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CLINICAL PERFORMANCE OF ALKASITE DENTAL MATERIAL AND HIGH VISCOSITY GLASS IONOMER RESTORATIONS IN CLASS I CAVITIES. COMPARATIVE STUDY FOR ONE YEAR FOLLOW UP.

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ABSTRACT

Objectives: To compare one year clinical performance of Alkasite Dental Material (Cention–N) and High Viscosity Glass Ionomer (Equia Forte Fil) as a restoration of class one cavities

Materials and Methods: Sixty class I cavities (30 for each evaluated restorative material) were selected. The teeth were prepared, restored, finished and polished by one operator using Alkasite Dental Material (Cention–N) and Equia Forte Fil (EF; a high-viscosity glass ionomer). Clinical evaluation was performed with the aid of a dental mirror and explorer at baseline (1 week after the restoration), 6 months, and 12 months for anatomic form, surface texture, marginal discolouration, marginal adaptation, secondary caries, post-operative sensitivity, and retention using modified USPHS criteria.

Results: Regarding all tested criteria, there was no significant difference in the clinical performance within the groups of tested materials or between the groups from baseline to 12 months.

Conclusion : Both tested materials showed acceptable clinical performance in the restoration of class I cavities after 12 months.

Keywords: Clinical Performance, Alkasite Dental Material, High Viscosity Glass Ionomer, Class I Cavities.

INTRODUCTION

The advancement of restorative dental material and its technology has enabled the use of tooth-colored restorative materials in dental restorations, where the dominant hope of all dentists is the existence of materials that combine the biocompatible properties and aesthetics [1]. In general, resin composites may be regarded as the

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gold standard material for repairing cavities caused by occlusal pits and fissure caries in stress-bearing regions [2]. Despite tremendous enhancements in the mechanical and cosmetic properties of resin composite materials over the past two decades, research is still continuing to develop solutions to avoid secondary caries formation underneath and at the margins around restoration. However, the majority of composite resins on the market have no remineralizing action [3]. There is an increasing propensity toward the use of resin-based bioactive and remineralizing restorative materials to rise and increase the longevity of bonded dental restorations [4] in order to circumvent these issues. Composite restorations are expensive, time-consuming, and technique-dependent. They have not rendered traditional "basic" dental materials (GIC and amalgam) unnecessary or insufficient [5].

Glass ionomers cement is one of the most widely used materials in restorative dentistry. One of the most important features is the ability of GICs to release fluoride and be recharged. And other reasons why GICs is commonly used in dentistry are their beneficial features, which include adhesion to tooth structure, a thermal expansion coefficient equivalent to that of a tooth, and great biocompatibility [6]. However, they have disadvantages such as severe wear, high solubility, poor mechanical properties, and limited occlusal force resistance. For instance, RMGIs, have compressive values ranging between 150 and 166 MPa, while composite resins have compressive strengths between 265 and 290 MPa [7]. The current generation of GICs has attempted to alleviate this drawback by introducing a fast-setting reinforced glass ionomer, which should provide protection during the early maturation period and increase strength and surface hardness [8]. Changes to the powder-to-liquid ratio, particle size, and dispersion have enhanced it. Thus, very viscous glass ionomer cement (HVGIC) has been introduced to the marketplace. In recent years, an encapsulated glass ionomer with high mechanical qualities according to the manufacturer has been introduced [9]. The fast-setting, high-viscosity GIC coated with a nanofilled resin which advertised as a restorative material which could be an alternative and substitute for an amalgam and composite restorations in class I and II cavities for permanent teeth [10, 11].

Dentists have long sought an ideal material that is inexpensive, fluoride-releasing, simple to apply, and gives both strength and acceptable aesthetics. Cention N, a unique bioactive material with superior bending strength, has been introduced to the marketplace [12]. It is an alkasite dental material that can be utilized for tooth repair to provide both strength and aesthetics. It can be used with or without adhesive. Cention N is available in powder and liquid forms, and according to the manufacturer, it can replace amalgam [13]. It is containing an alkaline filler that releases acid-neutralizing ions like fluoride, calcium, and hydroxide. The liquid includes urethane dime -thacrylate (UDMA), tetra-methyl-xlylen-diurethane dimethacrylate and polyethylene glycol 400 dimethacrylate .The powder includes barium aluminium silicate glass, ytterbium trifluoride, isofiller, calcium barium aluminium fluorosilicate glass, and calcium fluorosilicate glass [14]. This dual-cure restorative material contains alkaline fillers in a methacrylate resin matrix and emits hydroxyl ions, thereby neutralising the acidogenic caries bacteria [15].

