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ORIGINAL ARTICLE

SIX MONTHS CLINICAL PERFORMANCE OF SELF ETCH -SELF ADHESIVE FLOWABLE COMPOSITE AND CONVENTIONAL PIT-AND-FISSURE SEALANTS IN 7 TO 10 YEAR OLD CHILDREN

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ABSTRACT:
Background: The majority of sealants available in the market have the same basic chemical composition hence, it is important to know the effectiveness and retention capacity, marginal discoloration, surface texture and anatomical form of each sealant. **Aims:** Aim of this study was to evaluate the retention rate, marginal integrity and marginal discoloration of two different sealant using rubber dam isolation on molars of 7 to 10 year old children. **Material and methods**: 20 children of 7 to 10 year with intact deep and retentive fissures, who were reporting to the Department of Pedodontics and Preventive Dentistry were selected. The two sealants that were studied included (a) Conseal F(SDI) and(b) Constic (DMG, Germany) . The four permanent first molars of each child were randomly assigned for placement of each of the two materials. The data was collected in an evaluation form provided for every patient. Pit and fissure sealant was applied by clinician and children were examined by blinded investigator. To evaluate occlusal fissure sealants, visual and tactile examination was performed with a mouth mirror and an explorer in follow-up appointments and clinical examination.. All the cases were clinically evaluated after 1, 3 and 6 months follow up. **Results:** The data obtained were tabulated and compared statistically using the Chi-square test of significance for marginal integrity between group I and II at 1 month, 3month and 6month interval. Highly significant difference were found between the groups ($p<0.01$) except for maxillary molars at 1 month follow up which showed significant value (0.029). **Conclusion:** Results shows significant difference between groups except for 1 month follow up of mandibular teeth. The conseal-F sealant was better than flowable composite as sealant with respect to marginal integrity and anatomical form .Both the materials showed similar results with respect to marginal discoloration.
Key words: Pit and fissure sealant, 3 in 1 composite, discolouration, retention, marginal integrity.

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INTRODUCTION

Over the last few decades, several advancements have been made in caries prevention and systemic and topical fluoride. The increased acceptance and use of pit and fissure sealants have, without question, had an impact on the prevention of caries.[1] In this context, resin pit and fissure sealants are considered an important adjunct to oral health care strategies and fluoride therapy for preventing occlusal carious lesions.[2,3] The occlusal surface is at high risk for caries; this is especially true for newly erupted molars in which anatomic characteristics difficult access for cleaning procedures as incomplete maturation of enamel adds to caries susceptibility. Smooth surfaces have received the greatest reduction in caries incidence due to fluoride therapy; however, almost 90% of caries occurs in pit and fissures [4], Pit and fissures do

not respond to remineralisation as smooth surfaces [3], Pit and fissure sealants help control caries by forming a physical barrier that prevents plaque retention, minimizing the harmful action of cariogenic microorganisms on the enamel surface. Sealants applied before a carious lesion develops have been shown to be successful in preventing the development of caries[5], In fact, a first molar without sealant is 22 times more likely to develop caries than is a molar that is sealed [6]

The technique of pit and fissure sealants plays, undoubtedly, a fundamental role in preventing occlusal caries, both in primary and in permanent teeth.[7,8]The adhesive technique of fissure sealing became more acceptable among paediatric dentists when self-etching adhesive systems (all-in-one) were introduced in the early 2000's. These new, one-step systems simplify the clinical bonding procedure not only by eliminating the separate etching and rinsing steps but also accomplishing the priming and the bonding of the dental surfaces simultaneously (Trevor 2004). The main advantage of self-etching adhesive systems is that they reduce the chair time and this is of great importance for treating young patients (Feigal and Quelhas 2003).[9]

The clinical success of fissure sealants is related to their retention rates and integrity [10]Partial loss of the sealing material inherently leads to the occurrence of marginal microleakage and hence to caries development underneath the sealant. Sealant longevity is related to the proper isolation of tooth from saliva contamination during placement, [11-14] to the retentive condition of the surface debris and to the characteristics of the resin used.[15]Various materials have been proposed to enhance the longevity of sealants, but few studies have investigated flowable restorative material as a fissure sealant [16] Flowable composites have many beneficial properties, such as low viscosity, low modulus of elasticity, and easy handling [17], Their greater amount of filler particles lowers porosity, with better resistance and retention than conventional resin pit and fissure sealants,[18] which allows the material to be placed in ultraconservative preparations and microinvasive restorations successfully.

