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Comparative Evaluation of Clinical Efficacies of two Commercially Available Pit and Fissure Sealant in 8 to 11 Year Old Children: An Original Research Study

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ABSTRACT

Aim: To evaluate and compare the clinical efficacies of two commercially available pit and fissure sealant in 8- to 11-year-old children.

Materials and Methods: Study was conducted in the department of Pedodontics and preventive dentistry. Total twenty-four pediatric patients were screened and selected in the age range of 8 to 11 years. Authors studied two commercially available pit and fissure sealant namely Delton FS Sealant and Clinpro Sealant. The sealants were applied on mandibular permanent first molar of each child. Changes related to marginal areas and morphology was noted after two months, four months and six months. Intact, unstained and overall healthy margin was scored 0 while deteriorated and discolored margin with open fissure was scored 4. Score 2 and 3 was provided for intermediate situations as per observer's assessment and decision. All related data was noted and sent for statistical analysis.

Results: All the recorded details and values were tabulated and sent for statistical evaluation using statistical software Statistical Package for the Social Sciences version 21. All selected and studied patients were divided into 4 age groups. 9 patients were falling in the age of years 8 year. Level of significance evaluation by pearson chi-square test (six month post-operative phase) showed that p value was significant for group I and II (0.02 and 0.01). Comparison among the two study groups using one-way Anova (for group I, II) showed that the level of significant was highly significant (p value 0.001).

Conclusion: Within the limitations of the study, authors concluded that Clinpro Sealant has superior clinical efficacies related to marginal and morphological factors. These findings were noted in all three post application phases of sealant. Therefore, Clinpro is relatively suitable sealant for maintaining tooth integrity and preventing bacterial encroachments. Inferences of this study do not recommend the same for all commercially available pit and fissure sealants.

Keywords: Pit and Fissure, Clinpro, Delton FS, Sealants.

INTRODUCTION

As we all are aware that the idea of preventing the caries prone occlusal surfaces of teeth by means of pit and fissure sealants is widely acknowledged. It is also recognized as an integral part of a widespread

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caries preventive campaign. Many of the researchers have shown that only a single application of a pit and fissure sealant can drastically diminish incidence.[1,2] In few on the studies, this effectiveness has been shown to last long up to five years. This relative efficacy of pit and fissure sealants solely depends on their capability to infiltrate into narrow fissures in tooth surfaces before ultimate setting happens. Most of the studies conducted on their retention showed that the retention of a sealant depends on its capability to enter into the microscopic areas produced in enamel surfaces by the etching chemical. In general we knew that the occlusal surfaces of tooth signify only 13% of total surfaces of permanent dentition. However, these surfaces are responsible for almost 53% of caries in school children, making pits and fissures exceptionally susceptible to the development of caries.[3,4] Buonocore was one of the pioneer workers who showed initial resin bonded material for sealing pits and fissures. These were later developed and marketed as pit and fissure sealants and flowable composites. These materials were very helpful in caries prevention primarily by making obstacle. These physical obstacle stops metabolic exchange between fissure microorganisms and oral milieu.[5] The pits and fissures at the occlusal areas of molars are preferred region of food debris and dental plaque accumulation. These areas are at a higher risk for development of dental caries due to its complex nature. Kids are usually at higher risks for development of dental caries.[6,7] The underlying etiology includes, their high cariogenic diet, teeth erupting stage, deep pits and fissures which support withholding of food debris and dental plaque. Therefore, effective caries control is very crucial and imperative at this age group. In this modern era, various sealants are available in the dental market which claims for their effectiveness against dental caries. There are two main types of sealants as follows: resin-based and glass ionomer-based sealants. Literature has well evidenced that pit and fissure sealants have wide range of retention and hardness.[8,9,10] Keeping all these significant factors in the mind, authors have planned to evaluate and compare the clinical efficacies of two commercially available pit and fissure sealant in 8 to 11 year old children.

