

Case Report

Ledermix Pulp treatment in a permanent molar: A case report

*Fahd A.A.Karim^a, Asma Sultana^b, Tazdik G.Chowdhury^c, Md.Samsul Alam^d, Mohammed Wahiduzzaman^a

- a. FCPS trainee, Dept.of Conservative Dentistry & Endodontics, Bangabandhu Sheikh Mujib Medical University, Dhaka.
- b. Assistant Professor & Head, Department of Science of Dental Material, Update Dental College & Hospital, Dhaka,
- c. Assistant Professor & Head, Department of Paediatric Dentistry, Update Dental College & Hospital, Dhaka,
- d. Professor & Chairman, Dept.of Conservative Dentistry & Endodontics, BSMMU, Shahbag, Dhaka,

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ABSTRACT

This case report describes the Indirect Pulp Treatment (IPT) of deep carious lesion in a permanent molar with Ledemix. A 18 years old male patient reported discomfort associated with thermal stimulation on the mandibular right first permanent molar. Radiographically revealed a deep buccal carious lesion, very close to the pulp. periapical radiolucency and periodontal space thickening was absent. Pulp sensitivity was confirmed by thermal pulp vitality tests. Based on the main complaint and the clinical and radiographic examinations, the treatment plan was established to preserve pulp vitality. Clinical procedures consisted of removing the infected dentin and lining the caries-affected dentin with ledermix cement, the tooth was restored with composite cement. After 12 month follow-up, no clinical or radiographic pathological findings were found.

Introduction:

Concepts and treatment principles of deep carious lesion are an area of debate and constant change.¹ Difficulties in assessing the true clinical status of the pulp tissue under deep carious lesion make difficult a precise diagnosis of tooth vitality² An important priority in the treatment of deep carious lesions is to preserve pulp vitality.³

The consequences of pulp exposure from caries, trauma or tooth preparation misadventure can be severe, resulting in pain and infection which is then require either extraction or root canal therapy. Because of extraction, tooth become lost and need to be replaced. In Endodontic treatment, tooth restoration involves multiple appointments and considerable expense. An alternative procedure to extraction or endodontic therapy is pulp capping, in which a medicament is placed directly over the exposed pulp (direct pulp cap), or a cavity liner or sealer is placed over residual caries (indirect pulp cap) in an attempt to maintain pulp vitality. Following indirect pulp treatment (IPT) of 6 to 8 weeks time should be allowed to produce adequate remineralization of the cavity floor.^{4,5} This desirable outcome is essentially dependent on the maintenance of a

*Address of Correspondence :

Dr. Fahd A.A.Karim

FCPS trainee, Dept.of Conservative Dentistry & Endodontics, BSMMU,Shahbag,Dhaka

Phone: +8801912048831

E-mail: fahdkarim@yahoo.com

patent seal against micro leakage by the temporary and final restorations.

Ledermix paste is a glucocorticoid steroid antibiotic compound was developed and released for sale in Europe by Lederle Pharmaceuticals in 1960.^{6,7} The primary interest in developing Ledermix paste was based on the use of corticosteroids to control pain and inflammation associated with pulp and periapical diseases. Ledermix paste is a combination of the tetracycline antibiotic, demeclocycline-HCl (at a concentration of 3.2%), and a corticosteroid, triamcinolone acetonide (concentration 1%), in a polyethylene glycol base.⁸ It can be used as a sedative dressing or lining under temporary or definitive restoration in teeth with reversible pulpitis with or without pulp exposure.⁸ The sole reason for adding the antibiotic component to Ledermix was to prevent overgrowth of micro organization and compensate for what was perceived at the time to be a possible corticoid-induced reduction in the host immune response.⁷ Ledermix cement have also shown that the triamcinolone can diffuse into pulp space when placed in a coronal cavity.^{8,9} It is a hard-setting material, it contains triamcinolone and demeclocycline in lower concentrations (0.67% and 2.0% respectively) than in the paste.⁹ As it is a hard-setting cement, it is preferred for pulp capping rather than using the paste form. Researchers have shown that application of corticosteroid/ antibiotic association for short period of time was effective to control inflammation in the pulp tissue without determining changes in the healing process.³

Case report:

A 14-years-old boy came to the Department of Conservative Dentistry and Endodontics at BSSMU with complain of a tolerable, dull pain with mild discomfort associated with eating.

