Original Article

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Dentistry Section

Evaluation of Clinical Performance and Colour Match of Single and Multiple Shade Composites in Class-I Restorations: A Randomised Clinical Study

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ABSTRACT

Introduction: Biomimetic dentistry primarily focuses on achieving aesthetics that closely resemble natural enamel and dentin. This approach ensures that dental restorations seamlessly match the appearance of enamel and dentin, rendering them virtually invisible. Additionally, biomimetic dentistry aims to mimic not only the visual characteristics but also the physical properties of enamel and dentin, thereby ensuring functional acceptability. The introduction of new composite materials in the market is a gradual progression aimed at attaining the mentioned objectives.

Aim: To compare clinical performance and colour matching of single and multiple shade composites in simple Class-I carious lesions after one year.

Materials and Methods: This randomised clinical study included 21 patients with a total of 72 Class-I carious lesions with patients who provided informed consent. Teeth were randomised into two groups: Group-A (n=36) received multi-shade composite (3M Filtek z350), and Group-B (n=36) received single-shade composite (Omnichroma). Clinical performance was assessed by two blinded evaluators at baseline, six months, and one year using modified United States Public Health Service (USPHS) criteria. Colour matching was evaluated by capturing digital photographs with a DSLR camera, ring flash, and 100 mm macro lens. Colour measurements (L*, a*, b*) were analysed using Adobe Photoshop, and ΔE was calculated immediately after restoration. Statistical analysis was performed using Statistical Package for Social Sciences (SPSS) 21.0 software, employing Chi-square test, Friedman test, and independent t-test.

Results: No significant difference was found in clinical outcomes after one year using modified USPHS criteria ($p>0.05$). However, both Group-A ($p=0.002$) and Group-B ($p=0.007$) showed increased marginal discolouration, and decreased colour match ($p<0.001$) from baseline to one year. There was no statistically significant difference in colour matching potential between the two groups ($p=0.056$).

Conclusion: Single-shade composites effectively treat Class-I carious lesions, demonstrating satisfactory colour matching and clinical performance.

Keywords: Blending effect, Omnichroma, Single-shade composite

INTRODUCTION

In a society where aesthetics are valued highly, the influence of a person's smile on their general mental health, sense of self-worth, and appearance cannot be understated. In order to make their smiles look more youthful and natural, patients today seek aesthetic restorations for both the anterior and posterior teeth [1].

A multi-shade (polychromatic), or 3D layering, approach is a highly effective method for creating aesthetic direct restorations that mimic the appearance of natural teeth [1]. This technique allows the dentist to control the opacity and translucency of each layer to match the surrounding teeth. Although layering technique produces appropriate results for colour matching, the process requires significantly more time and skill than traditional methods [2].

The OMNICHROMA universal composite is designed to simplify shade matching and provide a more efficient and streamlined restoration process for clinicians [2]. By using a single shade, it eliminates the need for multiple shades matching, which can often be time-consuming and prone to errors. In addition, the OMNICHROMA composite can also reduce chairside time for restoration, as well as the need for a large inventory of different shades, making it a more cost-effective option for dental practices [3].

However, it's important to note that while OMNICHROMA composite is a good option for many restorations, it may not be suitable for every case, and more traditional shade matching methods may still be needed in some situations [3]. In addition, the shade matching abilities of OMNICHROMA composites may not be as precise as those of traditional composite materials, so it's important to evaluate the potential limitations of this material in individual cases [4].

Compared to conventional visual methods, instrumental shade determination offers a more reliable and objective approach to assessing colour matching. By eliminating the subjective element of colour perception, which can vary among individuals, it provides greater consistency in shade matching [4,5]. Spectrophotometers and digital cameras enable precise and repeatable measurements, further enhancing the reliability of the results. For colour matching using instrumental analysis, conventional image processing software such as Adobe Photoshop and Corel Photo-Paint are highly suitable and accurate [6].

Additional research is necessary to evaluate the colour matching capabilities and clinical effectiveness of single shade composites, as there has been only limited in-vivo studies conducted on this recently introduced composite [7,8]. Therefore, the aim of the study was to compare the clinical evaluation and colour matching of single shade composite with multiple shade composite in simple Class-I carious lesions at baseline, six months and one year.

