ORIGINAL RESEARCH

Clinical Evaluation of Bulk-fill Alkasite Restoration vs Resin-modified Glass Ionomer in Class V Carious Lesions: 1-year Randomized Clinical Trial

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Abstract

Aim and background: The balance between mechanical properties, esthetics, and therapeutic benefits in restorative materials, especially for high-risk patients, is lacking. Effective comparative study designs are required. This randomized clinical trial evaluated the clinical performance of Alkasite bioactive restorative material vs resin-modified glass ionomer (RMGI) in cervical carious lesions according to United States Public Health Service (USPHS) criteria over 1 year.

Materials and methods: Twenty-eight high-risk adult patients with Class V cavities in anterior or premolar teeth were randomly assigned to two groups (n = 14 each). The first group received restorations with an RMGI. In contrast, using a selective etching technique and a universal adhesive, the second group was restored with a bulk-fill alkasite. All materials were applied according to the manufacturer's instructions. The restorations were evaluated at baseline (1 week), after 6 months, and after 12 months using modified USPHS criteria. Data were recorded and statistically analyzed.

Results: Regarding the primary outcome of marginal integrity, no statistically significant difference was found between the alkasite and RMGI restorations at any follow-up interval. However, within the RMGI group, a statistically significant change in marginal integrity was observed across different follow-up periods. All secondary outcomes showed no statistically significant differences in either intragroup or intergroup comparisons at the various follow-up intervals, except for anatomic form, where a statistically significant difference was observed within the RMGI group over different follow-up periods.

Conclusion: Both restorations have shown similar clinical performance over a year, indicating their effectiveness in cervical restorations. Alkasite restoration can successfully replace RMGI for cervical restorations in patients with a high caries index.

Clinical significance: This study addressed the need for restorative materials that balance mechanical strength, esthetics, and therapeutic benefits in high-risk patients. Alkasite restorations are promising alternatives to RMGI. The findings will guide material selection for enhanced functionality, esthetics, and long-term caries prevention.

Clinical trial registration number: NCT04716517.

Keywords: Alkasite restoration, Carious class V, Cention N, Cervical caries, High-risk, Modified USPHS criteria, Resin-modified glass ionomer.

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Introduction

Dental caries is a chronic infectious disease that impairs shape and function, reduces the quality of human life, and causes a great economic burden.[1,2] Various restorative materials like amalgam, glass ionomer (GIC), and composites are available, each with advantages and disadvantages; hence, proper selection of restorative materials that re-establishes the esthetic, functional, and biological properties of the tooth structure.[3] Also, a restorative material that can withstand high caries-risk environments is crucial for its final intraoral success.[4]

The balance between mechanical properties, esthetics, and therapeutic benefits is one of the major gaps in the current research on restorative materials for class V carious lesions in high-risk patients. Resin-modified glass ionomers (RMGIs) have good chemical bonding properties and release beneficial ions like fluoride but have lower mechanical properties and lack the translucency and natural appearance of tooth enamel, limiting their esthetic appeal.[4] Conventional composite resins, on the other hand, have better mechanical strength and esthetics but lack fluoride release, restricting therapeutic benefits.[5] Alkasite restorations are a promising solution, potentially bridging this gap.[6]

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Table 1: Tested materials

Materials	*Composition*
Resin-modified glass ionomer restorative material (Fuji II LC® capsules)	Powder: 100% fluoroaluminosilicate Liquid: 35% HEMA, 25% distilled water, 24% polyacrylic acid, 6% tartaric acid, UDMA < 10, and 0.10% camphor quinone.
Dentin conditioner	77% distilled water, 20% polyacrylic acid, 3% aluminum chloride hydrate pH 1.9.
Glass ionomer coat (EQUIA-Coat, GC)	Methyl methacrylate 40–50%, colloidal silica 10–15%, camphor quinone 0.09%, urethane methacrylate 30–40%, phosphoric ester monomer 1–5%.
Cention N	Powder: Barium aluminum silicate glass, ytterbium trifluoride, isofiller, calcium barium aluminum fluorosilicate glass, and calcium fluorosilicate glass. Liquid: Urethane dimethacrylate, tricyclodecane dimethanol dimethacrylate, tetramethyl-xylylene diurethane dimethacrylate, polyethylene glycol 400 dimethacrylate, ivocerin, and hydroxyperoxide.
Tetric N-Bond Universal	Methacrylate, water, ethanol, silicon dioxide, photo stabilizers, stabilizers pH 2.5–3.0.
Spident FineEtch	37% phosphoric acid gel, thickening agents (colloidal silica), deionized water and coloring agents.

