Endodontics in Primary Molars Using Ultrasonic Instrumentation

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ABSTRACT

Purpose: The purpose of this study, which is a series of consecutive case reports, was to describe and evaluate the protocol used in the treatment of pulpal necrosed of primary molars, used by the dental service of Social Support Foundation of the Moinhos de Vento Hospital, Porto Alegre, RS, Brazil.
Methods: Eighteen primary molars in 15 children, ranging from 4 to 10 years of age, were endodontically treated using ultrasonic instrumentation.
Results: Clinical and radiographic controls showed a success rate of 94%, considering an evaluation time of 14.1±6.3 months.
Conclusions: The use of ultrasonic instrumentation in primary molars with pulpal necrosis succeeded in reducing appointment time and showed a high success rate. (J Dent Child 2008; 75:20-3) Received December 23, 2006 | Last Revision March 24, 2007 | Revision Accepted April 6, 2007.

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The best space maintainer in both primary and mixed dentition is the primary tooth itself, not only because of the clinical crown, but also due to the presence of the roots and periodontium that guide the eruption of the succedaneous permanent tooth. In addition, these teeth stimulate maxillary development, enable proper mastication of food, help the pronunciation of several different phonemes, prevent deleterious oral habits, and contribute to facial aesthetics. Thus, preserving the integrity of primary dentition is important for the adequate development of permanent dentition.[1,2]

Recognizing the importance of the primary teeth, pediatric dentistry has endeavored to preserve these teeth until they are ready to be replaced or, at least, as close as possible to this time. Thus, primary tooth pulpectomy should be done as a routine procedure after proper examination and diagnosis confirms its necessity. In view of this, endodontic treatment is considered the last option for keeping a primary tooth that has irreversibly affected pulp tissue, due to caries or traumatic lesions, in a child.

In pulpectomy, direct and complete intervention of the root canals should be performed, including all the stages of biomechanical canal preparation and filling. Necrotic tissue can only be removed by chemical-mechanical preparation that models the root canal and reduces the number of micro-organisms.[3,4]

Since the pain threshold of pediatric patients, as well as their cooperation in dental procedures, is much lower than in adults, radical endodontic treatment, especially in multirooted primary molars, is usually divided into several sessions. In case of necrotic pulps, 3 appointments are needed. During the first appointment, the following procedures are carried out: radiographic diagnosis, coronal opening, placement of dressing in the pulp chamber, and temporary sealing of the tooth. During the second appointment the canals are biomechanically prepared and filled with resorbable material and the tooth is temporarily sealed.

During the third and last appointment, the tooth is definitively restored. When considering biopulpectomy, the first appointment can be avoided.[5]

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During canal preparation, the use of K-type files with the ultrasonic technique does not eliminate the need for conventional hand instrumentation. It accelerates the treatment, however, enabling the number of appointments to be reduced. In biopulpectomy, the entire treatment of the dental element can be done in only one session.[5]

To verify the efficacy of the ultrasonic technique in the endodontic treatment of primary teeth, the purpose of this paper was to present a series of cases of primary molars with pulpal necrosis, which were treated with ultrasonic instrumentation during biomechanical canal preparation.

METHODS

After the study was approved by the Research Ethics Committee of the Institute of Education and Research of the Moinhos de Vento Hospital, the dental charts of 15 children with 18 necrotic primary molars treated with the use of the piezoelectric ultrasound NAC-Plus (Adiel Comercial Ltda, Ribeirão Preto, SP) were analyzed. This type of ultrasonic appliance produces high-frequency vibrations of over 30,000 Hz, which are extremely useful to obtain better cleaning action and smear layer removal inside the canals.

The endodontic technique used was divided into 2 appointments.

FIRST ENDODONTIC APPOINTMENT

An initial periapical radiograph of the tooth to be treated allows the working length to be determined for the files. In cases in which the permanent germ is located apical to the primary molar, the referred length is measured from the occlusal face of the primary tooth to 1 mm before the root apices of the roots. If the permanent germ is contained between the roots of the primary molar, however, the working length is considered from the primary tooth's occlusal face to the permanent germ's occlusal face (Figure 1).

