

A Clinical Study for the Management for Deep Carious Lesion in Young Permanent Molar: A Minimal Intervention Treatment

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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. 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 lesion.

Materials and method: 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. children with deep carious lesion strictly adhering inclusion and exclusion.

Results: There was no association present between the level of cold and among the state of examination of subjects i.e. pre and post examination among group p was not significant. $P > 0.05$.

Conclusion: Resin modified GIC restoration with Calcium Hydroxide base can be a choice in deep carious teeth to protect vital tooth specially in young patients. which was functional, asymptomatic, with normal physiologic mobility, normal probing depths, and a satisfactory coronal restoration. Statistically no significant association found between the level of quality and among the state of examination of subjects i.e. pre and post examination.

Keywords: Caries, minimal invasion, pulp-dentin complex, biocompatible, lining material.

INTRODUCTION

Discolored demineralized dentin is a natural part of progressing enamel lesion. When a closed and rapidly progressing environment develops, the dentine becomes increasingly infected. Microbial spread occurs along the enamel –dentine junction and as the enamel breaks down the cavity is converted from closed eco system to an open ecosystem. In “closed”, active and rapidly progressing lesion the initial tertiary dentin is laid down without dentinal tubules whereas in slowly progressing lesions dentin laid down is tubular resembling primary dentin.¹The affected layer beneath the infected layer comprises a zone of demineralized dentin that retains its basic structure

and is relatively free of bacteria.² In this layer the reversibly denatured collagen can be reorganized. It is stated that remineralization occurs in inner carious dentin, where living odontoblast supply calcium phosphate to the vital pulp.^{2,3} Thus, only the outer layer of carious dentin must be removed thereby permitting the preservation of inner carious layer and hence aiding the maintenance of pulp vitality and preventing mechanical exposure. Calcium concentration in dentin increases after minimal intervention treatment.^{4,5} Thus minimal intervention treatment is highly recommended in case of deep dentine carious lesions. Use of resin modified glass ionomer cement due to its

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antibacterial properties stimulate the reorganization of collagen cross links present in the affected dentin. Dycal as a result of its alkaline pH results in a high concentration of hydroxyl ions leads to irreversible damage to bacterial cell. This mechanism activates tissue enzymes promoting reorganization of collagen cross-links in the affected dentin.^{5,6,7}

The aim of the present study is to study the activity and progression of caries after partial excavation of carious dentin and tooth sealing for 3 month period by clinical analysis to promote the minimal intervention approach for creating a favorable environment for healing process in teeth.

MATERIALS AND METHODS

Study Design: Present study was carried out in patient reporting to the department of endodontic and conservative dentistry in Patna Dental College & Hospital, Bihar on Patients not less than 6 years of age and not more than 14 years of age . 27 molars were taken for this study. Study group comprised of suitable number of healthy young children with Permanent molars with open carious lesion in dentin. Prior permission with written consent of parents and/or primary health care providers and/or care takers were taken.

Inclusion criteria

- Permanent molars with deep carious lesion.
- Radiographically the depth of deep carious lesion extending more than half the thickness of the dentin.
- Permanent molars with no signs and symptoms of irreversible pulpitis.

Exclusion criteria

- Permanent molars with characteristic clinical symptoms of pulp and/or periapical abnormalities.
- If the tooth is affected by some disease i.e. Enamel Hypoplasia/Fluorosis/MIH or any congenital disease.
- If the patient is suffering from any systemic disease.
- Permanent molar with history of indirect pulp therapy.

The procedure, possible discomforts or risks, and possible benefits were be fully explained to the parents of the children being treated.

Methodology

Patient record forms were filled and case were selected according to strict inclusion and exclusion criteria. A seven day diet diary of each subject were planned to be evaluated and assessed for the total number of sugar exposure.

Clinical Procedure

A complete oral prophylaxis were performed of all patients. After completing the oral prophylaxis, teeth were cleansed using a rotating brush and pumice, washed with sterile water and air dried. Teeth of the patients were anaesthetized and isolated with a rubber dam.