Bulk fill "alkasite" restoration is a tooth-colored composite material that releases fluoride, calcium, and hydroxyl ions, making it an anti-cariogenic material. As it is dual-cured, it can be used as a bulk-filling material.[7] The manufacturer of alkasite claims it offers superior esthetics, a translucent nature, compressive strength and durability comparable to amalgam, and ion-releasing capabilities similar to GIC.[8]

This randomized study aimed to compare the clinical performance of alkasite bioactive restorative material with that of RMGI in the treatment of cervical carious lesions at different follow-up periods using modified United States Public Health Service (USPHS) criteria. The null hypothesis was that alkasite restoration would have the same clinical performance as RMGI in cervical carious lesions.

Materials and Methods

Two restorative materials were assessed in this study. Resin-modified glass ionomer with dentin conditioner and Equia Coat have been used in the control group, while bioactive alkasite restorative material with universal adhesive and in selective etching mode for the intervention group. As provided by the manufacturer, the specifications and chemical composition of the materials are detailed in Table 1.

Trial Design and Setting

The present study was double-blinded (where both patients and assessors were blinded to the group assignment), a randomized controlled clinical trial with two parallel groups designed 1:1 allocation ratio and an equivalence framework. This study was conducted in the clinics of the Conservative Dentistry Department at the Faculties of Dentistry, Future University, and Cairo University, from September 2022 to March 2024. It was written by the Consolidated Standards of Reporting Trials (CONSORT) guidelines.

Trial Registration and Ethical Approval

The ethical approval was obtained from the Research Ethics Committee of the Faculty of Dentistry, Cairo University (CREC), with Ref Number: 381020. It was registered at the www.clinicaltrials.gov database (NCT04716517**)**. The study aim was explained to participants, who signed written consent forms.

Sample Size Calculation

A power analysis was designed to have adequate power to apply a two-sided statistical test of the research hypothesis. According to the results of Koc Vural et al.[9] by adopting an alpha (α) level of 0.05 (5%), power = 80%. The predicted sample size (n) was a total of 22 (11) for each group. The sample size was increased by (20%) to account for possible dropouts during follow-up intervals to a total of 28 cases, i.e., (14) for each group. Sample size calculation was performed using G*Power Version 3.1.9.2 using the Chi-squared test.

Patient Recruitment

Patients were recruited from the outpatient clinics of the Conservative Dentistry Departments at the Faculty of Dentistry, Future University and Cairo University. Patients for the study were selected according to the following inclusion criteria: adult patients aged range 18–50 years with untreated cervical caries lesions in the anterior and premolar teeth. Both male and female patients with high caries risk and poor oral hygiene were included. Eligible patients had vital upper or lower teeth, a healthy periodontium, and no tooth mobility. All participants were medically free of conditions that could interfere with the study and were cooperative, consenting to participate in the study. The exclusion criteria included teeth with cervical caries margins below the cementoenamel junction and patients with allergies to the materials used. Patients with systemic diseases, dry mouth, or parafunctional habits were also excluded.

Randomization, Allocation, and Blinding

Simple randomization was done by generating numbers from 1:28 using a random sequence generator (https://www.random.org/), generated random numbers from 1 to 14 represented the control group, and from 15 to 28 represented the intervention group. Each participant was chosen between random numbers placed in an opaque sealed envelope that was arranged by a person who was not involved in any of the phases of the clinical trial. The operator was not blinded to the material assignment because of the difference in the application protocol and presentation of the restorative materials. However, the participants and assessors were blinded to the material assignment (Fig. 1).

Isolation and Cavity Preparation

Prior to the clinical procedure, caries risk assessment was done using the ADA caries risk assessment tool. Prophylactic scaling and polishing were done to all participants. Patients were given local anesthesia (Mepivacaine) as required 1mg was injected preoperatively unless declined by the patient. Multiple teeth were isolated using a rubber dam with sub-gingival clamps, complemented by a saliva ejector.