MATERIALS AND METHOD

This study was designed, planned and completed in the department of Pedodontics and preventive dentistry of the institute. Total twenty four pediatric patients were screened and selected in the age range of 8 to 11 years. Two very popular and commonly practiced pit and fissure sealant were studied in this study. These were two commercially available sealant namely Delton FS Sealant (Dentsply DeTrey GmbH, Konstanz, Germany) and Clinpro Sealant (3M ESPE, Minnesota, USA). All patients were screened thoroughly for any gross pathology or anomaly related to dentition. The sole criterion of selection was tooth with intact deep retentive fissures. For sealant application, mandibular permanent first molar of each child were selected. Therefore, effectively it was one tooth studied per child. Comprehensive medical and dental history was recorded including caries and plaque indexes/scorings. Other inclusion criteria were fully erupted permanent mandibular first molar, clinical absence of active carious lesion, absence of previous sealant application history, supportive and manageable child patient, no history of fluoride programme in child's school. Strict exclusion criterions were any systemic disease with impact of oral health, any noticeable parafunctional habit, non-cooperative child, excessive or highly reduced salivary flow. Out of twenty four children, fifteen were male and nine were females. The permanent first molars of each child were randomly assigned for placement of each of the two materials. Two different group were 1) Delton FS Sealant (12 teeth) 2) Clinpro sealant (12 teeth). Before application of sealant, oral hygiene was maintained comprehensively. Strict isolation was maintained throughout the procedure by rubber dam. Sealants were applied exclusively as per manufacturer's instructions. Complete polymerization of the sealant was achieved by light curing unit (wood pecker, Unicorn, Denmart) initially for twenty seconds and extended by an additional time of ten seconds. All the sealed areas were inspected carefully to ensure the marginal seal between the sealant and the tooth surface. Occlusion was evaluated with articulating paper for any premature contacts or irregularities (and removed if any). To assess the clinical presentation of the fissure sealants, visual and tactile examination was performed. Informed consents were obtained from guardians of children. Purpose of the study was also explained in detail to all parents of participating patients (guardians).

Privacy and other human rights were completely reserved and kept confidential. Changes related to marginal areas and morphology was noted after two months, four months and six months. Intact, unstained and overall healthy margin was scored 0 while deteriorated and discolored margin with open fissure was scored 4. Score 2 and 3 was provided for intermediate situations as per observers assessment and decision. Overall healthy, well formed anatomical occlusal forms and structures were scored 0. Total loss of pit and fissure sealant along with loss of adjacent occlusal anatomy and morphology was scored 4. Score 2 and 3 was provided for intermediate situations as per observers assessment and decision. All related data was noted and sent for statistical analysis.

RESULTS

All resultant data was recorded and complied in the MS excel sheet to formulate finalized spread sheet. This was further sent for appropriate statistical analysis using SPSS latest package 21.0. Data was shown in mean with Standard Deviation if any. P value less 0.05 was considered as significant one. Table 1 and Graph 1 showed that out of 24 patients, males were 15 and females were 9. All selected and studied patients were divided into 4 age groups. 9 patients were falling in the age of years 8 year. 5 patients were falling in the age of 9 year. Therefore we can presume that majority of the studied patients were of first two age groups. P value was found to be significant in group I & IV of age 8 and 11 years. The calculated p value was 0.01 and 0.01 respectively. Table 2 illustrates fundamental statistical illustration [two month post operative phase]. Here the mean of observational score of group I and group II was calculated. Table 3 shows the level of significance evaluation by pearson chi-square test [two month post operative phase]. Here the p value was noticed to be significant for group II (0.01). Table 4 shows the fundamental statistical illustration [four month post operative phase]. Here the mean of observational score of group I and group II was estimated. Table 5 shows the level of significance evaluation by pearson chi-square test [four month post operative phase]. Here the p value was noticed to be significant for group I and II (0.03 and 0.01). Table 6 shows the basic statistical description [six month post operative phase]. Here the mean of observational score of group I and group II was projected. Table 7 shows the level of significance evaluation by pearson chi-square test [six month post operative phase]. Here the p value was noticed to be significant for group I and II (0.02 and 0.01). Table 8 depicts comparison among the two study groups using one-way Anova [for group I, II]. The level of significant value [after comparison among two studied groups] was highly significant (0.001).

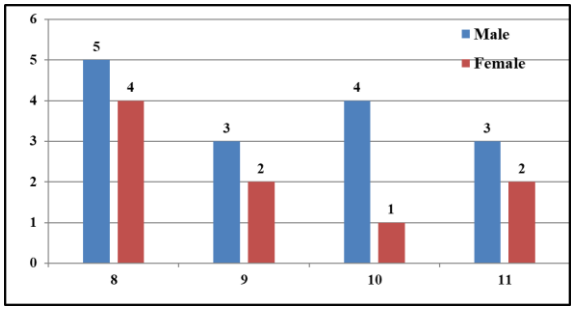

Fig 1: Age & gender wise distribution of patients.

Table 1: Age & gender wise distribution of patients.