Constic (DMG America) is the NEW 3-in-1 Self-Adhesive Flowable Composite. In constic, emanel etching is optional and no need of adhesives. Chair side time is reduced with this material and helpful in uncooperative paediatric patients. The purpose of this study was to compare the sealant retention rate of new material constic and conventional pit and fissure sealant using rubber dam isolation on molars in children with satisfactory cooperative behaviour.

AIM:

Purpose of this study is to evaluate the retention rate, marginal integrity and marginal discoloration of two different sealant using rubber dam isolation on molars of 7 to 10 year old children.

OBJECTIVES:

To investigate retention, marginal integrity and marginal discolouration of a new flowable composite (constic, DMG, America) as a pit and fissure sealant and conventional pit and fissure sealant (conseal f, SDI).

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MATERIALS AND METHOD

The clinical examination of all children were entirely done by clinician. Before conducting examination the clinician was calibrated at department of Pedodontist and Preventive Dentistry, KMSDCH, Vadodara under the guidance of a Professor in order to limit examiner variability. 20 children of 7 to 10 year with intact deep and retentive fissures, who were reporting to the Department of Pedodontics and Preventive Dentistry, K.M. Shah Dental College and hospital were selected. The two sealants that studied were (a) Conseal F (SDI) and (b) Constic (DMG, Germany). A thorough dental history was taken prior to our examination and the teeth checked for caries or gingival disease with a plain mirror and probe. The nature and objectives of the study as well as the possible discomforts and benefits were explained, and an informed consent was obtained from the parents /guardian.

Inclusion criteria:

1. Children between 6 and 10 years of age.
2. Presence of all four caries-free permanent first molars.
3. Evidence of an acceptable home dental cleaning regimen.
4. Patient cooperation and acceptance for the treatment.
5. Absence of class I clinical carious lesion.
6. No prior dental therapy.
7. Possibility to get proper isolation with cotton rolls.
8. No fluoride mouth rinse program practiced in the school.

Exclusion criteria:

1. History of any medical disease that might interfere with the study.
2. Long-term regimen of medication that could affect the salivary flow and diet modification.
3. History of any adverse reaction to any of the restorative materials used.
4. History of abnormal parafunctional activity.
5. Heavy occlusal contacts on the teeth to be restored.
6. Patients undergoing fluoride application regimen.

The four permanent first molars of each child were randomly assigned for placement of each of the two materials. Two different group were 1) conseal f sealant (40 teeth) 2) clinpro sealant (40 teeth)
Prophylaxis was done to remove salivary pellicle and the remaining dental biofilm. The teeth planned for placement of the sealant were isolated using rubber dam and low volume suction throughout the procedure. Sealants were applied based on manufacturers' instructions. The light curing was done using LED curing light (wood pecker, Unicorn, Denmart) initially for 20 seconds and extended by an additional time of 10 seconds to ensure complete polymerization of the sealant. A probe was run over the sealed surface to ensure the marginal seal between the sealant and the tooth surface the rubber dam were removed. Then the occlusion was checked with a articulating paper and premature contacts were relieved to ensure that the sealants do not produce any occlusal interference. Patients were prescribed same tooth paste (floridated) and tooth brush (soft bristles). All data were collected in an evaluation form provided for every patient. Pit and fissure sealant was applied by principal investigator and children were examined by blinded co-investigator. To evaluate occlusal fissure sealants, visual and tactile examination was performed with a mouth mirror and an explorer. Information about personal data, date of sealant therapy, sealed tooth location of the sealant in follow-up appointments and clinical examination were recorded. The detailed examination included pit and fissure sealant marginal integrity, marginal discolouration and anatomic form by Feigal criteria[20]. All the cases were clinically evaluated after 1, 3 and 6 months follow up.

FEIGAL CRITERIA FOR SEALANT EVALUATION ON OCCLUSAL SURFACES

Marginal integrity

0 - Restorative material adjacent to the tooth and not detectable with an explorer
1 - Margin detectable with the explorer
2 - Crevice along the margin of visible width and depth
3 - Crevice formation with exposure of central fissure

Marginal discolouration

0 - No colour change at the tooth/sealant interface
1 - Discolouration noted along the margin in one area
2 - Discolouration noted along the margin in multiple areas
3 - Severe discolouration with evidence of penetration and leakage

Anatomic form

0 - Harmonious and continuous with occlusal form and structure
1 - Change in anatomical form but all pits and fissures covered
2a - Loss of sealant from one or two pits or accessory grooves (partial loss), but no need to repair or replace sealant
2b - Loss of sealant from pits or accessory grooves (partial loss), with a need for replacement or repair of the sealant
3 - Loss of sealant from all pits (total loss)
7 - Partial loss due to occlusion
9 - Bubble (not connected with the margins)

Scores of 0 and 1 in all three criteria as well as scores of 0, 1, 2a, 7, 9 in anatomic form indicate successful seals. All other scores are considered sealant failures.

