



Journal Homepage: -www.journalijar.com

INTERNATIONAL JOURNAL OF ADVANCED RESEARCH (IJAR)

Article DOI:10.21474/IJAR01/16857
DOI URL: <http://dx.doi.org/10.21474/IJAR01/16857>



RESEARCH ARTICLE

"COMPARITIVE EVALUATION OF HORIZONTAL GINGIVAL DISPLACEMENT USING STAY-PUT RETRACTION CORD AND ASTRINGENT RETRACTION PASTE: AN IN VIVO STUDY"

Dr. Amruthasree V.¹, Dr. Leena Tomer², Dr. Sunita Choudhary³, Dr. Swati Tyagi¹, Dr. Puja Maity¹, Dr. Chandani¹, Dr. Vikas Sharma¹ and Dr. Pravender Kumar¹

1. Post Graduate Student, Department of Prosthodontics, Crown & Bridge and Implantology, Divya Jyoti College of Dental Sciences & Research.
2. HOD & Professor, Department of Prosthodontics, Crown & Bridge and Implantology, Divya Jyoti College of Dental Sciences & Research.
3. Professor, Department of Prosthodontics, Crown & Bridge and Implantology, Divya Jyoti College of Dental Sciences & Research.

Manuscript Info

Manuscript History

Received: 05 March 2023
Final Accepted: 09 April 2023
Published: May 2023

Abstract

Introduction: Gingival retraction cord is the most commonly used gingival displacement material; however, it causes discomfort and produces damage to the periodontium. Various new gingival retraction materials have been introduced to overcome these problems.

Aim: This study aims at comparative evaluation of horizontal gingival displacement using Stay-put retraction cord and Astringent retraction paste.

Materials and Methods: A total of 40 subjects were selected and 40 samples were made for the study. Samples were divided into two groups, 20 subjects in each group) depending on the materials used for gingival displacement. The impressions obtained after placing retraction system were poured in type IV die stone. The amount of gingival displacement was then measured as a distance from the tooth to the crest of the gingiva in a horizontal plane using stereomicroscope & analysed in image analysis software.

Results: Among the experimental groups, astringent gingival retraction paste showed the highest value for gingival displacement (0.518mm) and the stay-put retraction cord (0.435mm) showed the least value.

Conclusion: Within the limitations of this *in vivo* study, astringent gingival retraction paste showed the highest value for gingival displacement whereas, stay-put retraction cord showed the least value.

Copy Right, IJAR, 2023.. All rights reserved.

Introduction:-

The stability and long-term health of the adjacent periodontal structures are primarily responsible for the effectiveness of fixed restoration¹. A precise impression of the prepared tooth's finish line and some of the uncut apical tooth structure is necessary for an FPD. It is important to do this for the restoration to have a suitable emergence profile and well-adapted, smooth gingival margins. 2.

Corresponding Author:- Dr. Amruthasree V.

Address:- Post Graduate Student, Department of Prosthodontics, Crown & Bridge and Implantology, Divya Jyoti College of Dental Sciences & Research.

In cases involving fixed partial dentures, accurate fitting of the crown to the finish line is crucial to reducing cement breakdown and maintaining the peridontium. Only when preparation details are sufficiently recorded in the impression & transferred to the cast is accurate adaptation of the crown achievable. These factors make gingival displacement crucial to record information on sub-gingival preparation³.

One of the crucial steps in fixed prosthodontic therapy is the bending of gingival tissues prior to taking an impression. In the ninth edition of the glossary of prosthodontic terminology, gingival displacement is defined as "displacement of the marginal gingiva away from a tooth."⁴

Gingival displacement approaches include mechanical, chemical and surgical method. Mechanical processes are quick, easy, and cost effective. They stop bleeding and prevent crevicular seepage, although they are difficult and demanding to apply. They require the administration of anaesthesia since they are painful procedures.⁵

The most popular technique for achieving gingival retraction involves packing cord into the sulcus. Although safe, non-medicated cords inserted in the gingival sulcus have little control over haemorrhage. The studies have indicated both local and systemic adverse effects caused by medications used for gingival retraction, medicated retraction cords are still effective. Poor gingival displacement technique is the main cause of inadequately captured marginal detail.⁶

Various new materials have been introduced to tackle these issues. These recently introduced gingival retraction pastes work effectively as an alternative to the retraction cord for gingival displacement and homeostasis since they are effective and tissue-friendly products.

