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TO COMPARE THE EFFECTIVENESS OF RESIN MODIFIED GIC AND CALCIUM HYDROXIDE (DYCAL) AS SEALANTS FOR INDIRECT PULP THERAPIES WITH PARTIAL EXCAVATION IN TREATMENT OF DEEP CARIOUS LESION.

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ABSTRACT

Objective: To compare the effectiveness of Resin modified GIC and Calcium Hydroxide (Dycal) as sealants for Indirect pulp therapies with partial excavation in treatment of deep carious lesion. **Method and Materials:** A total of 300 school children were screened for deep carious lesion involving permanent molars. The preformed patient information and patient record form was explained to both the child and the accompanying parent. Cavity was accessed with a 329 carbide bur at high rotation and carious tissue involving the lateral and dentino-enamel junction was completely removed with smooth spherical burs at low speed were done in 1st visit After a period of 90 days, history and examination of the tooth in question was carried out by recording the status of restoration, any signs and symptoms indicating the progress of the carious lesion were recorded. A second post operative periapical radiograph was taken for each tooth in the 2nd visit. **Results:** Analysis of the baseline group and the analysis of the experimental group were done at 3 months interval. In overall study there were 21 subjects who reported no level of pain in pre examination and in post examination it was incremented by 19.04% to 25 subjects, The result was significant (p =.011) for RMGIC group. In Control group 44.4% changed their color from yellow to light brown, 22.2% changed color from light brown to dark brown and single case changed color from yellow to dark brown. **Conclusion:** More extensive study in term of time period and sample size may be useful for further research in his field.

KEYWORDS: Resin modified GIC, Calcium Hydroxide (Dycal), Indirect pulp therapies.

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 tissue.[1,2,3,4] 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. Discolored demineralized dentin below infected dentine is a natural part of progressing carious lesion. Complete caries removal of these lesions, with one step method indirect pulp therapy procedure, can cause a pulp exposure that endangers the pulps vitality.[5] It defeats the principal objective in management of young permanent teeth with deep carious lesion, i.e to preserves the tooth's vitality while causing as little trauma as possible to the pulp.[6] So, prior knowledge of healing in infected and affected dentin by macroscopic analysis can be a great asset in successful case selection and indirect pulp therapy as definitive treatment in minimal invasive management of deep carious lesion in young permanent teeth. So, present study was planned with objective to study the effectivity of two step excavation indirect pulp therapy technique using Calcium hydroxide and Resin modified glass ionomer (RMGICs) in deeply carious young permanent molars along with the aim of evaluating changes in intentionally left behind dentine at clinical macroscopic level.

MATERIALS AND METHOD

The present study designed as a randomized clinical study was conducted in the Department of Endodontics and Conservative Dentistry, at Patna Dental College.

Sample Selection

WHO examination was carried out in 2 schools in rular region. A total of 300 school children were screened for

deep carious lesion involving permanent molars. Visual examination was carried out under natural light. Oral examination revealed that 47 children had one or more deep carious lesion involving the permanent molars. Study group comprised of suitable number of healthy young children not less than 6 years of age and not more than 14 years of age with deep carious lesion in permanent molars. Thirty four children with deep carious lesion strictly adhering inclusion and exclusion criteria were planned for selection in the present study. Prior permission and informed written consent of parents and/or primary health care providers and/or care takers were taken. Patients were pre-informed as per information sheet about importance of permanent teeth and treatment method to be conducted to save their carious teeth. Thirty three teeth were selected in thirty five children. Greater than required number of teeth were taken keeping in mind withdrawal of cases due to patient personal reason or else. Following inclusion and exclusion criteria were strictly followed while selecting final cases for study.

Inclusion criteria

1. Permanent molars with deep carious lesion in age group of 6 to 14 years
2. Radiographically the depth of deep carious lesion extending more than half the thickness of the dentin.
3. Permanent molars with no signs and symptoms of irreversible pulpitis.
4. Patients who agree to participate in the trial and sign the informed consent.

Exclusion criteria

1. Permanent molars with characteristic clinical symptoms of pulp and/or periapical abnormalities.
2. Permanent molars with characteristic radiographic signs of irreversible pulpal inflammation.
3. If the tooth is affected by some disease i.e. Enamel Hypoplasia/Fluorosis/MIH or any congenital disease.
4. If the patient is suffering from any systemic disease.
5. Permanent molar with history of indirect pulp therapy

METHODOLOGY

Ist Visit

The preformed patient information and patient record form was explained to both the child and the accompanying parent. A complete history was taken and findings were recorded in the patient record form. Patient was asked to pick up chits stating different materials and accordingly special identification number was given to each child. Examination of the specific tooth in question was carried out by recording the activity of carious lesion, surface involved, signs and symptoms of reversible pulpitis. Clinical photographs of the child were taken. A pre operative radiograph was advised. Pre operative radiographic findings were recorded.

