

The Effectiveness of Using Pulpotec® in Treatment of Pulpitis by Pulpotomy of Vital Deciduous Molar and Vital Immature Permanent Molar

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المُلخَصَة

الاهداف: لتقييم فعالية معجون Pulpotec® في معالجة التهاب لب السن باستخدام طريقة بتر لب السن للأضراس النفضية الحويبية والأضراس الدائمة الغير ناضجة للأطفال. المواد وطرائق العمل: ثلاثون طفلاً من كلا الجنسين اختيروا من المرضى الذين تمت احوالتهم إلى قسم طب أسنان الأطفال، كلية طب الأسنان، جامعة الموصل بثلاثين سن [□] ضرس لبني ثاني أساسي [□] ضرس دائم ي أولي غير ناضج، سن واحد لكل طفل. السن كان يبينج باستخدام المخدر الموضعي و إجراء وإستعمال Pulpotec كمعجون سد بعد ازالة لب السن التاجي و يَحْتَمُ السن بالحشوة المؤقتة. بعد [□] ساعة يتم وضع الحشوة النهائية. فحَصَتُ الأَسْنَانُ المُعَالَجَةُ سريريا وإشعاعياً بعد [□] و [□] شهور. و تم تسجيل أي أدلة بالتغييرات الباثولوجية. **النتائج:** كَشَفَتُ الفحوص السريرية والأشعاعية بأن كُلَّ الحالات تُشَوِّفُ صورة فسلجية صحية وكان هناك دليل واضح من تشكيل الجذر المستمر في الأضراس الدائمة الغير ناضجة. **الإستنتاجات:** النتائج الإيجابية لتجربة الطبية للمستحضر 'Pulpotec' تُمَكِّنُهَا للإستعمال في الممارسة السريرية الشاملة..

ABSTRACT

Aims: To evaluate the effect of two types of disinfectant solutions (2% alkaline glutaraldehyde, 1% sodium hypochlorite) in wettability of three types of elastomeric impression materials (light body) which are used in crown and bridge restorations at different times of immersion. **Materials and methods:** Three types of elastomeric impression materials (light body) were formed on a flat acrylic resin block and allowed to set (five specimens of each impression material was done for each immersion time (15, 30 and 60 minutes) of each disinfectant solution in addition to control groups). The wettability is indicated by measuring the contact angle of aqueous solution of CaSO₄ on surface of cured impression materials. **Results:** indicated no significant effect of immersion times on wettability of three types of impression materials. The hydrophilic type produce high wettability. **Conclusions:** The disinfectant solutions have different effects on each impression material. Sodium hypochlorite has the greatest beneficial effect on wettability.

Key words: Pulpotec®, pulpotomy, deciduous teeth.

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INTRODUCTION

The primary objective of pulp therapy is to maintain the integrity and health of the teeth and their supporting tissues. The treatment objective is to maintain the vitality of the pulp of a tooth affected by caries, traumatic injury, or other causes. Especially in young permanent teeth with immature roots, the pulp is integral to continue apexogenesis. Long term retention of a permanent tooth requires a root with a favorable crown/root ratio and dentinal walls that are thick enough to withstand normal function. Therefore, pulp preserva-

tion is a primary goal for treatment of the young permanent dentition. A tooth without a vital pulp, however, can remain clinically functional⁽¹⁾

The indications, objectives, and type of pulpal therapy depend on whether the pulp is vital or nonvital, based on the clinical diagnosis of normal pulp (symptom free and normally responsive to vitality testing), reversible pulpitis (pulp is capable of healing), symptomatic or asymptomatic irreversible pulpitis (vital inflamed pulp is incapable of healing), or necrotic pulp.⁽²⁾

Teeth exhibiting provoked pain of short duration relieved with over-the-counter analgesics, by brushing, or upon the removal of the stimulus and without signs or symptoms of irreversible pulpitis, have a clinical diagnosis of reversible pulpitis and are candidates for vital pulp therapy. Teeth diagnosed with a normal pulp requiring pulp therapy or with reversible pulpitis should be treated with vital pulp procedures.⁽³⁻⁷⁾

Pulpotomy, a therapeutic procedure, is used in reversible inflammation of pulp of primary and immature periapex permanent teeth, when the radicular pulp tissue has remained healthy and is capable to serve healthy for long term until normal exfoliation.⁽⁸⁾