Mild to moderate pain is experienced on thermal stimulation on the mandibular right first permanent molar (tooth no 46). No history of spontaneous and excruciating pulpal pain was reported. Status of the pulp and periradicular tissues was carefully evaluated. The clinical examination revealed a large buccal carious lesion without any frank pulpal exposure. The tooth responds normally to percussion. The gingiva in relation to the tooth appears normal and is asymptomatic on palpation. Radiograph revealed deep buccal carious lesion without pulp exposure. The extent of caries penetration depth is up to three-fourth of entire thickness of dentin. The lamina dura appears normal. No radiolucencies at the periapical regions and normal thickness of the periodontal spaces were noticed in periapical radiograph. The case was diagnosed reversible pulpitis on mandibular right first permanent molar and indirect pulp treatment was planned.

Clinical procedure:

Administered local anesthesia and isolate with cotton roll. Established cavity outline with a high-speed hand piece. Removed the majority of soft, necrotic, infected dentin with a large round bur in a slow-speed hand piece without exposing the pulp. Peripheral carious dentin was removed with sharp spoon excavator on the cavity floor. Cavity is flushed with normal saline and dried with cotton pellets. Covered the remaining affected dentin with ledermix cement (according to manufacturer). Fill or base the remainder half of the cavity with glassionomer cement. Finally composite filling material was done. Patient was recalled after 3 months, 6 months, 9 months and 12 months, vitality was checked and periapical radiograph was taken, there was no sign and symptom both clinically and radiologically.



Fig.-1: Pre-operative figure showing large buccal carious lesion of lower first permanent molar.

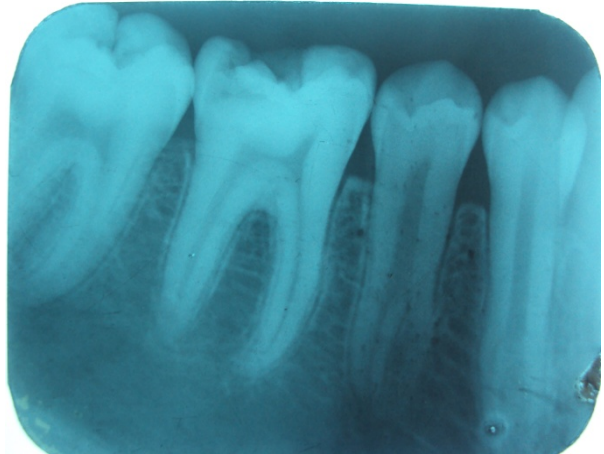


Fig.-2: Radiograph showing buccal carious lesion penetrate deep to three-fourth of entire thickness of dentin without pulp exposure & periapical radiolucencies.



Fig.-3a



Fig.-3b



Fig.-3c



Fig.-3d

Figure 3(a,b,c,d): Clinical procedure Showing (a) After removal of caries.(b) Covered the remaining affected dentin with ledermix cement.(C) Filled the remainder

half of the cavity with glassionomer cement.(d) After final (composite) filling.



Fig.-5c

Fig.-4: Post operative radiograph showing radiopacity (due to restoration) on the crown area on tooth no. 46 without pulpal involvement.



