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ASSESSMENT OF CHANGE OF TOOTH SHADE WITH CONVENTIONAL AND HERBAL WHITENING PASTES: A DOUBLE BLINDED, RANDOMIZED CLINICAL TRIAL.

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ABSTRACT

Background: Teeth whitening using whitening toothpastes are simple and economical means of bleaching discoloured teeth. Teeth whitening toothpastes containing peroxides and abrasives expedite whitening of discoloured teeth. However, their deleterious effects on the oral tissues have lead to a predisposition towards natural toothpastes. Herbal toothpastes made from natural ingredients, are marketed aggressively for teeth whitening. Hence, the aim of this clinical study was to assess and compare the whitening effect of conventional whitening paste and herbal whitening paste in patients aged between 20-40 years over a period of 4 weeks.

Methodology: 76 patients within the inclusion criteria were selected for the study. The initial tooth shades of the maxillary anterior teeth in all patients were recorded. The patients were randomly divided into two groups: Group A: Colgate visible white toothpaste and Group B: Himalaya herbal sparkling toothpaste based on the type of tooth whitening toothpaste administered. They were recalled every week for a period of 4 weeks. The whitening scores were recorded at each time interval.

Statistical analysis: The data was evaluated using *Chi-Square* test. The level of statistical significance was $P < 0.05$.

Results: Eighteen cases in Group A (47.3%) and 15 cases in Group B (29.4%) presented with whitening of teeth at the end of 4 weeks. The change over a time period of 4 weeks was not statistically significant between the two groups ($p=0.48$).

Conclusion: Within the limitations of the study, it could be concluded that both the conventional whitening toothpaste and the herbal whitening tooth paste showed favourable and comparable whitening effect with no significant difference at the end of 4 weeks.

KEYWORDS :

1. INTRODUCTION:

The most common complaint in patients seeking aesthetic treatment is tooth discolouration. Tooth whitening treatment includes vital tooth bleaching technique such as at-home, in-office bleaching and over-the-counter (OTC). Although peroxide containing tooth whitening agents expedite predictable whitening of discoloured teeth (Ribeiro et al., 2019), using these compounds at high concentrations have detrimental effect on the oral tissues. These side effects have raised concerns and restricted their use.

The whitening toothpastes contain abrasives, adsorbent particles, and lower level of peroxides, enzymes or optical effect agents (Joiner et al., 2002). Manufacturers of such toothpastes promise bleaching results within 2 to 4 weeks, thus, becoming a simple and economical means of bleaching discoloured teeth. Few of the commercially available whitening toothpastes in India include, Colgate Max White Toothpaste, Sensodyne Extra Whitening, Pepsodent Whitening Toothpaste, and Himalaya sparkling white paste. There is a predisposition towards natural toothpastes, to avoid synthetic and artificial flavours. Herbal toothpastes contain natural ingredients and are aggressively marketed for tooth whitening.

Two systematic reviews evaluated the efficacy of dental bleaching using whitening toothpastes as compared to conventional toothpastes, further suggesting that they can be used as potential tooth whitening agents. However, they concluded that there was a lack of clinical studies employing same colour evaluation method of dental substrates (Casado et al., 2018 and Soeteman et al., 2018). In the second systematic review evaluating the efficacy of natural tooth bleaching agents, these agents demonstrated weak evidence in literature and reported high heterogeneity between studies and suggested the need for more clinical trials (Ribeiro et al., 2019). Thus, clearly there was a lack of clinical evidence comparing the efficacy of such whitening toothpastes.

Hence, the aim of this clinical study was to assess and compare the whitening effect of conventional whitening paste and herbal whitening paste in patients aged between 20-40 years over a period of 4 weeks. The null hypothesis was that there is no difference in the whitening effect provided by either whitening toothpastes.

2. MATERIALS AND METHODOLOGY:

76 outpatients referred to the Dept of Conservative Dentistry and Endodontics, V. S. Dental College & Hospital, Bengaluru-560004, were selected for this study. The patient that met the inclusion criteria were recruited of the study.

2.1 INCLUSION CRITERIA :

1. Maxillary anterior teeth without any restorations
2. Not wearing any prosthesis

2.2 Exclusion criteria :

1. Smokers
2. Anterior teeth having varying shades, dental caries, attrition and abrasion
3. Systemic or oral disease

Computer generated random allocation sequence was used for randomization. The two toothpastes were dispensed into plain white collapsible tubes without any indication of the type other than carrying a mark designated to the respective toothpastes. The participants and the investigator were blinded to the group assignment.

Group A: Colgate visible white toothpaste (n=38) (Colgate-Palmolive, USA)

Group B: Himalaya herbal sparkling toothpaste (n=38) (Himalaya, Bengaluru, Karnataka, India)

The initial tooth shades of all the maxillary anteriors were determined using VITA 3D shade guide (3D; Vita Zahnfabrik, Germany). The shade in the middle third of the labial aspect of the maxillary anteriors was matched and recorded, according to the American Dental Association. After seeking the consent from each patient, they were instructed to brush their teeth with ORAL-B [medium] regular toothbrush (Procter and Gamble Co, Ohio, USA) and toothpaste (Group A or Group B). They were instructed to brush their teeth twice a day and follow their regular eating and drinking habits. Participants were recalled every week for a period of 4 weeks to evaluate the whitening scores. Two calibrated examiners scored the teeth as 'teeth that were whitened', 'teeth that were not whitened', and 'previously whitened teeth that underwent further whitening'. Whitened was defined as a change in shade half or one tone in the shade guide. Any disagreement between the examiners was sorted out by joint evaluation.