Numerous clinical criteria are employed for the clinical evaluation of dental restorations. The US Public Health Service (USPHS) criteria, often recognised as the Ryge criteria, are the most frequently applied set of criteria. Most typically, modified versions of (USPHS) criteria have been utilised to evaluate the clinical performance of various dental restorations [16].

Equia Forte Fil and Cention N are both claimed to be superior to Glass Ionomer Cement, with equivalent qualities for Cention N and filling

composites. However, scientific data comparing the clinical performance of these newer restorative materials is limited. In this study, we examined the clinical performance of EQUIA Forte and Cention N, two relatively novel restorative materials.

MATERIALS AND METHODS

This trial was planned in accordance with the Consolidated Standards of Reporting Trials (CONSORT). Two posterior direct filling materials were clinically evaluated in this split-mouth (equal allocation ratio), randomised, prospective clinical study: glass hybrid innovation of conventional glass ionomer (Equia Forte Fil; GC, Tokyo, Japan) and fluoride releasing composite filling material Cention-N (Alkasite, Ivoclar Vivadent). Table 1 lists the materials that were utilised.

The study protocol was authorised by the Faculty of Dentistry, Beni-Suef University Research Ethics Committee (FDBSU-REC) (Approval number: #FDBSUREC/21092021/EM). The study's aims and substance were explained to the participants, who signed written consent forms.

Patient Recruitment

Patients who applied for dental care were examined at the department of Restorative Dentistry, Faculty of Dentistry, Beni-Suef University. The following were the inclusion criteria used to identify patients for the study: 1) The participant must have good oral health; 2) the patient should need minimum two or more posterior teeth need restorations in contact with the adjacent and opposing teeth; 3) the tooth need restoration must be vital and symptom-free; and 4) the isthmus size of the cavity must exceed one-third of the intercuspal distance. The following were the criteria for exclusion: 1) lack of contact and normal occlusion, 2) presence of any periodontal complications, 3) pulpal pain or inflammation, 4) Previously pulp capping treatment , and 5) any severe systemic diseases, or adverse medical conditions, 6) allergies to the materials used in the study

Sample size calculation

The sample estimation of sample size was done in accordance with the guidelines for conducting controlled clinical trials [17] . The minimal sample size was determined as 30 per group using a 5% alpha, a 90% power value, and a two-sided test technique. The drop-out rate was projected to climb by 15%. A total of 30 patients (13 men and 17 women) who met the eligibility requirements were chosen to take part in this research investigation. The patients' average age was 33 years (range 20-45 years).

Randomization

Sixty class I restorations (30 for each evaluated restorative material) were done by the same operator, each patient got at least two restorations. The test materials were distributed to patients based on a database of random numbers [18]. For each of the two experimental conditions, the teeth were randomised using a table of program-generated random numbers called "Research Randomised Program" (http://www.randomizer.org/form.htm).

Preoperative evaluation of the patients:

All participants chosen for the research had their medical and dental histories documented. Preoperative clinical and intraoral evaluations were performed in terms of discomfort, tenderness on percussion, periodontal health, and tooth restorability.

Treatment protocol

Prior to beginning the restorative treatments, teeth were cleansed with a pumice slurry and dental hygiene instructions were delivered. Rubber dams were used to isolate the patient. Diamond fissure burs (OKO DENT®, Germany) were used with water as coolant system at high-speed. When the patient expressed pain or sensitivity,

local anaesthetic was used to make the restorative process more comfortable. Following the principles of minimally invasive dentistry, utilising tissue-conserving, conservative cavity design. Cusps were not involved in the cavity preparations. Cavities that did not fulfill these requirements were eliminated. The hollow walls did not get bevel preparation. Calcium hydroxide (CaOH) cavity liner (Life Regular Set, Kerr Corporation, USA) was used as a base material where it was necessary. A GI restorative (Equia Forte Fil, GC, Tokyo, Japan) or Alkasite composite resin CN was used to restore the prepared cavities (Cention-N, Ivoclar Vivadent).

