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RESEARCH ARTICLE

CLINICAL PERFORMANCE OF EQUIA FORTE FILL. GAENIAL POSTERIOR, CENTION N IN CLASS II CAVITY IN PRIMARY TEETH- AN IN VIVO STUDY

Dr. Manna Subba Limboo, Dr. Parminder Dua, Dr. Ritu Mangla, Dr. Divya Vyas and Dr. Neha

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Abstract

Context:
Aims:The aim of this study is to compare clinical performance of EQUIA Forte Fill. G-Aenial Posterior, Cention N in class II cavity in primary teeth- An In vivo study
Setting and design: The study was conducted at Himachal Institute of dental sciences, Department of Pediatrics and Preventive dentistry, Paonta Sahib, Himachal Pradesh
Subject and methods: In total 45 class II restorations were performed in patients aged 4-9 years using three different restorative materials: EQUIA Forte Fill [EF], GAenial Posterior [GP], Cention N [CN]. The restorations were evaluated using method USPHS criteria in terms of anatomic form, secondary caries, color match, retention, marginal adaptation, polishability, surface staining, pre and post operative sensitivity, soft tissue health, proximal contact point. The data was analized using chi-square test, McNemar's test, marginal homogeneity test.
Statistical analysis used: The statistical analysis was done using Statistical Package for Social Sciences (SPSS for Windows, Version 19.0). Descriptive statistics were calculated as frequency and percentage. The comparison of study parameters at various time periods among the three study groups was done using chi-square test. Comparison of change in study parameters at various time periods was assessed using McNemar's test and marginal homogeneity test. The level of significance for the present study was fixed at a p-value of less than 0.05.
Result: The clinical performance of GAenial Posterior was superior to EQUIA Forte Fill and Cention N
Conclusion:GAenial Posterior is a promising user-friendly restorative material that can be used to restore carious primary teeth. It offers a better restorative properties like aesthetics, improved radiopacities and can be manipulated with ease by the clinicians.

Introduction:-

Dental caries is an infectious microbiological disease of the calcified tissues of the teeth characterized by demineralization of the inorganic and destruction of the organic substances of the tooth [1] .it continues to a veritable scourge on mankind, despite widespread preventive measures, it exerts a social, physical, mental and financial

Corresponding Author:- Dr. Manna Subba Limboo

burden on a global scale. Walter Losche [1986] termed it as the most expensive infection that most individuals have to contend with during the life time. the cost that Losche talks about is not only in the context of monetary loss, but tooth loss resulting in diminished chewing ability, pain suffering and cosmetic difficulty [2] . considering possible innovations in materials namely amalgam, composites, glass ionomers, and resin ionomers together they present interesting choices. Amalgam is widely used but it fails to provide better esthetics [3]. Newer material such as omocers, compomers, giomers have been developed for the restoration of the primary teeth yet they have failed to perform in the field of biocompatibility, resistance to fracture, longevity and ease of manipulation.

With the recent modernization in the properties of GIC, EQUIA Forte Fill was introduced in 2014. They consists of highly reactive glass particle within the traditional GIC. It is ultra fine, strongly packed, self adhesive which can be chemically cured. Further with more advancement in mechanical and fluoride releasing properties,Cention N has been introduced in dentistry as a choice for bulk fill material claiming to have the strength of amalgam and chemical properties of GIC. It is a self-curing filling material with optional light curing properties. It is an alkasite restorative which utilizes alkaline filler which is capable of releasing acid-neutralizing ions and an isofiller which reduces polymerization shrinkage. Meanwhile conventional composite resins have been considered a state of art in today's restorative dentistry. However, there were setbacks that were composite related including polymerization shrinkage and microleakage. Recently GC (Tokyo, Japan) developed a newer composite G-Aenial Posterior with the combination of two polymerized resin fillers contributing to low level of polymerization shrinkage and improved physical properties.

Materials and Method:-

The present study was conducted in the Department of Pedodontics and Preventive dentistry, Himachal Institute of Dental Sciences, Paonta Sahib, District Sirmaur, Himachal Pradesh.

Study was conducted on 45 patients which fulfilled the inclusion and exclusion criteria in a cariously exposed primary teeth in a single visit.