The appointment involves the following steps:

1. infiltrative anesthesia and rubber dam isolation of the operating field;
2. total removal of the carious tissue;
3. chamber opening and location of the root canals; endodontic dressing placement with a sterile cotton pellet —the dressing of choice was 1/5 dilution of formocresol in alcohol (Inodon, Rio Grande do Sul, Brazil);
4. temporary restoration of the teeth with chemically activated glass ionomer cement.

Figure 1. Initial periapical radiograph of tooth no. S, which contained the first premolar between its roots, showing the determination of the working length.

SECOND ENDODONTIC APPOINTMENT

Seven days after the first appointment, on the second appointment: infiltrative anesthesia, rubber dam isolation of the operating field, and removal of the temporary restoration.

Biomechanical root canal preparation is next performed in association with an irrigant liquid (sodium hypochlorite 1%) and K-type files calibrated to the working length. It is important to explore the canals with a low caliber conventional file to verify their anatomic details. Next, canal instrumentation begins with the patency file and profuse irrigation. Normally, a file caliber 15 is used at this stage. Subsequently, the same file is used with the ultrasonic technique to enlarge the canals rapidly and efficiently. At this stage, the ultrasonic device must be adjusted at the power indicated for endodontics, and used under constant irrigation with the agent of choice which, in the treated cases, was distilled water. The ultrasonic device must be turned on only when the entire working length of the file is inside the canal. When the ultrasound is turned on, vertical movements must be made against all the canal walls, with intervals of 15 seconds, to enlarge and clean it with constant irrigation.

At the end of the ultrasonic instrumentation, the caliber 25 or 30 K-type file is manually used for final canal conformation. Afterwards, final irrigation is done with 1% sodium hypochlorite. With the aid of an ultrasonic appliance, the entire biomechanical root canal preparation process, which takes around 10 minutes, involves:

1. drying the root canals with absorbent paper points of caliber equivalent to the final endodontic file;
2. filling the canals with lentulo spiral, endodontic file or an association of both; the endodontic filling material must be absorbable to allow the primary tooth root resorption process. In the present cases, a paste consisting of calcium hydroxide, iodoform, and propylene glycol was used because it is easy to manipulate and apply, rapidly absorbed in situations of extravasations, and capable of accompanying the physiologic root resorption;
3. vertical compression of the filling material in the pulpal chamber, using a cotton pellet;
4. removing the excessive filling material from the pulpal chamber with cotton pellet imbibed in alcohol;
5. inserting chemically activated glass ionomer cement with a centrix syringe, to serve as a base for the final restoration;
6. final restoration of the tooth, which can be done with composite resin or resin-modified glass ionomer cement;
7. occlusal adjustment, finishing, and polishing of the restoration;
8. final periapical radiograph (Figure 2).

Figure 2. Final periapical radiograph showing adequate filling of the root canals of tooth no. 5 with the filling paste.

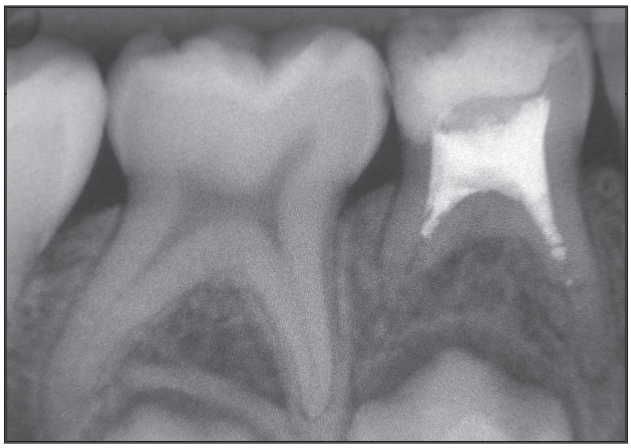

Figure 3. Radiographic follow-up of tooth no. 5 after 6 months. The loss of material from the apexes of the roots denotes the natural process of primary tooth resorption.

