

To Compare and Evaluate the Effects of Resin Modified GIC And Calcium Hydroxide (Dycal) as Sealants for Indirect Pulp Therapies with Partial Excavation In Treatment of Young Permanent Teeth

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ABSTRACT

Background: Caries process is driven by the activity in the biofilm. Thus, the cavitated lesion after provisional sealing is more favorable to the remineralization of dentin as there is decrease of the bacterial count as a result of reduction of exogenous nutrient supply.

Method: A total of 32 children were selected in our study. The study was a twostep procedure. Analysis of the baseline group and the analysis of the experimental group were done at 3 months interval. Pearson's Chi-square and Fisher's exact test was used in our study. The statistical significance of the data was determined at $p < 0.05$.

Results: showed 24 out of 27 cases 88.8% success when two step excavations was carried out with part of carious dentine left behind after 3 months.

Conclusion: However this difference was not statistically significant it shows the favorable sealing capacity of RMGIC for healing in present technique.

Keywords: Caries, RMGIC, Calcium hydroxide, Sealant, IPC, Young Permanent Teeth.

INTRODUCTION

Researchers have recently turned their attention to more conservative methods of treating deep dentinal carious lesions by not totally removing infected and affected dentin to maximally preserve natural dentinal ^{1,2}. Two step excavation indirect pulp therapy technique includes use of a biocompatible material as liner, followed by excellent coronal seal while intentionally leaving infected carious dentine behind which is expected to heal with time to avoid an otherwise obvious pulp exposure.

Caries process is driven by the activity in the biofilm. Thus, the cavitated lesion after provisional sealing is more favorable to the remineralization of dentin as there is decrease of the bacterial count as

a result of reduction of exogenous nutrient supply.³ Here, postmitotic odontoblasts can be induced to up-regulate their synthetic and secretory activities in response to reduced infectious challenge in permanent teeth with deep carious lesion⁴. The cavity is subsequently re-opened, and the remaining treated dentin, expected to be more organized and mineralized, is removed safely to prevent otherwise obvious pulp exposure. Two step indirect pulp therapy, liners and coronal seal bring about required changes in residual affected dentin. They concluded that macroscopic examination of treated dentin during clinical procedure could be of great help while taking definitive treatment decisions.^{4,5,6} So, study was planned with objective to study the effectivity of two step excavation indirect pulp therapy technique using Calcium hydroxide and

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Resin modified glass ionomer(RMGICs) in deeply carious young permanent molars.

MATERIALS AND METHODS

Sample Selection

WHO examination was carried out in 2 schools in semi urban region. A total of 130 school children were screened for deep carious lesion involving permanent molars. Visual examination was carried out under natural light.

Inclusion criteria

- a) Permanent molars with deep carious lesion in age group of 6 to 14 years
- b) Radiographically the depth of deep carious lesion extending more than half the thickness of the dentin.
- c) Permanent molars with no signs and symptoms of irreversible pulpitis.

Exclusion criteria

- a) Permanent molars with characteristic clinical symptoms of pulp and/or periapical abnormalities.
- b) Permanent molars with characteristic radiographic signs of irreversible pulpal inflammation.

METHODOLOGY

1st Visit

The preformed patient information and patient record form was explained to both the child and the accompanying parent. Cavity was accessed with a carbide bur at high rotation and carious tissue involving the lateral and dentino-enamel junction was completely removed with smooth spherical burs at low rotation, with the size of bur being compatible with the lesion. However, only superficial necrotic dentin was removed from the pulpal and axial walls using low speed round burs. Before the Baseline Sample was collected, baseline dentin was analyzed for the appearance, consistency and humidity of dentin.

Dentin analysis was classified according to the following criteria (Modified Criteria of Bjorndal et al1997)

- I. Color
 - a) Dark Brown
 - b) Light brown
 - c) Yellow.
- II. Consistency
 - a) Hard -similar to normal dentin
 - b) Medium Hard/Leathery-excavator removed dentin when firmly used
 - c) Soft-could be easily removed by operator
- III. Humidity
 - a) Wet-If tissue oozed moisture
 - b) Dry-If tissue did not ooze moisture

Baseline Sample Collection

Clinically visible residue of infected carious tissue on the cavity floor was divided into two parts (buccolingual direction) with a spoon excavator to cultivate sample at same depth. The baseline sample was removed from the mesial portion while the experimental sample that remained in the distal portion after 90 days was similarly removed with a spoon excavator .The sample removed was stored in transport media of 2% Glutardehyde solution with a sodium phosphate buffer of 0.1M for 2 to 4 hours and post fixed in 1% osmium tetraoxide.

