

Comparative clinical and quantitative evaluation of the efficiency of five different non-invasive gingival retraction systems: An in-vivo study.

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Abstract

Background A wide variety of gingival retraction materials are available, but the efficacy of horizontal as well as vertical retraction was unknown.

Purpose: The purpose of the present study was to evaluate and compare the efficiency of five different non-invasive gingival retraction systems.

Materials & Method: Five different gingival retraction systems ie; Retraction cord, Retraction capsule, Racegel, Comprecap, and Traxodent retraction paste were used to retract gingiva in healthy mandibular 1st molar. After retraction impressions were made with additional silicone and cast poured with die stone, which was further sectioned along the mid buccal groove and scanned under the profile projector for measurement of vertical and horizontal separation.

Result: The mean score value of traxodent paste was found to be the highest in comparison to the other four gingival retraction system. The difference between each group was found to be very highly significant($P < 0.001$).

Conclusion: Traxodent paste was found to be the most effective and comprecap was the least effective non - invasive gingival retraction system.

KEY WORDS: Gingival retraction, Vertical separation, Horizontal separation, Retraction cord, Retraction capsule, Racegel, Traxodent paste, Comprecap.

INTRODUCTION

For the long-term success of a fixed partial denture the relationship between the fixed dental prosthesis and the surrounding hard and soft tissue is considered crucial.¹ Fixed dental prosthesis requires an accurate impression that records location of the finish line of the prepared tooth and a portion of apical unprepared tooth structure.² Therefore, displacement of the gingival tissue is essential for obtaining accurate impressions for the fabrication of fixed restorations, particularly while the finish line is at or just within the gingival sulcus and cervical lesions are present.³

Tissue management includes placing the gingival tissues away from the preparation margins; so, they can record the impression combined with providing hemostasis when the gingival tissues are susceptible to bleeding.⁴

Mainly two types of displacement is seen, one is lateral which displaces the tissue so that adequate bulk of the impression material can be interfaced with the prepared tooth and the other is apical or vertical which exposes the uncut portion of the tooth apical to the finish line which may cause trauma of the gingival tissues followed by recession.⁵ The technique used should be atraumatic to the periodontal tissues.

Some recent advances in the field of gingival retraction are in use today, which are - expasyl, magic foam cord, gitgitrac, gel cord, tissue goo, g-cuff and retraction capsule.⁶ Expasyl (SDS/KERR) is viable alternative to a conventional retraction cord.⁷ The factors responsible for the longevity and aesthetics of a restoration are intimately linked to the gingival and periodontal tissues.⁸ The placement of any restoration placed in close proximity to the

gingival tissues requires adequate access and isolation, for which various gingival retraction methods and materials are available.⁹ These are classified broadly as mechanical, chemo-mechanical, cordless and surgical techniques.¹⁰ This study was conducted to compare the efficacy of gingival retraction of conventional method (retraction cord) and four recent advanced gingival retraction system in term of ease of their application and removal, comfort of the patient as well as post retraction gingival health.

MATERIALS AND METHODOLOGY

The study was conducted in Department of Prosthodontics and Crown and Bridge, Institute of Dental Studies and Technology, Kadrabad, Modinagar (Uttar Pradesh), India. Twenty patients with healthy periodontal status with respect to mandibular first molar were selected in this study. For the scope of this study, convenient sampling was deployed; volunteer patients were considered as individuals for the research. Medically compromised patients, pregnant and lactating women, and those who have undergone any type of periodontal surgery in the past 6 months were not included in the study.¹¹ The research protocol was evaluated by the institutional ethical committee and clearance was received. Informed consent was obtained from the participants.¹²

The materials which were used in this study are Retraction cord (Coltene, Switzerland), Retraction capsule (3M ESPE, India) Racegel (Septodent, India), Comprecap (Premier, USA) and Traxodent retraction paste (Premier, USA). Addition silicone (Light Body and Putty Consistency; Imprasil, Pyrex, India) was used to make the impression.

METHODOLOGY

All subjects were advised for oral prophylaxis and restoration of the caries in the selected tooth or any other tooth (if needed).¹³ Before preparation, all teeth had to be free of active periodontal inflammation and have probing depths <3 mm and no bleeding on probing.¹⁴

Baseline Impression

Baseline impressions were made for the control group in which no gingival displacement was done.¹⁵ Impressions were made with addition silicone and removed from patient's mouth after the material was set and it was rinsed under running water. Then the impressions were poured with type IV gypsum product - Die Stone (Kalrock, Kalabhai Dental Products, India).



