Research Article

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A Comprehensive Evaluation of the Efficiencies of Three Commonly Used Gingival Retraction Systems In Fixed Partial Denture Therapies: An Original Research Study

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ABSTRACT

Background: This study was conducted to comprehensively evaluate the efficiencies of three commonly used gingival retraction systems in fixed partial denture therapies. These were studied commercially available systems i.e. Magic Foam Cord, Expasyl Paste and Ultrapak E knitted cord.

Materials and Methods: Authors have endeavoured to study the gingival retraction capabilities of Magic Foam Cord (Coltene); Expasyl Paste (Satellec Company); and Ultrapak E knitted cord. The study was conducted on mandibular right first molar. The gingival retraction was attempted of total sixty patients those who were undergoing fixed partial denture therapies. Four impressions were made for each patient at the time interval of 10 days. The amount of lateral gingival displacement was measurement by Optical Microscope which was attached to Axiovision soft Imaging System Software. The amount of retraction was considered by subtracting the measured width (gingiva to the tooth) before retraction from the one which was after retraction.

Results: In the present study, total 60 patients were studied judiciously for gingival retraction. Males were 38 and females were 22. 7 patients were in age range of 25 to 28 years. P value was reported to be significant here. 12 patients were noted in second age range of 29-32 years. 13 patients were identified in age range of 33-36 years. P value was non significant here. Maximum 15 patients were noticed in last age group of >40 years. P value was significant here. For Ultrapak E knitted cord in all sixty evaluated patients, mean values of retractions were maximum when compared with other tested retraction methods.

Conclusion: Within the limitations of the study authors concluded that Ultrapak E knitted cord has optimal gingival retraction ability among all three tested retraction systems. Authors have also noticed few very imperative advantages with Expasyl Paste and Magic Foam Cord like their ease of usage, painless nature and quick application without patient irritation.

Keywords: Complete Denture Hygiene, Oral health, Oral hygiene practices.

INTRODUCTION

As we all know that an impression is an imprint or negative likeness of the teeth, and the soft tissues surrounding structures. It is used for prosthetic purposes in the clinics and laboratory. Right before

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making the impression, and determinate the exact prepared tooth, the gingival tissues located around teeth must be evaluated cautiously.[1,2,3] The most significant deliberation need to be taken care of is gingival retraction. If the prepared finish line of abutment is adjoining to the gingival sulcus, gingival retraction techniques must be employed to reduce the marginal incongruity among the restoration and the prepared abutment. Precise marginal placement of the prosthesis in the prepared finish line of the abutment is necessary for curative, defensive and aesthetic purposes.[4,5] Gingival retraction techniques can be classified as mechanical, chemical or surgical. Gingival retraction without permanent injury to the gingival tissues is crucial to capture sub-gingival preparation details.[6,7] Gingival retraction procedure allows sufficient lateral displacement of gingiva for sufficient flow of low viscosity impression material into sulcus. This also ensures perfect recording of prepared finish line and a part of tooth structure. Various techniques of gingival retraction have been shown in the literature by several pioneer workers.[8,9,10] There are diversity of techniques and materials available for gingival retraction and finish line exposure in different fixed partial denture therapies. The correct selection of any one of the different methods solely depends on the clinical circumstances and the predilection of the clinician.[11,12] This study was conducted to comprehensively evaluate the efficiencies of three commonly used gingival retraction systems in fixed partial denture therapies. These were studied commercially available systems i.e. Magic Foam Cord, Expasyl Paste and Ultrapak E knitted cord.