Astringent gingival retraction paste is the newly introduced retraction paste for easy and fast retraction of the sulcus without causing trauma and time consuming method. It is available in paste form. Pastes are relatively easier in application and do not cause unnecessary harm and pain to the patient.

Stay-put is a mechanical cord system which combines the advantages of braided cord with the adaptability of a fine metal filament. It has no hemostatic agent. It serves quick homeostasis when impregnates with aluminium sulfate medicament.

Thus, the aim of the following study was to evaluate the horizontal gingival displacement using Stay-put retraction cord and Astringent retraction paste, bleeding control and effects on gingival health.

Materials and Methods:-

A total of 40 patients were selected for this study. Before the study, the protocol was explained to the participants, and informed consent was obtained. The study protocol was approved by the Institutional Ethical Committee. The sample size was further divided into two equal groups of 20 each, Group I and Group II.

1. Group I (20 patients): Stay-put Retraction Cord (Rokeo, Coltene/Whaledent, US)
2. Group II (20 patients): Astringent Retraction Paste (3M ESPE, Germany)

The inclusion criteria for the study included:

1. Any first and second molar teeth (maxillary & mandibular) with thick gingival biotype
2. Age >18 years.
3. Preparation needed for full coverage restorations
4. Abutment teeth of normal size and contour (no development anomaly or regressive changes).
5. Sound gingival and periodontal health of the abutment teeth.

While the exclusion criteria were:

1. Age <18 years.
2. Grossly decayed abutments.
3. Tipped, tilted or rotated abutment teeth.
4. Any kind of Gingival pathology.
5. Uncontrolled diabetes, hypertension, hyperthyroidism and other cardiovascular disorders.

First and second molar teeth (maxillary & mandibular) were selected with thick gingival biotype. A periodontal probe was used to evaluate gingival biotype. Patients having healthy gingiva and periodontal status was selected.

Criteria for assessing healthy gingival and periodontal status was kept as probing depth of 1-3mm; no bleeding on probing/mobility/furcation involvement; 0mm clinical attachment loss/bone loss and no visible inflammation.

Tooth preparation was done for full veneer crown restoration. The tooth was prepared with sub-gingival level without retraction of the gingival sulcus.

Gingival displacement using stay-put retraction cord

Isolation was done on the tooth with cotton rolls to maintain the working area dry. The required size of the retraction cord was selected according to the gingival biotype of the subject. The retraction cord was moistened by dipping it in buffered 25% aluminum chloride haemostatic gel (PrevestDenPro) in a dappen dish for 10 minutes. The impregnated cord was looped around the prepared tooth. The cord was held between the thumb and forefinger, and it was gently slipped between the tooth and the gingiva in the mesial interproximal area with a cord packer. Once the cord had been tucked in on the mesial, the instrument was used to lightly secure it in the distal interproximal area. Work then proceeds to the lingual surface, beginning from the mesiolingual corner around to the distolingual corner. The tip of the instrument was inclined slightly toward the area where the cord had already been placed (ie, the mesial). The length of cord protruding from the mesial sulcus was cut off as closely as possible to the interdental papilla. Packing of the cord continues around the buccal surface, overlapping the cord in the mesial interproximal area. The cord was left in the sulcus for 10 min after which it was slowly retrieved. (Fig 1)



Figure 1:- Gingival retraction using stay-put retraction cord

The teeth were rinsed, dried, and then isolated to maintain the working area dry. The retraction paste capsule was loaded to applicator dispenser gun. The extremity of the retraction capsule tip was placed into the buccal gingival sulcus and the material was slowly and steadily injected into the sulcus. The astringent retraction paste was left in place to work for 2 min maximum. The whitening of the gums shows the compression by the material. With a gentle air-water spray and simultaneous aspiration, the paste was eliminated. After the sulcus had dried. (Fig 2)



Figure 2:- Gingival retraction using astringent retraction paste.