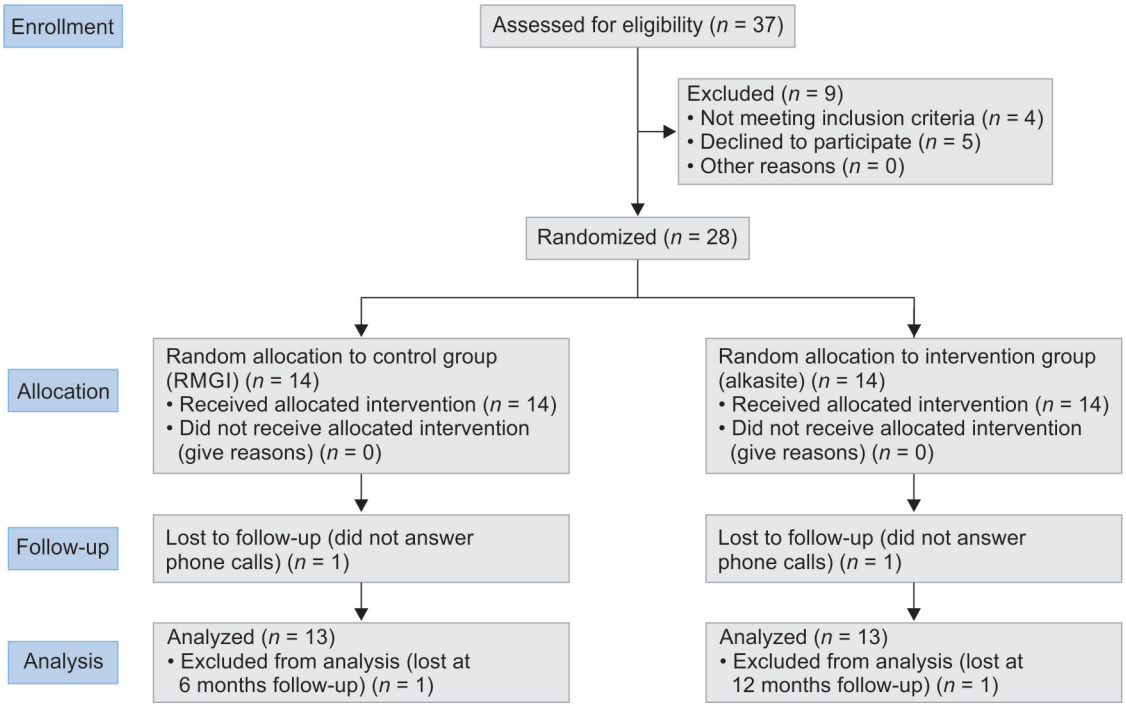

Fig. 1: CONSORT flow diagram showing the process of case selection

Class V cavities were prepared on the buccal surfaces of anterior teeth or premolars using a No. 330 bur with a diameter of 0.8 mm and a length of 1.6 mm attached to a high-speed contra-angle handpiece with a water coolant system. Soft carious dentin was removed with a sharp spoon excavator, while deeper carious tissue was removed using tungsten carbide burs in a slow-speed handpiece. Cavity margins were finished using an ultra-fine grain diamond bur. Any tooth with pulpal exposure was excluded from the study. Each bur was discarded after five preparations.

Restoration Procedures

Resin-modified Glass Ionomer

A dentin conditioner (20% polyacrylic acid solution) was applied for 10 seconds, then rinsed and gently dried with a cotton pellet. Resin-modified glass ionomer capsules were activated, triturated for 10 seconds, and applied to the prepared cavity. The restoration was adapted using LM ARTE Applica Style Italiano and light-cured for 20 seconds as per the manufacturer's instructions. EQUIA Coat was applied and light-cured for 20 seconds.

Alkasite Bioactive Restorative Material

Selective etching of the enamel margins of the class V cavity was performed with 37% phosphoric acid for 20 seconds, then rinsed with an air/water spray for 15 seconds. A universal bonding agent was applied to all cavity surfaces and cured for 10 seconds. Alkasite restoration was mixed and placed as a bulk fill in the prepared cavity, then carefully adapted to the cavity with a Cention N special applicator. Finally, the restoration was light cured for 40 seconds, all according to the manufacturer's instructions.