MATERIALS AND METHOD

The study was outlined, abstracted and finalized in the department of prosthodontics. The basic idea of study is to check the amount of lateral displacement of free gingival margin by different retraction systems. Depending on availability and other factors, authors have endeavoured to study Magic Foam Cord (Coltene); Expasyl Paste; and Ultrapak E knitted cord. The study was conducted on mandibular right first molar. The inclusion criteria included optimum periodontal heath, absence of malocclusion, no missing teeth, noncarious teeth and other dental anomalies. For the ease of study, the gingival retraction was attempted of total sixty patients those who were undergoing fixed partial denture therapies. Males were 38 and females were 22. The age ranges were 25 to 40 years. Prior to the study, comprehensive history was taken including demographic details. After retraction of gingival, impressions were made by suing elastomeric impression material (addition silicon light body and heavy body combination). Casts were poured and individual die were sectioned in die stone. The amount of lateral gingival displacement was measurement by Optical Microscope which was attached to Axiovision soft Imaging System Software. Four impressions were made for each patient at the time interval of 10 days. One impression without gingival displacement and the rest three after gingival displacement using three different retraction systems following manufacturer's instructions for their use. So, total 240 cast models were effectively studied in this study. Each cast were labelled as per their retraction method or control group. It ended with segregation of models into four groups (A, B, C, D) of sixty each. (A- Control, B- Magic Foam, C-Expasyl Paste, D- Ultrapak E knitted cord.) The effective gingival sulcus width was calculated as the distance from the tooth to the crest of the gingiva in the horizontal plane placing the half section of the model under Optical Microscope with axiovision imaging System Software. The amount of retraction was considered by subtracting the measured width (gingiva to the tooth) before retraction from the one which was after retraction. The consequences of retraction (if any) on the health of gingiva were also reassessed after ten days of gingival retraction. Written and informed consents were taken from all participants. Authors have determined to perform this study as controlled clinical trial because such studies are believed to be extremely valuable to obtain complete data about clinical and group outcomes. Such studies are also competent of evaluating the results at individual levels. The relative importance of the study was explained in detail to all participating patients. Results thus obtained was compiled and sent for necessary statistical analysis. P value less than 0.05 was considered significant ($p< 0.05$).

RESULTS

All the recorded data and responses were complied and sent for statistical evaluation using statistical software Statistical Package for the Social Sciences version 21 (IBM Inc., Armonk, New York, USA). The resulting data was subjected to suitable statistical

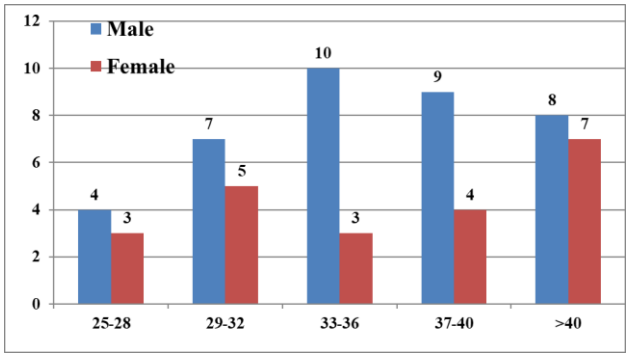
tests to obtain p values, mean, standard deviation, chi- square test, standard error and 95% CI. Table 1 and Graph 1 show that out of 60 patients, males were 38 and females were 22. 7 patients were in age range of 25 to 28 years. P value was reported to be significant here. 12 patients were noted in second age range of 29-32 years. 13 patients were identified in age range of 33-36 years. P value was non significant here. Maximum 15 patients were noticed in last age group of >40 years. P value was significant here. Basic statistical explanations with Pearson chi-square test have been shown in table 2. For Ultrapak E knitted cord in all sixty evaluated patients, mean values of retractions were maximum when compared with other tested retraction methods. The level of significance evaluation also showed significant p value for Ultrapak E knitted cord. It was noticed as 0.001 (table 3).

Table 1: Age & gender wise distribution of patients.

Age Group (Yrs)	Male	Female	Total	P value
25-28	4	3	7	0.02*
29-32	7	5	12	0.80
33-36	10	3	13	0.90
37-40	9	4	13	0.20
>40	8	7	15	0.01*
Total	38	22	60	*Significant

***p<0.05 significant**

Graph 1: Age & gender wise distribution of patients.