Equia Forte Fil restorations

Both enamel and dentin were treated with 20% polyacrylic acid. (Equia Forte Fil) was then swirled for 5 s before activation in order to aerate the powder contained within the capsule, the mixing time was 10 s via a mixing device (TPC DIGITAL, Topdental, USA), injected instantly into the cavity and shaped by hand instrument according to the manufacturer's instructions. The restoration was completed with ultrafine diamond burs (Heerbrugg, Switzerland) and polished with abrasive discs once the material had cured (about 2.5 minutes) (Sof-Lex Pop-On discs, 3M ESPE, St Paul, MN, USA). The coating substance (EQUIA Coat) was then placed on the restoration's surface with a micro brush and irradiated for a time equal 20 seconds (Bluephase N, Ivoclar, Vivadent, Liechtenstein) [19].

Cention-N restorations

The enamel and dentin were conditioned for 20 s with 37 % phosphoric acid gel before being washed with distilled water using a three-way syringe. To provide a gleaming look and to reduce potential drying after etching, the tooth surface was dried with cotton pellets. The bonding agent (Tetric N-Bond, Ivoclar Vivadent) using an applicator tip the adhesive was applied to the prepared cavity and cured for 20 s under a blue phase light. Then, as a bulk, Cention-N was applied and irradiated for 40 s. The restorations were polished with silicone cups and completed with ultrafine diamond burs (Heerbrugg, Switzerland) at the same appointment following their completion immediately [20].

Calibration for Clinical Evaluation

Prior to the beginning of the assessments, two highly knowledgeable assessors didn't participate in the restorative procedures were trained on intraexaminer and interexaminer reliability. They saw ten photos that were indicative of each score for each criterion for this purpose. The percentage of agreement amongst the examiners was a minimum of 85 %. Before the patients left, a consensus was achieved in the event of dispute.

Blinding

The clinical assessments were carried out by examiners who were not engaged in the restoration processes and were blind to the group assignment. Subjects were likewise kept in the dark about their group assignment.

Clinical examination

The evaluation was performed with the aid of a dental mirror and explorer probe at baseline (1 week after the restoration), 6 months, and 12 months for anatomic form, surface texture, marginal discolouration, marginal adaptation, secondary caries, post-operative sensitivity, and retention using modified USPHS criteria (table 2).

Statistical Analysis

The data was inserted into Excel and analysed descriptively. Inferential analysis was performed with the non-parametric Friedman Test for the comparison between the tested materials. Wilcoxon test was applied for paired data in the comparison between wear assessments through OCT. The margin of error used in the decision of the statistical tests was 5% and the software used for the statistical analysis was the SPSS (Statistical Package for the Social Sciences), version 23.

TABLE (1) The materials used in the study

Material	Manufacturer	Composition
EQUIA fort Fil	GC, Tokyo, Japan	Powder: 95% strontium floro alumno-silicate glass, 5% poly-acrylic acid Liquid: 40% aqueous poly-acrylic acid
EQUIA Coat	GC, Tokyo, Japan	40%-50% methyl methacrylate, 10%-15% collidal silica, 0.09% camphorquinon, 30%-40% urethan methacrylate, 1%-5% phospheric estr monomer
CENTION N	Ivoclar, Vivadent , Liechtenstein	The liquid comprises dime-thacrylates (UDMA, DCP, an aromatic aliphatic UDMA and PEG-DMA) and initiators, the powder contains numerous glass fillers (barium- aluminium silicate glass filler, ytterbum trifluoride, an Isofiller, a calcium barium alumnium flurosilicate glass filler and a calcium fluorosilicate (alkaline) Glass filler, initiator (Ivocerin) and pigments.

TABLE (2) Modified USPH for clinical evaluation of tested materials.

Category	Score		Criteria
	Acceptable	Unacceptable	
Anatomical form	0		The restoration is contiguous with tooth anatomy
	1		Little under- or over-contoured restoration; marginal ridges slightly under-contoured contact slightly open (maybe self-correcting); occlusal height reduced locally
		2	Restoration is under-contoured, dentin or base exposed; contact is faulty, not self-correcting; occlusal height reduced, occlusion affected
		3	Restoration is missing partly or totally, fracture of tooth, displays traumatic occlusion; restoration causes pain in tooth or adjacent tissue
Marginal adaptation	0		Restoration is continuous with present anatomic form; explorer does not catch
	1		Explorer catches; no crevice is noticeable into which explorer will penetrate
	2		Crevice at margin, enamel exposed
		3	Noticeable crevice at margin; dentin or base exposed
		4	Restoration fractured, mobile, or missing
Surface Texture	0		Smooth occlusal surface
	1		Somewhat rough or pitted
	2		Rough surface, cannot be refinished or polished
		3	Surface intensely rough, pitted or irregular, cannot be refinished or polished
Marginal discoloration	0		No marginal discoloration obvious
	1		Slight marginal discoloration
	2		Noticeable marginal discoloration cannot be polished away
		3	Intensive staining
Secondary Caries	0		No indication of caries adjoining with the margin of the restoration
		1	Caries is obvious adjoining with the margin of the restoration
Post-operative sensitivity	0		No – sensitivity
	1		Sensitivity missing in one week
		2	Incessant sensitivity

