

Original Article

Effect of gingival retraction cord and retraction paste on gingival tissue in fixed prosthodontics impression

*Mohammad Shamsuzzaman^a, Sheikh. Md.Shahriar Quader^b, Shakila Fatema^c, Md. Abdul Gofur^d, Khaleda Akter^e

^aOral & Dental Surgeon, Z & Z Orthodontic & Dental Clinic, Uttara, Dhaka.

^bAssistant Professor, Dentistry, Sher-e-Bangla Medical College, Barisal.

^cAssistant Professor & Head, Dept. of S.D.M, Holy Family Red Crescent Medical College Hospital

^dLecturer, Dept.of Dental Pharmacology, Dhaka Dental College. Dhaka.

^eAssistant Professor, Department of Conservative Dentistry and Endodontics, BSMMU

ARTICLE INFO

Article history:

Received : 20 October 2012

Accepted : 17 March 2013

Keywords:

Gingival retraction;
Retraction cord;
Paste retraction system;
Hemostatic solution;
Subgingival preparations.

ABSTRACT

Background & Objectives: Of the various gingival retraction systems available in the market, a cordless paste system is fairly new entrant into this field. This system promises to provide an easier method to obtain optimum retraction with excellent hemorrhage control. The present study was designed to clinically evaluate the efficacy of paste retraction system and medicated retraction cords on the basis of relative easy of working, hemorrhage control and amount of vertical gingival retraction.

Methods: 40 subjects were selected requiring full veneer restoration where more than one abutment teeth were to be prepared. After the preparation of the abutment teeth flexible scales were used to measure the sulcus depth before retraction and after retraction. Medicated retraction cord technique was used on one abutment tooth and on the other abutment tooth paste retraction system was employed. Subjectively easy of placement and hemorrhage scores was assessed.

Results: The mean time taken for paste retraction technique was 45.13 seconds and for medicated retraction cord technique was 105.4 seconds. In all the subjects paste retraction technique was relatively easier as compared with medicated retraction cord technique. Mean hemorrhage scores using paste retraction technique was 0.05 and using medicated retraction cord technique it was 1.70. Mean vertical gingival retraction using paste retraction technique was .36mm and using medicated retraction cord technique was 0.54mm

Conclusion: Within the limitations of this study, paste retraction system requires reduced time for application, is easier to place, and provides excellent hemorrhage control in comparison to medicated retraction cord. However, medicated retraction cord provides increased amount of vertical retraction as compared to paste retraction technique.

*Address to correspondence:

Dr. Mohammad Shamsuzzaman,
BDS, MS (Prosthodontics), Self employed
Z & Z Orthodontic & Dental Clinic
Uttara, Dhaka-1230, Bangladesh
Cell phone no: 01715012446
E-mail: drzamanb@yahoo.com

Modern Dentistry is based on two directions: prevention and aesthetics. Introducing in the dental practice new materials and improved technologies has created new opportunities to attain these two goals. For a precision of fit and long-term success with fixed prosthetic dental restorations, the quality of impressions taken is a key element of decisive importance. Obtaining an extremely accurate impression is one of the first and most important steps in providing our patients with a superior crown and bridge restoration. Taking an accurate impression requires appropriate tooth preparation and soft-tissue management.

Gingival management with proper moisture control and gingival retraction are two particular factors that determine success or failure of the procedure. For the retraction of soft tissue (widening of the sulcus), three principle methods are available for use today: 1) mechanical; 2) chemo-mechanical; and 3) electrosurgical; ¹. The chemo-mechanical technique is probably the most widely used. It is important to note that if we wish to achieve a good haemostatic opening of the gingival margin, the highly sensitive gingival must not be traumatized to such an extent that long-term retraction is a result; the healing process of maltreated epithelium can present us with an exposed crown margin during the insertion of the final tooth restoration or periodontal disease.