Finishing and polishing were done for both the groups. Finishing was done with a high-speed contra-angle handpiece with yellow-coded fine tapering stone with rounded end under copious water coolant in single direction. It removed the excess filling material, irregularities, gave smooth surface, and contoured the restoration. Polishing was then completed using sequential super-snap polishing discs, resulting in a finalized smooth surface.

Clinical Evaluation using Modified USPHS Criteria for Dental Restorations

The clinical performance of the tested restorative materials was evaluated by two blinded assessors at baseline (1 week), 6 months, and 12 months using the modified USPHS criteria for dental restorations. The evaluation was conducted using a dental flat-surfaced mirror and a sharp explorer probe in a properly isolated field, following the criteria presented in Table 2. The performance of the materials was assessed for marginal integrity as the primary outcome. Marginal discoloration, retention, color match, anatomic form, secondary caries, and postoperative hypersensitivity were evaluated as secondary outcomes. The scores were categorized as Alpha, Bravo, or Charlie. Alpha score indicates excellent restoration, Bravo indicates an acceptable restoration requiring minor repair, and Charlie indicates an unacceptable restoration that needs replacement.

Statistical Analysis

Qualitative data were presented as frequencies and percentages. The Chi-squared test and Fisher's Exact test were used to compare the two groups. Freidman's test was used to study the changes by time within each group. Age data were compared using Student's *t*-test. The significance level was set at $p \leq 0.05$. Statistical analysis was performed with IBM SPSS Statistics for Windows, Version 23.0. Armonk, NY: IBM Corp.

Results

Demographic Data

A total of 28 participants were enrolled in this study. The mean ages of all subjects were 33.1 ± 6.6 years for the RMGI group and

Table 2: Modified USPHS criteria, score, characteristics, measuring unit and method of diagnosis for assessment of dental restorations

Criterion (outcome)	*Score*	*Characteristics*	*Measuring unit*	*Method of measure*
Marginal adaptation	A	No detectable gap	Ordinal	Clinical evaluation by visual inspection with explorer and mirror in properly isolated field
	B	Detectable gap with an explorer		
	C	Marginal Crevice in which dentin is exposed requiring replacement		
Retention	A	No loss of restoration	Binary	Clinical evaluation by visual inspection
	C	Loss of retention		
Marginal discoloration	A	No discoloration between tooth structure and restorative material	Ordinal	
	B	Non-penetrating marginal discoloration which can polish away		
	C	Discoloration has penetrated the margin in the pulpal direction		
Anatomic form	A	Restoration continuous with existing anatomic form	Ordinal	Clinical evaluation by visual inspection with explorer and mirror in properly isolated field
	B	Restoration discontinuous with existing anatomic form but clinically acceptable		
	C	Sufficient material is lost to exposed dentin		
Secondary caries	A	No caries present at the margin of the restoration	Binary	
	C	There is evidence of caries at the margin of the restoration		
Color match	A	The restoration color matches the color of the tooth	Ordinal	
	B	Acceptable mismatch		
	C	Unacceptable mismatch		
Postoperative sensitivity	A	Alfa: Not present	Binary	Verbal by asking the patient
	B	Sensitive but diminishing in intensity		
	C	Constant sensitivity not diminishing		

32.4 ± 5.3 years for the alkasite group. Seventeen participants were male (60.7%) and 11 were female (39.3%). Fifteen maxillary teeth (53.6%) and 13 mandibular teeth (46.4%) were restored. Eighteen restorations (64.3%) were placed in the upper arch, whereas 10 (35.7%) were placed in the lower arch. There was no statistically significant difference in gender distribution between the two groups (p = 0.053). There was also no statistically significant difference in mean age values between the two groups (p = 0.733). The RMGI group showed a statistically significantly higher presence of lower teeth compared to the Alkasite group (p = 0.008), while there was no statistically significant difference in tooth distribution between the two groups (p = 0.115) (Table 3).

