyl siloxane foam retraction system, vinyl polysiloxane paste retraction system, and copper wire reinforced retraction cord in endodontically treated teeth: an in vivo study. Contemp Clin Dent. 2019;10(3):428-32. PMid:32308315.

31. Weir DJ, Williams BH. Clinical effectiveness of mechanical-chemical tissue displacement methods. J Prosthet Dent. 1984;51(3):326-9. http://dx.doi.org/10.1016/0022-3913(84)90214-2. PMid:6368802.

32. Polat NT, Ozdemir AK, Turgut M. Effects of gingival retraction materials on gingival blood flow. Int J Prosthodont. 2007;20(1):57-62. PMid:17319365.

33. Bader JD, Bonito AJ, Shugars DA. A systematic review of cardiovascular effects of epinephrine on hypertensive dental patients. Oral Surg Oral Med Oral Pathol Oral Radiol Endod. 2002;93(6):647-53. http://dx.doi.org/10.1067/moe.2002.123866. PMid:12142870.

34. Hilley MD, Milam SB, Giescke AH Jr, Giovannitti JA. Fatality associated with the combined use of halothane and gingival retraction cord. Anesthesiology. 1984;60(6):587-8. http://dx.doi.org/10.1097/00000542-198406000-00012. PMid:6731915.

35. Csillag M, Nyiri G, Vag J, Fazekas A. Dose-related effects of epinephrine on human gingival blood flow and crevicular fluid production used as a soaking solution for chemo-mechanical tissue retraction. J Prosthet Dent. 2007;97(1):6-11. http://dx.doi.org/10.1016/j.prosdent.2006.10.004. PMid:17280885.

36. Kellam SA, Smith JR, Scheffel SJ. Epinephrine absorption from commercial gingival retraction cords in clinical patients. J Prosthet Dent. 1992;68(5):761-5. http://dx.doi.org/10.1016/0022-3913(92)90198-J. PMid:1432796.

37. Anderson AB, Colecchi C, Baronoski R, DeWitt TG. Local anesthesia in pediatric patients: topical TAC versus lidocaine. Ann Emerg Med. 1990;19(5):519-22. http://dx.doi.org/10.1016/S0196-0644(05)82182-1. PMid:2184706.

38. Pryor GJ, Kilpatrick WR, Opp DR. Local anesthesia in minor lacerations: topical TAC vs lidocaine infiltration. Ann Emerg Med. 1980;9(11):568-71. http://dx.doi.org/10.1016/S0196-0644(80)80227-7. PMid:7436066.

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