Fig 1 : Gingival retraction done with retraction



Fig 2 : Gingival retraction done with capsule.



Fig 3 : Gingival retraction done with racegel



Fig 4 : Gingival retraction done with comprecap.



Fig 5 : Gingival retraction done with traxodent.



Fig 6 : Impression made after retraction



Fig 7 : Cast obtained from the impression.



Fig 8 : Sectioning the mandibular right molar from the mid buccal groove.

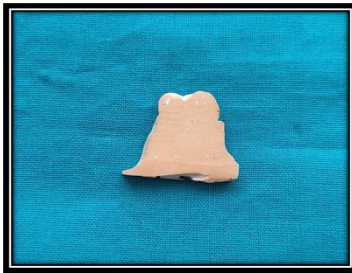


Fig 9 : Sectioned Die

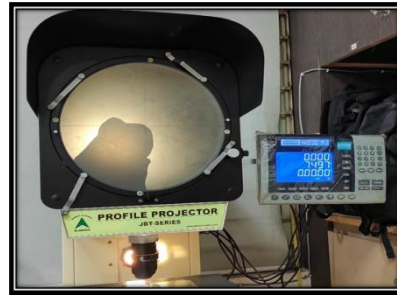


Fig 10 : Measuring the vertical separation



Fig 11 : Measurement of horizontal separation

Gingival Retraction and Impression Making

Individual impressions were made with addition silicone (Light Body and Putty Consistency; Imprasil, Pyrex, India) using five different gingival retraction systems (Retraction cord(Fig 1), Retraction capsule, Racegel, Comprecap and Traxodent retraction paste) providing a time interval of 15 days in between the each retraction methods.¹⁶ Then each of the impressions were poured with type IV gypsum product - Die Stone Stone (Kalrock, Kalabhai Dental Products, India).

room temperature (T: 20°C) and turns into a firm gel when placed in contact with oral tissues (T: 35°C). This effectively creates a space in the gingival without applying any pressure, keeping the gingiva passive and the patient comfortable.¹⁷

Impressions were made after retracting the gingiva with each retracting system. (Fig 6). Then the impressions were poured with type IV gypsum product - Die Stone (Kalrock, Kalabhai Dental Products, India) (Fig 7).

Die Preparation

Casts with individual die was made in type IV gypsum product - Die Stone (Kalrock, Kalabhai Dental Products, India). Die stone models thus obtained was sectioned along the buccal groove of the mandibular first molar vertically¹⁸(Fig 8).

Groups

All the participants were divided into six groups and each group had four sub-groups(X_1 . Measurement of vertical separation, X_2 . Measurement of vertical retraction, Y_1 . Measurement of horizontal separation, Y_2 . Measurement of horizontal retraction). Group-I(Control group): Consist of patients whose gingiva was not retracted. Group-II: Consist of patients whose gingiva was retracted by Retraction cord. Group-III: Consist of patients whose gingiva was retracted by Retraction Capsule. Group-IV: Consist of patients whose gingiva was retracted by Racegel. Group-V: Consist of patients whose gingiva was retracted by Comprecap. Group-VI: Consist of patients whose gingiva was retracted by Traxodent retraction paste.

Labelling

Each model (Fig 9) was given a label for proper identification, such as -1A, 1B, 1C, 1D, 1E, 2A, 2B, 2C, 2D, 2E to 20A, 20B, 20C, 20D, 20E. - where numerals were denoted as the participants and the alphabets indicated retraction methods. (A -Retraction cord, B - Retraction capsule, C – Racegel, D -Comprecap, E-Traxodent retraction paste.)

TESTING OF SAMPLES

Measuring Sulcus Width (Fig 10)

Width of the sulcus or Horizontal separation was measured on the sectioned dye by using a Profile projector which has axis (X-Y axis) to carry out various measurements. The sulcus width or amount of gingival retraction were measured as the distance from the tooth surface to the crest of the marginal gingiva in the horizontal plane.¹⁹ Thus value so obtained were recorded and compared with pre-retracted and five different post-retracted methods. All the values so recorded were kept for future references.

Measuring Change in Sulcus Depth (Fig 11)

Change in sulcus depth or vertical displacement was measured as the distance from the cusp tip to deepest point of the gingival sulcus by using a Profile projector which has axis (X-Y axis) to obtained were recorded and compared with pre-retracted and five different post-retracted methods.²⁰ All the values so recorded were also kept for future references.