Fig.-5a

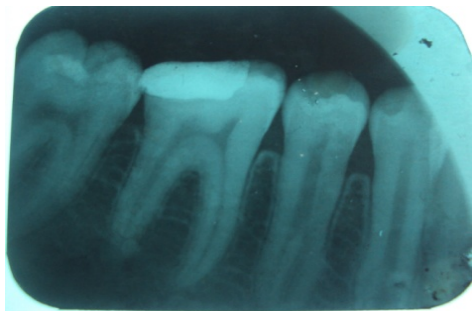


Fig.-5b

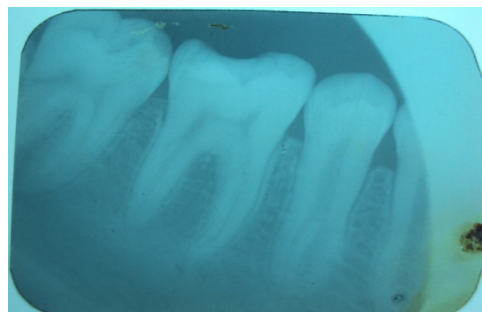


Figure 5(a,b,c): Follow up radiograph after (a) 3 month (b)9 month (C)12 month, showing no definite sign and symptom.

Discussion:

The choice for IPT in this case was based on careful pulp diagnosis, which was supported by evaluation of clinical and radiographic findings. Removal of caries is one of the most basic activities in dentistry. When caries is deep, every restorative dentist is faced with the question of the best way to proceed: is it better to remove all caries regardless of pulpal consequences, or stop and not expose the pulp? When practitioners in a dental Profession were given a hypothetical scenario that involved this question, only 17% responded that they would stop, leave the remaining caries in place and restore the tooth.¹⁰ Several studies show restored teeth with partial caries removal have equal success compared to restored teeth with complete caries removal. Partial caries removal significantly reduces the chance of pulp exposure during caries excavation.¹¹⁻¹³

Active caries lesion can be distinguished into two layers: infected dentin which is a superficial soft layer of collagen fibrils partially degraded that cannot be remineralized; and affected dentin, which is partially demineralized, with intact collagen fibrils that can be remineralized.¹⁴ However, the clinical recognition of these two layers is a difficult task because not only color and consistency of the dentin are absolute indicators of decayed tissue.¹⁵ Experience and clinical judgment are essential skills for appropriate removal of infected dentin, leaving the potentially remineralizable affected dentin. For some authors it is not necessary the complete removal of decay in a second step^{16, 17}. Their clinical and radiographic results support the theory that the decay Process was apparently arrested after IPT with a single visit procedure¹⁶. The second appointment may not be necessary, if the final restoration maintains the cavity sealed and the tooth asymptomatic¹⁸.

In the literature retrospective and prospective studies showed that in both dentitions the success rate for IPT is similar, ranging from 73% to 95% after 2 weeks to 11 years of follow up^{1, 16, 19}. To search the ideal vital pulp therapy material,

researchers investigate many different materials such as Ca (OH)₂ compound, Zinc oxide, Calcium phosphate, polycarboxylate cement, antibiotic and growth factor combination, Resin modified glassionomer cement and recently MTA. Other studies have included ledermix, antibiotic mix, glyceric acid, potassium nitrate and dimethyl isosorbide.³ But each of these pulp capping materials has its own limitations and defects.

At present Calcium hydroxide is the most commonly used indirect pulp capping material which was introduced to the dental profession in 1921 and has been considered the “gold standard” of pulp capping materials for several decades²⁰. Many researchers agree that calcium hydroxide encourages the formation of dentinal bridges.²¹ It has some disadvantages also. The self-cure formulations are highly soluble and are subject to dissolution over time²². It has no inherent adhesive qualities and provides a poor seal²³. Ca (OH)₂ has been shown to be cytotoxic in cell cultures, does not exclusively stimulate reparative dentin formation, shows poor marginal adaptation to dentin, and induce pulp cell apoptosis.²⁴ The material can be degraded and dissolve beneath restorations, and it can also suffer interfacial failure upon amalgam condensation. It produces a gap between the dentin interfaces when used with bonding resins. Another criticism noted of calcium hydroxide is the appearance of so-called “tunnel defects” in reparative dentin formed underneath calcium hydroxide pulp caps^{23, 24}. The disintegration of Ca (OH)₂ under restorations associated with defects in the dentinal bridge can provide microorganisms with a pathway for penetration into pulpal tissue and the subsequent stimulation of circulating immune cells, inducing pulpal irritation and potential pulpal calcification and obliteration.