RESULTS

The data was obtained at 1 month, 3 months and 6 months intervals. The results were tabulated for marginal integrity, marginal discoloration and anatomic form of pit and fissure sealants and statistically compared with the Chi square test. Table 1 shows comparison for marginal integrity between group I and II at 1 month, 3month and 6month interval. Highly significant difference were found between the groups ($p<0.01$) except for maxillary molars at 1 month follow up which shows significant value (0.029)

Table 1: Comparison of Marginal integrity

	Group 1(Conseal f)				Group 2(Constic)				Chisquare Value	Probability
	0	1	2	3	0	1	2	3		
Lower										
1 month	93.5	7.5	0	0	78.7	18.0	3.3		10.75	0.000 HS
3 month	89.7	10.3	0	0	68.7	28.0	3.3	0	12.35	0.002 HS
6 month	86.3	16.7	0	0	56.7	36.7	6.7	0	19.24	0.000 HS
Upper										
1 month	95.3	4.7	0	0	82.3	16.7	0	0	7.14	0.029 HS
3 month	93.3	6.7	0	0	77.3	22.7	0	0	13.38	0.000 HS
6 month	93.3	6.7	0	0	71.0	25.7	3.3	0	17.60	0.002 HS

HS = Highly significant ($P < 0.01$); Sig = Significant ($P < 0.05$); NS = Non-significant ($P > 0.05$), 0 - Restorative material adjacent to the tooth and not detectable with an explorer 1 - Margin detectable with the explorer 2 - Crevice along the margin of visible width and depth 3 - Crevice formation with exposure of central fissure

Table 2 shows comparison between groups for marginal discolouration. No significant difference were found between groups at 1 month, 3 month and 6 month follow up for marginal discolouration.

Table 2: Comparison of Marginal discolouration

	Group 1(Conseal f)				Group 2(Constic)				Chi square Value	Probability
	0	1	2	3	0	1	2	3		
Lower										
1 month	98.3	2.7	0	0	97.7	2.3	0	0	1.21	0.267 NS
3 month	86.7	13.3	0	0	93.3	6.7	0	0	2.43	0.119 NS
6 month	86.7	13.3	0	0	93.0	6.7	0	0	2.42	0.117 NS
Upper										
1 month	100	0	0	0	100	0	0	0	0.00	0.00 HS
3 month	96.7	3.3	0	0	93.3	6.7	0	0	1.22	0.279 NS
6 month	96.7	3.3	0	0	90.3	10.0	0	0	3.62	0.047 NS

HS = Highly significant ($P < 0.01$); Sig = Significant ($P < 0.05$); NS = Non-significant ($P > 0.05$), 0-No colour change at the tooth/sealant interface 1 - Discolouration noted along the margin in one area 2 - Discolouration noted along the margin in multiple areas 3 - Severe discolouration with evidence of penetration and leakage

Table 3 shows comparison of anatomic form at 1 month, 3 month and 6 month interval. Results show highly significant difference between groups except for 1 month follow up of mandibular teeth. When comparison were done for mandibular 1st molar at the end of one month, no significant difference were observed between two groups .At the end of 3 months and 6 months highly significant difference were observed in both groups.

Table 3: Comparison of anatomical form

	Group 1(Conseal f)					Group 2(Constic)					Chi square Value	Probability
	0	1	2a	2b	3	0	1	2a	2b	3		
Lower												
1 month	90.0	10.0	0	0	0	83.0	17.0	0	0	0	3.95	0.138 NS
3 month	86.7	13.3	0	0	0	80.0	16.7	3.3	0	0	13.22	0.001 HS
6 month	83.3	14.3	2.4	0	0	63.3	30.0	6.7	0	0	10.65	0.004 HS
1 month	98.2	2.8	0	0	0	88.0	10.0	2.0	0	0	6.57	0.010 HS
3 month	96.7	3.3	0	0	0	86.7	11.3	2.0	0	0	10.81	0.001 HS
6 month	93.3	6.7	0	0	0	76.7	20.0	3.3	0	0	14.89	0.000 HS