Age Group (Yrs)	Male	Female	Total	P value
8	5	4	9	0.01*
9	3	2	5	0.07
10	4	1	5	0.06
11	3	2	5	0.01*
Total	15	9	24	*Significant

Table 2: Fundamental statistical illustration [two month post operative phase]

Sealant Groups	Mean Scores (Observational)	Std. Deviation	Std. Error	95% CI
Group I: Delton FS (n=12)	3	0.328	0.478	1.60
Group II: Clinpro (n=12)	1	0.455	0.306	1.96

Table 3: Level of significance evaluation by pearson chi-square test [two month post operative phase]

Sealant Groups	Pearson Chi-Square Value	df	Level of Significance (p value)
Group I: Delton FS (n=12)	1.322	1.0	0.08
Group II: Clinpro (n=12)	1.573	2.0	0.01*

***p<0.05 significant**

Table 4: Fundamental statistical illustration [four month post operative phase]

Sealant Groups	Mean Scores (Observational)	Std. Deviation	Std. Error	95% CI
Group I: Delton FS (n=12)	2	0.453	0.672	1.76
Group II: Clinpro (n=12)	0	0.212	0.698	1.51

Table 5: Level of significance evaluation by pearson chi-square test [four month post operative phase]

Sealant Groups	Pearson Chi-Square Value	df	Level of Significance (p value)
Group I: Delton FS (n=12)	1.545	1.0	0.03*
Group II: Clinpro (n=12)	1.787	2.0	0.01*

***p<0.05 significant**

Table 6: Fundamental statistical illustration [six month post operative phase]

Sealant Groups	Mean Scores (Observational)	Std. Deviation	Std. Error	95% CI
Group I: Delton FS (n=12)	3	0.343	0.897	1.91
Group II: Clinpro (n=12)	1	0.291	0.231	1.55

Table 7: Level of significance evaluation by pearson chi-square test [six month post operative phase]

Sealant Groups	Pearson Chi-Square Value	df	Level of Significance (p value)
Group I: Delton FS (n=12)	1.450	1.0	0.02*
Group II: Clinpro (n=12)	1.748	2.0	0.01*

***p<0.05 significant**

Table 8: Comparison among the two study groups using ONE-WAY ANOVA [for group I, II]

Parameters	Degree of Freedom	Sum of Squares ∑	Mean Sum of Squares m∑	F	Level of Significance (p value)
Between Groups	4	6.343	1.984	5.343	0.001*
Within Groups	37	9.323	0.356	-	
Cumulative	221.54	12.785	-		

***p<0.05 significant**

DISCUSSION

Dental caries is one of the oldest diseases of dental hard tissue. It usually develops on the occlusal surface of posterior teeth and has become a significant dental health dilemma. As mentioned, maxillary and mandibular molars and premolars are the most susceptible teeth to be attached by cariogenic bacterium.[11,12] Such a high susceptibility of posterior teeth to dental caries is directly associated to anatomy of their occlusal areas. As shown in the literature, fluoride has superb anti caries property.[13,14] These properties are widely utilized in different caries preventive tooth pastes and medicaments. Many of the pioneer workers have also stated dental caries as a disease of rough irregularities.[15,16] Enamel areas with severe pits and fissures get minimal caries defense from either systemic or topical fluoride agents. This is the key factor in understanding for ineffectiveness of fluorides in the pit and fissure caries. It is solely because of the relative dissimilarities in enamel thickness and the inaccessibility of the base of pits and fissures to topical fluorides.[17,18] The most proficient means to stop pit and fissure caries is by efficiently closing the fissures using resins known as pit and fissure sealants. Literature has well evidenced that dental caries is one of the most extensive disease of humanity. It is also well known as single most common chronic childhood disease.[19] Caries in children starts soon after eruption of the deciduous teeth and continues to increase at a significant rate in their mixed dentition age. Deep pits and fissures attract food accumulation and are very hard to clean by routine brushing techniques. Deep pits and fissures usually offer a positive shelter for the oral microorganisms. These activities of microorganisms usually increase and change the carbohydrates to acids, which ultimately leads to demineralization of the enamel. As shown by many of the researchers, the most proficient way to stop pit and fissure caries is by efficiently sealing the fissures using specialized resins called pit and fissure sealant. We already know that dental diseases are an expensive burden to the humans, particularly with the patient's deprived oral health and systemic disease. The popular medical phrase says "prevention is better than cure." Pit and fissure sealants are literally working on this philosophy only. We have also seen an ever changing trend toward prevention as compared to the treatment based practice. In the last few years, caries prevention methodologies have evidenced numerous innovations.[20] In stopping caries progression on occlusal surfaces of the teeth, systemic and topical fluoride has been shown very helpful. However, these effects are somewhat lesser on the occlusal surfaces of posterior teeth. Because of the occlusal anatomy of young permanent teeth with deep narrow pits and fissures, there is insufficient cleaning in these susceptible regions leading to progression of early caries.

CONCLUSION

Within the limitations of the study, authors concluded that Clinpro Sealant has superior clinical efficacies related to marginal and morphological factors. These findings were noted in all three post application phases of this sealant. Therefore, Clinpro is relatively suitable sealant for maintaining tooth integrity and preventing bacterial encroachments. Inferences of this study do not recommend the same for all commercially available pit and fissure sealants. However, we expect some other large scale studies to be conducted that can establish certain standard and concrete guidelines in these perspectives.

CONFLICTS OF INTEREST

The authors declare they have no potential conflict of interests regarding this article.

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