In this this study paired ‘t’ test was applied as one sample (mandibular 1st molar) has been tested repeatedly and two of the groups has to be compared with each-other. Wilcoxon Signed Rank test was applied in while comparing horizontal separation of control group with other as the data is not normally distributed.

RESULT

The data obtained was compiled systematically, transformed from a pre-coded proforma to a computer and a master table was prepared. The total data was distributed meaningfully and presented as individual tables along with graphs.

Table 1: Gingival Retraction

Material Used	Vertical Retraction		Horizontal Retraction	
	Mean	SD	Mean	SD
Conventional Cord with Gel	1. 314	0. 345	0. 620	0. 104

Capsule	0.680	0.283	0.301	0.080
Race Gel	0.949	0.273	0.460	0.095
Traxodent	1.622	0.350	0.793	0.166
Comprecap	0.336	0.224	0.126	0.055

Table 2: Comparison of gingival retraction between different materials used for retraction

Materials Used	Vertical Retraction		Horizontal Retraction	
	Paired 't' test	p – Value	Paired 't' test	p – Value
Conventional Cord with Gel vs Capsule	13.761	< 0.001*	15.338	< 0.001*
Conventional Cord with Gel vs Race Gel	8.205	< 0.001*	11.412	< 0.001*
Conventional Cord with Gel vs Traxodent	12.382	< 0.001*	8.774	< 0.001*
Conventional Cord with Gel vs Comprecap	15.914	< 0.001*	18.967	< 0.001*
Capsule vs Race Gel	16.098	< 0.001*	12.500	< 0.001*
Capsule vs Traxodent	15.742	< 0.001*	14.340	< 0.001*
Capsule vs Comprecap	8.193	< 0.001*	10.941	< 0.001*
Race Gel vs Traxodent	11.787	< 0.001*	13.146	< 0.001*
Race Gel vs Comprecap	14.987	< 0.001*	14.974	< 0.001*
Traxodent vs Comprecap	18.065	< 0.001*	16.747	< 0.001*

* Very Highly Significant

The mean values with respect to gingival retraction of different groups are tabulated (Table 1) depicting that comprecap (group VI) group shows the least retraction with mean value of 0.336 ± 0.224 . Traxodent paste (group v) shows the highest retraction with mean value of 1.622 ± 0.350 . Comparison of gingival retraction between different materials (Table 2) used for retracting the gingiva was done by paired t – test for both vertical as well as horizontal retraction, showing p – values < 0.001 which is statistically very significant.

DISCUSSION

This *in vivo* study included twenty individuals requiring having healthy mandibular first molar were selected for the study. Clinical investigation was performed for comparative evaluation of the efficacies of retraction cord, retraction capsule, racegel, traxodent and comprecap systems in displacing the gingival tissues. The research work analyzed the effectiveness of these gingival retraction systems on vertical and lateral gingival displacement.²¹

Though the five materials used in this study achieved the adequate amount of horizontal as well as vertical displacement, agent which is least traumatic ranks better. Cord packing procedures have a potential to cause detachment of sulcular epithelium and induce bleeding if adequate care is not exercised during placement of retraction cord.²² In case of retraction cord the pressure applied was mechanical and uncontrolled as it is placed in the sulcus manually. So it is less effective than the traxodent paste, but more effective than the comprecap. Also, the comprecap used applied occlusal pressure for retraction which can cause trauma to the gingiva as pressure is not uniform around the tooth causing least amount of retraction. In contrast placement of retraction capsule, Racegel and traxodent paste requires only passive syringing of the material into the sulcus. Within the limited scope of this study, it can be evaluated that Traxodent paste was found to be the most promising retraction material system in terms of gingival sulcus widening/displacement as the soft paste produces gentle uniform pressure by absorption of excess crevicular fluid and blood by the filler particles present in the paste.²³ The aluminium chloride creates astringent effect without irritating or discoloring the surrounding tissue.²⁴

CONCLUSION

The mean values with respect to the vertical as well as gingival retraction of different groups, that gingival retraction with traxodent paste (group V) that is a mechano-chemical method was most effective for the proper displacement of gingiva, while comprecap (group VI) was the least effective of all. Comparison of gingival retraction between different materials used for retraction was done by paired t-test depicting that all the materials are highly significant with each other, having p-value <0. 001.

Hence, group V i.e.; Traxodent paste may be considered for achieving effective optimum gingival retraction compared to other four groups (Knitted retraction cord with gel, 3M ESPE retraction capsule, Racegel, and Comprecap), while group VI ie; Comprecap showed the least gingival retraction.

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