

Radicular Pulp Therapy for the Primary Dentition

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Abstract: Objective: *The aim of this research was to screening the radicular pulp therapy for the primary teeth. Materials and methods:* *There were two different clinical procedures were used in this study one was single visit and another one was multiple visits. Out of those two single visits was more preferable. Various methods were also used to determine the working length of the teeth. Results:* *We found normal and healthy soft tissue after the treatment. No pathologic resorption associated with bone rare fraction also seen. Radiographic treatment was successful without evidence of bone reabsorption and no periapical radiolucency formation postoperatively. Conclusions:* *Pulpectomy is meant to protect the main teeth that are missing. The pulpectomy technique consists of debridging and widening canals with graded files in advance of shuttering.*

Keywords: *Pulpectomy, pulp, primary teeth, radiographic, treatment.*

1. INTRODUCTION:

Thousands of investigations, millions of hours, and innumerable words have been directed towards maintenance of dental pulp. One valid question is "Why the vitality of pulp is essential." During tooth life, essential pulp tissue formed by biological or pathological stimuli continuously produces secondary or reparative dentine. Pulp tissue keeps dentin supple and moist and, in turn, assures protection from forces of mastication.¹

Premature loss of teeth due to pulpal involvement as a sequela to traumatic injuries or dental caries creates a special problem in the child. The resultant mesial drift of the permanent teeth may lead to malocclusion. Tooth replacement techniques such as fixed bridgework or partial dentures that are readily performed for the adult patient cannot be easily utilized in the child because of the changes taking place in the mixed dentitions.

Although space maintenance techniques for children are adequate, many do not restore function and all require constant monitoring of the appliance following insertion.

It is desirable to maintain pulp vitality whenever possible. Pulp autolysis can be stabilized, however, or the by greatly affecting tooth work, pulp can be completely removed. Endodontic procedures are preferable to space maintenance in preserving arch integrity if the tooth can be rendered free of pathology and restored to normal function.^{2,3}

At times, the concerns and challenges in considering endodontic treatment in children vary from those in adults. The objectives of the procedure include preventing infection and chronic inflammation, thus alleviating the discomfort involved. For the good masticatory function and future eruption of the permanent teeth with an optimum development of occlusion, maintenance of the arch length is necessary. As a basic guideline, a tooth should be retained instead of being removed.

There are important considerations to be made as to patients' stability for handling. The patient's general health must be reviewed so that endodontic therapy is not contraindicated. The parent's approach to care and the willingness of the child to work together for longer treatments need careful evaluation. When designing a care plan, the general dental health of the child must be taken into consideration, with special respect to the caries experience.

The complications of endodontic treatment for children refer primarily to root canal anatomy and potential pathologic changes in the primary tooth and the complications associated with inadequate root development in the permanent teeth.⁴

Historically, guidelines for pulpal therapy were established by empirical methods. Controlled experimentation is a relatively recent method of evaluating dental pulp response to various techniques. Today, as clinicians, we may acquaint ourselves with experimental findings by reviewing the voluminous literature published on a nearly daily basis. Before implementing the findings of any one investigation, a critical evaluation of materials utilized must be made.

Results from animal tissue are not necessarily applicable to human tissue largely because, as organisms increase in complexity, circulation requirements multiply accordingly, healing time lengthens, and entire process becomes more subtle. Fortunately a growing number of studies now conform easily to reproducible formats and employ uniform standards of evaluation^{5,6,7,8}. Artifactual problems, as with sectioning and fixation, can be largely eliminated with the use of advanced laboratory technique. The burden of interpretation, however ultimately lies with the clinician.¹ Objectives of nonvital pulp therapy for primary teeth are:⁹

1. The infectious process after diagnosis can be identified as indicated by the resolution of clinical and radiographic signs and symptoms of adverse pre-treatment.
2. Radiographical proof of effective filling without gross overfilling and underfilling should be given.
3. The treatment would allow the primary radical structures and materials to be resorbed in a reasonable period and allow the succedaneous tooth to erupt normally.
4. Radiographic proof of further disintegration of supporting tissues should not be available.
5. Therapy should relieve more sensitivities, discomfort or swelling, and avoid them.
6. External resorption or other physiological changes should not be demonstrated.