The aim of gingival retraction is to allow access for the impression material beyond the abutment margins and to create space for the impression material to be sufficiently thick. Tear resistance of the impression material can be affected by the material thickness. Gingival retraction should be mandatory prior to impression so as to expose the prepared tooth surfaces. Impression with less sulcular width has higher incidences of voids, tearing of impression materials, and reduction in marginal accuracy. Occasionally, gingival retraction is required in order to permit the completion of tooth preparation or to allow cementation of laboratory-manufactured restorations. A number of studies have been done on the various materials and methods used for gingival retraction.

The success of fixed prosthodontic restorations is largely dependent upon the long-term health and stability of the surrounding periodontal structures ². No single restoration in dentistry is more dependent upon nor influences more the health of periodontal structures than the full veneer restoration.

Full veneer preparations often require subgingival margins because of caries, existing restorations, esthetic demands, or the need for additional retention ^{3,4}. In these situations it is important to take an impression that accurately capture the prepared cervical finish lines and permit the fabrication of accurate dies on which the restorations are fabricated. But, often the cervical finish lines captured by the clinicians are inadequate.

The inability of the impression materials to adequately displace soft tissues, fluids or debris mandates adequate isolation. The gingival displacement procedure allows the impression material to flow apical to the subgingival finish line thereby exposing it and an area apical to it ⁵. These procedures lead to easy instrumentation, clear visualization and good impression, resulting in a quality prosthesis having a marginal fidelity and a sound emergence profile.

Exposing the gingival margins of a preparation prior to making impression may be one of the most difficult procedures for the dentist to perform. This difficulty is further complicated by variations in sulcular depth, distendability of gingival tissues, degree of gingival inflammation, level of margin placement and tissue laceration ⁶.

Several clinical methods are available for adequate gingival retraction. Mechano-chemical method of using a retraction cord impregnated or soaked in various chemicals is the most frequently used method ⁷. Retraction cord mechanically displaces the gingival tissue and absorbs moisture contamination in the gingival sulcus, while the chemical agents control hemorrhage and shrink the gingival tissues.

Clinically comparative evaluations of gingival retraction systems are done very rarely mainly because there is no consensus on the evaluation

criteria. Evaluating the clinical efficiency is difficult because of the lack of appropriate measuring tools. Choice of appropriate gingival retraction system is still a dilemma in the mind of the operator.

Of the various gingival retraction systems available in the market, a cordless paste system is fairly new entrant into this field⁸. This system promises to provide good retraction and excellent hemorrhage control. Till date there are very few studies exclusively done to compare this retraction system with commonly used medicated retraction cords. Therefore the present study is designed to evaluate the clinical outcome of paste retraction system and medicated retraction cords on the basis of relative easy of working, hemorrhage control and amount of gingival retraction.

Materials and methods:

It was a comparative (in vivo) study. This study was carried out in the Department of Prosthodontics, Faculty of Dentistry, Bangabandhu Sheikh Mujib Medical University, Dhaka. Duration of the study was January 2009 to December 2010. Simple random sampling was followed to select the subject of this study. Subject was not less than 18 years of age, Preparation for full veneer restoration involving more than one-abutment teeth, Sound gingival and periodontal health of the abutment teeth, Abutment teeth of normal size and contour (no developmental anomaly or regressive age changes) and no Cardiovascular disorders, diabetes, hypertension, epileptic, gingival hyperplasia, blood disorder and other debilitating diseases, no attachment loss or signs of periodontal disease, no Tipped, tilted or rotated abutment teeth. In total 40 patients were taken as sample of this study. Patients who need upper Anterior fixed partial denture. **Group A:** 40 abutment teeth with retraction cord (Gengiret). **Group B:** 40 abutment teeth with retraction paste (Traxodent).

Study procedure:

Each of the patient was evaluated by a thorough medical and dental history as well as clinical examination according to the history sheet (Appendix-2)

Preparation of subjects:

Subjects were assessed clinically and radiographically for the sound condition of the abutment. Abutments were prepared for full veneer restoration with subgingival margins taking care to avoid damage to surrounding gingival tissues. After the preparation of teeth the area was isolated thoroughly.

PREPARATION OF FLEXIBLE SCALES:

The flexible scales were fabricated by printing scale markings on transparent sheets to the accuracy of 0.5 mm.

