



COMPARATIVE EVALUATION OF THREE CORDLESS GINGIVAL DISPLACEMENT SYSTEMS

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ABSTRACT The basic indication for gingival retraction is to provide access for the impression material to record the sub gingival finish lines without harming the tissues. Among them, the chemico-mechanical method of using a retraction cord impregnated or soaked in various chemicals is the most frequently used method. However, aside from being time-consuming, they cause discomfort and produce damage to the periodontium if used carelessly. To overcome the shortcomings, many cordless techniques and materials have been recently introduced to save time and enhance patient comfort while being minimally invasive. The present study intended to compare and evaluate the effectiveness of retraction of three cordless gingival retraction systems—Traxodent Hemodent paste, Hemostop Gingival Retraction and Hemostatic gel and 3M Astringent Retraction Paste by measuring the difference in sulcus width and depth in pre and post retraction dies using Profile projector optical instrument.

KEYWORDS : Gingival retraction; Fixed Prosthesis; gingival margin.

INTRODUCTION

Tooth-supported fixed dental prostheses (FDPs) and single crowns have been routinely used in prosthodontics to rehabilitate missing or decayed teeth/tooth for both esthetic and functional purposes.¹ The long term clinical success of the prosthesis depends on the marginal adaptation and this is possible only when preparation margins especially subgingival margins are recorded accurately in the impression and transferred on to the cast.^{2,3} For these reasons gingival retraction is necessary to capture accurate subgingival preparation details.

Generally, the gingival displacement procedures are either surgical, mechanical, chemical methods, or a combination of any of these.^{1,4,7} Among them, the chemico-mechanical method of using a retraction cord impregnated or soaked in various chemicals is the most frequently used method.^{4,5,8} However, apart from being time-consuming, these methods cause discomfort and produce potential damage to the periodontium if used carelessly. To overcome this, many cordless techniques and materials such as expanding polymers and expanding paste-like gingival displacement materials have been recently introduced which save time and also enhance patient comfort while being minimally invasive.^{9,10}

The present study intended to compare and evaluate the effectiveness of retraction of three cordless gingival retraction systems – Traxodent Hemodent paste (Expanding topical gingival displacement paste with hemostatic agent), Hemostop Gingival Retraction and Hemostatic gel (Thermo-gelifiable gel with 25% aluminum chloride) and 3M Astringent Retraction Paste (Astringent Retraction Paste) by measuring the difference in sulcus width and depth in pre retraction and post retraction dies with the help of Profile projector optical instrument.

MATERIALS AND METHODS

The study was conducted in the Department of Prosthodontics and Crown & Bridge and Implantology, Coorg Institute of Dental Sciences, Virajpet and it comprised of a total of 18 subjects, both male and female. The patients were selected based on the inclusion and exclusion criteria.

INCLUSION CRITERIA

1. Subjects who are within the age of 18-30years.
2. Subjects in need of single metallic/metal-ceramic/all-ceramic crown.
3. Subjects with healthy periodontal status.

EXCLUSION CRITERIA

1. Subjects with a history of any allergic or adverse reaction to the materials to be used in the study.
2. Subjects in need of master impressions for FPD or implant-supported prosthesis.
3. Subjects with any systemic disease.

4. Pregnant or lactating women.
5. Smokers.
6. Subjects who refuse to give informed consent.

The proposed study was explained to each of the selected patients and a written consent was obtained.

Initial to tooth preparation, Pre retraction impressions were made with monophasic Poly Vinyl Siloxane impression material (PVS) using custom tray fabricated using Cold cure acrylic resin. After tooth preparation of the intended tooth, the subjects were randomized into three groups based on the cordless retraction system used. Based on the group randomized, the prepared teeth was retracted following the manufacturer's instruction of the cordless retraction system and after gingival retraction, post retraction impression was made in a similar way as pre retraction impressions. Dies were then prepared from the obtained impressions using Type IV gypsum. The intended tooth was marked and sectioned bucco-lingually to measure the changes in the sulcus depth and width using a Profile projector optical instrument.

Width of the gingival sulcus was measured as the distance between the crest of the marginal gingiva and tooth surface and sulcus depth was measured as the distance between the tip of cusp to the deepest point of the gingival sulcus. The measurements were made on both pre retraction and post retraction dies and the values so obtained were recorded and comparison of change in sulcus width and depth were made between all three retraction systems.