Next the haemostatic potential was checked accordingly, scores 0, 1, and 2 were given in Table 1.

Table 1:- Hemorrhage scores.

Score 0	No bleeding
Score 1	Bleeding controlled within 1 min
Score 2	Bleeding not controlled within 1 min

After checking the haemorrhage, two impressions were made using double mix putty wash technique from each subject, using elastomeric impression materials. First impression was used for this study and the second one was sent to dental laboratory for the fabrication of full veneer crowns.

The impression was then rinsed under running tap water and the casts with individual dye were made in type IV die stone (Kalrock, Kalabhai Dental Products, India) for measurement of gingival retraction.

The amount of gingival displacement was then measured as a distance from the tooth to the crest of the gingiva in a horizontal plane. The horizontal gingival displacement on the die was measured and compared using stereomicroscope (Fig 3) (Olympus SZX7, Tokyo, Japan) having magnification of 20 X and image was captured and transferred to image analysis software with an accuracy of 1/10th of a micron.



Figure 3:- Steriomicroscope.

The width of gingival displacement was measured and compared at the mesiobuccal(MB)distobuccal(DB), mesiopalatal(MP) and distopalatal(DP) line angle regions(Fig 4).The values of gingival displacement for all the specimens in mm were tabulated and subjected to statistical analysis.

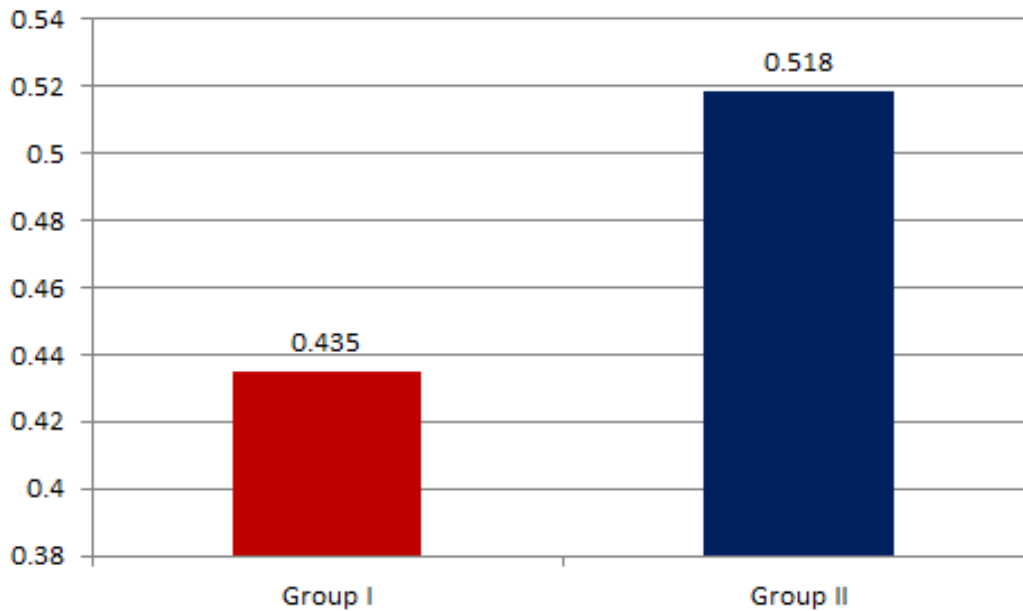


Figure 4:- Distance measured in image analysis software.

Results:-**Table 2:-** Intergroup comparison of Gingival displacement measurements between the Groups (Average).

