Effect of Medicaments on the Kinetic Absorbency of Retraction Cord

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Abstract

Background: One of the problems appearing in the process of fixed prosthetic restoration is the accurate impression of the marginal detail so retraction of the gingival sulcus is a management of soft tissue before an impression procedure. Aim: To evaluate the effect of two different medicaments on the kinetic absorbency of retraction cord. Methodology: Ultrapak retraction cord (No. 00) cut into pieces of identical lengths (25 mm) was used. They were immersed in medicaments (Potash Alum and 21% ferric sulphate) for 20 minutes. Artificial saliva was used to simulate the oral environment. The capability of the cords to absorb fluid was measured by a gravimetric method. The data were analyzed by F test analysis, and P < 0.05 was regarded as significant. Results: There was a significant difference in kinetic absorbency of all the three groups (P < 0.01). Conclusion: The results of this study indicated that kinetic absorbency increased when treated with medicaments. Potash alum showed most favourable results.

Keywords: Gingival sulcus, medicaments, retraction cord

INTRODUCTION

The accurate impression of every detail of the prosthetic area is of extreme importance for the successful prosthetic restorations. One of the problems appearing in the process of fixed prosthetic restoration is the accurate impression of the margin detail.1 Marginal integrity is one of the basic criteria of principles of tooth preparation. Margins are one of the most important and weakest links in the success of restorations and also referred as “gingival finish line.”2 There are three types of gingival finish lines according to the location of the marginal placement: supragingival, equigingival, and subgingival.3 Supragingival and equigingival margins exert less impact on the health of abutment teeth as compared to subgingival margin, because of difficulty in recording the finish line during impression procedure, to finish the restoration and to maintain the health of abutment teeth. Hence, the gingival tissue must be dilated vertically and horizontally to allow sufficient impression material to be injected into the dilated gingival tissue to record the subgingival margin accurately.4,5

Nowadays, retraction cords have gained wide application. Notwithstanding the wide variety of retraction materials, the use of retraction cords is still considered “the classic” technique for gingival retraction.6

Many different medicaments have been used or suggested for gingival retraction procedures. These include epinephrine, aluminum chloride (AlCl3), aluminum sulfate, zinc chloride, alum (aluminum potassium sulfate), and ferric sulfate. When the effectiveness and lack of the local injury are considered, the materials appear to be acceptable as gingival retraction agents: alum, aluminum sulfate, ferric sulfate, AlCl3 (buffered), and racemic epinephrine.7,8 A gingival retraction medicament should be (1) effective for its intended use, (2) safe – both locally and systemically, and (3) the effects should be spontaneously reversible, wearing off in a short time, leaving no permanent tissue displacement.9

The present study was done to evaluate the effect of two different medicaments on the kinetic absorbency of retraction cord.

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**Materials and Methods**

The commonly available plain retraction cord (No. 00; Ultrapak, Ultradent Products, South Jordan, Utah, USA) was selected for this study. The cord was cut into 90 pieces with an identical length of 25 mm. These 30 pieces were then divided into three groups according to the different solutions tested as retraction medicaments which were potash alum (NICE Chemicals Pvt., Ltd.) and 21% ferric sulfate (NICE Chemicals Pvt., Ltd.). Hence, each group had 30 pieces of the cord. The amount of the absorbed fluid was determined by gravimetric system with an electronic analytical balance (ICPA Health Products Ltd., India) by subtracting the weight value of the sample measured before immersion from the weight value measured at the end of immersion. Thirty samples of Group A were left untreated and their dry weight was recorded. Thirty samples of Group B were immersed in potash alum solution and thirty samples of Group C were immersed in 21% ferric sulfate solution for 20 min and the samples were taken out. The excess fluid accumulating on the outer surface of samples was removed by filter paper. Their initial wet weight was recorded. Then, the cords were immersed in artificial saliva for 10 min. The samples were taken out and the excess fluid accumulating on the outer surface of samples was removed by filter paper. The piece of cord was weighed again by gravimetric method. The amount of fluid absorbed by samples of Group A was calculated by subtracting the dry weight value of the sample from the final wet weight value (kinetic absorbency: Wet weight − dry weight). Similarly, the same observation was carried for Group B and C.