Cavities were accessed with a 329 carbide bur at high rotation and carious tissue involving the lateral walls and dentino-enamel junction were completely removed with smooth spherical burs at low rotation, with the size of bur being compatible with the lesion. However, only superficial necrotic dentin were removed from the pulpal and axial walls using low speed round burs. A layer of calcium hydroxide or resin modified GIC were applied on pulpal floor and with coronal sealing by Resin modified GIC. The teeth were randomly assigned for the treatment group. All materials were used according to the manufacturer's instructions.

Each patient was re-examined clinically after a period of 3 months.

STATISTICAL ANALYSIS

Pearsons Chi-square and Fisher's exact test was used in this study.

RESULTS

Chronology Of Pain	Calcium Group		RMGIC Group		Control Group		Total	
	Pre	Post	Pre	Post	Pre	Post	Pre	Post
No Pain	07	09	07	08	07	08	21	25
Momentary	02	00	02	00	02	00	06	00
Constant				01		01	00	02

Level of Chronology of pain in pre and postoperative state of examination in different experimental groups

There was no significant association present between the level of chronology and among the state of examination of subjects i.e. pre and post examination.(p = 0.470)

Quality of Pain	Calcium Group		RMGIC Group		Control Group		Total	
	Pre	Post	Pre	Post	Pre	Post	Pre	Post
No pain	07	09	07	08	07	08	21	25
Dull	02	00	02	00	02	00	06	00
Lasting				01		01	00	02

Level of Quality of pain in pre and postoperative state of examination in different experimental groups

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)

Sensitivity to cold	Calcium Group		RMGIC Group		Control Group		Total	
	Pre	Post	Pre	Post	Pre	Post	Pre	Post
	04	09	06	09	04	09	14	27
Present	05	00	03	00	05	00	13	00

Level of sensitivity to Cold in pre and postoperative state of examination in different experimental groups

There was no association present between the level of cold and among the state of examination of subjects i.e. pre and post examination among group p was not significant. P>0.05

At the follow-up the patient complained of sensitivity to cold which had significantly decreased 1 week post-operatively. Tenderness to percussion was not reported in both follow-ups. Clinical examination with cold test showed a vital tooth which was functional, asymptomatic, with normal physiologic mobility, normal probing depths, and a satisfactory coronal restoration.

DISCUSSION

Philosophies and concepts of carious tooth tissue management have been changing. This has challenged who believe that all softened carious tissue should be removed prior to placement of a restoration^{8,9}. These philosophical changes are working in tandem with the ideals of minimum

intervention treatment methodologies. Associated with this paradigm shift is the need for sound evidence and reassurance that it is safe to leave softened infected carious dentine in the cavity and then place a restoration. 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^{1,10,11,12}.

There was overall decrease in type of pain indicating reversible pulpitis in both groups. Subjects who reported no pain (measured as chronology-i.e constant,localized quality-dull, lasting, *sensitivity to sweet*, sensitivity to cold) in pre examination, increased in post examination by 19.04% ,19.04% ,92.8% ,66.6% respectively. Nyvad and Fejerskov(1986)¹³ described similar clinical features to be characteristics of the inactive lesion. However it was *statistically significant* with $p<0.05$ for sensitivity to sweet. Two cases in RMGIC and one in Control group showed clinical signs of irreversible pulpitis i.e lasting constant pain, pain on percussion. Mertz-Fairhurst (1998)¹⁴ similarly reported failure due to loss of coronal restoration in cariostatic sealed restorations. Also in the classic study by Handelsmann¹⁵ et al it was reported reduction in bacterial number in carious lesions when sealed off from the oral cavity. Similar results were observed by King JB jr(1965)¹⁶,Fisher FJ(1966)¹⁷.

Deprived of nutrition, the remaining bacteria are unable to produce the acid to cause demineralization, thus inhibiting proteolytic destruction of the organic material. This contributes to the formation of tertiary dentin and sclerosis of dentinal tubules, thus preventing unnecessary pulp exposure as the dental pulp possesses the ability to form a dentin-like matrix as a part of the repair in the dentin pulp organ

CONCLUSION

This treatment method is intended to protect *primary* odontoblasts and promote *reactionary dentin* formation at the pulp-dentine junction^{18,19}. However, some primary odontoblasts may be destroyed depending on the severity of carious involvement of the dentin-pulp complex and reparative dentin is formed in conjunction with reactionary dentin. An important

function of the bioactive lining material is to stimulate the odontoblasts to form reactionary and reparative dentin and promote remineralization of existing dentine, thus encouraging the dentin-pulp complex¹⁸.