DISCUSSION

Gingival retraction is defined as the deflection of marginal gingiva away from a tooth. Precise impressions for subgingival crown margins necessitate gingival tissue retraction. Different materials, methods, and techniques are there for gingival retraction.[13,14] In the field of prosthodontic treatment, revealing the gingival margin around the prepared tooth to aid an accurate impression is considered one of the most difficult stages in gingival tissue management. Gingival tissue management is generally defined as 'The process of temporary retraction of gingiva far from the tooth surface or extending of gingival sulcus to uncover the cervical part of a tooth with the end goal to have legitimately negligible complete to the rebuilding or by building up a decent cervical cavo-surface edge to the tooth preparation'.[15,16,17]

Table 2: Basic statistical explanation with Pearson chi-square test.

Retraction Systems	N	Mean (mm)	Standard Deviation	Std. Error	95 % CI	Pearson Chi-Square Value
Magic Foam Cord	60	0.4980	0.1937	0.923	1.63	1.938
Expasyl Paste	60	0.5690	0.1376	0.340	2.43	2.675
Ultrapak E knitted cord	60	0.7987	0.0963	0.938	2.72	2.920

Table 3: Level of Significance evaluation (p value).

Retraction Systems	N	df	Level of Significance (p value)
Magic Foam Cord	60	1.0	0.900
Expasyl Paste	60	1.0	0.080
Ultrapak E knitted cord	60	1.0	0.001*

***p<0.05 significant**

Ideally, a gingival retraction agent must be efficient enough for its intended use, harmless both locally and systemically, and the results must be spontaneously reversible, reverting very quickly, diminishing with no permanent tissue displacement.[18,19] Ultrapak cord is manufactured from 100% cotton, knitted into thousands of tiny loops to form long, interlocking chains. Such distinctive knitted design exerts a gentle, continuous outward force following placement, as the knitted loops seek to open. Optimal tissue displacement occurs in 3–8 minutes. Ultrapak E

knitted cord is impregnated with racemic epinephrine hydrochloride.[20,21] Expasyl, an alternative to a dental retraction cord, is a viscous paste used for all procedures requiring gingival retraction including: impressions, seating of restorations, fitting rubber dams, and restoring class II, III, and V cavities. Expasyl is extruded directly into the sulcus where it holds its rigidity to create space between the tooth and the tissue, much like retraction cord. Bleeding and crevicular seepage are controlled through the presence of aluminum chloride, which also shrinks epithelial tissue further expanding the sulcus. Expasyl utilizes a mechanical and chemical component for sulcus opening and hemostasis. It is comprised of three materials: Kaolin, water, and aluminum chloride. Magic Foam Cord is usually considered as gingival retraction without using cords. Magic Foam Cord had been developed as first expanding PVS material especially designed for painless and speedy retraction of the sulcus without the potentially disturbing and time consuming packing of traditional retraction cord. Magic foam cord, is actually a polymeric material, which has to be introduced into the gingival sulcus and allowed to set under pressure. During setting, the material slightly expands, pushing the gingiva, producing excellent lateral displacement and good vertical displacement.[22,23]

CONCLUSION

Within the limitations of the study authors concluded that Ultrapak E knitted cord has optimal gingival retraction ability among all three tested retraction systems. The level of significance evaluation also showed significant p value for Ultrapak E knitted cord. Interestingly, authors have also noticed few very imperative advantages with Expasyl Paste and Magic Foam Cord over the Ultrapak E knitted cord. These were ease of usage, painless, quick and without irritating to patient. All clinicians must thoroughly estimate the advantages and disadvantages of the particular gingival retraction system depending upon clinical circumstances. Our study results must be considered as suggestive for presuming prognosis for similar clinical conditions. However, we expect some other large scale studies to be performed that can further establish certain concrete and authentic norms in these perspectives.

CONFLICTS OF INTEREST

The authors declare they have no potential conflict of interests regarding this article.

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