	Groups	Mean	SD	Std Error	P value
Average (MB+DB+MP+DP)	Group I	0.435	0.040	0.008	0.001 (Sig)
	Group II	0.518	0.076	0.016	

This table illustrates the intergroup comparison of mean average of horizontal gingival displacement. The lowest horizontal gingival displacement was found to be of Group I (Stay-put retraction cord) (0.435) followed by Group II (Astringent retraction paste) (0.518). The mean average of MB+DB+MP+DP is significantly ($P < 0.05$) higher in Group II than in Group I

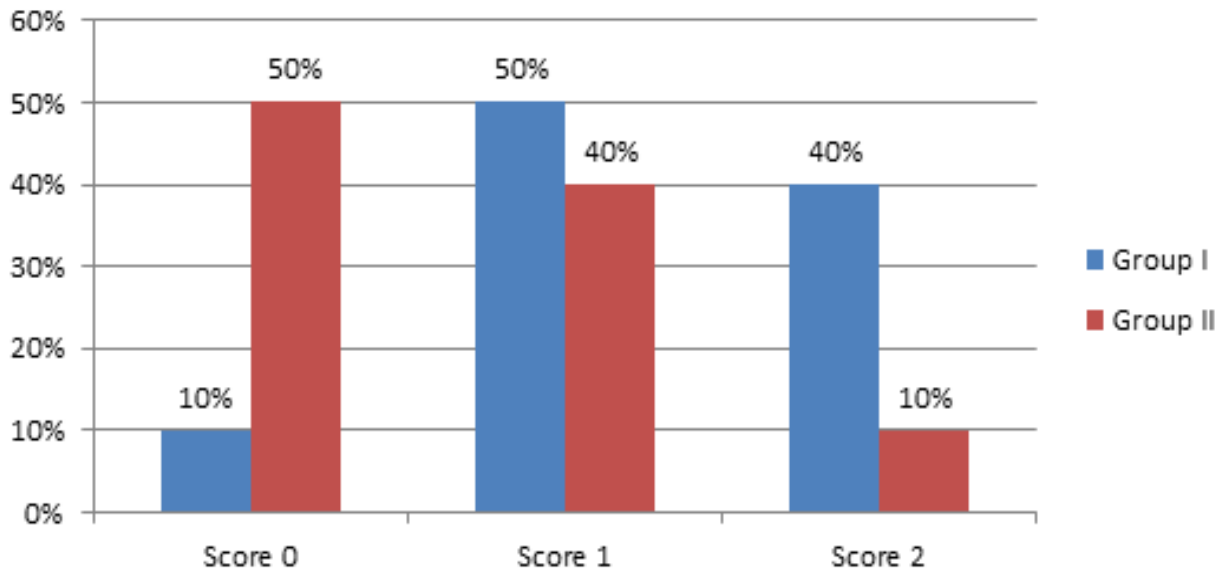


Graph 1:- Represents the mean average horizontal gingival displacement of two groups, Stay-put retraction cord and Astringent retraction paste. The lowest horizontal gingival displacement was found to be of Group I (Stay-put retraction cord) (0.435) followed by Group II (Astringent retraction paste) (0.518). The mean average of MB+DB+MP+DP is significantly ($P < 0.05$) higher in Group II than Group I.

Table 3:- Intergroup Comparison Of Haemorrhage Scores Between The Groups.

	No bleeding (Score 0)	Bleeding controlled within 1 min (Score 1)	Bleeding not controlled within 1 min (Score 02)	P value	Significance
Group I	02	10	08	0.001	Significant
	10%	50%	40%		
Group II	10	08	02	0.001	Significant
	50%	40%	10%		

This table illustrates the haemorrhage score of both groups. In Group I, 8 (40%) bleeding can not be controlled within 1 minute, 10 (50%) bleeding can be controlled within 1 minute and 2 (10%) has no bleeding on removal. In Group II, 10 (50%) has no bleeding on removal, 8 (40%) bleeding can be controlled within 1 minute and 2 (10%) bleeding not controlled within 1 minute. Score 0 and score 1 is significantly higher in Group II and Group I respectively