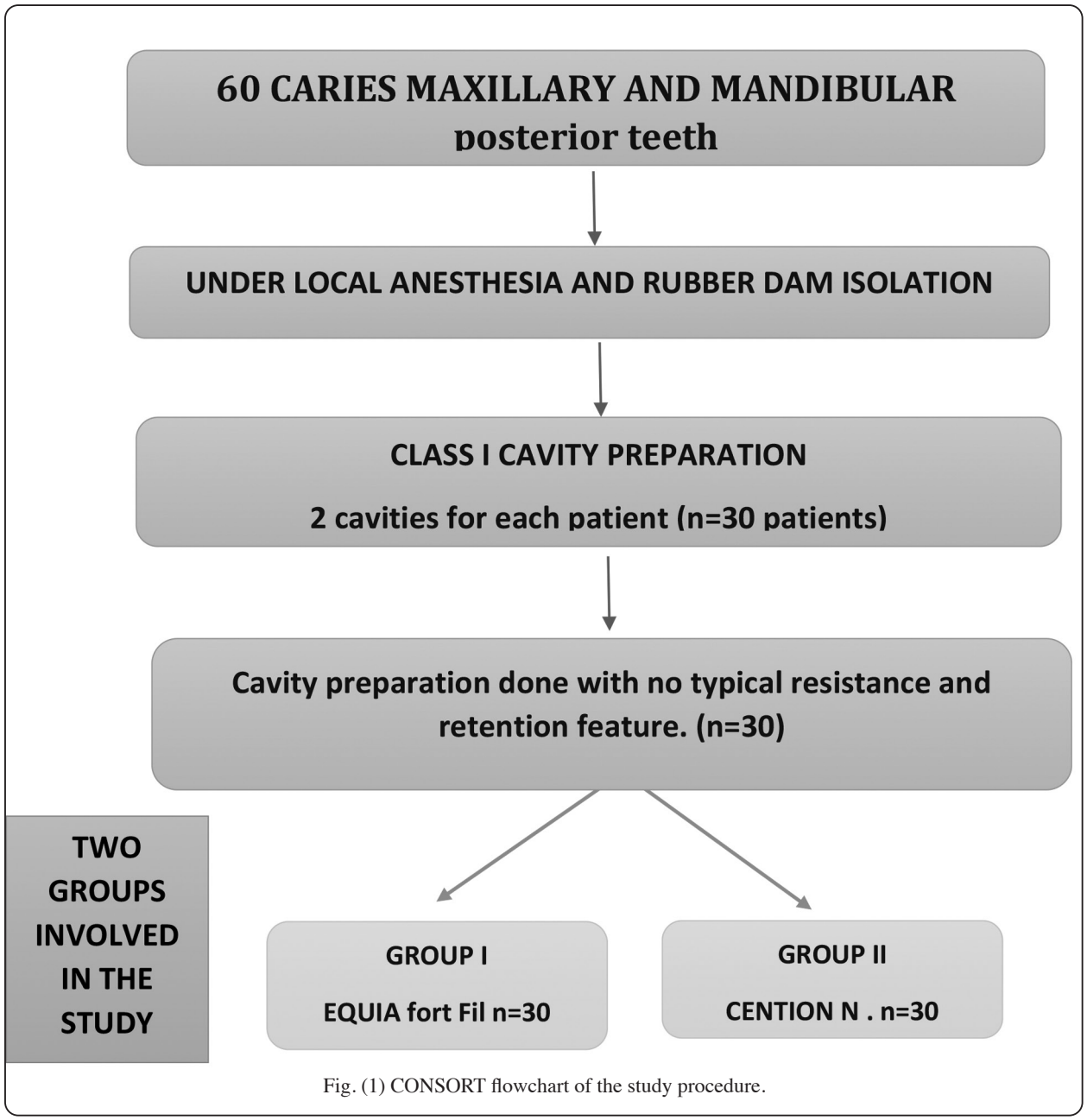

Fig. (1) CONSORT flowchart of the study procedure.