MATERIALS AND METHODS

This randomised parallel clinical study was conducted at KM Shah Dental College, following the necessary approval from the Institutional Ethical Committee (SVIEC/ON/DENT/BNPG20/D21036) and adhering to the principles outlined in the 1975 Declaration of Helsinki. The trial, registered under CTRI (CTRI/2021/04/032635),

from April 2021 to October 2022. Prior to participation, patients provided informed consent for their participation in the study.

Inclusion criteria: Twenty-one patients between 18 to 60 years of age with 72 simple Class-I carious lesions in maxillary and mandibular molars and premolars, as well as teeth with radiographical evidence of radiolucency in the coronal dentin, at least two Class-I carious lesions on opposite sides, teeth exhibiting secondary decay or fractures in old amalgam and composite fillings, and teeth with contact from both opposite and adjacent teeth were included.

Exclusion criteria: Those patients with poor oral hygiene, severe or chronic periodontitis, heavy bruxism, malocclusion, rotated teeth, attrition, pulpal and/or periapical pathology, developmental anomalies, congenital defects, and teeth intended for use as an abutment were excluded from the study.

Sample size calculation: Based on the study conducted by de Abreu JLB et al., determination of the sample size was using the following formula $N=2*(Z1+Z2)2*SD^2/d^2$ [4]. In this formula, Z1 represents the z-value associated with a confidence level of 1.96, Z2 represents the z-value linked to a power of 0.842, SD signifies the assumed standard deviation set at 0.85, and d stands for the assumed mean difference, which is 0.57 [4]. A minimum of 60 samples was calculated, with 30 in each group, ensuring a confidence level of 95% and a power of 80%. To account for a potential 20% dropout, a minimum of six samples per group were included, resulting in a final considered sample size of 72.

Procedure

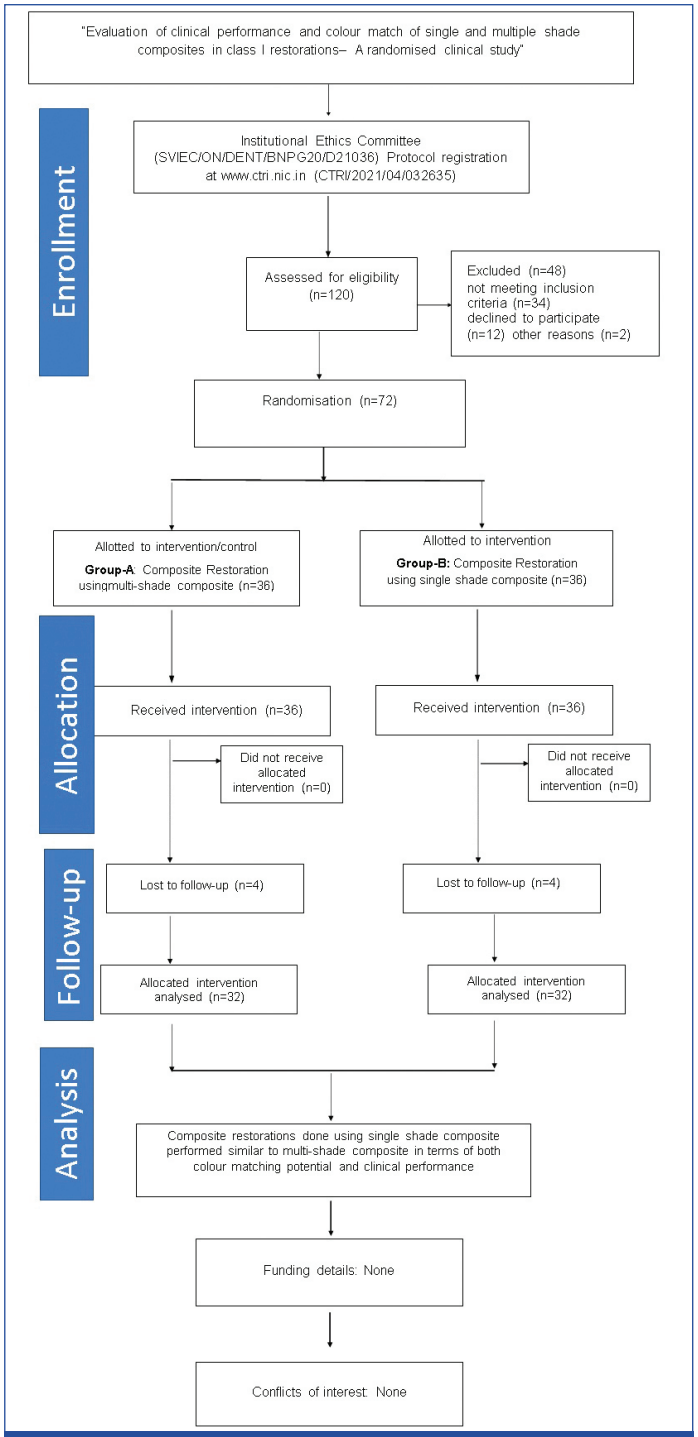
The teeth were divided among two groups- Group-A: multi-shade composite (n=36) and Group-B: single shade composite (n=36) by computer randomisation method on www.randomizer.org. The samples were allocated into two groups with an allocation ratio of 1:1 using Sequentially Numbered Opaque Sealed Envelopes (SNOSE) method. The evaluator and the patient were blinded during the course of the study [Table/Fig-1].