At the II Visit (After 3 months)

After a period of 3 months, recorded the status of restoration, any signs and symptoms indicating the progress of the carious lesion. Again the cavity was accessed. Restorative material was removed using a high speed diamond bur. The cavity was once again washed with sterile water and dried with cotton pellets. And then experimental sample that remained was removed from the distal portion.

STATISTICAL ANALYSIS

Permanent molar was taken as one unit. Data was coded and entered onto a PC. The computer program "Statistical Package for Social Sciences" (SPSS) was used. For numeric data, mean and standard deviation was calculated. For categorical data, frequency and percentage were calculated. Pearsons Chi-square and Fisher's exact test was used in our study. The statistical significance of the data was determined at $p < 0.05$.

RESULTS

The study was designed and carried out in the department of Pediatric and Preventive Dentistry, Patna Dental college and Hospital. A total of 32 children were selected in our study. Our study was a two step procedure. Analysis of the baseline group and the analysis of the experimental group were done at 3 months interval. The participation was voluntary. Prior permission and informed consent of parents and children were taken. Following data presents results of the study done.

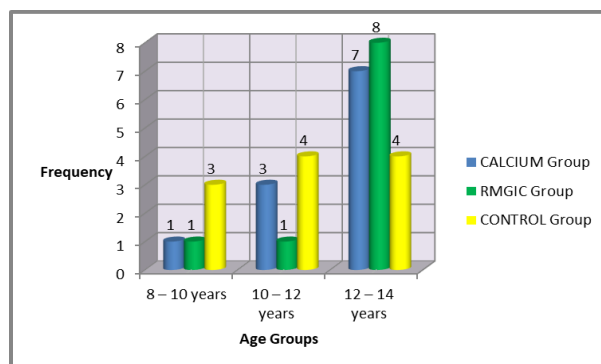
The groups are divided on the basis of lining material used:

- 1) Calcium hydroxide group is abbreviated as Calcium group
- 2) Resin Modified Glass Ionomer Group is abbreviated as RMGIC group
- 3) Gutta percha as Control group

Table 1: Distribution of subjects according to their Age Groups in different experimental groups.

Age-Group	Calcium Group	RMGIC Group	Control Group	Total
8 – 10 years	1 (9.1%)	1 (9.1%)	3 (27.3%)	5 (15.7%)
10 – 12 years	3 (27.3%)	1 (9.1%)	4 (36.4%)	8 (25.0%)
12 – 14 years	7 (63.6%)	8 (72.7%)	4 (36.4%)	19 (59.3%)
Total	11	10	11	32

Table 1 and Graph 1 show among 11 subjects in Calcium group 63.6% were in the age group 12 – 14 years, 27.3% were in 10 – 12 years and 9.1% were in 8 – 10 years. Among 10 subjects of RMGIC group maximum 72.7% were in age group of 12 – 14 years and 9.1% each were in the age groups of 8 – 10 years and 10 – 12 years respectively. In Control group, there was almost similar distribution of subjects i.e. 36.4% subjects each were from the age groups 10 – 12 years and 12 – 14 years and 27.3% subjects were from the 8 – 10 years age group.



Graph1: Distribution of subjects according to their Age Groups in different experimental groups.

Table 2 and Graph 2 show the overall age of the subjects in the research study was 12.56 ± 1.48 years whereas in the Calcium group it was 12.63 ± 1.28 years, in RMGIC group it was 13.2 ± 1.47 years and in Control group it was 11.90 ± 1.47 years.

Table 3: Distribution of subjects according to their Region of Lesion in different experimental groups.