RESULTS

At the end of 12 months, 60 restorations were examined in total. 10 restorations were unable to be assessed because five patients (14.28%) had departed. The recall rate was 100% at six months and 85.7% at 12 months. Table 3 represents the distribution of the restorations. At both recall periods, the success rate of Cention N was a perfect 100 %. At the 6-month recall, the success rate of EQUIA Forte Fill restorations was 100 %, and at the 12-month recall, it was 93.7 %.

Table 4 presents the findings of the clinical evaluation of the tested restorations. From baseline to 12 months, the present investigation noted that there was no significant difference in the clinical performance regarding all tested criteria of the tested groups or between the groups (Table 5).

A visible and perceptible loss of anatomic form was shown in 3.33% (n = 1) of EQUIA Fort fill (Gp I) and 6.67% (n=2) of Cention N (Gp II) restorations at 12 months recall time, 10% (n=3) of gp. I and 6.67% (n=2) of gp. II showed slightly under-contoured restorations at the same recall date, whereas no change in anatomic form was reported at 6 months recall (Table 4). Anatomic form loss demonstrated statistically significant difference among the two groups in all the time interval (1 W,6&12months) (Table 4).

In terms of marginal adaptation and marginal discoloration; score 1 was reported for two restorations (6.67%) of each test material at 6 months recall time, with slight catch for 2 (6.67%) EQF restorations and 3 (10.00%) CN restorations at 12 months. The present study showed no statistically significant difference between the marginal adaptation at baseline, 6 and 12 months interval among the scores in both the groups. None of the restorations from both groups showed any change in surface texture till the 12-month clinical evaluation. Four restorations (6.66%) showed minor change in texture at 12 months.

Two EQUIA Forte Fill restorations (6.67%) showed minor mismatches in color match at baseline, and three (10.00%) at six months, as well as three (10.00%) at 12 months, one of them showed unacceptable color mismatch (score 2). However, Cention N showed color matching with tooth structure at baseline with slight change for four restorations at recall times (6&12 month). No significant difference was seen between the EQUIA Forte Filland Cention N restoration groups (p=0.365) for color change (Table 5). At all evaluation periods, no restoration from both materials were reported with post operative sensitivity or recurrent caries (Table 4).

Table (3): The distribution of the restorations (Arch/ Tooth) for tested restorative materials

Restorative Material	Arch		Tooth	
	Max	Mand	Premolars	Molars
EQUIA Fort Fil	13 (43.3%)	17 (56.6%)	3 (10%)	27 (90%)
Cention N	10 (33.3%)	20 (66.6%)	4 (13.3%)	26 (86.6%)
Total	23 (44%)	37 (56%)	7 (26%)	53 (74%)

TABLE (4): Clinical Evaluation Scores of the Restorations at Baseline [21] and at 6, 12 Months

Modified USPHS Criteria/Scores	**EQUIA FORT – Gp I**			
	BL	6 Months	12 Months	Cochran's Q/*P* value
Anatomic form				
0^{A}:	30 (100)	30 (100)	26 (86.67)	8.000/0.018*
1^{A}:	0 (0)	0 (0)	3 (10.00)	
2^{U}:	0 (0)	0 (0)	1 (3.33)	
3^{U}:	0 (0)	0 (0)	0 (0)	
Marginal adaptation				
0^{A}:	30 (100)	28 (93.33)	28 (93.33)	4.000/0.135
1^{A}:	0 (0)	2 (6.67)	2 (6.67)	
2^{U}:	0 (0)	0 (0)	0 (0)	
3^{U}:	0 (0)	0 (0)	0 (0)	
4^{U}:	0 (0)	0 (0)	0 (0)	
Surface Texture				