Many authors have observed the clinical efficacy of corticosteroid-containing materials used as either direct or indirect pulp-capping agents in reducing pulpal inflammation and pain. This was due to their two major functions as medicaments – namely, anti-inflammatory action and antimicrobial action^{9,25}. They also help to ensure effective and rapid pain relief for patients. Other functions of these medicaments include the

inhibition of clastic cells that are responsible for root resorption and the stimulation of hard tissue repair (such as bone and cementum).^{9,26} Ledermix cement is also used as a sedative dressing or lining under temporary or definitive restorations in teeth with reversible pulpitis.^{8,9} Ledermix Cement has been shown to release triamcinolone which then diffuses through the dentine to reach the pulp space. Approximately 70% of the triamcinolone is released by the end of the first day and the remainder is released by the end of the third day following application to a cavity floor.⁹ In a study ledermix cement applied as an indirect pulp capping or lining material in 85 teeth with reversible pulpitis due to the presence of cracks in the teeth. Removal of the crack and caries was followed by the placement of Ledermix cement and an interim glassionomer restoration, complete resolution of symptoms occurred immediately in 71% of the patients. A further 21% of cases had resolution of the symptoms within 1 day, 6% took 2 days and 3% took 3 days. On a follow-up after three months, 98% of the teeth showed signs of the pulpitis having completely resolved and the pulps had returned to a clinically normal state.⁸ After the triamcinolone is released from Ledermix Cement, the remaining cement is essentially a zinc oxide-eugenol material with calcium hydroxide. Both of these components have well known therapeutic effects on the pulp. Calcium hydroxide has beneficial effects on the healing of dental pulps and the formation of reactionary/reparative dentine.^{27, 28} Whilst the eugenol has both anti-inflammatory and anti-bacterial action depending on the concentration reaching the dentine and pulp as it is released by progressive hydrolysis occurring at the cavity floor^{29,30,31}. Tetracycline form a strong reversible bond with the dental hard tissues and that they exhibit slow release and diffusion through dentine over an extended period of time up to at least 12 weeks. Demeclocycline is used for its antimicrobial action and it also has some limited ability to inhibit the clastic cells involved in root resorption.^{32,33,34}

Conclusion:

Since the beginning of modern dentistry, researchers have endeavored to better understand and expand their knowledge of pulp physiology, microbiology and caries progression. The

challenge is to identify a reliable pulp capping agent and a suitable delivery technique. Identification of a reliable pulp capping agent and a suitable delivery technique is challenging. Though $\text{Ca}(\text{OH})_2$ is widely used, less expensive and gold standard as an indirect pulp capping material, it has no anti-inflammatory action. On the other hand Ledermix has anti-inflammatory and antibacterial properties. It also has the ability to form secondary dentin like $\text{Ca}(\text{OH})_2$.

Bangladesh is a developing country. Endodontic Dentistry in Bangladesh is developing step by step. Continuous exploration of new equipments and materials in a regular basis is mandatory to enrich endodontic dentistry. For many years ledermix has been a popular endodontic medicament in Europe and Australia mainly due to its anti-inflammatory action over $\text{Ca}(\text{OH})_2$. Various clinical and research works had been done and scientific papers also had been published in well known dental journals supporting its advantages. So this study will be an attempt to evaluate ledermix as a pulp capping agent in order to minimize pulp inflammation and consequently to provide relief of postoperative pain and sensitivity and there by the patients will be benefited.

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