PREPARATION OF MEDICATED RETRACTION CORD: Medicated retraction cord was obtained by soaking plain knitted retraction cord in aluminum chloride hemostatic agent (Roeko gingival liquid) for 20 minutes in a clean container.

Recordings:

The subjects were seated comfortably in an upright position on the dental chair and the light was focused to illuminate the area to be recorded. Prior to the application of any retraction technique, flexible scales were used to measure the sulcus depth at mesio buccal, midbuccal and disto buccal region on both the abutment teeth. This recording gave the sulcus depth before retraction. Subsequently image was captured using digital still camera for future verification.

Medicated retraction cord technique was used on one abutment tooth and on the other abutment tooth paste retraction system was employed.

MEDICATED RETRACTION CORD:

Retraction cord of adequate length was selected i.e., slightly more than required to encircle the tooth was cut and looped around the tooth. Cord packing was started from the mesial interproximal area by gently pushing the cord into the sulcus. The cord packer was angled toward the tooth so that, the cord was pushed directly into the area. Cord placement was continued all around the tooth. The operator assessed the easy of placement (cord) subjectively. Further the time taken for placement (from start of packing till completion) of cord was recorded. The cord was left in the sulcus for 5 minutes, after which it was slowly

retrieved. The amount of hemorrhage was then recorded in terms of score 0 to 2.

{Score 0: No bleeding on removal.

Score 1: Bleeding controlled with air and water spray within 1 minute.

Score 2: Bleeding not controlled within 1 minute}

Immediately following the assessment of hemorrhage, amount of vertical gingival retraction was recorded at the same three locations (mesio buccal, midbuccal, disto buccal), using flexible scales. Subsequently image was captured using digital still camera for future verification.

PASTE RETRACTION SYSTEM:

The paste was injected slowly into the sulcus resting on the tooth. Care was taken to ensure that the point of cannula created a closed space between the tooth and marginal edge of the gingiva. No pressure was applied on gingiva with the cannula. Sufficient quantity was placed so that the paste totally fills the sulcus in order to obtain an adequate retraction.

The operator assessed the easy of placement subjectively. Time taken for placement of paste (from start of placement till completion) in the sulcus was recorded. At the end of 2 minutes paste was washed away from sulcus using air and water spray. Amount of hemorrhage after retraction was recorded using scores 0 to 2.

Immediately following the assessment of hemorrhage, amount of vertical gingival retraction was recorded at the same three locations (mesio buccal, midbuccal, disto buccal), using flexible scales. Subsequently image was captured using digital still camera for future verification.

Data were collected on the basis of the following parameters.

Vertical gingival retraction ⁹

Amount of vertical gingival retraction was recorded at the three locations mesio buccal, midbuccal, and disto buccal region, using flexible scales.

Score for gingival hemorrhage ³

The cord was left in the sulcus for 5 minutes, after which it was slowly retrieved. The amount of hemorrhage was then recorded in terms of score 0 to 2. And at the end of 2 minutes paste

was washed away from sulcus using air and water spray. Amount of hemorrhage after retraction was recorded using scores 0 to 2.

Score 0: No bleeding on removal.

Score 1: Bleeding controlled with air and water spray within 1 minute.

Score 2: Bleeding not controlled within 1 minute

Time required for application ¹

From start of placement till completion

Easy of placement ¹⁰

Subjects were asked to feel any pressure or pain during immediately after each material was applied.

Data collected on the basis of specific parameters, collected data was recorded on the pre designed data collection sheet. The following methods of statistical analysis have been used in this study. The results were averaged (mean \pm standard deviation) for each parameter. The following methods of statistical analysis have been used in this study. The results were averaged (mean \pm standard deviation) for each parameter. A paired 't' test was performed to determine whether there were significant difference in amount of vertical gingival retraction between paste retraction technique and medicated retraction cord technique. In all above test P value less than 0.05 was taken to be statistically significant. The data was analyzed using SPSS statistical package.