Modified USPHS Criteria/Scores	**EQUIA FORT – Gp I**			
	BL	6 Months	12 Months	Cochran's Q/*P* value
0[A]:	30 (100)	30 (100)	28 (93.33)	4.000/0.135
1[A]:	0 (0)	0 (0)	2 (6.67)	
2[U]:	0 (0)	0 (0)	0 (0)	
3[U]:	0 (0)	0 (0)	0 (0)	
Colour match				
0[A]:	28 (93.33)	27(90.00)	27(90.00)	0.333/0.846
1[A]:	2 (6.67)	3 (10.00)	2 (6.67)	
2[U]:	0 (0)	0 (0)	1 (3.33)	
3[U]:	0 (0)	0 (0)	0 (0)	
Marginal discoloration				
0[A]:	30 (100)	28 (93.33)	28 (93.33)	
1[A]:	0 (0)	2 (6.67)	2 (6.67)	
2[U]:	0 (0)	0 (0)	0 (0)	
3[U]:	0 (0)	0 (0)	0 (0)	
Recurrent caries				
0[A]:	30 (100)	30 (100)	30 (100)	
1[U]:	0 (0)	0 (0)	0 (0)	
Postoperative sensitivity				
0[A]:	30 (100)	30 (100)	30 (100)	
1[A]:	0 (0)	0 (0)	0 (0)	
2[U]:	0 (0)	0 (0)	0 (0)	
Modified USPHS Criteria/Scores		**CENTION N – Gp II**		
	BL	6 Months	12 Months	Cochran's Q/*P* value
Anatomic form				
0[A]:	30 (100)	30 (100)	26 (86.67)	
1[A]:	0 (0)	0 (0)	2 (6.67)	8.000/0.018*
2[U]:	0 (0)	0 (0)	2 (6.67)	
3[U]:	0 (0)	0 (0)	0 (0)	
Marginal adaptation				
0[A]:	30 (100)	28 (93.33)	27 (90.00)	
1[A]:	0 (0)	2 (6.67)	3 (10.00)	
2[U]:	0 (0)	0 (0)	0 (0)	4.667/0.097
3[U]:	0 (0)	0 (0)	0 (0)	
4[U]:	0 (0)	0 (0)	0 (0)	
Surface Texture				
0[A]:	30 (100)	30 (100)	28 (93.33)	
1[A]:	0 (0)	0 (0)	2 (6.67)	4.000/0.135
2[U]:	0 (0)	0 (0)	0 (0)	
3[U]:	0 (0)	0 (0)	0 (0)	

Modified USPHS Criteria/Scores	EQUIA FORT – Gp I			
	BL	6 Months	12 Months	Cochran's Q/*P* value
Colour match				
0^A:	30(100)	28 (93.33)	28 (93.33)	3.714/0.156
1^A:	0 (0)	3 (10.00)	3 (10.00)	
2^U:	0 (0)	0 (0)	0 (0)	
3^U:	0 (0)	0 (0)	0 (0)	
Marginal discoloration				
0^A:	30 (100)	28 (93.33)	28 (93.33)	2.000/0.368
1^A:	0 (0)	2 (6.67)	2 (6.67)	
2^U:	0 (0)	0 (0)	0 (0)	
3^U:	0 (0)	0 (0)	0 (0)	
Recurrent caries				
0^A:	30 (100)	30 (100)	30 (100)	2.000/0.368
1^U:	0 (0)	0 (0)	0 (0)	
Postoperative sensitivity				
0^A:	30 (100)	30 (100)	30 (100)	2.000/0.368
1^A:	0 (0)	0 (0)	0 (0)	
2^U:	0 (0)	0 (0)	0 (0)	

TABLE (5): Analytic statistics showing comparison of clinical performance properties within Group I and Group II at baseline, 6 and 12 months

Parameter		Friedman Test /p Value			X^2	p value
		B-6M	**B-12M**	**6-12M**		
Gp I-EQF	**Anatomic form**	-	0.236	0.236	0.000	1.000
Gp II-CN		-	0.236	0.236		
Gp I-EQF	**Marginal adaptation**	0.472	0.472	1.000		
Gp II-CN		0.472	0.236	1.000		
Gp I-EQF	**Surface Texture**	-	0.472	0.472	0.000	1.000
Gp II-CN		-	0.472	0.472		
Gp I-EQF	**Colour match**	0.472	0.355	0.513	2.018	0.365
Gp II-CN		1.000	1.000	1.000		
Gp I-EQF	**Marginal discoloration**	0.472	0.472	1.000		
Gp II-CN		1.000	1.000	1.000		
Gp I-EQF	**Recurrent caries**	-	1.000	1.000		
Gp II-CN		-	-	-		
Gp I-EQF	**Postoperative sensitivity**	-	-	-		
Gp II-CN		-	1.000	1.000		

EQF= Equia Fort Fill . CN= Cention N

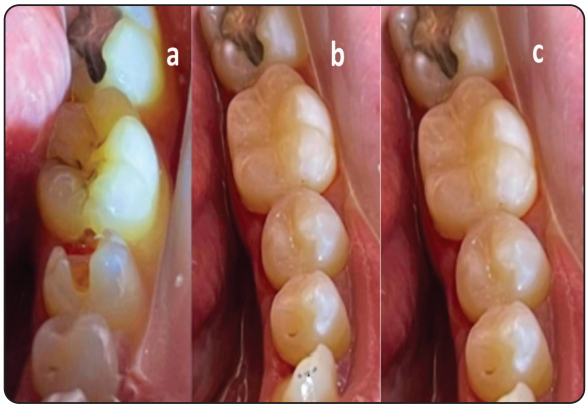

Fig. (2): Clinical representatives of Equia Fort Fill before restorations and cavity preparations (a), restorations at baseline (b), restorations after 12 months (c)