Group-A- Multi-Shade composite

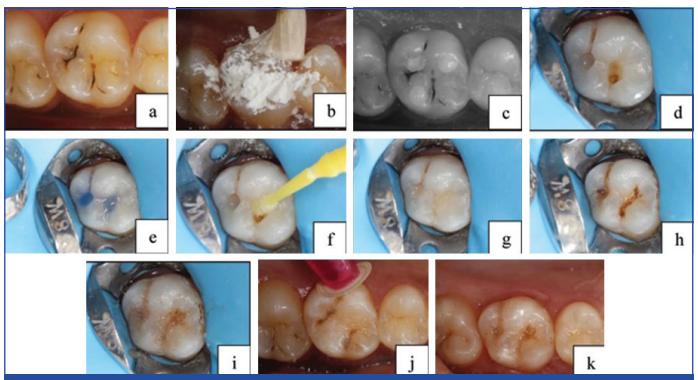
The clinical procedure began with shade selection by placing composite buttons of different enamel and dentin shades (3M Filtek Z350, Minnesota, United States) on the tooth surface without application of bonding agent and a digital photograph was clicked with a Canon camera in a B/W filter to eliminate hue and chroma. The shade with the highest matching value was selected for restoration. Caries excavation was done using spoon excavators (Hu-friedy, Chicago) and round carbide bur (MANI, India) followed by rubber dam isolation. Selective enamel etching was carried out using 37% phosphoric acid (D-tech, dental technologies, India) followed by a coating of universal bonding agent (3M Universal bond) which was cured for 20 seconds using LED light curing unit (bluephase C8, Ivoclar vivadent, Liechtenstein). Incremental layering of nano-hybrid composite was done using dentin shade. Before application of the final enamel layer, tint application was done (Kolour+plus resin colour modifier). Finishing and polishing of the restoration was done using coarse to superfine polishing disks (Shofu super snap rainbow kit, India) and the occlusion was checked using a 40-15 microns articulating paper (Artexact, Alfred becht gmbh, germany) and finishing burs were used to reduce the marked areas [Table/Fig-2].