After the endodontic treatment, the tooth was periodically followed-up with clinical and radiographic exams (Figure 3).

RESULTS

A total of 18 cases with pulpal necrosis in primary molars were treated with the described technique in 15 children: 10 boys and 5 girls. Three children needed to undergo endodontic treatment in 2 molars each. The patients' ages ranged from 4 to 10 years old (mean age=6 years, 6 months).

The success rate was 94% (exact binomial 95% confidence interval=73%-100%) with a mean follow-up of 14.1±6.3 months. The only case of failure was due to the fracture of a primary molar that had to remain with a temporary restoration. This failure was observed in the third month of follow-up.

DISCUSSION

The use of the ultrasound in the endodontics of primary teeth allows a reduction in the number of clinical appointments. In addition, the referred reduction in attendance time results in decreased physical and emotional stress in pediatric patients and a reduction in costs.[5]

The use of devices that reduce clinical time in pediatric appointments is of great value. It is known that the use of the rotary instrumentation technique in primary molar canals reduced the instrumentation time to one third in comparison with manual instrumentation.[6] The disadvantages of rotary instrumentation, which consists of nickel-titanium files attached to a low speed handpiece are: absence of simultaneous irrigation, high cost of the files, limited life span of the files, and need for previous training. Although the ultrasound technique also requires adequate preliminary instruction for use, the advantages of this device are the possibility of adapting conventional files to the insert and constant irrigation, which prevents deposition of dentinal smear layer and necrotic material inside the canals.

The use of the ultrasonic device in permanent teeth is already widely accepted because of its numerous advantages, such as better canal cleaning, constant irrigation, preservation of dental tissue, reduction of postoperative pain, increased of bactericidal action, improvement in patient's comfort, and shortening of clinical time.[7,8] Since biomechanical preparation of the primary tooth is similar to the technique used in the permanent tooth, there is no reason not to make use of the advantages offered by using ultrasound in the endodontic treatment of children.

In addition to the advantages related to the use of the ultrasound, the Pécora et al (1990) study[9] showed that ultrasonic instrumentation enhances dentinal permeability in the pulp chamber floor when compared with manual instrumentation. This is a very important result when considering a primary molar, in which the endodontic lesion is located in the furcation area, since ultrasonic instrumentation allows great diffusion of medications that are applied inside the canals.

Primary molars almost always present great difficulties for endodontic treatment, because their canal systems are generally atresic, reabsorbed, and altered by the permanent germ. Moreover, primary molars present numerous foramines in the pulpal chamber floor. Because of these characteristics, many dentists choose to extract these teeth.[3,4]

Pulpectomy techniques in pediatric dentistry are still contradictory, and several clinical protocols have been reported. Nevertheless, the traditional endodontic techniques with manual instrumentation may lead to a complex treatment of long duration that often makes it impractical to use in pediatric patients who require minimal appointment time.[6] Considering that the ultrasonic device can make endodontic treatments less time consuming and offer the patient and the operator more comfort, it is of great value in pediatric dentistry.

The use of ultrasound technology in endodontics offers the possibility of facilitating access and dilating atresic canals. Adequate dilation assures a high level of root canal asepsis, better conditions for inserting the intracanal medication, and superior penetration and action of chemical agents as a result of the excellent cleaning of the dentinal tubules.

Furthermore, after using this technique, it is possible to visualize medication extravasations through the accessory and laterals canals, which indicate the quality of the cleaning obtained.[10]

CONCLUSIONS

Based on this study's results, the following conclusions can be made:

1. The use of ultrasonic instrumentation in primary molars with pulpal necrosis enabled the reduction of the children's appointment time, and showed a success rate of 94%, with a mean follow-up time of 14.1±6.3 months.
2. The technique described should be studied in randomized clinical trials to determine its effectiveness in pediatric dentistry more definitively and, therefore, to be adopted on a large scale.

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