Graph 2:- Represents the hemorrhage scores of two groups, Stay-put retraction cord and Astringent retraction paste. In Group I (40%) bleeding can not be controlled within 1 minute, (50%) bleeding can be controlled within 1 minute and (10%) has no bleeding on removal. In Group II, (50%) has no bleeding on removal, (40%) bleeding can be controlled within 1 minute and (10%) bleeding not controlled within 1 minute. Score 0 and score 1 is significantly higher in Group II and Group I respectively. Hence the graph illustrates the haemorrhage control was good in Group II compared to Group I.

Discussion:-

The goal of fixed prosthodontic treatment is to improve patient comfort, masticatory function, maintain the health and integrity of the dental arches, and enhance patient self-image by replacing and restoring teeth with artificial substitutes⁷.

Clinical factors like the location of the finish line, the patient's periodontal health, and sulcular haemorrhage during the impression process all have a direct impact on the accuracy of the impression in fixed partial prosthodontics. A precise transfer of the patient's characteristics to the final cast is necessary to provide an appropriate marginal fit for the prosthesis. Therefore, gingival displacement is necessary to capture both the adjacent tooth morphology and the gingival finish line⁸.

Many different methods have been put forth in historical literature. These methods include surgical methods, chemical retraction pastes, mechanical retraction cord impregnated with chemicals, mechanical retraction cord, and in current practise, laser technology. The selection of technique is based on operator preference and the clinical situation because there is no scientific evidence to support the dominance of one technique over another. Despite looking promising, surgical procedures and the use of lasers are expensive and technique-dependent.

As a result, mechanical, chemicochemical, and chemical approaches predominate in daily practise⁹.

Hence in the present study, we evaluated the two recent gingival retraction materials, i.e. stay-put gingival retraction cord, expasyl gingival retraction paste, and astringent gingival retraction paste.

Stay-put, a braided retraction cord is a "Chemicochemical method" of gingival retraction.

The technique results in both mechanical and chemical displacement of the tissue. Stay-put cord was chosen as one of the gingival retraction materials in this study because of its special property to be wrapped around an extremely thin copper wire, which improves stability in the gingival sulcus. The advantages of stay-put gingival retraction cord are that it is adaptable and pliable which gives freedom of reshaping. It also provides good color contrast with gingiva. It does not have any cardiovascular risk.

Astringent gingival retraction paste contains 15% aluminium chloride. It is easy and time-saving retraction process and decreases the risk of bleeding after removal. The extra-finetip of the capsule fits directly into the sulcus and gets easy access into the gingival sulcus and in interproximal areas. The tip of is smaller and designed to correspond to a perioprobe. This may support a more effective and complete filling of the sulcus from the bottom and thus potentially more contact area to the tissue to be displaced. Astringents are metal salts that cause gingival displacement by precipitation of proteins and inhibition of transcapillary movement of plasma proteins. They act by reducing cell permeability and drying surrounding tissue. Hence, this retraction material was included in the study.

Based on the data collected, stay-put showed maximum bleeding on removal, minimal bleeding on removal by Astringent retraction paste. A study conducted by Acar et al¹⁰. in the year 2014 evaluated the clinical performance and the impression quality between the cordless, and conventional retraction system showed that the displacement paste and cap showed better results in terms of ease of application, time spent and bleeding. Furthermore, the pressure generated by the cordless system was studied by Bennani et al¹¹ in the year 2014 confirmed atraumatic pressure, with lower levels of post-treatment inflammatory cytokines as compared to the cord system.

This result is similar to that in the study by Qureshi et al¹ he compared the three gingival retraction material i.e. Astringent retraction paste, Stay-put, Expasyl. The Astringent retraction paste showed more gingival retraction than Stay-put retraction cord. However the finding is contrary to the results reported by Rahul Madan et al¹² who found that impregnated cords were better than Astringent retraction paste.