Group-B- Single-shade composite

No shade selection was required since it's a single universal shade composite caries excavation was done using spoon excavators and round carbide bur followed by rubber dam isolation and selective enamel etching. Universal bonding agent (Palfique bond force, tokuyama, Japan) was applied followed by light curing for 20 seconds. Omnichroma blocker (Tokuyama Dental Tokyo, Japan) application was done on the floor of the cavity to mask the discolouration in case of secondary caries or discolouration caused by old amalgam fillings. Incremental build-up was done using

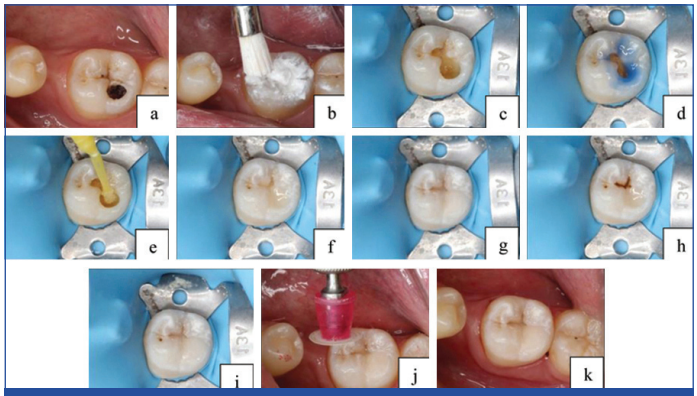


[Table/Fig-1]: Prisma flowchart.



[Table/Fig-2]: Group-A: Multi-shade Composite (a) Pre-operative photograph; b) Conditioning using prophy paste; c) Shade selection; d) Caries excavation; e) Selective enamel etching; f) Application of bonding agent; g) Placement of body shade composite; h) Application of tint; i) Placement of enamel shade composite; j) Finishing and polishing of the final composite; k) Postoperative photograph.

omnichroma single shade composite and tint was applied before application of the final layer followed by finishing and polishing as well as occlusal corrections [Table/Fig-3].



[Table/Fig-3]: Group-B- Omnichroma composite: a) Preoperative photograph; b) Conditioning using prophy paste; c) Caries excavation; d) Elective enamel etching; e) Application of bonding agent; f) Placement of opaque; g) Placement of omnichroma composite; h) Application of tint; i) Placement of omnichroma composite; j) Finishing and polishing of the final composite; k) Postoperative photograph.

Clinical evaluation: The evaluation of the clinical performance of the restorations was conducted using modified USPHS criteria [9,10], encompassing various aspects such as marginal discolouration, marginal adaptation, secondary caries, surface texture, colour match, anatomic form, retention, and post-operative sensitivity. The assessment occurred at three time points: baseline, six months, and one year. Two impartial evaluators, employing a K coefficient of 0.85 and a standard error of 0.09, performed the evaluations to ensure an unbiased and objective judgment.

Digital shade matching using adobe photoshop: Photographic evaluation was done postoperatively after final finishing and polishing when the tooth was rehydrated to check the shade matching achieved in both the groups. Standardised protocols [11] were used to click pictures of each restoration, which included usage of a DSLR Camera (Canon 13D), 100 mm focal length macro lens (Canon) with a ratio of 1.5, a close-up Speedlight ring flash (Yongnuo, Shenzhen Yongnuo Photographic Equipment Co., Ltd., Shenzhen, China), retractors (Lip and cheek), contractors and mirrors. All photographs were clicked with standardised parameters: flash in manual configuration at ½ capacity, Exposure (ISO (200), f (25), 1/125 seconds), focusing (1:1), distance (~15 cm), in RAW format.

Images were transferred to a digital adobe photoshop software (adobe Inc.) for colour matching analysis using CIELab coordinates; L*, a*, b* coordinates were taken from the: 1) From the surface of the restoration and from; 2) Intact tooth surface- 1 mm away from the margin of the restoration as per the study conducted by de Abreu JLB et al., using these two L*, a*, b* coordinates, the difference in the shade matching was evaluated between the restoration and intact tooth surface using by calculating delta E [4]. The formula used to calculate delta E was CIEDE2000 formula [12]. The Delta E value was then evaluated.

STATISTICAL ANALYSIS

The data obtained were tabulated and sent for analysis. The statistical analysis was carried out with the Chi-square test and Friedman test using Statistical Package for Social Sciences (SPSS) version 21.0 (IBM Corp., Armonk, NY, USA). 0 with ($p<0.05$) and 95% confidence interval.

RESULTS

Of the 21 patients (having 72 Class-I lesions) treated, four were male, while 17 were female. The age of one patient was between 46-60 years, age of four patients was 31-45 years, while age of rest 16 patients was between 18-30 years.