RESULTS

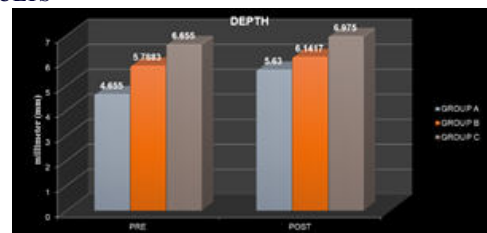


Figure 1- Comparison of pre and post mean and sum of ranks of measurement of change in gingival sulcus depth.

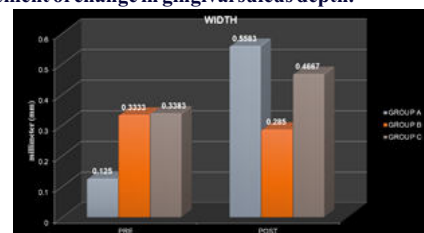


Figure 2- Comparison of pre and post mean and sum of ranks of measurement of change in gingival sulcus width

The statistical analysis of the collected data revealed that both Group A (5.63) and Group C (6.975) produced significant difference ($P < 0.05$) in the sulcus depth than Group B (6.141) and the maximum amount of displacement was found with Group C. The comparison of pre and post mean, median, standard deviation and paired t-test of change in gingival sulcus width between Group A, B and C showed significant statistical difference ($P < 0.05$) in Group A when compared to Group B and C. Group B (0.285) showed decrease in the sulcus width than the pre retraction values and maximum amount of change in sulcus width was found in Group A (0.5583).

DISCUSSION

Cordless retraction systems were introduced to overcome certain drawbacks of traditional retraction systems. Most of these cordless retraction materials contain aluminium chloride in different concentrations as the main component for haemostasis and have claimed to provide blood-free retraction while capturing an accurate impression in an easy, simple, and predictable manner. Each cordless system makes use of a slightly different delivery system, has different consistencies, and may also include specially designed accouterments that aid in getting the material into the sulcus and also keeping the tissue dry at the same time.^{9,10} According to a study by Kazemi et al (2009), it was found that cordless systems showed less injury than the impregnated retraction cords resulting in damage to the underlying epithelium.¹¹

In the present study, Pre and post retraction impressions were made using monophasic PVS impression material using custom trays to have even bulk of the material and avoid discrepancy due to the use of two materials, tray positioning, and the time elapsed in the two-stage procedure between removal of the gingival retraction material and the impression made.¹² The impressions were poured with type IV gypsum due to its strength and adequate surface hardness.

The changes seen in the sulcus depth and width was measured using Profile projector (Meera Metzger Group, Mathura, Uttar Pradesh, India) with an in-built Vernier caliper (millimeters). It was inferred that 3M Astringent paste (Group C) and Traxodent Hemodent paste (Group A) showed significant change in terms of vertical dilation and maximum displacement was provided by 3M Astringent paste. Traxodent Hemodent paste provided significant change in terms of horizontal dilation. Hemostop Gingival Retraction and Hemostatic gel (Group B) provided the least retraction and also showed decrease in gingival width. This is in accordance with a study done by Dederichs M et al (2019) in which the retraction gels produced less pressure than retraction pastes. The average pressure generated by Traxodent Hemodent paste and 3M Astringent paste is around 82.74 ± 29.29 kPa and 58.8 kPa respectively.^{7,13}

The pressure generated by the cordless gingival retraction systems depends on the consistency of the system. Traxodent Hemodent paste and 3M Astringent paste usually have thicker consistency and this is because of the formulation as Traxodent Hemodent paste contains clay patented formulation which exerts moderated calculated pressure on gingiva while 3M Astringent Retraction Paste contains polydimethyl siloxane and 15% aluminum chloride in paste form which acts by mechanically pushing the sulcus away and due to the high consistency of the kaolin material (an aluminum-silicate-hydrate), which absorbs GCF and expands.^{3,7,14,15} Hemostop Gingival Retraction and Hemostatic gel is a water based retraction gel composed of 25% aluminum chloride, Cetrimide and fillers. The filler content in the gel add in volume and cause gingival retraction while aluminium chloride which is an astringent agent causes tissue contraction, explaining the reason for decrease in sulcus width post retraction.^{16,17} However a similar study conducted by Rayyan et al (2018), it was found that 3M astringent paste showed better horizontal and vertical gingival displacement than Traxodent Hemodent paste.¹⁸ Therefore more studies are needed to justify the efficiency of gingival displacement of these materials.

CONCLUSION

Within the limitations of the study, it was concluded that

1. Traxodent Hemodent paste and 3M Astringent paste showed a better change in sulcus depth than Hemostop Gingival Retraction and Hemostatic gel.
2. Traxodent Hemodent paste showed a maximum change in sulcus width than Hemostop Gingival Retraction and Hemostatic gel and 3M Astringent paste.

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