Inclusion Criteria

1] have two but not more than four extended size proximal carious lesion in the posterior teeth
2] Have a healthy periodontal status [gingival index=0.28-0.35, plaque index=0.08-0.16[22] and zero bleeding on probing.
3] present a good likelihood of recall availability
4] have teeth in which the restoration must be in occlusion
5] Be asymptomatic and vital

Exclusion Criteria

1] partially erupted teeth
2] potential behavioral problems
3] unhealthy periodontal status
4] systemic diseases
5] Absent of adjacent and antagonistic teeth

Restorative Procedures
GROUP OF SAMPLES
GROUP I : EQUIA Forte Fill [n=15]
GROUP II : G-Aenial Posterior[n=15]
GROUP III: Cention N[n=15]

In Group I

1. Cavity was prepared, washed and briefly dried with cotton.
2. Etching was done with 35% phosphoric acid gel for 10 seconds,
3. Rinsed for 5 seconds and gently dried with cotton.
4. Bonding agent was applied using a disposable applicator and light cured for 20 seconds.
5. EQUIA Forte was mixed automatically for 10 seconds in the amalgamator and immediately injected into the cavity.

6. Cotton roll and saliva ejector was used for isolation.
7. The restoration was light polymerized for 20 seconds using a photo curing light
8. The restoration was polished by a polishing and finishing bur.

In Group II

1. After cavity preparation, the cavity was washed and briefly dried with cotton.
2. Etching was done with 35% phosphoric acid gel for 10 seconds,
3. Rinsed for 5 seconds and gently dried with cotton.
4. Bonding agent was applied using a disposable applicator and light cured for 20 seconds
5. G-Aenial Posterior was placed with incremental technique (layer 2mm thick), each layer was light cured for 20 seconds.
6. Finishing and polishing of the restoration was done by finishing and polishing burs.

In Group III

1. After cavity preparation, the cavity was washed and briefly dried with cotton.
2. Etching was done with 35% phosphoric acid gel for 10 seconds.
3. Rinsed for 5 seconds and gently dried with cotton.
4. Bonding agent was applied using a disposable applicator and light cured 20 seconds
5. The Cention N was mixed according to the manufacturer's instructions.
6. The material was inserted into the cavity and properly condensed and light-cured for 20 s.
7. Final finishing was done with the sequential use of finishing and polishing burs.

Figure 1:- Class II cavity preparation.

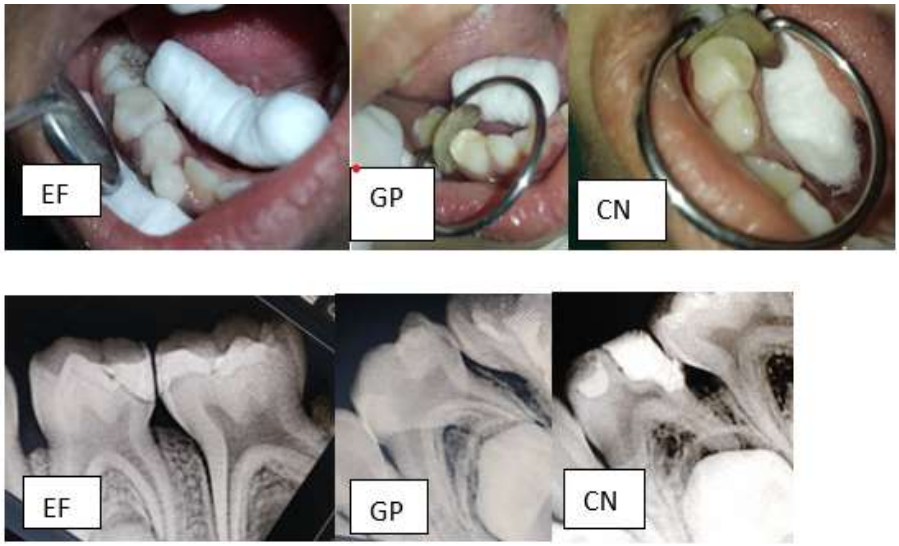

Figure 2:- Clinical and radiographical representation of cavities restored with EQUIA Forte Fill [EF], G Aenial Posterior [GP], Cention N [CN].

Comperative Parameters
Clinical evaluation of the restorations was done at 3,6 and 9 months of follow up according to the given criteria.