Of the 72 Class-I lesions 35 were in maxilla and 37 were in mandible. The dropout percentage for both Group-A and Group-B was 2.7% at the end of six months and 11.1% at the end of one year [Table/Fig-4] which was compensated under 20% dropout included in the sample size and thus did not affect the power of the study. Hence, the final size was 36 at baseline, 35 at the end of six months and 32 at the end of one year [Table/Fig-4].

Group	Time interval	Sample present (No.)	Samples lost to follow-up (No.)	Samples lost to follow-up (%)
Multi shade composite (GROUP-A)	At Baseline	36	-	-
	At 6 months	35	1	2.7
	At 1 year	32	4	11.11
Single shade composite (GROUP-B)	At Baseline	36	-	-
	At 6 months	35	1	2.7
	At 1 year	32	4	11.11

[Table/Fig-4]: Samples lost to follow-up in Group-A and B at different time intervals.

Intergroup analysis showed that there was no statistically significant difference between the two groups for all the variables of modified USPHS, that is marginal discolouration with p=0.69 at six months and p=0.345 at one year, marginal adaptation with p=0.691 at six months and p=0.62 at one year, secondary caries with p=0.512 at six months and p=0.592 at one year, surface texture with p=0.085 at six months and p=0.185 at one year, colour match with p=0.314 at baseline, p=0.495 at six months and p=0.611 at one year, anatomic form with p=0.163 at six months and p=0.329 at one year [Table/Fig-5].

Variables of modified USPHS criteria	Group-A (Multishade composite)			Group-B (Single shade composite)			p-value		
	At baseline	At 6 months	At 1year	At baseline	At 6 months	At 1year	At baseline	At 6 months	At 1 year
1) Marginal discolouration							-	0.69	0.345
Alpha	36 (100%)	25 (71.4%)	22 (68.7%)	36 (100%)	25 (71.4%)	25 (78%)			
Bravo	0 (0%)	9 (25.7%)	10 (31.5%)	0 (0%)	9 (25.7%)	6 (18.75%)			
Charlie	0 (0%)	1 (2.8%)	0 (0%)	0 (0%)	1 (2.8%)	1 (3.1%)			
2) Marginal adaptation							-	0.691	0.62
Alpha	36 (100%)	33 (94.2%)	30 (93.7%)	36 (100%)	32 (91.4%)	29 (90.6%)			
Bravo	0 (0%)	2 (5.7%)	2 (6.2%)	0 (0%)	3 (8.5%)	2 (6.25%)			
Charlie	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	1 (3.1%)			
3) Secondary caries							-	0.512	0.592
Alpha	36 (100%)	34 (97.1%)	31 (96.8%)	36 (100%)	32 (91.4%)	30 (93.75%)			
Bravo	0 (0%)	1 (2.8%)	1 (3.1%)	0 (0%)	3 (8.6%)	2 (6.25%)			
4) Surface texture							-	0.085	0.185
Alpha	36 (100%)	32 (91.4%)	29 (90.6%)	36 (100%)	35 (100%)	30 (93.75%)			
Bravo	0 (0%)	3 (8.57%)	3 (9.4%)	0 (0%)	0 (0%)	2 (6.25%)			

5) Colour match							0.314	0.495	0.611
Alpha	36 (100%)	31 (88.57%)	20 (62.5%)	35 (97.2%)	29 (82.9%)	18 (56.3%)			
Bravo	0 (0%)	4 (11.42%)	12 (37.5%)	1 (2.8%)	6 (17.1%)	14 (43.7%)			
Charlie	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)			
6) Anatomic form							-	0.163	0.329
Alpha	36 (100%)	34 (97.14%)	31 (96.9%)	36 (100%)	34 (97.1%)	31 (96.9%)			
Bravo	0 (0%)	1 (2.9%)	1 (3.1%)	0 (0%)	1 (2.9%)	1 (3.1%)			
Charlie	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)			
7) Postoperative sensitivity							-	-	-
Present	36 (100%)	35 (100%)	32 (100%)	36 (100%)	35 (100%)	32 (100%)			
Absent	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)			
8) Retention							-	0.328	0.333
Alpha	36 (100%)	34 (97.1%)	30 (93.75%)	36 (100%)	34 (97.1%)	30 (93.8%)			
Bravo	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)			
Charlie	0 (0%)	1 (2.8%)	2 (6.25%)	0 (0%)	1 (2.9%)	2 (6.2%)			

[Table/Fig-5]: Samples distribution in Group-A and Group-B and inter-group analysis (p-value) at different time intervals.