HS = Highly significant ($P < 0.01$); Sig = Significant ($P < 0.05$); NS = Non-significant ($P > 0.05$), 0 - Harmonious and continuous with occlusal form and structure 1 - Change in anatomical form but all pits and fissures covered 2a - Loss of sealant from one or two pits or accessory grooves (partial loss), but no need to repair or replace sealant 2b - Loss of sealant from pits or accessory grooves (partial loss), with a need for replacement or repair of the sealant 3 - Loss of sealant from all pits (total loss)

DISCUSSION

In developing country like India, the preventive measures toward oral health are imperious. The initial cost of preventive measures like sealants may be higher than the cost of restorative materials, in the long term, sealants or any other preventive measure would be more cost-effective as the tooth would be maintained state of health. It has been claimed that FS minimize the harmful effects of cariogenic microorganisms on the surface of tooth enamel by producing an effective mechanical barrier against the plaque. This study evaluated the clinical success of 2 FS. Stepped margins of FS contribute to the accumulation of plaque[21] therefore, marginal integrity is an important criterion in the evaluation of FS. Effectiveness of sealant as a caries preventive agent is dependent upon its full retention. Several authors showed that the caries increment is low when there is full retention of the sealant.[22-24]

The complete retention rate of a sealant is a determinant of its effectiveness as a caries prevention measure [25] The Feigal assessment criteria were used as a more detailed evaluation system in the present study. For the marginal integrity and marginal discolouration criteria, fissure sealant success rates were 98.2% and 95.5%, respectively. These two criteria were used to evaluate 80 teeth. 14.4% of the sealants failed in terms of marginal integrity and 17.1% in terms of marginal discolouration. Marginal discoloration of a restoration can be considered as an early indicator of its loss of marginal integrity with the adjacent tooth structure. A restoration discolours at its margins when there is marginal breakdown, which creates a rough and irregular surface. This can act as a niche for the accumulation of plaque and food debris and also promote the penetration of oral fluids and cause microleakage, which can lead to secondary caries formation. If there is marginal discoloration that penetrated the sealant margins deep in a pulpal direction, it should be checked thoroughly for any secondary caries, preferably with a radiograph.

With regard to position in the arch, no signifiant relationship between sealant success rate and tooth location was found, as was also discovered by Holst et al (1998).[26] This was in accordance with Whitehurst and Soni (2001), who found that the greatest sealant loss occurred during the first 6 months. They also reported only 18% of first and second molars were completely sealed after 1 year.[27] Also, Stephen et al. (1998) reported that only 12 out of nearly 400 teeth remained completely sealed after 1 year in a study performed under field conditions.

In our study, marginal discoloration was checked visually with the help of a mirror. At baseline, all the sealants were checked visually and scored no marginal discoloration. The marginal discoloration was not statistically significant in the 3 months and 6 months evaluation. The marginal discoloration of constic was more in the lower arch than in the upper arch. Thus, margin discoloration is vital for the sealant as this could be the earliest indicator for the initiation of secondary caries.[28]The marginal discoloration of conseal-f sealants was similar in the maxillary and mandibular teeth. This study revealed higher sealant retention rates for the mandibular teeth. This is in agreement with other studies that have compared resin-based sealants and glass ionomer sealants.[29,30] This could be because of direct visualization during application, gravity-aided flow of the sealant, and the presence of well-defined pits and fissures contribute to superior retention.[31] Also, the effect of occlusal stress on the sealant of the maxillary molar appeared at an earlier stage of eruption compared with that of the mandibular molar. The decrease in retention rates found in 8 to 9-year-old children may be related to the occlusal stress that occurs during eruption. In the earlier stages of mandibular eruption, the maxillary teeth contact only mandibular cusps not reaching the sealant. The present study suggested that Conseal-F sealant was better than Flowable composite as sealant with respect to retention, anatomical form and surface texture. Both the materials showed similar results with respect to marginal discoloration. The Conseal-F sealant performed better in the upper arch than in the lower arch with respect to all properties. Conseal f performed better in the upper arch than in the lower arch with respect to retention, anatomical form and surface texture. But, with respect to marginal discoloration, constic showed similar results both in the upper and in the lower arches. More long-term studies are necessary, nevertheless, to determine the potential benefits of both materials.

CONCLUSION

Results show highly significant difference between groups except for 1 month follow up of mandibular teeth. The conseal-F sealant was better than flowable composite as sealant with respect to marginal integrity and anatomical form. Both the materials showed similar results with respect to marginal

discoloration. More long term studies are necessary, nevertheless, to determine the potential benefits of both materials.

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