Complete pulpotomy (also known as cervical pulpotomy) is the removal of coronal pulp tissue and the placement of a wound dressing on the canal orifice. Complete pulpotomy will arrest dentin formation in immature permanent teeth and can result in obliteration of the root canals. It

should be followed by complete endodontic therapy when root development is completed. Partial pulpotomy (also known as pulp curettage), removal of only the outer layer of damaged and hyperemic tissue in exposed pulps, is considered to be a procedure staged between pulp capping and complete pulpotomy.⁽⁹⁾

Formaldehyde derivatives have been used as acceptable, high successful, and the most common capping material for the fixation of the pulp for many years.⁽¹⁰⁾ Success rate of pulpotomy with formocresol has been comprised with sulfate ferric, electrosurgery⁽¹¹⁾ glutaraldehyde⁽¹²⁾, laser⁽¹³⁾ and mineral trioxide aggregate.⁽¹⁴⁾

Pulpotec[®] obturating paste (Produits Dentaires S.A., Switzerland) is radiopaque, non resorbable paste for the treatment of pulpitis by pulpotomy in vital molars, both permanent and deciduous. It manufactured in form of powder (polyoxymethylene, iodoform, excipient) and liquid (dexamethasone acetate, formaldehyde, phenol, guaiacol, excipient) (Figure 1).



Figure (1): Pulpotec[®] obturating paste (Produits Dentaires S.A., Switzerland) used in this study.

The aims of the present study were to evaluate the effectiveness of Pulpotec[®] obturating paste (Produits Dentaires S.A., Switzerland) in treatment of pulpitis by pulpotomy of vital deciduous molars and immature permanent molars of children. Follow up extended to 6 months, each 2 month recall to evaluate the treated teeth-clinically and radiographically.

MATERIALS AND METHODS

Thirty children of both genders were selected from patients who referred to the Department of Pediatric Dentistry, College of Dentistry, University of Mosul with thirty teeth (15 primary second primary molars and 15 immature first permanent molars), one tooth per child. Children ages ranged from 4-7 years and all of them

were healthy and cooperative. Full detailed treatment plans were explained to the children's parents and written consents for treatment were obtained prior to clinical procedures. The criteria for tooth selection in this study were:

1. Second primary molars or immature first permanent molar with vital carious pulp exposures that bled upon entering the pulp chambers.

2. Absence of any clinical and radiographic evidence of pulpal degeneration such as pain on percussion, history of swelling or sinus tracts.

3. Absence of radiographic signs of internal or external resorption and no furcation radiolucency.

4. Teeth that could be restored with proper restorations.

First, the tooth was anesthetized with local anesthetic agent (Septodont, France). The treatment included caries removal followed by pulpotomy, which is, removing the inflamed pulp to orifice level with a large high-speed round diamond bur accompanied with copious irrigation. High-speed rotary instrument was used in order to avoid tearing the radicular fibres and take care to eliminate all the cameral pulp. Associated bleeding in all the cases indicated pulp vitality. Hemostasis was achieved by irrigation with sterile normal saline along with gentle application of small pieces of sterile cotton pellets for five minutes.⁽¹⁵⁾

According to the manufacturer's instructions, Pulpotec liquid was mixed with Pulpotec powder and blended to obtain the required thickness, creamy consistency of the paste. The paste was inserted into the pulp-chamber. Presence of small quantities of blood does not affect the efficiency of Pulpotec. The cavity was air dried just prior to applying the paste. Seal with a reinforced zinc oxide eugenol cement (Produits Dentaires SA, Vevey/Switzerland). A cotton roll was placed between the 2 dental arches and the patient was requested to bite progressively but firmly, so that the Pulpotec paste clings to the walls of the pulp-cavity as well as to the root-canal orifices. Setting time of Pulpotec is approximately 7 hours. The second session took place after

24 hours, after the initial Pulpotec insert was set. The treatment was then completed by setting the final tight obturation with amalgam. This was directly placed on the Pulpotec, leaving a thin intermediary layer of temporary cement to insulate Pulpotec from the final obturation material.