For Group-A, there was a statistically significant difference within the group for marginal discolouration (p=0.002) and colour match (p<0.001) at the end of one year. For Group-B, there was a statistically significant difference within the group for marginal discolouration (p=0.007) and colour match (p<0.001) at the end of one year [Table/Fig-6].

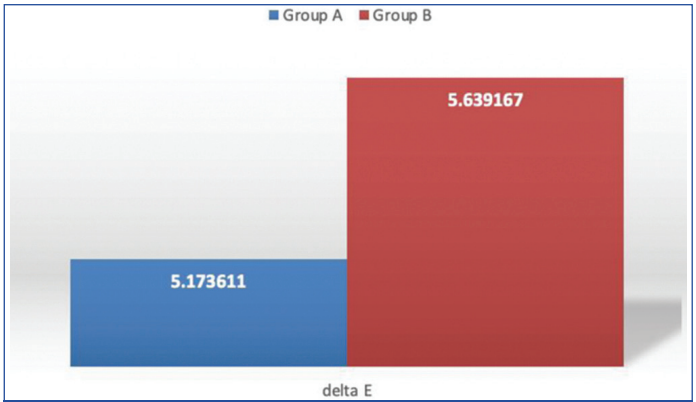
In terms of colour match potential, there was no significant difference in L*, a* and b* values within the groups at surface of the restoration and tooth margin (p>0.05) for both the group [Table/Fig-7]. Similarly, no significant difference (p=0.056) was observed in the delta E values between Group-A (delta E= 5.17±1.2) and Group-B (delta E=5.63±1.24) [Table/Fig-8].

		Baseline mean rank	6 month mean rank	1 year mean rank	Chi-square value	p-value
1) Marginal discolouration	Group-A	1.72	2.09	2.19	12.923	**0.002**
	Group-B	1.78	2.11	2.11	9.8	**0.007**
2) Adaptation	Group-A	1.89	2.03	2.08	4.333	0.115
	Group-B	1.91	2.05	2.05	4.5	0.105
3) Secondary caries	Group-A	1.94	2.03	2.03	2.667	0.264
	Group-B	1.97	2.02	2.02	1	0.607
4) Surface texture	Group-A	1.89	2.03	2.08	5.2	0.074
	Group-B	1.98	1.98	2.03	2	0.368
5) Anatomic form	Group-A	1.94	2.03	2.03	4	0.135
	Group-B	2	2	2	-	-
6) Colour match	Group-A	1.73	1.92	2.34	20.462	**<0.001**
	Group-B	1.73	1.97	2.3	18.167	**<0.001**
7) Postoperative sensitivity	Group-A	2	2	2	-	-
	Group-B	2	2	2	-	-
8) Retention	Group-A	1.95	2	2.05	3	0.223
	Group-B	1.97	1.97	2.06	4	0.135

[Table/Fig-6]: Friedmans test with mean values to compare the three time periods in each groups separately.
*(Friedman's test is a non-parametric test, gives same values as chi-square test)

			N	Mean±SD	Mean difference±SD	t	p-value
Group-A	Pair 1 (L)	Values at the surface of restoration-L	36	68.17±5.82	0.31±5.03	0.36	0.718
		Values on tooth margin-l	36	67.86±4.16			
	Pair 2 (a*)	Values at the surface of restoration-A	36	6.97±2.48	0.08±2.93	0.17	0.866
		Values on tooth margin-a	36	6.89±2.47			
	Pair 3 (b*)	Values at the surface of restoration-B	36	16.42±3.65	0.94±3.72	1.52	0.136
		Values on tooth margin-b	36	15.47±2.71			
Group-B	Pair 1 (L)	Values at the surface of restoration-L	36	69.56±5.33	0.36±5.85	0.37	0.713
		Values on tooth margin-l	36	69.19±4.46			
	Pair 2 (a*)	Values at the surface of restoration-A	36	7.86±2.55	0.08±3.12	0.16	0.874
		Values on tooth margin-a	36	7.78±2.91			
	Pair 3 (b*)	Values at the surface of restoration-B	36	15.58±2.95	-0.11±3.82	-0.18	0.862
		Values on tooth margin-B	36	15.69±2.94			