Table 3: Descriptive statistics and results of Chi-squared test and Student's *t*-test for comparisons between baseline characteristics in the two groups

Base line characteristics	*RMGI (n = 14)*	*Alkasite (n = 14)*	*p-value*
Gender, *n (%)*			
Male	6 (42.9%)	11 (78.6%)	0.053
Female	8 (57.1%)	3 (21.4%)	
Age (mean, SD)	33.1 (6.6)	32.4 (5.3)	0.733
Arch, *n (%)*			
Upper	4 (28.6%)	11 (78.6%)	0.008*
Lower	10 (71.4%)	3 (21.4%)	
Tooth, *n (%)*			
Anterior	7 (50%)	11 (78.6%)	0.115
Premolar	7 (50%)	3 (21.4%)	

*Significant at $p \leq 0.05$

Clinical Evaluation

Regarding the primary outcome of marginal integrity, there was no statistically significant difference between alkasite and RMGI restorations at various follow-up intervals (p = 0.472). However, within the RMGI group, a statistically significant difference in marginal integrity was observed between different follow-up periods (p = 0.022). All secondary outcomes, except for anatomic form (retention, marginal discoloration, color match, secondary caries, and postoperative hypersensitivity), showed no statistically significant differences in either intragroup or intergroup comparisons at the various follow-up periods (p = 1, p = 0.730, p = 0.516, p = 1, p = 1, respectively). Regarding anatomic form, there was no statistically significant difference between alkasite and RMGI restorations at various follow-up intervals (p = 1). However, a statistically significant difference was noted within the RMGI group across different follow-up periods (p = 0.050) (Table 4). All patients returned for 6 months in group Alkasite, while 13 patients returned for six months in group RMGI. After 12 months of follow-up visits, 13 patients returned in each group; thus, the recall rate was 92.86%.

Clinical Success

Scores (Alpha) and (Bravo) were considered a success, while the (Charlie) score was considered a failure. Since none of the

Table 4: Outcome, follow-up, frequency, percentage, and *p*-value for all the USPHS criteria

		RMGI			*Alkasite*			
Outcome	*Follow-up*	*Alpha*	*Bravo*	*Drop out*	*Alpha*	*Bravo*	*Drop out*	*p-value*
Marginal Integrity	Baseline	14 (100%)	0 (0%)	0 (0%)	14 (100%)	0 (0%)	0 (0%)	
	6 months	12 (85.7%)	1 (7.1%)	1 (7.1%)	13 (92.9%)	1 (7.1%)	0 (0%)	1
	12 months	9 (64.3 %)	4 (28.6%)	1 (7.1%)	12 (85.7%)	1 (7.1%)	1 (7.1%)	0.472
	p-value		0.022*			0.223		
Retention	Baseline	14 (100%)	0 (0%)	0 (0%)	14 (100%)	0 (0%)	0 (0%)	
	6 months	13 (92.9%)	0 (0%)	1 (7.1%)	14 (100%)	0 (0%)	0 (0%)	1
	12 months	13 (92.9%)	0 (0%)	1 (7.1%)	13 (92.9%)	1 (7.1%)	1 (7.1%)	1
	p-value		0.368			0.368		
Marginal discoloration	Baseline	14 (100%)	0 (0%)	0 (0%)	14 (100%)	0 (0%)	0 (0%)	
	6 months	12 (85.7%)	1 (7.1%)	1 (7.1%)	14 (100%)	0 (0%)	0 (0%)	0.481
	12 months	11(78.6%)	2 (14.3%)	1 (7.1%)	13 (92.9 %)	1 (7.1%)	1 (7.1%)	0.730
	p-value		0.097			0.368		
Color match	Baseline	11 (78.6%)	3 (21.4%)	0 (0%)	13 (92.9%)	1 (7.1%)	0 (0%)	0.596
	6 months	9 (64.3%)	4 (28.6 %)	1 (7.1%)	12 (85.7 %)	2 (14.3%)	0 (0%)	0.385
	12 months	8 (57.1%)	5 (35.7 %)	1 (7.1%)	11(78.6%)	2 (14.3%)	1 (7.1%)	0.516
	p-value		0.097			0.223		
Secondary caries	Baseline	14 (100%)	0 (0%)	0 (0%)	14 (100%)	0 (0%)	0 (0%)	
	6 months	13 (92.9)	0 (0%)	1 (7.1%)	14 (100%)	0 (0%)	0 (0%)	1
	12 months	13 (92.9)	0 (0%)	1 (7.1%)	13 (92.9)	0 (0%)	1 (7.1%)	1
	p-value		0.368			0.368		
Postoperative sensitivity	Baseline	11 (78.6%)	3 (21.4%)	0 (0%)	14 (100%)	0 (0%)	0 (0%)	0.222
	6 months	13 (92.9%)	0 (0%)	1 (7.1%)	14 (100%)	0 (0%)	0 (0%)	1
	12 months	13 (92.9%)	0 (0%)	1 (7.1%)	13 (92.9)	1 (7.1%)	1 (7.1%)	1
	p-value		0.717			0.368		
Anatomical form	Baseline	14 (100%)	0 (0%)	0 (0%)	14 (100%)	0 (0%)	0 (0%)	
	6 months	12 (85.7%)	1 (7.1%)	1 (7.1%)	13 (92.9 %)	1 (7.1%)	0 (0%)	1
	12 months	10 (71.4 %)	3 (21.4%)	1 (7.1%)	11(78.6%)	2 (14.3%)	1 (7.1%)	1
	p-value		0.050*			0.097		