3. Statistical Analysis:

The data was evaluated using *Chi-Square* test. Data analysis was performed using Statistical Package for Social Science (Version 20; SPSS Inc., Raleigh, NC, USA). The level of statistical significance was $P < 0.05$.

4. RESULTS:

The change in teeth shade was observed from third week onwards. 9 patients in the Group A (23.6%) and 8 patients in Group B (21%) presented with whitened teeth at the 3rd week interval. However, this difference was statistically insignificant (p=0.78).

Nine new cases (31%) in Group A and 7 new cases (23.3%) in Group B showed whitening of teeth. In total, 18 cases in Group A (47.3%) and 15 cases in Group B (29.4%) presented with whitening of teeth. The change over a time period of 4 weeks was statistically insignificant between the two groups (p=0.48) (Table 1).

TABLE 1: *Chi-Square* test to determine the relationship between type of toothpaste and whitening achieved.

		Group A	Group B	P value
Week 1	Whitened	0	0	1
	Not whitened	0	0	
Week 2	Whitened	0	0	1
	Not whitened	0	0	
Week 3	Whitened	9 (23.6%)	8 (21%)	0.78
	Not whitened	29 (76.45)	30 (79%)	
Week 4 Group A: n=29 Group B: n=30	Whitened for the first time	9 (31%)	7 (23.3%)	0.80
	Not whitened	20 (69%)	23 (26.7%)	
	Previously whitened	0	0	
	Total whitened teeth at the end of 4 weeks	18 (47.3%)	15 (39.4%)	0.48
	Total non whitened teeth at the end of 4 weeks	20 (53.7%)	23 (60.6%)	

*P<0.05 is statistically significant (Chi square test)

1. DISCUSSION:

In this study, whitening scores were used to assess the efficacy of whitening toothpastes. Since, manufacturers claim that bleaching effect of these toothpastes is seen within 2-4 weeks, the whitening effects of the toothpastes were compared for duration of 4 weeks. The Vita shade visual assessment was successful in previous clinical studies (Casado et al., 2018). Therefore, it was used for visual assessment of the degree of whiteness in this study.

Whitening toothpastes generally act by controlling the formation of extrinsic stains. Products contained ingredients such as large amounts of abrasives, low levels of peroxides, phosphate salts, detergents and whitening agents (Kalliath et al., 2018). Colgate visible white toothpaste (Group A) contains silica and sorbosil BFG51 blue as the abrasives, detergents such as sodium lauryl sulphate and pyrophosphates inhibiting calculus formation which could help in teeth whitening(Chandrapooja, 2021). Although, both peroxide and abrasive containing products are well acknowledged for tooth whitening, these can cause irritation, allergies, mucosal ulceration and tooth wear.

Incorporation of non- abrading whitening agents namely, optimized abrasives, oxidants, enzymes, optical modifying agents or activated charcoal seem to be a softer approach (Vaz et al., 2019). There is an upsurge in herbal products for teeth whitening owing to the perception that natural ingredients minimize side effects when substituted for synthetic chemicals. Himalaya herbal sparkling toothpaste contains natural enzymes such as bromelian that removes stains, and papain which is a mild whitening leading to tooth whitening effect (Patil et al., 2015).

In this study chemical toothpaste showed increased lightening of enamel shade than herbal toothpaste. Since, this was statistically insignificant, null hypothesis was accepted. Similar results have been found in pervious clinical and in vitro studies evaluating efficacy of tooth whitening using the herbal and the chemical whitening toothpastes (Patil et al., 2015 and Vaz et al., 2019).

Contradicting studies have also been reported, where in external stains were more easily removed by enzymatic pastes than the abrasive pastes, although statistically insignificant (Joiner et al., 2002). This was as a result of the dual action of the proteolytic enzyme and mild abrasives used in enzymatic whitening toothpastes that acted on both

intrinsic and extrinsic stains. Further, an in vitro study reported that there is deposition of blue covalence onto the tooth surface giving a yellow or blue-yellow shift with overall improvement in measurable and perceptible tooth coherence (Joiner et al., 2002).

Another systematic review evaluated the efficacy of natural, peroxide-free tooth-bleaching agents suggesting that peroxides with incorporated natural bleaching agents may improve bleaching (Ribeiro et al., 2019).

Further studies need to be carried along these lines to develop whitening toothpaste consisting of a blend of clinical efficiency and biocompatibility.

5.1 Limitations of the study:

In the present study only maxillary anterior teeth were evaluated for whitening effect as the commissure smile is the most common smile pattern (Philips, 1999). Also, in the present study, objective type of shade guide was not used such as the digital shade guide. Whitening performance of these toothpastes should be visibly perceptible to patients. Their input could be considered in the evaluation of the efficacy of whitening toothpastes. Also, the duration of evaluation could be increased to evaluate the stability of whitening achieved.

2. CONCLUSION:

Considering the limitations of the study, it could be concluded that both the conventional whitening toothpaste and the herbal whitening tooth paste showed favourable and comparable whitening effect with no significant difference at the end of 4 weeks.

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