[Table/Fig-7]: Paired t-test to compare L and l, A and a and B and b of Group-A and Group-B, separately.



[Table/Fig-8]: Comparison of the delta E between the two groups shows that delta E is higher in Group-B with a t value of -1.944 and is statistically non-significant with a p-value of 0.056.

DISCUSSION

According to the results of this study, the null hypothesis was partially rejected. Intergroup analysis showed there was no statistically significant difference in the clinical performance and shade matching potential of single shade and multi-shade composites. According to a research finding by Kim-Pusateri S et al., revealed that the average colour difference between teeth and matched shade tabs intraorally was recorded at a ΔE of 3.7 [13]. Detecting colour variations within the oral cavity is more challenging due to distractions like mucosa and shadowing from the lips, causing the threshold for perceiving colour differences to be higher [13]. Therefore, a delta E value of Group-A (delta E= 5.17±1.2) and Group-B (delta E=5.63 ±1.24) with p-value (p=0.056) is considered clinically acceptable, considering these difficulties in detecting small colour differences within the oral environment. Additionally, on intra-group analysis, the study showed no statistically significant difference in the clinical performance of multi-shade composite group and single shade composite group in terms of marginal adaptation, secondary caries, post-operative sensitivity, surface texture and retention at the end of one year except for marginal discolouration and colour match (p-value >0.05). The findings of this study are in agreement with other studies conducted by Durand LB et al., Pereira Sanchez N et al., and Zulekha et al., which concluded omnichroma had a more pronounced capability for colour adjustment than commonly used resin composites like TPH Spectra, Filtek Supreme Ultra, Tetric EvoCerm and Herculite Ultra [Table/Fig-9] [7,14,15].

According to clinical studies, nanohybrid resin composites (Filtek Z350, 3M ESPE, USA/Tetric-EC) have enough compressive strength and wear resistance to be exposed to stress in high-stress locations like the occlusal surfaces of posterior teeth [16,17]. They have physical properties that are similar to those of hybrid (Filtek Z350, 3M ESPE, USA/Tetric-C) and micro-hybrid (Gradia -DP) resin composites due to filler loading of more than 60% volume. A nano-hybrid composite is the material of choice for posterior teeth because of all these characteristics. As per the findings by Deepika K et al., nano-composites surpass microhybrid composites in terms of compressive strength, with the nanocomposite displaying an optimum compressive strength ranging from 312 to 417 megapascals (MPa) [18]. The current research utilised omnichroma, which has proven to be one of the highly successful single shade composite. Numerous research studies have been conducted to explore its colour adjustment capabilities and optical characteristics, highlighting its effectiveness as a single shade composite [4,15,19,20].

To control the optical properties of the resin composite, the manufacturer asserts that Omnichroma does not rely on pigments. Instead, its colour characteristics are derived from structural colour(s), utilising an innovative chromatic technology known as smart chromatic technology. This technique has made it possible to create a resin composite that flawlessly reflects a particular wavelength within the tooth colour space in accordance to light waves at a set frequency. The filler of the composite must only be definite, single-sized spherical particles in order to replicate structural colour. Utilisation of 260 nm spherical fillers effectively generates the necessary 'a' and 'b' colour parameters to replicate natural teeth [21]. However, the structural colour phenomenon and the composite's capability for shade matching may be influenced or hindered by discrepancies in the size and shape of the filler material. Consequently, OMNICHROMA exclusively incorporates 260 nm spherical fillers (referred to as OMNICHROMA Filler) to ensure consistent and reliable results in shade matching [3].