restorations in the two groups showed a Charlie score, the clinical success is 100% in each group.

The results of the present trial demonstrated that both tested restorative materials exhibited satisfactory clinical performance, with no significant differences between alkasite and RMGI across different follow-up periods according to all USPHS criteria. However, alkasite showed slightly better results in terms of marginal integrity and anatomic form, suggesting its potential as a superior restorative material.

Discussion

Recent developments in dental materials have attempted to enhance mechanical properties, esthetics, and therapeutic advantages. Resin-modified glass ionomer and composite resins each have their strengths and limitations. Resin-modified glass ionomers promote caries prevention due to fluoride release; however, they are mechanically weaker and less esthetic than resin composites.[10,11] Although composite resins are stronger and more esthetically pleasing, they lack fluoride release, limiting their preventive benefits. Bulk-fill alkasite restorations present a promising alternative, combining durability, esthetic appeal, and ion release, making them particularly beneficial for high-risk patients.[4]

This randomized study compared the clinical performance of alkasite restorative material and RMGI in treating cervical carious lesions over various follow-up periods. Resin-modified glass ionomer was selected as the comparator due to its reputation for fluoride-releasing restorations, helping to reduce secondary caries risk.[12] The alkasite restorative material, chosen for its unique features like ion release, bulk filling, and dual curing, offers enhanced mechanical and esthetic properties.[13] Its ion-releasing matrix, containing fluoride, calcium, and hydroxide ions, supports remineralization, while the UDMA-based resin matrix provides a natural translucency, enabling it to blend well with teeth.[6] The study included patients with poor oral hygiene to assess the material's effectiveness in the real world, under challenging conditions, offering insights into its benefits for caries-prone patients.[14]

For the RMGI group, tooth conditioning with 10% polyacrylic acid improved bonding by removing the smear layer.[15] The remaining hydroxyapatite facilitated interaction with GIC, enhancing chemical bonding.[16] The alkasite group utilized selective etching with a universal bonding agent to further enhance bond strength and retention.[17] Using the dual-cure mode for the alkasite enhances its performance by significantly improving strength, reducing water sorption, and increasing the degree of conversion compared to the self-cure mode, as noted in previous studies.[13]

The findings showed that both materials exhibited clinically satisfactory performances, showing no significant differences from each other across different follow-up periods. Therefore, the null hypothesis was accepted. However, with respect to marginal integrity and anatomic form, alkasite showed slightly better results.

Regarding marginal integrity, the results showed that alkasite has better marginal integrity over time than RMGI. This is most likely owing to the presence of "isofillers" in alkasite, which help relieve shrinkage stresses. Furthermore, the cross-linking of monomers in alkasite improves marginal integrity.[18] The material's ability to release fluoride, calcium, and hydroxide ions contributes to stable marginal integrity. In addition, selective enamel etching and universal adhesive improved the marginal and bond quality of alkasite restoration.[19] In contrast, RMGI, while successful, showed some marginal degradation, most likely due to minor chipping at the restoration margins and wear, as well as its hydrophilic character.[20] The findings are consistent with Attia et al.[21] and Kataria et al.,[22] who reported that alkasite's marginal integrity remained stable over 12 months. In contrast, Fattah et al.[23] observed poor marginal integrity in some alkasite restorations, which they attributed porosities in the manual mixing mix, resulting in marginal gaps.