A growing body of evidence has demonstrated that minimal intervention treatment is successful for the management of deep caries lesion. However, well-conducted clinical trials on this proposed technique will be required for more grounding clinical evidence.

CONFLICTS OF INTEREST

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

REFERENCES

1. Bjorndal L, Kidd E. The treatment of deep dentine caries lesion. *Dent Update* 2005;32:402-13.
2. Thompson V, Craig R, Curro F, Green W. Treatment of deep carious lesions by complete excavation or partial removal. *J Am Dent Assoc* 2008;139(6):705-12.
3. Wambier D, Santos F, Pinto A, Gastaldon R. Ultrastructural and microbiological analysis of the dentin layers affected by caries lesion in primary molars treated by minimal intervention. *Pediatr Dent* 2001; 29(3):228-34.
4. Maltz M, Oliveria E, Fontanella V, Bianchi R. A clinical, microbiologic, and radiographic study of deep caries lesion after incomplete caries removal. *Quintessence Int* 2010;1(10):40-8.
5. Eidelman E, Finn S, Koulourides T. Remineralization of carious dentin treated with calcium hydroxide. *J Dent Child* 1965;32:218-25
6. Massler M. Treatment of profound caries to prevent pulpal damage. *J Can Dent Assoc* 1971;2:99-105
7. Jordan RE, Suzuki M. Conservative treatment of deep carious lesions. *J Can Dent Assoc* 1971;37:337-42
8. Jordan RE, Suzuki M. Conservative treatment of deep carious lesions. *J Can Dent Assoc* 1971 ;37(9):337-42
9. Kerkhove BC Jr, Herman SC, Klein AI et al. A clinical and television densitometric evaluation of the indirect pulp capping technique. *J Dent Child*.1967 ;34(3):192-201
10. Bjorndal L, Larsen T. Changes in cultivable flora in deep carious lesions following a stepwise excavation procedure. *Caries Res* 2000 ; 34:502-8.
11. Orhan AL, Oz FT, Orhan K. Pulp exposure occurrence and outcomes after 1-or 2-visit indirect pulp therapy vs complete caries removal in primary and permanent molars. *Pediatr Dent* 2010;32:347-55
12. Maltz M, Oliveira EF, Fontanella V, Bianchi RA. Clinical, microbiological, and radiographic study of deep carious lesions after incomplete caries removal. *Quintessence Int* 2002; 33:151-9.
13. Nyvad B, Fejerskov O. Active root surface caries converted into inactive caries as a response to oral hygiene. *Scand J Dent Res*. 1986 Jun;94(3):281-4.
14. Mertz-Fairhurst EJ, Curtis JW, Ergle JW et al. Ultraconservative and cariostatic sealed restorations: Results at year 10. *J Am Dent Assoc* 1998; 129:55-66.
15. Gao W, Smales RJ, Yip HK. Demineralisation and remineralisation of dentine caries, and the role of glass-ionomer cements. *Int Dent J*. 2000;50(1):51-6.
16. King JB Jr, Crawford JJ, Lindahl RL. Indirect pulp capping: a bacteriologic study of deep carious dentine in human teeth. *Oral Surg Oral Med Oral Pathol*. 1965 ; 20(5):663-9.
17. Fisher FJ. The viability of microorganisms in carious dentine beneath amalgam restorations. *Brit dent J. Br Dent J*. 1966;121 (9):413-6.
18. Tziafas D. The future role of a molecular approach to pulp-dentinal regeneration. *Caries Res*. 2004;38(3):314-20.

24. Molander A, Reit C, Dahlén G, Kvist T.
Microbiological status of root-filled teeth with

apical periodontitis. Int Endod J. 1998;31(1):1–7.