Patients were re-examined after 2, 4 and 6 months intervals. At each visit, the treated teeth were examined clinically and radiographically. The outcome of success or failure was determined by the following clinical and radiographic criteria.⁽¹⁶⁾

- Presence of any signs such as spontaneous or nocturnal pain, tenderness to percussion or palpation, abscess, swelling, fistula and pathologic mobility was definitively indicative of clinical failure.
- Lamina dura of the pulpotomized teeth, examined on high quality periapical radiographs were compared with their radiographs before treatment. Observation of partial loss of the lamina dura or widening of the periodontal ligament (PDL) was recorded as a radiographic failure.
- Presence of any sign of pathologic external or internal root resorption as well as periapical or inter-radiolar radiolucency was definitively demonstrative of radiographic failure.
- Presence of encouraging continued root development. Absence of any changes was recorded as a radiographic failure.

RESULTS

Immediate pain relief after treatment in 80% of cases; mild pain which lasts only 2 to 3 days in 20% of cases. These teeth are clinically mute and function normally.

Clinical and radiographical examinations carried out on follow up visits revealed that all cases showed a healthy physiological image with no trace of any pathological changes. Concerning the treated immature permanent molars, there was clear evidence of continued root formation that was observed radiographically in the follow up visits (Figures 2, 3).

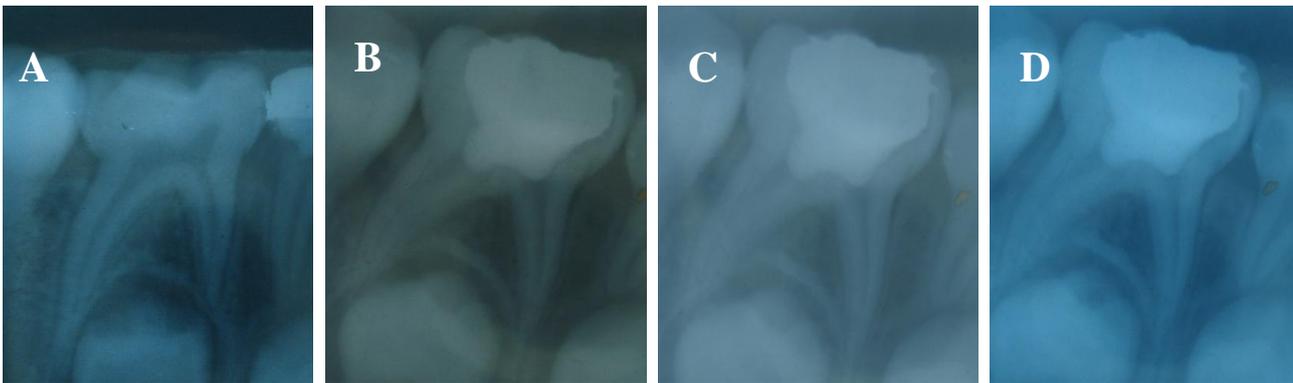


Figure (2): Radiographical views of vital pulpotomy using Pulpotec® in deciduous tooth. A: preoperative. B: after 2 months. C: after 4 months. D: after 6 months.