Results:

Parameter of the study, gingival vertical retraction, gingival hemorrhage, time taken for application and easy of application are measured and results are expressed in tables and bar diagrams as follows:

Table I: Distribution of the study sample according to Mesio buccal (MB) sulcus depth (n=80)

	Group A (n=40)	Group B (n=40)	P Value
	Mean \pm SD	Mean \pm SD	
MB	0.54 \pm 0.16	0.34 \pm 0.12	0.001 ^s
Range (min-max)	(0.25-0.75)	(0.25-0.5)	

Data are analyzed using unpaired t-test and are presented as Mean± SD.

n= Total number of subjects

S= significant, NS= Not significant

MB= Mesio buccal

Group A: abutment teeth with retraction cord

Group B: abutment teeth with retraction paste

Table I show that the mean (±SD) MB sulcus depth of the study samples (upper anterior teeth) are 0.54± 0.16 mm in group A and 0.34±0.12mm in group B. Mean MB is significantly (p<0.05) higher in group A than group B.

Table II: Distribution of the study sample according to Mid buccal (B) sulcus depth (n=80)

B	Group A (n=40)	Group B (n=40)	P Value
	Mean± SD	Mean± SD	
Mean ± SD	0.58±0.14	0.41±0.14	0.001 ^s
Range (min-max)	(0.25-0.75)	(0.25-0.75)	

Data are analyzed using unpaired t-test and are presented as Mean± SD.

n= Total number of subjects

S= significant, NS= Not significant

B= Mid buccal

Group A: abutment teeth with retraction cord

Group B: abutment teeth with retraction paste

Table II show that the mean (±SD) B sulcus depth of the study samples (upper anterior teeth) are 0.58±0.14 mm in group A and 0.41±0.14mm in group B. Mean B is significantly (p<0.05) higher in group A than group B.

Table III: Distribution of the study sample according to Disto buccal (DB) sulcus depth (n=80)

DB	Group A (n=40)	Group B (n=40)	P Value
	Mean± SD	Mean± SD	
Mean ± SD	0.49±0.15	0.34±0.13	0.001 ^s
Range (min-max)	(0.25-0.75)	(0.25-0.75)	

Data are analyzed using unpaired t-test and are presented as Mean± SD.

n= Total number of subjects

S= significant, NS= Not significant

DB= Disto buccal

Group A: abutment teeth with retraction cord

Group B: abutment teeth with retraction paste

Table III show that the mean (±SD) DB sulcus depth of the study samples (upper anterior teeth) are 0.49± 0.15 mm in group A and 0.34±0.13 mm in group B. Mean DB is significantly (p<0.05) higher in group A than group B.

Table IV: Distribution of the study sample according to Average of Mesio buccal (MB)+ Mid buccal (B)+ Disto buccal (DB) sulcus depth (n=80)

	Group A (n=40)	Group B (n=40)	P Value
	Mean± SD	Mean± SD	
Average of MB+B+DB	0.54±0.10	0.36±0.09	0.001 ^s
Range (min- max)	(0.25-0.75)	(0.25-0.75)	

Data are analyzed using unpaired t-test and are presented as Mean± SD.

n= Total number of subjects

S= significant, NS= Not significant

MB= Mesio buccal, B= Mid buccal, DB= Disto buccal

Group A: abutment teeth with retraction cord

Group B: abutment teeth with retraction paste

According to the table IV show that the mean (±SD) average of MB+B+DB sulcus depth of the study sample (upper anterior teeth) are 0.54± 0.10 mm in group A and 0.36±0.09 mm in group B. Mean average of MB+B+DB is significantly (p<0.05) higher in group A than group B.

Table V: Distribution of the study sample according to time taken for application (n=80)

	Group A (n=40)	Group B (n=40)	P Value
	Mean± SD	Mean± SD	
Time (sec.)	105.4±18.95	45.13±7.96	0.001 ^s
Range (min-max)	(59-143)	(31-62)	

Table V show that the mean (±SD) time taken of the study samples (upper anterior teeth) are 105.4± 18.95 sec. in group A and 45.13±7.96 sec. in group B. Mean time taken is significantly

($p < 0.05$) higher in group A in comparison to group B.