2. MATERIALS AND METHODS

Clinical Procedures

There are different spool of thought of doing pulpectomy: single visit partial pulpectomy^{6,7} and multiple visit pulpectomy. But the single visit pulpectomy is advisable for the expected outcome is long term.

Step by step procedures for pulpectomy:

1. Pre-operative radiograph is taken to ascertain the status of the tooth, root length and its relation to the succedaneous tooth.¹⁰

2. Anaesthesia⁸: Profound anaesthesia is needed for the removal of vital pulp tissue. Unless obtained, the result is not only a distressed patient but also an inadequately performed operation.

3. Placement of the rubber dam: ^{3, 11, 12} It serves a variety of functions thus acting as the best

means of isolating the tooth from saliva. The use of rubber dam is mandatory as with any pulpal procedures.

4. Removal of carious dentin and faulty restorations⁸: All carious lesions and faulty restorations have to be removed and clean surroundings established so as not to further infect the pulp in the canals once the chamber is opened.

5. Surface sterilization: During root canal treatment, instruments may inadvertently touch the rubber in the vicinity of the tooth, sometimes without the operator's knowledge. The surface of the rubber immediately adjoining and opposite to the tooth is therefore usually also sterilized. All the operating instruments should be sterilized before pulpectomy procedure, so that it should create aseptic condition during procedure.^{13, 14}

6. Access opening for pulpectomy on primary teeth: Preparing access is the most critical significant root canal treatment technical process. Access is the secret to optimizing washing, shaping and sealing^{15, 16}

7. Determination of working length of the tooth: The period of research is used to denote the

Range to the point of coronal measurement between the apical limit to the instrumentation.

In the endodontic glossary, the working length is specified as a distance between a coronary reference point and the point of termination of the canal preparation and sectioning.¹⁷

Methods of determining working length

To measure the working length of tooth followings are determination methods, out of which electronics method is most preferable.

1. Determination of working length by radiographic method
2. Precision of estimates of work period by direct optical xeroradiography
3. Functional length determination by remote touch
4. Apical periodontal sensitivity assessment of working times.
5. Determination of working length by paper point measurement
6. Determination of working length by electronics

8. Removal of pulp tissue and root canal debridement: The coronal pulp is removed as in pulpotomy technique using a sharp spoon excavator⁷. In order to properly perform root canal therapy, the clinician should be familiar with the morphological changes occurring in primary teeth related to physiologic root resorption and differences between primary and permanent root canal anatomy³.

9. Irrigation and drying: Instruments used for irrigation systems minimize Fracture risk due to the solution's lubricant action.

10. Intracanal medicaments: The term 'Intracanal medicament' denotes the application of an antiseptic agent to the walls of the pulp cavity with the object of eliminating microorganism still present after cleaning.

11. Obturation: Developmental, anatomic, and physiological differences between primary and permanent teeth call for differences in the criteria for root canal filling materials².

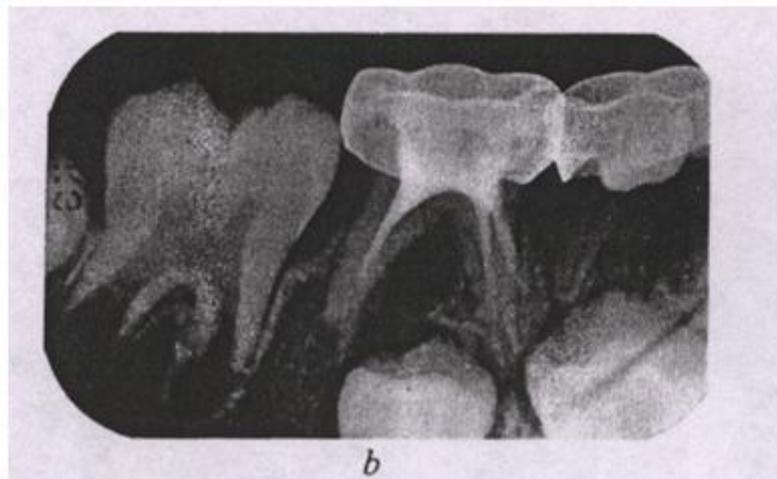
Final restoration following pulpectomy^{6, 7}: In certain dentists the permanent restoration of a tooth has been a common procedure in weeks or months. The goal was to provide time for the completion of the treatment procedure. Yet deficiencies only become apparent months later. Therefore, the period in which the tooth is replaced with a paste to densify the tooth properly and avoid oral fluids is one cause for failure to treat the pulp.