In the present study, astringent gingival retraction paste showed the highest amount of gingival retraction among the experimental groups. The probable reason being the consistency of the material, which was very thick, which caused more tissue displacement also the extra fine tip of the capsule provided easy access into the sulcus.

There are limitations to this study study did not compare the efficacy of both retractions systems in vertical displacement of free gingiva. However, studies should be conducted in future to evaluate the patient's comfort, gingival injury while application of the material, or recession after application of the material. Further clinical investigations are needed to investigate the clinical performance of newly formulated gingival displacement materials.

Conclusion:-

Based on the results and within the limitations of the study, it can be concluded that:

1. The astringent gingival retraction paste produced the highest amount of horizontal gingival displacement than stay-put retraction cord.
2. The hemorrhage control with the astringent gingival retraction paste system was found better than hemorrhage control with stay-put retraction cord.
3. The astringent retraction paste system is more effective among the two retraction systems used in this study, as it was easier in placement, attained good amount of retraction and induced minimal bleeding on removal compared to stay-put retraction cord

References:-

1. **Siddique Mohammed Qureshi**. Comparative evaluation of the amount of gingival displacement using three gingival retraction system-an invivo study. Contemp Clin Dent 2020;11:28-33
2. **Marco Ferrari, Maria crysanticagidiaco, carlo Ercoli**. Tissue management with a new gingival retraction material; A preliminary clinical report. J Prosthet Dent. 1996; 75:242-47.
3. **Shivasakthy M**. Comparative Study on the Efficacy of Gingival Retraction using Polyvinyl Acetate Strips and Conventional Retraction Cord – An in Vivo Study. Journal of Clinical And Diagnostic Research 2013;7(10):2368-71.
4. **The glossary of prosthodontic terms**: Ninth edition. J Prosthet Dent 2017 May;117(5S):e1-e105.
5. **Ashish R Jain, Deepak Nallaswamy**. Comparison of gingival retraction produced by retraction cord and expasyl retraction systems - An in vivo study Drug Invention Today 2018;10(1):35-41.
6. **Gupta, A., Prithviraj, D. R., Gupta, D., & Shruti, D**. P Clinical Evaluation of Three New Gingival Retraction Systems: A Research Report. The Journal of Indian Prosthodontic Society 2012;13(1): 36-42.
7. **Shillinburg HT, Sumiya H, Whitsett LD, Richard J, Brakette SE**. Fundamental of Fixed Prosthodontics. 3rd ed. Chicago: Quintessence Publishing Co. Inc.; 1997.

8. **Kohli, P. K., and V. Hegde.** Comparative evaluation of efficacy of gingival retraction using chemical and mechanical methods: an in vivo study". *asian journal of pharmaceutical and clinical research*, vol. 11, no. 2, feb. 2018, pp. 128-31, doi:10.22159/ajpcr.2018.v11i2.22674.
9. **Prasad KD, Hegde C, Agrawal G, Shetty M.** Gingival displacement in prosthodontics: A critical review of existing methods. *J Interdiscipl Dent* 2011;1:80-6.
10. **OzlemAcar, SelimErkut et al.** A clinical comparison of cordless and conventional displacement systems regarding clinical performance and impression quality.*JProsthet Dent* 2014;111:388-394.
11. **Bennani V, Aarts JM, Brunton P.** A randomized controlled clinical trial comparing the use of displacement cords and aluminum chloride paste. *J EsthetRestor Dent.* 2020 Jun;32(4):410-415. doi: 10.1111/jerd.12581. Epub 2020 May 22. PMID: 32442353.
12. **Madaan R, Paliwal J, Sharma V, Meena KK, Dadarwal A, Kumar R.** Comparative Evaluation of the Clinical Efficacy of Four Different Gingival Retraction Systems: An In Vivo Study. *Cureus.* 2022 Apr 7;14(4):e23923. doi: 10.7759/cureus.23923. PMID: 35530916; PMCID: PMC9078289.