Table VI: Status of hemorrhage score of the study sample

Hemorrhage score	Group A (n=40)		Group B (n=40)		P Value
	n	%	n	%	
Score 0	2	5.0	38	95.0	
Score 1	8	20.0	2	5.0	
Score 2	30	75.0	0	0.0	
Mean \pm SD	1.70	± 0.56	0.05	± 0.22	0.001 ^s

Data are analyzed using Chi-square test and are presented as number and percentage

n= Total number of subjects

S= significant, NS= Not significant

Group A: abutment teeth with retraction cord

Group B: abutment teeth with retraction paste

Score 0: No bleeding on removal.

Score 1: Bleeding controlled with air and water spray within 1 minute.

Score 2: Bleeding not controlled within 1 minute.

Table VI display that in group A, the terms of the hemorrhage score, majority 30(75.0%) bleeding can not be controlled within 1 minute, 8(20.0%) bleeding can be controlled with air and water spray within 1 minute and 2(5.0%) has no bleeding on removal. In group B, 38(95.0%) has no bleeding on removal and bleeding can be controlled with air and water spray within 1 minute for the rest 2(5.0%). Score 0 and score 1 are significantly higher in group A and group B respectively. The mean hemorrhage score is 1.70 ± 0.56 in group A and 0.05 ± 0.22 in group B. There fore the mean hemorrhage score is significantly ($p < 0.05$) higher in group A than group B.

Table VII: Distribution of the study sample according to easy of placement (n=80)

	Group A (n=40)		Group B (n=40)	
	n	%	n	%
Easy of Placement	0	0.0	40	100.0

Table VII Show that no easy of placement in Group A at 0(0.0%) and easy of placement in Group B at 40(100%).

Discussion:

Several studies are available about the performance of cord as well as paste, the present study was designed to evaluate clinically the efficacy of paste retraction system and medicated retraction cords on the basis of relative easy of working, hemorrhage control and amount of gingival retraction.

40 patients were selected requiring full veneer restoration where at least two abutment teeth need to be prepared. One tooth was prepared using the cord and other by the paste. After the preparation of the abutment teeth, the area was isolated thoroughly. Flexible scales (fabricated by printing scale markings on transparent sheets to the accuracy of 0.5 mm. which was easy to insert the sulcus) were used to measure the sulcus depth (mesio buccal, mid buccal, distro buccal) before application of any retraction technique. Medicated retraction cord technique was used on one abutment tooth and on the other abutment tooth paste retraction system was employed. Subjectively easy of placement and hemorrhage scores was assessed. Using flexible scales post retraction measurement of sulcus was assessed for both the techniques.

The data were analyzed statistically (SPSS) that showed the mean time taken for paste retraction technique was 45.13 seconds and for medicated retraction cord technique was 105.4 seconds. The results indicated a statistically significant increased time required for medicated retraction cord compared to paste retraction system because cord was placed by the cord packer which was time consuming.

In this study easy of placement using paste retraction technique was 100% (40 subjects) whereas for medicated retraction cord technique was 0% (no subjects) because no feeling any pressure or pain during immediately after each material was applied. The results indicated paste retraction system to be more operator - friendly in comparison to medicated retraction cord^{1,11}; also showed that paste was easy to use, nontraumatic, and less time consuming retraction of the sulcus and did not induce

bleeding during or after retraction. Although cord can be painful and uncomfortable for the patient¹².

In another study^{10,13} reported that paste designed for easy and fast temporary retraction of the sulcus and also non-traumatic and conservative method. Easy and fast application directly to the sulcus without pressure or packing. Comfortable to the patient. No haemostatic chemicals to contaminate the impression site – no need for extensive rinsing. Outstanding retraction for perfect impressions.

In this clinical study the mean hemorrhage scores using paste retraction technique was 0.05 and using medicated retraction cord technique it was 1.70. Because cord cannot dry the field immediately after removal. The results indicated a statistically significant difference P-value of 0.001 was observed regarding control of post retraction bleeding in paste retraction system compared to medicated retraction cord. This was similar to the findings reported by¹⁰ who found that less bleeding and pain was observed with the paste retraction technique compared with the use of medicated retraction cord.