Modified USPHS Criteria/Score [Cvar and Ryge 1971]

Anatomic form	A: Restoration contour is continuous with existing anatomic form and margins. B: Restoration is slightly overcontoured or undercontoured. C: Marginal overhang or tooth structure (dentin or enamel) is exposed. D: Restoration is missing; traumatic occlusion or restoration causes pain in tooth or adjacent tissue
Secondary caries	A: No visible caries. B: Caries contiguous with the margin of the restoration.
Color match	A: No mismatch in color, shade, or translucency between restoration and adjacent tooth structure B: Mismatch between restoration and tooth structure within the normal range of tooth. C: Mismatch between restoration and tooth structure outside the normal range of tooth. D: Esthetically displeasing color, shade, and translucency
Retention	A: Present. B: Partial loss. C: Absent
Marginal adaptation	A: Excellent continuity at resin–enamel interface; no ledge formation, no discoloration. B: Slight discoloration at resin–enamel interface; ledge at interface. C: Moderate discoloration at resin–enamel interface measuring 1 mm or greater. D: Recurrent decay at margin.
Polishability	A: Smooth and highly shiny, similar to enamel. B: Smooth and satin, highly reflective. C: Rough and shiny, satin, somewhat reflective. D: Rough and dull or satin, not reflective
Surface staining	A: Absent. B: Present
Sensitivity	A: Preoperative Yes No B: Postoperative Yes No

Soft tissue health	A: Excellent response-no inflammation. B: Slight inflammation of gingival tissue. C: Moderate to severe gingival inflammation
Proximal contact points	A: Present. B: Absent

The results obtained were subjected to statistical analysis.

Statistical Analysis

The statistical analysis was done using Statistical Package for Social Sciences (SPSS for Windows, Version 19.0). Descriptive statistics were calculated as frequency and percentage. The comparison of study parameters at various time periods among the three study groups was done using chi-square test. Comparison of change in study parameters at various time periods was assessed using McNemar's test and marginal homogeneity test. The level of significance for the present study was fixed at a p-value of less than 0.05.

Result:-

In the comparison of anatomic form all the 15 (100%) samples in the three study groups had a score of A (Restoration contour is continuous with existing anatomic form and margins) at all time periods. In the comparison of secondary caries in the study groups at various time periods. Statistical analysis was done using McNemar's test which showed that in Equia Forte Fill, G Aenial Posterior, Cention N group, there was no statistically significant change in secondary caries from 3 months to 6 months (P=1.000), from 3 months to 9 months (P=1.000) and from 6 months to 9 months (P=1.000).

Color match in the study groups at various time periods by statistical analysis was done using marginal homogeneity test which showed that in Equia Forte Fill group, G Aenial Posterior, Cention N there was no statistically significant change in color match from 3 months to 6 months (P=0.317), from 3 months to 9 months (P=0.317) and from 6 months to 9 months (P=1.000). In the comparison of retention in the study groups at various time periods. Equia Forte Fill, G Aenial Posterior, Cention N group, there was no statistically significant change in retention from 3 months to 6 months (P=1.000), from 3 months to 9 months (P=1.000) and from 6 months to 9 months (P=1.000). The comparison of marginal adaptation in the study groups at various time periods. Equia Forte Fill group,GAaenial Posterior, Cention N there was no statistically significant change in marginal adaptation from 3 months to 6 months (P=0.564), from 3 months to 9 months (P=1.000) and from 6 months to 9 months (P=0.564). The comparison of polishability in the study groups at various time periods. Equia Forte Fill and Cention N group, there was no statistically significant change in polishability from 3 months to 9 months (P=0.083). There was, however, a statistically significant change in polishability of Equia Forte Fill from 6 months to 9 months (P=0.046). In G-Aenial group, there was no statistically significant change in polishability from 3 months to 6 months (P=1.000), from 3 months to 9 months (P=1.000) and from 6 months to 9 months (P=1.000). In the comparison of surface staining in the study groups at various time periods. Equia Forte Fill group, G Aebnial Posterior, Cention N there was no statistically significant change in surface staining from 3 months to 6 months (P=0.500), from 3 months to 9 months (P=1.000) and from 6 months to 9 months (P=1.000). The comparison of pre-operative sensitivity and post operative sensitivity in the study groups at various time periods. All the 15 (100%) samples in the three study groups had no pre-operative sensitivity at all time periods. Hence statistical analysis could not be carried out. In the comparison of soft tissue health in the study groups at various time periods. Equia Forte Fill group, G Aenial Posterior, Cention N there was no statistically significant change in soft tissue health from 3 months to 9 months (P=1.000), from 3 months to 9 months (P=1.000) and from 6 months to 9 months (P=1.000). The comparison of proximal contact points in the study groups at various time periods. In Equia Forte Fill and G Aenial Posterior group,there was no statistically significant change in proximal contact points from 3 months to 6 months (P=1.000), from 3 months to 9 months (P=1.000) and from 6 months to 9 months (P=1.000). In Cention N group, there was no statistically significant change in proximal contact points from 3 months to 6 months (P=0.125) and from 6 months to 9 months (P=0.500). There was, however, a statistically significant change in proximal contact points of Cention N from 3 months to 9 months (P=0.031).