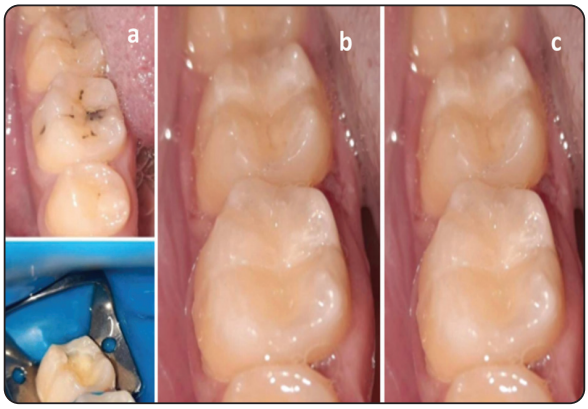

Fig. (3): Clinical representatives of Cention N before restorations and cavity preparations (a), restorations at baseline (b), restorations after 12 months (c)

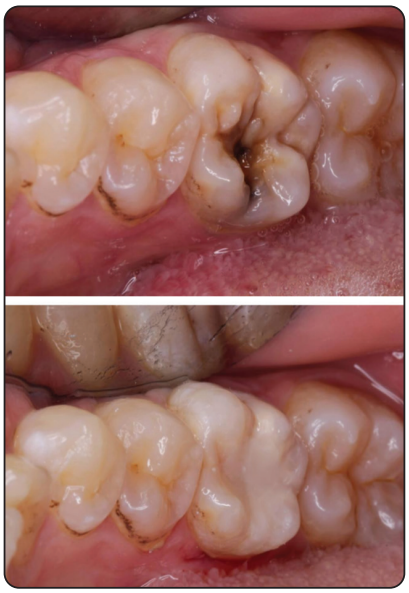

Fig. (4): Typical clinical picture of showing color change of Equia Fort Fill at 12 months recall.

DISCUSSION

In general, a prospective study that is precisely constructed is superior to a retrospective study, especially if the prospective study was conducted in a university setting, as longitudinal studies are regarded as excellent studies for generating scientific data regarding treatment processes [22].

A randomised, controlled clinical trial was performed to assess the clinical efficacy and performance of Cention N (with adhesive) and (Equia Forte Fill) in posterior class I and II restorations by means of USPHS (United States Public Health Service) Criteria. The present investigation demonstrated that both posterior composite restorations worked successfully one year after placement, validating prior laboratory research.

USPHS criteria for clinical evaluation of the restoration were generated by Cvar and Ryge in 1971 and have been widely used for clinical assessment of restorations. These criteria are the only extensively used criteria for long-term evaluation of restorations and are considered valid for comparing studies at various observation periods [23].

The ideal requirements of posterior restorative material are to be dimensionally stable, no expansion/ shrinkage, wear resistance, sufficient compressive and flexural strength, able to withstand occlusal and masticatory load, biocompatibility, antibacterial preferably should be bactericidal, user-friendly, less operating time and ease of placement. Finally, it should also be aesthetically pleasing to the patient and be color-stable and stain resistant. Even though ideal restorative material does not exist, Composite resin is by far the most used restorative material for direct tooth coloured posterior restoration [24-27].

Recently, a new material ,Cention N available , the material presented in the tooth shade A2 has been introduced in dentistry which belongs to the group of alkasites , has properties of both Amalgam

and GIC and offers tooth-colored esthetics as well as high flexural strength with optional additional light-curing property [14, 28, 29]. It employs an alkaline filler that is capable of releasing equivalent amounts of fluoride ions to conventional GIC [28]. It also releases hydroxyl and calcium ions, which serves to neutralize excess acidity during an acid attack by cariogenic bacteria and avoid demineralization. This liquid contains the organic monomer. It is composed of four distinct dimethacrylates, which account for 21.6 % of the total weight of the substance. Cention N is devoid of Bis-GMA, HEMA, and TEGDMA. It contains UDMA, DCP, an aromatic aliphatic-UDMA, and PEG-400 DMA that cross-links during polymerization, resulting in robust mechanical characteristics and excellent long-term stability [30].