However, contrasting results have been obtained by de Abreu JLB et al., and AlHamdan EM et al., who revealed that multi-shade composites had greater colour matching capabilities than single-shade composites [4,22]. The difference in optical performance between restorations placed in the anterior or posterior portion of the dental arch is thought to be the cause of this. The dark oral cavity's background may have an impact on the anterior restorations' translucency, as well as the wavelength they reflect, turning them greyish. One potential solution to this issue is the use of the blocker agent supplied by the Omnichroma manufacturer in Class-III restorations and restorations missing lingual walls which makes up for the oral cavity's dark background [23].

The results of the present study exhibited statistically significant difference in terms of marginal discolouration from baseline to one year in both the groups. This can be attributed to the greater surface area of the nanofillers in the nanocomposites which can cause it to have higher sorption and solubility. This can result in greater discolouration of nanohybrid composites and make them more susceptible to ion leaching and hydrolysis of the silane coupling agent. These processes can cause the filler particles to detach [24].

S. No.	Author's name and year	Place of study	Number of Subjects/ Specimen	Materials compared	Parameters assessed	Parental acceptance of BMT (conclusion)
1).	Durand LB et al., 2021 [14]	Spain	10 specimens	Omnichroma (O), Harmonize (H), Filtek Universal (F)	Spectral reflectance and colour co-ordinates, Instrumentak CAP00, TAP00.	Among the studied material, the highest colour, lightness, hue, and translucency adjustment potentials were recorded for Omnichroma.
2).	Pereira Sanchez N et al., 2019 [15]	Houston	10 specimens	Omnichroma, Filtek Supreme Ultra, TPH Ultra, Herculite Ultra, Tetric Evoceram	Reflectance, CAP-I and CAP-V Values assesed.	Omnichroma resin composite, exhibited significant and most pronounced CAP-I, followed by Tetric EvoCeram, TPH Spectra, Filtek Supreme Ultra, and Herculite Ultra.
3).	Zulekha et al., 2022 [7]	Andhra Pradesh, India	25 Subjects, 50 teeth	Omnichroma, Tetric-N-Ceram	Modified USPHS, Colour match, marginal integrity, retention, Anatomic form, Surface texture, Postoperative sensitivity.	The clinical performance of Omnichroma in terms of colour match, colour stability, and retention was comparable to nanohybrid composite, Tetric-N-Ceram.
4).	Present study	Vadodara, Gujarat	21 subjects, 72 teeth	Omnichroma, 3M Filtek Z350	Modified USPHS, Colour match, marginal integrity, retention, Anatomic form, surface texture, Postoperative sensitivity.	Single-shade composites effectively treat Class-I carious lesions, demonstrating satisfactory colour matching and clinical performance.

[Table/Fig-9]: Comparison of various studies in literature.

The current research demonstrated that single shade composites have satisfactory colour matching abilities and clinical effectiveness when compared to multi-shade composites for restoration of Class-I cavities.

Limitation(s)

The study acknowledges a limitation in terms of its follow-up duration. A more extended period of observation would provide a more comprehensive understanding of the durability and performance of the restorations over time, especially considering potential long-term effects that may not be evident within the studied time frame. The study did not consider the influence of patient-related confounding factors, particularly oral habits such as the consumption of various foods and beverages. These factors can introduce variables that may affect the rate of discolouration and disintegration of the restorations. Understanding and controlling for these habits are crucial to ensure that observed changes in colour matching potential are attributed to the restorations themselves and not external factors.

CONCLUSION(S)

Within the limitations of this study, it can be concluded that, as far as posterior restorations are concerned, colour adjustment potential of single shade composites is comparable to that of multi-shade composites. Single shade composites exhibit good clinical performance in terms of marginal adaptation, secondary caries, post-operative sensitivity, surface texture and retention at the end of one year except for marginal discolouration and colour match. Further investigations with larger sample sizes and a variety of carious lesions are necessary. The information presented is highly valuable in filling the existing knowledge gap regarding the application of these new-generation universal composites in posterior restorations. Furthermore, further clinical studies are necessary to corroborate the findings and conclusions drawn from this particular clinical study.

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