Discussion:-

Table 1:- Comparison of study parameters at various time periods.

			Equia Forte Fill	Cention N	G-Aenial
Anatomical Form	3 months	6 Months	---	---	---
	3 months	9 months	---	---	---
	6 Months	9 Months	---	---	---
Secondary Caries	3 months	6 Months	1.000	1.000	---
	3 months	9 months	1.000	1.000	---
	6 Months	9 Months	1.000	1.000	---
Color Match	3 months	6 Months	0.317	0.317	---
	3 months	9 months	0.317	0.317	---
	6 Months	9 Months	1.000	1.000	---
Retention	3 months	6 Months	1.000	1.000	0.250
	3 months	9 months	1.000	1.000	0.250
	6 Months	9 Months	1.000	1.000	1.000
Marginal Adaptation	3 months	6 Months	0.564	0.317	0.317
	3 months	9 months	1.000	0.317	0.317
	6 Months	9 Months	0.564	1.000	1.000
Polishability	3 months	6 Months	---	0.317	1.000
	3 months	9 months	0.083	0.317	1.000
	6 Months	9 Months	0.046*	1.000	1.000
Surface Staining	3 months	6 Months	0.500	1.000	1.000
	3 months	9 months	1.000	1.000	1.000
	6 Months	9 Months	1.000	1.000	1.000
Sensitivity (Pre-op)	3 months	6 Months	---	---	---
	3 months	9 months	---	---	---
	6 Months	9 Months	---	---	---
Sensitivity (Post-op)	3 months	6 Months	1.000	1.000	---
	3 months	9 months	1.000	1.000	---
	6 Months	9 Months	1.000	1.000	---
Soft Tissue Health	3 months	6 Months	1.000	1.000	---
	3 months	9 months	1.000	1.000	---
	6 Months	9 Months	1.000	1.000	---

Proximal Contact Points	3 months	6 Months	1.000	0.125	0.250
	3 months	9 months	1.000	0.031*	0.250
	6 Months	9 Months	1.000	0.500	1.000

The evolution of restorative materials has improved clinical performance offering better quality in performed treatments. In the last 20 years, advancements in glass ionomer has led to several variables in powder and polycarbonic acid components, possessing unique properties such as suitable adhesion to enamel and dentin, better aesthetics and long-term fluoride release but these materials suffer limitations when applied. This is due to their low resistance, fragility and the ease they tend to absorb and lose water, thus decreasing their properties resulting in a very specific indications for their use.

'Anatomic form' among the three groups because all the 15 (100%) was continuous with existing anatomic form and margins at all time periods. **Gurgan S et al [4]** stated that both EQUIA Forte Fill and G-Aenial Posterior both show acceptable clinical performance with excellent anatomic form.

In Equia Forte Fill, G Aenial Posterior, Cention N group, there was no statistically significant change in **'secondary caries'** among the three groups from 3 months to 6 months (P=1.000), from 3 months to 9 months (P=1.000) and from 6 months to 9 months (P=1.000). **Huang Q et al[5]** stated that the antibacterial experimental composite resin was biocompatible and had mechanical properties similar to those of some commercially available composite resins. G-Aenial Posterior might, therefore, be useful in preventing the occurrence of secondary caries.