Self-adhesive restorative materials are of greater interest than bonded resin composites for load-bearing (occlusal posterior or occlusal-proximal) restorations, primarily due to their relative moisture insensitivity and convenient handling. Modern developments of high-viscosity glass ionomers (HVGIC), bioactive glass ionomers, and composite hybrid materials have attempted to combine the durability and wear resistance of resin composites with the advantageous properties of glass- ionomer cements [31-33]. Recent evidence from clinical studies of an HVGIC in permanent posterior teeth demonstrates good clinical performance, highlighting the potential future for expanding these materials' indications [34].

In our study, acceptable anatomic form was observed till 6 months for both of the restorative materials, but at 12 month anatomic form loss for Equia Fort was statistically significant with $P < 0.05$. Similar results were obtained for Equia Fort restorations by Latta et al. 2020., who compared localized and generalized wear loss of three commercially available restorative materials, Activa (A), Fuji II LC (F), and Equia Forte (E) and one experimental material, ASAR-MP4 (S) with self-adhesive properties. Equia Forte exhibited worse overall wear resistance than the other materials (p 0.05) [35]. The reinforcement process of Equia is based on the integration of equally dispersed, highly reactive ultrafine glass particles and the application of polyacrylic acid with a greater molecular weight [32]. Less robust filler integration in the polyacrylic continuous phase contributes to more erosive material loss. Cention N, on the other hand, contains a proprietary filler partially functionalized by silanes that minimises shrinkage stress [4]. Similar results were obtained from Roulet in 2019, who conducted a study to measure the wear of Activa, Cention N, and the GIC and observed that the wear behaviour of Cention N was in the same range as that of conventional composites and they determined that Cention N can be used as a restorative material for posterior teeth [36].

To guarantee great aesthetics, tooth-colored restorative materials must characterized by long lasting color match and color stability and resist surface discoloration. In the contemporary study, color match was recognised as the second most significant issue for EQF after use. Starting from baseline seven restorations, exhibited mismatches in color throughout all periods of clinical evaluation. Gurgan et al. 2020 reported a significant mismatch in color of glass hybrid restorations after 24 months that could be due to an increase in the opacity and the larger size of glass particles present in EQF. These particles scatter light and give the restoration an opaque and whitish appearance [37]. In this study, there was a mismatch of color between EQF and Cention N at baseline. The Cention N group was given a score of 0, while the GIC group was given a score 1. This mismatch of color was attributed by the manufacturers to the difference in the translucency of the material and to the chameleon effect of Cention N, so that the Cention N mergers more naturally with the surrounding tooth structure than EQF.

However, marginal integrity criteria showed distinct values; nevertheless, the difference was not statistically significant. In Group I (EQF) and Group II (CN), all the restorations showed 100% score 0 at baseline with slight catching (score 1) at 6, and 12 months with a maximum of five restorations out of 60, and none of the restorative materials showed any clinically significant gap between restorative and cavosurface margin till 12 months of followup. Marginal integrity is important to increase the longevity of any restoration. Both the Cention N and the Equia Fort bonds chemically to the tooth structure. Cention N contains a shrinkage stress reliever, isofiller. This reduces polymerization shrinkage, ensuring marginal integrity. Same results were obtained by Chowdhury et al.,2018 and Arora et al., 2022[38, 39].

Regarding secondary caries and postoperative sensitivity in the present study, none of the restoration showed either secondary caries or postoperative sensitivity. These findings may relate to the proper selection of the patients participate in the study

Both two tested restorative materials the polishability was successful, and none of the restorations showed unacceptable surface roughness. In addition, both restorative materials studied contain calcium barium aluminium fluorosilicate glass, calcium fluoro silicate glass, and Ytterbium trifluoride in the filler component. It releases a significantly larger number of ions (F-, OH-, Ca2+) when the pH value is acidic, thereby preventing demineralization of the tooth substrate and prevent evidence of secondary caries [12].

Regarding all tested criteria; Cention N exhibited clinical performance comparable to those of the reinforced glass ionomer Equia Forte Fil. These findings were not compatible with Balkaya and Arslan 2020**.** The disagreement may be related to the difference in cavity preparation design and the tested material compared with Equia Forte Fil [19].

CONCLUSION

1. Both tested materials demonstrated satisfactory clinical performance in the restoration of class I cavity preparation of permanent teeth after 12 months.
2. The recently developed self-adhesive composite Cention N exhibited comparable results to the reinforced glass ionomer Equia Forte Fil.

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