3. PULPECTOMY OF NON- VITAL MANDIBULAR SECOND PRIMARY MOLAR

Fig-1: Preoperative Radiograph



Fig-2: Postoperative Radiograph



4. RESULTS

SUCCESS OF PULPECTOMY

Clinical criteria¹⁸

1. No irregular flexibility
2. No compassion to drumming
3. Strong arrival of the lenient tissue

Criteria for radiographic success^{19,20,21,22}

Root therapies have historically been deemed effective without bone rarefaction pathologic resorption.

Payne et al²³ Say that most doctors are prepared in the absence of clinical signs and symptoms to take the main, treatment-pulp teeth with a minimal amount of radiation and/or pathological root resorption. This relies on the promise that if there is an urgent problem, the

parents will contact the dentist and the patient will return in 6 months after a retri al. In the majority of literature research, according to Payne at al, these teeth were deemed "appropriately treated" Such requirements are more acceptable and scientifically recognized for paediatric dentists by Fuks et al.

Radiographic criteria

1. No bone or root resorption proof except in conjunction with the exfoliation process³⁵
2. A bifurcation radiolucency resolved 6-12 months postoperatively
3. No periapical radiolucency formation postoperatively³⁷

5. DISCUSSION

Primary teeth endodontics have been advocating for a long time because the conditions for the conventional treatment of pulpotomy cannot be met. Pulpectomy is also prescribed for teeth with persistent inflammatory symptoms with and without periapical involvement of the radicular pulp or pulp necrosis²⁶. Due to the combination of resorption and hard tissue deposition the endodontic anatomy of primary molars is difficult to predict. The resorption induces drilling lacunas through the root wall, also at the furcation point, and modifies the form, size and location of the endodontic apex²⁴. The high incidence of furcation radiation in primary molars was due to the presence of accessory channels on the human primary molar bifurcation region. (Winter, 1962).

Also, the pulpal floor in primary molars may be more porous and permeable (Moss et al, 1965). The accessory canals and porous pulpal floor, which is thinner in primary than in permanent teeth, may permit the diffusion of inflammatory exudates more readily; this would explain the high incidence of inter-radicular rather than periapical pathology in necrotic primary teeth⁷. The high frequency of accessories networks in the primary teeth furcation region shows that better scientific attention is required during endodontic and periodontal administration.

Sweet Mentioned the four- or five-step formocresol technique for fistulae-free pulpless teeth. Starkey in 1968 recommended a single visit partial pulpectomy for a vital tooth. In cases of necrotic pulp and periradicular involvement, Starkey's multiappointment approach was promoted. Coronal pulp debris were collected at the first meeting, but canals were not used. A pulp chamber was used to position a drug like formocresol or camphorized monochlorophenol, sealed with IRM for 1 week. Since the tooth and underlying gingival tissues at the second visit were asymptomatic and clinically negative, the channels were washed and decomposed mechanically and then lined with ZOE cement⁵.

Several methods have been put forth for the determination of working length of the tooth of which radiograph with the file in place is most widely employed. However, according to Curzon MEJ, Roberts JF and KennedyDB, a diagnostic file radiograph is not needed to assess root length as in permanent teeth⁷. Locators in the electronic apex minimize the necessary number of X-rays and help create complexity when X-rays are applied. These may also signify cases in which the foramen is a certain distance from the X-ray apex. The invention of the electronic apex locator has led to an accurate and consistent measurement of working time. (Fouda& Reid).¹³Barr E. S. et al in 2000¹⁴ advocated the use in primary teeth of nickel rotary titanium files for root canal tools. The simplicity and nature of the device permits the file to follow the root channel route closely. Research have shown how safe and effective root canal preparation with NT in permanent teeth is. Main teeth may be subject to the same definition. The tortuous and irregular canal wall of primary molars is effectively cleaned with NT because pulpal tissues and dentine are pushed out of the channel when the files are engaged in the clockwise motion of rotating files. FlexMaster, Machine GT, HERO 642, K3, ProTaper, and RaCe are the separate rotary nickel titanium (Ni-Ti) instruments ¹⁵.