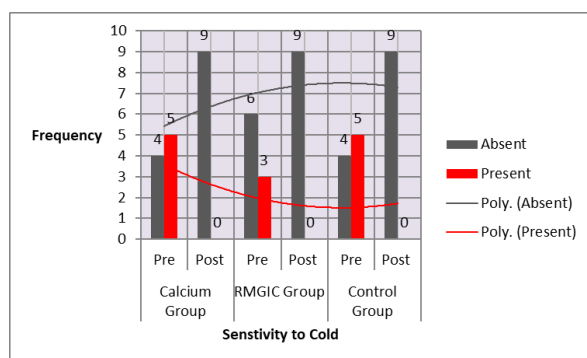
Region of Lesion	Calcium Group	RMGIC Group	Control Group	Total
Occlusal	6 (35.2%)	6 (35.2%)	5 (29.6%)	17
Occlusolingual	1 (5.0%)	1 (5.0%)	0	2
Occlusobuccal	1 (25.0%)	1 (25.0%)	2 (50.0%)	4
Occlusomesial	0	0	2 (100.0%)	2
Distoocclusal	1 (50.0%)	1 (50.0%)	0	2

Table 3 and Graph 3 represents the frequency distribution of the subjects in according to their region of lesion i.e. Occlusal, Occlusolingual, Occlusobuccal, Occlusomesial and Distoocclusal in each experimental group and overall distribution of subjects.

Table 4: Distribution of subjects according to their Radiographic Extension of Lesion in different experimental groups.

Radiographic Extent of the lesion	Calcium Group	RMGIC Group	Control Group	Total
> 1/3	00	00	01	01
> 1/3 and 2/3	02 (50.0%)	01 (25.0%)	01 (25.0%)	04
> 2/3	07 (31.8%)	08 (31.8%)	07 (36.4%)	22

Table 4 and Graph 4 represents the frequency distribution of the subjects in according to their radiographic extension of lesion i.e. $> 1/3^{\text{rd}}$, $> 2/3^{\text{rd}}$ and $1/3^{\text{rd}}$ - $2/3^{\text{rd}}$ in each experimental group and overall distribution of subjects. It is seen that there were 22 subjects with greater than $2/3^{\text{rd}}$ radiographic extension of lesion overall and among them 31.8% each were from the group Calcium and RMGIC and 36.4% were from the Control group. The subjects with radiographic extent of lesion between $1/3^{\text{rd}}$ to $2/3^{\text{rd}}$ were four in study and among them one each was from RMGIC and Control group and two subjects were from the Calcium group. The subject with greater than $1/3^{\text{rd}}$ radiographic extent of lesion in study was one and was from the control group.



Graph 5: Distribution of subjects according to their level of pre and postoperative state of examination in different experimental groups.

DISCUSSION

Although encouraging clinical success rates have been reported in number of studies, there is still some resistance whether intentionally left carious dentine behind is safe ^{6,7,8}. Present study was conducted to assess the success of 2 step excavation technique by examining "Clinical analysis of dentin layers in deep carious lesion treated by partial excavation using two sealing materials – A minimal intervention in vivo study". We included young permanent molars in our study as pit and fissure caries is the most common cause of endodontic treatment needs of permanent teeth of young children. Pulp in young permanent molars has great capability of healing even after insults by various means such as bacteria toxins, trauma and others ^{9,10}.

The objective of the exercise is to arrest lesion progression and allow the formation of reparative dentine before final excavation, making pulpal exposure less likely. Our study was conducted with an aim to examine the intentional residual carious dentin by using two best biocompatible material as pulp capping agents i.e. calcium hydroxide successfully ^{11,12,13} and RMGIC used by various authors ^{14,15}. Both the material are well known for making healing changes in dentine such as arresting carious lesion, inducing mineralization or sealing the tubules to further prevent the ingestion of bacteria and toxins.

The subjects with extended region of lesion in between $1/3^{\text{rd}}$ to $2/3^{\text{rd}}$ were four (14.8%) in study and among them one each was from RMGIC and Control group and two subjects were from the Calcium group. The subject with $1/3^{\text{rd}}$ extent of lesion in study was single and was from the control group. ^{16,17,18,19}

Clinical parameters- According to clinical parameters our study showed 24 out of 27 cases 88.8% success when two step excavations was carried out with part of carious dentine left behind after 3 months.

CONCLUSION

However this difference was not statistically significant it shows the favorable sealing capacity of RMGIC for healing in present technique. As resin modified glass ionomer cement performed better than calcium hydroxide and control group, it seems to be a better option as lining material for two step excavation indirect pulp therapy technique.

However our study also points out that for maximum preservation and cost effective management for deep carious lesion in young permanent molars two step excavation technique with excellent coronal seal is primary requisite followed by biocompatible lining material used for promoting favorable conditions and enhancing defensive responses of the pulp-dentin complex by hard tissue formation and achieving arrest of carious lesion.

CONFLICT OF INTEREST

No potential conflict of interest relevant to this article was reported.

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