Regarding retention, both materials had good retention, with no restorations lost over the 12-month follow-up period. This might be explained by the bond strength of both restorative materials and their resiliency.[24]

In terms of marginal discoloration, the results showed that while two restorations in the control group were evaluated as Bravo, all in the intervention group recorded Alpha scores during the timeframe of 12 months without any significant variations in follow-up periods within either of the two groups. This constancy can be explained in terms of the good sealing at the interface of the tooth and restoration, which reduces the chances of micro gaps and staining.[25] These findings are consistent with Hussainy et al.[26] However, they differ from Ballal et al.,[27] who found alkasite superior in retention and marginal discoloration scores.

While differences in esthetic performance were observed between restorative materials, no statistically significant differences in color matching were found between the two materials at any follow-up period or within each group. In the RMGI group, baseline Bravo ratings were associated with the "chalking phenomenon," which can affect appearance in dry situations.[28] Overall, RMGI demonstrated acceptable color stability, possibly due to its dual reaction mechanism and also the application of resin coatings containing nanofillers that improve stain resistance.[12,29] In the alkasite group, optimal color match and stability were attributed to its chameleon effect, high translucency and the use of thiocarbamide as a photoinitiator, which reduces color change caused by amine discoloration.[27,30] The relatively small nanoparticle size of alkasite contributes to its opalescent effect and light-blending property.[22] This is consistent with the findings of Arora et al.,[31] who reported no significant color changes in alkasite after 12 months.

Regarding secondary caries, both groups showed no recurrent caries at the margins of their respective restorations. This result is expected due to the anticariogenicity feature of both restorations. Both materials demonstrated excellent anticariogenic property as they were capable of releasing fluoride. Alkasite releases fluoride, calcium, and hydroxide ions that neutralize acids and promote remineralization, lowering the incidence of recurrent caries.[32] Similarly, RMGI releases fluoride and can replenish its fluoride storage from the surrounding environment. This makes both materials efficient at preventing secondary caries, particularly in high-risk patients.[11]

Concerning postoperative sensitivity, no statistically significant differences were seen between the tested groups throughout the trial. Three patients in the RMGI group experienced mild sensitivity at baseline, most likely due to the cavity preparation; however, this sensitivity resolved over time, possibly due to the absence of marginal leakage, which reduces fluid movement in the dentinal tubules.[26] This finding was consistent with previous research by Zaki et al.[33] The proper sealing of both materials likely favored the overall lack of sensitivity in the investigation. Moreover, the release of fluoride from both alkasite and RMGI may have contributed to reducing sensitivity by promoting the remineralization of the tooth structure.[34] However, our findings differed from Bharate et al.,[35] who found higher postoperative sensitivity in RMGI restorations compared to alkasite. In addition, Hirani et al.[36] observed increased sensitivity with alkasite, this could be due to the use of alkasite without adhesive in a routinely constructed cavity.

The present study showed that both restorative materials maintained an acceptable anatomic form for up to 6 months. However, by 12 months, the anatomic form loss for RMGI was statistically significant ($p < 0.05$). The changes in anatomical form indicate a decline in the material's wear-resistance properties.[22] Alkasite maintained its anatomic form and showed superior wear resistance, this is attributed to the material's monomer matrix, which enhances its mechanical properties.[6] Even though RMGI performed well in the short term, there was a marked loss of anatomic over time as a result of its lower strength and susceptibility to wear. These findings were consistent with those of Santos et al.[12] and Hussainy et al.,[26] who reported greater anatomic loss in RMGI restorations after 1 year. Attia et al.[21] also reported similar findings, noting that alkasite retained a satisfactory anatomic form after 1 year.

This clinical trial comparing alkasite and RMGI in cervical carious lesions showed positive outcomes for both materials. Alkasite showed better results in marginal integrity, anatomic form, wear resistance, and esthetics, suggesting its potential as a superior restorative material. However, the short follow-up period, the subjective method of evaluating postoperative sensitivity, and the challenges associated with the manual mixing of alkasite are notable limitations. Future clinical trials with larger sample sizes and extended follow-up periods are recommended to evaluate the long-term survival of restorations. Furthermore, studies should explore the performance of Alkasite restorations for a broader range of clinical indications beyond cervical restorations.

Conclusion

Within the limitations of the current study, it could be concluded that both alkasite and RMGI demonstrated good clinical performance in class V carious lesions. Alkasite may be a better choice in specific clinical situations, such as for high-risk patients who require fluoride release and wear resistance, and where esthetics are a priority. Alkasite restorations can successfully replace RMGI for cervical restorations.

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