ProTaper instruments caused greater widening of canals compared to K3 or RaCe and also showed a tendency to ledge or zip formation at the end-point of preparation. Less tapered, more flexible instruments, like K3 and RaCe are advocated in the apical preparation of canals with a complicated curvature¹⁶. However, it was found that ProTaper instruments created more regular canal diameters. All Ni-Ti systems maintained the canal curvature, were associated with few instrument fractures and were more rapid than a standardized manual technique¹⁵.

Irrigation of the root canal along with instrumentation is a must due to lubricating and antimicrobial effects²⁰. Different irrigants used are sodium hypochlorite, hydrogen peroxide, urea, saline, EDTA etc. Of these a combination of sodium hypochlorite and hydrogen peroxide are most common. Though previously a 2.6% to 5.2% sodium hypochlorite was recommended¹⁷, it is now believed that a Water of 0.6% of sodium hypochlorite dissolves necrotic but not essential tissues and is much less toxic to periodontal cells than a 5% water²⁰. However, there have been concerns of sodium hypochlorite being forced out of the tooth apex and injuring the periapical tissue due to which its use is limited in pedodontics¹⁸.

Intracanal medications have been advocated in infected root canals. Formaldehyde and phenol type medicaments have effective antibacterial properties but they have been reviewed for their mutagenic and carcinogenic potentials^{21,22}. Antibiotics have been used but not always recommended due to A possible risk of allergic reactions, sensitization and resistant bacterial strain growth. Because of its antibacterial properties, calcium hydroxide has also emerged as a popular intracanal medicine.²⁰ As the entire spectrum of root-canal microbes has no intracanal medications, polyantimicrobial formulations were used. Intra-channel drugs play a secondary function and should be not used to clean and shape thoroughly²⁶.

All is required is a resorbable, long-term antibacterial properties filling material. Such criteria tend to be fulfilled by iodoform pastes²⁷. Rifkin first showed that 'KRI paste,' which was initially developed in permanent teeth for root canal therapy, could be adapt to primary teeth needs^{27,28}. Garcia – Gordoy long-established the effectiveness of this preparation³⁶ Primary teeth were regularly cleaned and maintained, with essential infection, feral involvement and mobility. The healing rate was impressive. The item is forgiving clinically. The paste can be quickly injected with a syringe into the canals after preparation. Apices are difficult to fill and almost unnecessary. The main thing is to put the paste on the floor of the pulp chamber so that the auxiliary canals that move through the furcation are medicated. When the paste is expressed in the dental space, within one or two weeks it will be absorbed. There is evidence of rapid healing within one week.

Depicted in figure with calcium hydroxide is a promising treatment choice for pulpal necrosis in immaturity teeth, but further studies are required in order to track these teeth for a long time before they have broken erupt²⁹. Mineral Trioxide Aggregate has been shown to be an effective material for pulpotomies, repair of perforations and as a root end filling material⁴¹⁻⁴³. Newer materials like Bone Morphogenic Proteins, hydroxyapatite and platelet derived preparations have been developed^{30,31,32} for use in pulp capping procedures and pulpotomies. But these materials need to be studied further before they can be tried as pulpectomy agents.

6. CONCLUSIONS

The goal of pulpectomy is to maintain the space for eruption of the permanent tooth there by prevent crowding for the future. However, physicians disagree with the effectiveness of primary teeth pulpectomy procedures. Difficulties in preparing primary root canals which have a variable and complex morphology and confusion regarding their impact on successive teeth are dissuading some medical professionals from using the method.

Many dentists are unable to carry out primary teeth root canal care due to behavioural issues, often in paediatrically patients. Nevertheless, the popularity of primary dental pulpectomies has led most paediatric dentists to prefer them to extractions and room management alternatives.

The pulpectomy process consists of debriding and widening the canals with wider files until closure. The biggest drawback for the sluggish resorption of zinc oximoeugenol paste, which is widely used in the U.S. primary root fillings, is that it is always much slower than bone. Throughout South America, Japan and Europe, other root canal pastes containing or changing iodoform by adding calcium hydroxide are used. Easier and more effective pulpectomy therapy are promising iodoform pastes. Vitapex, a mixture of calcium hydroxide and iodoform is a nearly ideal material due to its antibacterial property and resorption in synchrony with the tooth.

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