Regarding the mean vertical gingival retraction using paste retraction technique was .36 mm and using medicated retraction cord technique was 0.54mm, with a P - value of 0.001. Because the cord was placed by cord packer with pressure. The results indicated a statistically significant vertical gingival retraction in medicated retraction cord compared to paste retraction system. Similar study carried out by¹⁴; retracted sulcus in the presaturated cord group (0.46 ± 0.34 mm) was greater than paste group (0.34 ± 0.36 mm, $p < 0.001$). Based on the findings, gingival retraction with paste method caused less injury to gingival tissues than impregnated cord, while both provide gingival retraction.

The mean vertical gingival retraction using paste retraction technique at mesio buccal location was .34mm, at midbuccal location was .41mm and at disto buccal location was .34mm and mean vertical gingival retraction using medicated retraction cord technique it was 0.54mm at mesio buccal location, 0.58mm at midbuccal location, and 0.49 mm at disto buccal location with a P value of 0.001. The average of vertical gingival retraction with medicated

retraction cord is significantly better than the paste retraction system. It was also the same reason as above.

Conclusion:

Within the limitations of the study, paste retraction system appears to be a promising system for the control of hemorrhage and easy of placement. However, the amount of vertical gingival retraction observed with paste retraction system was significantly less than the medicated retraction cord system.

Recommendation:

- Paste retraction system is easy to apply and also less time consuming.
- In terms of hemorrhage control paste retraction system is more effective.
- For vertical gingival retraction presaturated gingival cord is recommended.
- Combination of medicated retraction cord and paste retraction system may be considered for achieving both effective hemorrhage control and optimum gingival retraction, however this aspect require further studies.

References:

1. 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 Dec; 35(12):1053-8.
2. Ferencz JL. Maintaining and enhancing gingival architecture in fixed prosthodontics. *J Prosthet Dent* 1991; 65:650-7.
3. Weir DJ, Williams BH. Clinical effectiveness of mechanical-chemical tissue displacement methods. *J Prosthet Dent* 1984; 51:326-9.
4. Bishop K, Briggs P, Kelleher M. Margin design for porcelain fused to metal restorations which extend onto the root. *Br Dent J* 1996; 180:177-84.
5. Trivedi SC, Talim ST. The response of human gingiva to restorative materials. *J Prosthet Dent* 1973; 29:73-80.
6. Nemetz H, Donovan T, Landesman H. Exposing the gingival margin: A systematic approach for the control of hemorrhage. *J Prosthet Dent* 1984; 51:647-.
7. Donovan TE, Gandara BK, Nemetz H. Review and survey of medicaments used with gingival

- retraction cords. *J Prosthet Dent* 1985; 53:525-31.
8. Donovan TE, Chee WWL. Current concepts in gingival displacement. *Dent Clin North Am* 2004; 48:433-70.
 9. Rena T Vakay, John C Kois. Universal Paradigms for Predictable Final Impressions. *Compendium / March 2005, Vol. 26, No. 3.*
 10. Jen-chang yang, chih-mong tsai, may-show chen, joan yvette wei, sheng-yang lee, che-tong lin. Clinical study of a newly developed injection-type gingival retraction material. *Chin Dent J* 2005 Vol 24 No 3.
 11. Sushma Phatale, P.P. Marawar, Girish Byakod, Sanjay B. Lagdive and Jitendra V Kalburge. Effect of retraction materials on gingival health: A histopathological study. *J Indian Soc Periodontol.* 2010 Jan–Mar; 14(1): 35–39.
 12. Abdulaziz m albaker, gingival retraction - techniques and materials: a review, *Pakistan Oral & Dental Journal* Vol 30, No. 2 (December 2010).
 13. Agripina Zaharia, Mihaela Duta, Corina Stefanescu. Modern technique for the gingival sulcus management. *OHDMBSC - Vol. VI - No. 2 - June, 2007*
 14. Kazemi, M.; Memarian, M.; Loran, V. Comparing the Effectiveness of Two Gingival Retraction Procedures on Gingival Recession and Tissue Displacement: Clinical Study. *Research Journal of Biological Sciences* Year: 2009 Volume: 4 Issue: 3 PageNo.335-33.