Evaluation of the Effectiveness of Tooth Whitening of Using Reservoir in Bleaching Trays as Compared to Using Bleaching Tray without the Reservoir: An Observational Clinical Trial

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ABSTRACT

Background: Bleaching procedures have gained importance due to the increase in aesthetic demand. At-home bleaching procedures have become popular due to their ease of application at their own time. At-home bleaching procedures can be modified to increase effectiveness.

Aim: The present study aims to compare the effectiveness of tooth whitening by using bleaching trays with reservoirs and ones without reservoirs.

Materials and Methods: The present study is an observational clinical trial done on 24 patients in Palestine. All the caries-free participants with Canine shades darker than A2 were included in the present study. The sample was divided into two groups. One group received bleaching trays with a reservoir, another group received bleaching trays without a reservoir. 10% carbamide peroxide was used as a bleaching agent in both groups for 21 days with 3-hour wear of trays. The primary outcome measured in the study was color change using the spectrophotometer VITA Easyshade. The secondary outcomes measured in the study were post-bleaching gingival irritation and tooth sensitivity. Statistical analysis was done using SPSS software. T-test was done to compare the primary outcomes between the two groups and the Chi-square test was done to compare the secondary outcomes.

Results: T-test showed that there is no significant difference between the color change in the two groups. The chi-square test showed that there is no significant difference in the occurrence of gingival irritation and tooth sensitivity between the two groups (P>0.05).

Conclusion: There is no significant difference in color change between the bleaching tray with the reservoir and without the reservoir. There is no significant difference in the increase in gingival irritation or tooth sensitivity between the two groups. Further studies and meta-analyses need to be conducted to obtain more evidence-based data on the outcomes.

Keywords: Dental bleaching, dental tray, dental whitening, dentistry.

I. INTRODUCTION

Aesthetics in dentistry have shown an increased demand due to the current emphasis of the media on beauty. In a recent study by Al Awadh et al. [1] have shown the effect of social media on the patient approach to aesthetic treatment choices. Patients are showing increased desire for whiter smiles as a need for better aesthetics. Another study by Tin-Oo et al. [2] has shown increased patient satisfaction when the patients have whiter smiles. Another study by Kershaw et al. [3] have shown whiter teeth to be associated with social competence, intellectual ability, and relationship status. Hence, bleaching treatment has gained popularity in recent times.

Bleaching procedures can be done as in-office procedures using higher concentration of bleaching agents and as an at-home bleaching procedure using lower concentration of bleaching agents [4]. A variety of modified protocols are used for at-home bleaching procedures. Currently, carbamide peroxide and hydrogen peroxide are the most commonly used at home bleaching ingredients [5]. In addition to the different bleaching agents, various modifications have been introduced in the bleaching tray. These can be the presence or absence of a reservoir [6].

Reservoirs in bleaching trays were first introduced by Fischer in 1992. The primary aim of a reservoir in the bleaching tray is to create a space between the tooth surface and the tray so that a high quantity of bleaching agent can be
The primary outcome for the change in the shade after 21 days was measured using the spectrophotometer, VITA Easyshade. The colour change was calculated from the pre-treatment record and 21 days after the bleaching procedure. The change in the colour shade was measured from the middle third surface of the canines. The colour change (ΔE) was calculated using the following equation given by l'Eclairage [10]:

$$\Delta E = \sqrt{(L_2 - L_1)^2 + (a_2 - a_1)^2 + (b_2 - b_1)^2}$$

where, L represents luminosity, a represents measurements on the red-green axis and b represents measurement on the yellow-blue axis.

The secondary outcome noted in the present study is sensitivity post treatment and gingival irritation between the two groups. Tooth sensitivity was noted by 4-point scale, where 0 indicates no sensitivity, 1 indicates mild sensitivity, 2 indicates moderate sensitivity and 4 indicates severe sensitivity. Gingival irritation was noted as a closed ended question, wherein patients were asked if they felt any irritation in the gingiva.

All the data obtained was entered in the spreadsheet. Statistical analysis was done using SPSS software version 22. T-test was done to compare the statistical difference between the colour change in the two groups. Frequency was calculated for the sensitivity as well as for gingival irritation. Chi-square test was done to find significance between the two groups. All the values were considered significant less than 0.05.

III. RESULTS

The present study included 24 patients. Out of the 24 patients included 10 were females and 14 were males. The mean age of the participants in the study was 26.8±5.3 years.

The mean colour change value for participants who received a tray with a reservoir was 8.98±3.38. The mean colour change value for participants who received a bleaching tray without a reservoir was 8.67±3.01. The results of the T-test showed there was no significant difference in the colour change between the two groups at a 21 day follow up period. (p>0.05).

Out of the total participants included, 75% participants did not report any sensitivity, 16.66% reported mild sensitivity and only 8.33% reported moderate sensitivity in the patients using a bleaching tray with reservoir. In patients using a bleaching tray without a reservoir, 91.66% reported no sensitivity and only 8.33% reported moderate sensitivity. Chi-square test show that there is no significant difference between the two groups (p>0.05).

Out of all the participants included in the study, 83.33% reported no gingival irritation and 16.66% reported some amount of gingival irritation in patients using a bleaching tray with reservoir. In patients using a bleaching tray without a reservoir, 91.66% reported gingival irritation and only 8.33% reported gingival irritation. Chi-square test show that there is no significant difference between the two groups (p>0.05).
IV. DISCUSSION

The demand for tooth whitening procedures has increased in recent times. This has led to an increase in the availability of at-home as well as in-office procedures. In order to make whitening procedures more readily available, at-home procedures have gained popularity [11]. In recent times, studies have been conducted comparing the different modalities of bleaching techniques [12]. On the same lines, the present study was conducted to find an evidence-based protocol for at-home bleaching procedures.

Reservoirs in the bleaching tray are known to increase the quantity of bleaching agent carried in the tray. There have been varying results in the literature about the use of reservoirs in bleaching trays. A study by Martin et al. [13] has shown that trays with reservoirs show no significant benefits as compared to bleaching trays without reservoirs. Alternatively, a systematic review by Martín et al. [9] showed a risk of bias in the studies included. Another study by Hayeood et al. [14] has shown the use of a reservoir to reduce the tightness and fit of the tray. Hence, the present study was conducted to study the effect of reservoirs in bleaching trays.

In order to avoid the subjective measurement of change in color, the present study used a spectrophotometer to standardize the outcome variables. This will make the study more reproducible as well as provide objective outcome values. Another study by Martini et al. [13] has also used similar outcome methods along with clinical factors like gingival irritation noted in the present study.

The results of the present study showed no significant difference in the bleaching outcomes with the use of reservoir and without the reservoir. Along with the color change, there was no significant difference in the gingival irritation as well as sensitivity. A study by Miller et al. [7] also showed similar findings to the present study. Similar results were found in other studies as well [15].

Since the present study is cross-sectional, a high level of evidence cannot be obtained. This study can form a base for future split-mouth blinded randomized controlled trials as well as meta-analyses that will give more evidence-based literature on the use of reservoirs for bleaching agents.

V. CONCLUSION

The present study shows that there is no significant difference in the aesthetic outcomes by the use of bleaching trays with a reservoir and without a reservoir. In addition, there was no significant difference in gingival irritation and tooth sensitivity between both the treatment groups.

REFERENCES