**Results**

Values for fluid uptake of cords incubated in different test solutions were plotted in a linear coordinate system, and the best-fit line was constructed. The data were analyzed by F-test analysis, and $P < 0.05$ was regarded as statistically significant [Table 1 and Figure 1].

The results showed that Group B showed the maximum fluid absorbency and Group A showed minimum fluid absorbency.

**Discussion**

The retraction of the gingival tissue is a long-established technique. It can be defined as the process of deflection of the marginal gingiva away from a tooth. Periodontal factors influence the quality of the marginal fit of a restoration. A good-quality impression is influenced by location of finish lines, periodontal health, and sulcus bleeding during impression making. Although the necessity to place the finish line into the gingival sulcus obviously has a negative effect on the quality of the impression, aspects of gingival retraction have only been sparsely investigated. 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.

![Figure 1](image-url)  
**Figure 1**: Comparing mean values of kinetic absorbency of the retraction cord soaked in artificial saliva when kept untreated (Group A), treated with potash alum (Group B), and 21% ferric sulfate (Group C)

| Group | n   | Mean   | SD    | SE    | F     | P       |
|-------|-----|--------|-------|-------|-------|---------|
| A     | 30  | 0.0056400 | 0.00023022 | 0.00010296 | 626.030 | <0.001* |
| B     | 30  | 0.0069600 | 0.00025100 | 0.0001225 | 256.227 | <0.001* |
| C     | 30  | 0.0061800 | 0.00005831 | 0.0005831 | 454.161 | <0.001* |

*Very highly significant, SD: Standard deviation, SE: Standard error

Ultrapak retraction cord was chosen because it has chain-like construction of interlocking loops which let the cord bend passively in any direction. Ultrapak cord’s interlocking loops can carry approximately 2.5 times more hemostatic solution than conventional cords.

All the samples were of the same length, i.e., 25 mm which is in accordance with the study done by Runyan et al., who used 10 cords each 25 mm of 7 different types of retraction cords by the different manufacturers to check fluid absorbency after soaking in AlCl3 solution.

Due to hemorrhage caused while placement of gingival retraction cord, there is a presence of saliva, blood, and gingival crevicular fluid. To simulate the oral environment in vitro, artificial saliva was taken.

Two medicaments, i.e., potash alum and 21% ferric sulfate, were selected for this study as both are astringents that cause precipitation of tissue proteins and vasoconstriction. According to a survey by Donovan et al., equally effective astringent gingival deflection agents such as potash alum and ferric sulfate exert no systemic effects.

Twenty minutes of soaking time in the medicament solution was standardized for all the treated samples. This time period was in accordance with the previous studies by Csempesz et al. and Patel et al. who determined the optimal soaking time required for hemostatic fluid uptake for different retraction cords.

Ten minutes of soaking time in the fluids (plasma and artificial saliva) was standardized for all the samples. This is the period for which the retraction cord should be kept in the gingival sulcus for optimal tissue retraction and fluid absorption.
This period was based on the results of the previous studies by Harrison,[20] Reiman,[21] and Nowakowska et al.[22] who recommended 5–10 min of retraction period ideally.

The results of this study showed that kinetic absorbency of retraction cords was improved when they were soaked in medicaments. Samples of retraction cord soaked in potash alum showed maximum fluid absorption followed by samples those were soaked in 21% ferric sulfate solution. The untreated samples showed the least fluid absorption.

The results of the present study showed that samples treated with alum had greater fluid absorbency and AlCl3 solution had similar fluid absorbency as for untreated cords, which means that soaking the retraction cords in a hemostatic solution (alum and AlCl3) does not decrease the ability of the cord to absorb fluid which is present around the gingival sulcus.

As it is an in vitro study, so the conditions created could not completely simulate that in the oral cavity which is the limitation to the study. Doors of enlightenment and improvement are always open; therefore, there is a scope for the future investigation in the field.

**CONCLUSION**

Gingival retraction should be mandatory before impression so as to expose the prepared tooth surfaces. The use of medicaments along with retraction cord ensures successful retraction procedures. The results of this study indicated that kinetic absorbency increased when treated with medicaments. Potash alum showed the most favorable results.

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**Conflicts of interest**

There are no conflicts of interest.

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