A complete oral prophylaxis was performed. Pulp Vitality was confirmed by an electric pulp tester (Parkell, Farmingdale, NY). Teeth of the patients were anaesthesized with 2% lignocaine and isolated with a rubber dam. Cavity was accessed with a 329 carbide bur at high rotation and carious tissue involving the lateral and dentino-enamel junction was completely removed with smooth spherical burs at low speed, 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)

1. Color

a) Dark Brown
b) Light brown
c) Yellow.

2. 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

3. Humidity

a) Wet-If tissue oozed moisture
b) Dry-If tissue did not ooze moisture

Baseline Sample Collection

After removal of the carious tissue, antisepsis of the rubber dam was performed with 2% chlorhexidine solution and sample of dentin was collected from the teeth. 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 (Fig:8)was stored in transport media of 2% Glutardehyde solution with a sodium phosphate buffer of 0.1M for 2 to 4 hours and postfixed in 1% osmium tetraoxide.

Once the sample was collected as described, a clinical photograph of the experimental sample remaining in the tooth was taken. Then a layer of calcium hydroxide or resin modified glass ionomer cement or control with gutta percha was applied on pulpal floor and with coronal sealing by conventional resorative glass ionomer cement. The teeth were randomly assigned for the treatment group according to the chits picked up by the children previously. All materials were used according to the manufacturer's instructions.

Immediately after the restoration, a post operative periapical radiograph was taken for each tooth. Patient was kept on a regular follow up examination

At the II Visit (After 3 months)

After a period of 90 days, history and examination of the tooth in question was carried out by recording the status of restoration, any signs and symptoms indicating the progress of the carious lesion were recorded. A second post operative periapical radiograph was taken for each tooth. Pulp Vitality was confirmed by electric pulp tester (Parkell, Farmingdale, NY).Clinical and radiographic analysis of the treatment performed were checked for postoperative success of treatment. Tooth that presented clinical or radiographic signs or symptoms of irreversible pulp pathology or necrosis underwent root canal therapy and were recorded as treatment failure. Two operators performed the clinical and radiographic follow up examinations, and a consensus was reached to determine if the tooth in question presented a successful or unsuccessful outcome of the indirect pulp treatment.

The cavity was accessed again under similar conditions. Restorative material was removed using a high speed diamond bur. A slow speed round bur was used, followed by air syringe after which the restorative material became opaque. This helps to distinguish the restorative material from the carious tissue remaining. Clinical photograph of the experimental sample (Fig: 9) was taken for macroscopic analysis.

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 $p<0.05$. Intraclass correlation coefficient ICC was calculated to determine inter examiner variability(r=.73)

RESULTS AND ANALYSIS

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.

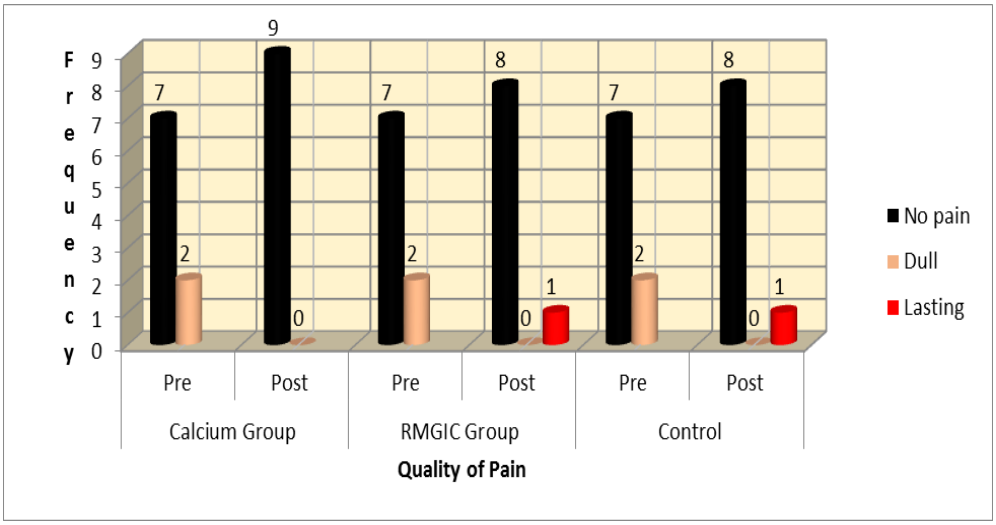
The groups are divided on the basis of lining material used:

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

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

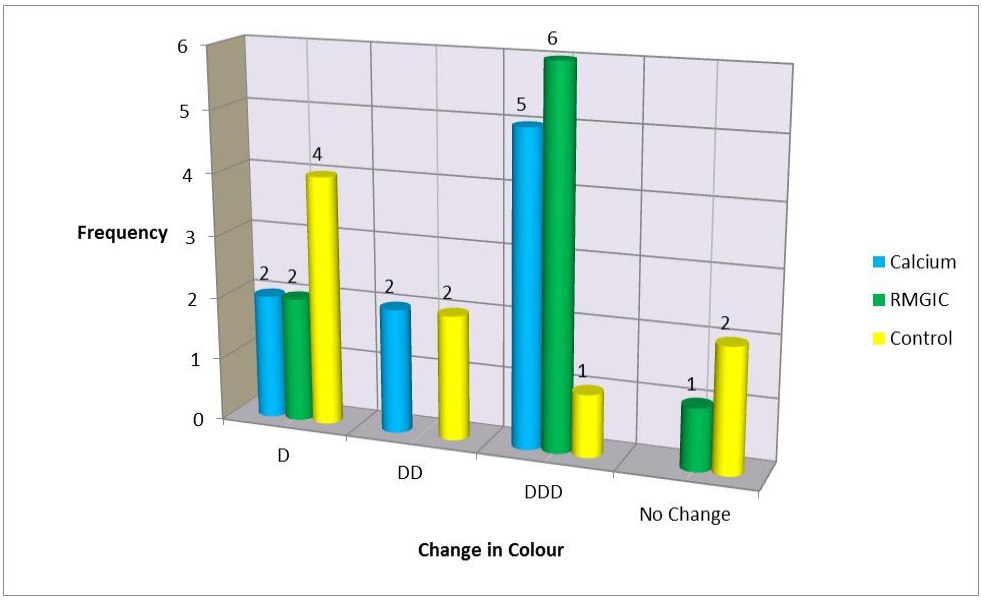
According to their Radiographic Extension of Lesion in different experimental groups

In overall study there were 21 subjects who reported no level of pain in pre examination and in post examination it was incremented by 19.04% to 25 subjects. Similarly in Calcium, RMGIC and Control group, two subjects each were in dull level of pain during pre examination but in post examination they had no pain. There were two cases identified in constant level of chronology in post test examination one in RMGIC and Control group respectively. There was no significant association present between the level of quality and among the state of examination of subjects i.e. pre and post examination ($p = 0.470$).



According to their level of Quality of pain in pre and postoperative state of examination in different experimental groups

Macroscopic Changes
According to their Color change in different experimental groups
Color change was coded according to the following key:
1) Yellow to light brown-**D**;
2) light brown to dark brown-**DD**;
3) Yellow to dark brown **DDD;**
4) No change



According to their Color change in different experimental groups

The result was *significant* **(p =.011)** for RMGIC group. In Control group 44.4% changed their color from yellow to light brown, 22.2% changed color from light brown to dark brown and single case changed color from yellow to dark brown.

DISCUSSION

In 1859, John Tomes wrote, 'it is better that a layer of discoloured dentine should be allowed to remain for the protection of the pulp rather than run the risk of sacrificing the tooth', but in 1908,G.V.Black disagreed claiming "it will often be a question of whether or not the pulp will be exposed when all decayed dentine overlaying it is removed… it is better to expose the pulp of a tooth than to leave it covered only with softened dentine".[19]

Present study was conducted to assess the success of 2 step excavation technique by examining "Clinical and ultrastructural 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.

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.

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.

After 3 months follow up total **Clinical** success for two step excavation was 88% in 24 out of 27 permanent molars. It was found to be *highly significant* **p<.001**. Clinical success for this technique group wise in calcium, RMGIC and control group was 100%, 88.8% and 77.7% respectively. The difference was not statistically significant between the groups. This indicates high success rate of two step excavation technique irrespective of the lining material used. **Macroscopic** analysis of dentine showed 55.6%, 66.7%, 11.10% changed from yellow to dark brown in calcium, RMGIC and control group respectively. The RMGIC was found to have shown a *significant* color change with maximum 2 shift increase in the scale in number from yellow to dark brown and was found to be significant **p=0.011**.Increased darkness in color is indicative of arrest of lesion and healing in the tissue.77.8%, 66.6%, 33.3% showed soft to hard consistency (CCC) in calcium, RMGIC and control group respectively. 88.9%, 88.9%, 77 % change in humidity i.e from wet to dry was observed in calcium, RMGIC and control group respectively. Present study reports highly significant

success of two step excavation technique for management of deep carious permanent molars It also favours use of Resin modified glass ionomer cement followed by Calcium hydroxide and control with comparable coronal seal in terms of lining material.

CONCLUSION

More extensive study in term of time period and sample size may be useful for further research in his field.

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