' **Color match'** among the three groups at 3 months (P<0.001) was observed that at 3 months, the proportion of participants with mismatch between restoration and tooth structure within the normal range of tooth was significantly higher in Cention N (46.7%) compared to both Equia Forte Fill (0%) and G-Aenial (0%). It was observed that at 6 months, the proportion of participants with mismatch between restoration and tooth structure within the normal range of tooth was significantly higher in Cention N (53.3%) compared to both Equia Forte Fill (0%) and G-Aenial (0%). The same difference in color match was observed at 9 months (P<0.001) where the proportion of participants with mismatch between restoration and tooth structure within the normal range of tooth was significantly higher in Cention N (53.3%) compared to both Equia Forte Fill (0%) and G-Aenial (0%). **Eiaziz A H R et al[6]**HAS stated that for color match measured after 6 and 18 months in his study , G- Aenial Posterior(8.8%) cases had Bravo score in Class II restorations demonstrating satisfactory clinical outcome with regard to color match throughout the 18-month follow-up.

'Retention' among the three groups at 3 months (P=0.012) was observed that at 3 months, the proportion of participants with partial loss in retention was significantly higher in Cention N (60%) compared to that in G-Aenial (13.3%). and at 9 months (P=0.143). Our findings are in accordance with **Kaya R et al[7]** stated that the retention of the G Aenial Posterior was superior to EQUIA Forte Fill at 24 months in the management of molar hypomineralization-affected molars.

'Marginal adaptation' among the three groups at 3 months (P<0.001)was observed that at 3 months, the proportion of participants with slight discoloration at resin–enamel interface/ledge at interface was significantly higher in Cention N (80%) compared to both Equia Forte Fill (26.7%) and G-Aenial (0%). It was observed that at 6 months, the proportion of participants with slight discoloration at resin–enamel interface/ledge at interface was significantly higher in Cention N (86.7%) compared to both Equia Forte Fill (33.3%) and G-Aenial (6.7%). At 9 months (P<0.001) where the proportion of participants with slight discoloration at resin–enamel interface/ledge at interface was significantly higher in Cention N (86.7%) compared to both Equia Forte Fill (26.7%) and G-Aenial (6.7%). **Rocca T G et al[8]** has also stated that the marginal adaptation before and after loading was significantly low for G-Aenial posterior after loading

The**'polishability'** among the three groups at 3 months (P=0.011)was observed that at 3 months, the proportion of participants with rough and shiny, satin, somewhat reflective surface was significantly higher in Cention N (46.7%) compared to both Equia Forte Fill (6.7%) and G-Aenial (0%). At 6 months (P<0.001) it was observed that at 6 months, the proportion of participants with rough and shiny, satin, somewhat reflective surface was significantly higher in Cention N (53.3%) compared to both Equia Forte Fill (0%) and G-Aenial (0%). At 9 months the

proportion of participants with rough and shiny, satin, somewhat reflective surface was significantly higher in Cention N (53.3%) compared to both Equia Forte Fill (0%) and G-Aenial (0%). According to **Pala k et al[9]** G-aenial Posterior was determined to be the glossiest surfaces.

Surface staining among the three groups at 3 months (P<0.001) was observed that at 3 months, the proportion of participants with surface staining was significantly higher in both Equia Forte Fill (60%) and Cention N (86.7%) compared to G-Aenial (13.3%). At 6 months, the proportion of participants with surface staining was significantly higher in Cention N (86.7%) compared to G-Aenial (20%). At 9 months, the proportion of participants with surface staining was significantly higher in Cention N (86.7%) compared to G-Aenial (20%). According to **Guney T et al[10]** G-aenial Posterior group in terms of marginal discoloration was (p<0.05) showing least discoloration.

It was observed that all the 15 (100%) samples in the three study groups had no **pre-operative and post operative sensitivity**at all time periods. **Guney T et al[10]** stated in his own study that in 24 months none of the patients from any group suffered pre operative and post operative sensitivity

'Soft tissue health' among the three groups in all time period showed no significance **Gurgan S et al[4]** stated that G-Aenial posterior showed overall clinical and radiographic success rate of 96.6%.

'Proximal contact points' in all three groups at all time period showed no significance. **Gurgan S et al [4]** stated in his own study that under SEM observations G Aenial Posterior exhibited acceptable surface and marginal adaptation characteristics at 24 months.

Conclusion:-

At the end of 9 months, EQUIQ Forte Fill and G Aenial Posterior showed similar and successful clinical performance where asCention N showed worse performance. However the use of GAenial Posterior as a restorative material in class II primary teeth rather than Equia Forte Fill might be more appropriate since discoloration, staining and dislodgment of the restorations were observed after 9 months.

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