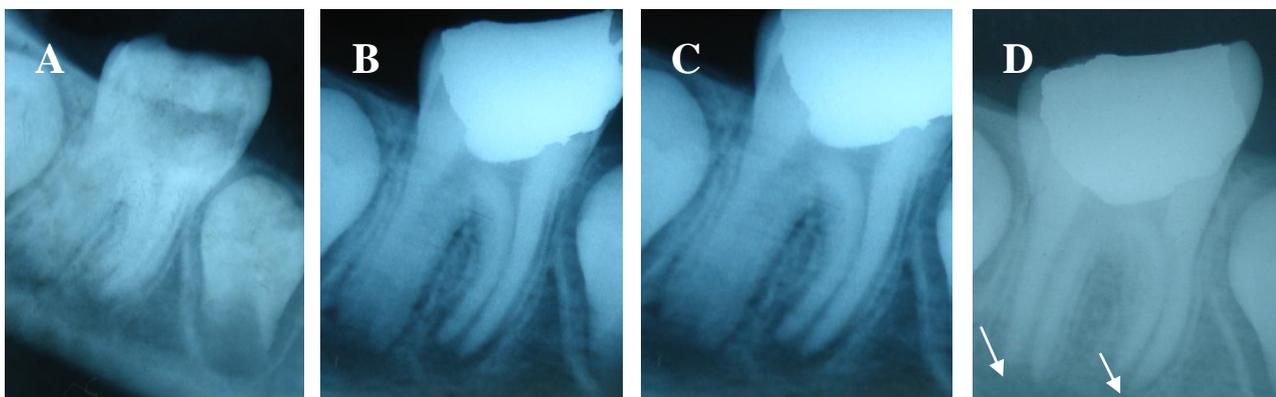


Figure (3): Radiographical views of vital pulpotomy using Pulpotec® in permanent tooth. A: preoperative. B: after 2 months. C: after 4 months. D: after 6 months. Note there was some continued root formation after 6 months (arrows).

DISCUSSION

The main indication for use of ‘Pulpotec’ is treatment of odontitis in temporary and permanent teeth of children is to keep the root pulp viable. The problem is not solved till now due to uncertain results of use of preparations based on calcium hydrate, eugenol paste, glutaronic aldehyde, etc. in vital amputation method. Viable pulp in root canals serves as safe barrier for germ intrusion into periapical tissues preventing from development of dental infection. Infection of tissues surrounding roots of the temporary tooth makes a big danger for rudiments of permanent teeth as it may tend to be a violation in the normal development and even to loss.⁽¹⁶⁾

They do not possess materials meeting all demands in full for vital amputation of pulp till now. The preparation used shall provide haemostatic, anesthetic, antiphlogistic and long-term antiseptic state of pulp’s stump and its hermetic closing.⁽¹⁷⁾

This clinic trial of ‘Pulpotec’ provided was aimed to estimate its effectiveness and tolerance by patients, detection of possible complications or any pathological changes during the process of treatment, in the nearest time afterwards and dynamic observation up to 6 months with X-ray control at stages of the treatment.

Easiness and simplicity of use of ‘Pulpotec’ were ascertained during this study. Also mentioned by Tairov and Melkhov⁽¹⁸⁾ that the ‘Pulpotec’ paste hardens quickly after mixing of ingredients that preventing isolation of volatile fractions, providing optimal conditions for depositing of cavity liner and seal and decreasing the time for treatment radically. Preparation does not adhere to tools and does not strive after them, it has good adhesion ability relatively on tooth cavity sides. It is important to mention that a uniform paste is produced after mixing of ingredients of the preparation having no

pungent, foul smell and causing no negative reaction of the patient.

Keeping of children's pulp viable in permanent teeth with incomplete development of roots is the most actual thing because only at the condition of the normal functioning of the root pulp the final development of a root, closing of the apical opening and development of the valuable periodontal membrane are possible.^(19,20)

It has been found that despite removal of the pulp crown portion, a root pulp may be partly viable. At first glance this occurrence may be considered doubtful because of the mummification properties of the components, but we suggest a mummification process refers to the pulp mouth part which closely adjoins the Pulpotec layer while the apical portion remains viable enabling some continues root formation of the immature permanent molars which may be related to the limited follow up periods of this study, meanwhile Taorov *et al.*⁽²¹⁾ stated that the root formation completed required more time. These findings helped gain more recognition for vital pulpotomy as a strong possible alternative therapy when pulps are exposed by deep carious lesions in immature permanent molars. The rationale for this therapy is to remove the infected and/or inflamed pulpal areas beneath the carious lesion and disintegrated tissue. A rapid and simplified procedure would allow the general practitioner to perform this procedure when necessary at dental clinics, without specialist facilities under conditions that avoid unnecessary contamination of the pulp.^(17,18)

CONCLUSIONS

According to the clinical trials provided the high efficiency of 'Pulpotec' for treatment of odontitis in molars of temporary and permanent teeth by vital amputation method and absence of negative dynamics during 6 months of the observation were ascertained. The preparation surpasses in efficiency similar drugs being in possession of pediatric dentists. Simplicity in use, absence of pain symptoms during the treatment, decreasing of terms of treatment to two visits, keeping of pulp vital shall be considered to be advantages of the preparation. Positive results of clinical trials of 'Pulpotec' preparation enable

to recommend it for use in extensive clinical practice.

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