Clinical Evaluation of Root Canal Obturation Methods in Primary Teeth

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Abstract

Purpose: This study evaluated in vivo 2 different obturation techniques (lentulo spiral mounted in a slow-speed handpiece and hand-held) in primary teeth.

Methods: The study was carried out on 24 children (mean age=6.71 years) who had received 50 single-visit zinc oxide and eugenol (ZOE) pulpectomies in primary molars. The root canal filling materials were deposited into the canals either by a lentulo spiral mounted in a slow-speed handpiece or by a hand-held lentulo spiral. Evaluation of pulpectomized molars was performed by both authors immediately and 6 months following treatment using specific clinical and radiographic criteria. In cases of disagreement, the lower rank was selected.

Results: The study found 64% (16/25) optimal filling (if 1 or more of the canals having ZOE ended at the radiographic apex or up to 2 mm short of the apex) when the lentulo spiral mounted in the slow-speed handpiece was used. It also found a 96% (21/22) clinical success rate in the group obturated by the lentulo spiral mounted in a slow-speed handpiece vs 48% (12/25) optimal filling and a 92% (23/25) clinical success rate in the group obturated by a hand-held lentulo spiral. The radiographic success for over- and optimally filled canals, when combining both lentulo groups, was significantly greater than underfilled root canals (P=.009).

Conclusions: There was no statistically significant difference between the 2 techniques of obturation, according to the quality of the root canal filling or success rate. (Pediatr Dent 2006;28:39-47)

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The primary objective of pulp therapy is to maintain the integrity and health of the teeth and their supporting tissues. It is desirable to attempt to maintain the vitality of the pulp of a tooth affected by caries, traumatic injury, or other causes. A tooth without a vital pulp, however, can remain clinically functional.[1] Extraction should be considered when:

1. the infectious process cannot be arrested by the treatment methods indicated for nonvital pulp treatment for primary teeth diagnosed with irreversible pulpitis or necrotic pulp;
2. bony support cannot be regained;
3. inadequate tooth structure remains for an appropriate restoration; or
4. excessive pathologic root resorption exists.[1-3]

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Pulpectomy can be one option for treatment of severely infected primary teeth.[4] Pulpectomy involves root canal preparation followed by filling with a resorbable material such as nonreinforced zinc oxide-eugenol.[5] The most popular root canal filling materials for primary teeth are zinc oxide and eugenol (ZOE), calcium hydroxide ($Ca[OH]_2$), and iodoform paste.[6] ZOE is probably the most commonly used filling material for primary teeth in the United States.[7] Both ZOE and Vitapex produce encouraging results.[7]

Many investigations have been carried out to evaluate and compare the success rate of different root canal filling materials used for primary teeth. Previous in vitro investigations of methods of obturation in primary teeth showed good performance of the lentulo spiral over other techniques.[9,10] A single visit pulpectomy has been described by O'Riordan and Coll (1979).[11] Many investigations were carried out using similar techniques and reported favorable results of pulpectomy procedures in primary teeth.[12,13] A recent retrospective study reported that Endoflas F.S. (Sanlorand cfa. en C.S., Colombia, South America) can be used as an alternative root canal filling material for primary teeth. One condition for success is the prevention of microleakage by placement of a permanent restoration.[14]

The methods selected by practitioners to fill the pulpectomized canals of primary teeth are numerous and varied. The obturation materials can be:

1. carried to the pulp chamber and canals by a lentulo spiral;
2. placed in bulk and pushed into the canals with an endodontic plugger or with a cotton pellet; or
3. applied by using an endodontic pressure syringe.[15-18]

It has been reported that the lentulo spiral was most effective in carrying the $Ca(OH)_2$ paste to working length and also produced the highest quality fill.[19] In vitro evaluation of root canal obturation methods in primary teeth have reported superiority of the lentulo spiral mounted in a slow-speed handpiece in filling straight and curved root canals of primary teeth.[9,10] Clinical evaluation of the lentulo spiral in obturation of root canals of primary teeth, however, has not yet been investigated. Therefore, the aim of this study was to evaluate in vivo 2 different applications of the lentulo spiral (lentulo spiral mounted in a slow-speed handpiece and hand-held) in obturation of a root canal in a primary molar.

Methods

Study population

This study was approved by the Ethics Committee of the College of Dentistry Research Center (CDRC) and the College of Graduate Studies, King Saud University, Riyadh, Saudi Arabia. Parental informed consent was obtained prior to the investigation.

The study population consisted of 24 healthy, cooperative children (4½ to 9 years) who had at least 1 primary tooth indicated for pulpectomy. The patients were recruited from the patient population of the Pediatric Dental Clinic at the College of Dentistry, King Saud University.

A full-mouth dental examination and age-appropriate radiographs, including standardized periapical radiographs, were taken of any teeth with possible indication for pulpectomy before the start of the clinical study. To obtain accurate radiographs that would permit good visualization of tooth structure as well as reproducibility, the Rinn XCP instrument (Dentsply Rinn, Elgin, Ill) and radiographic parallelism and standard exposure techniques were used.

Fifty primary molars (17 maxillary and 33 mandibular molars) were included in this study, according to the following criteria:

1. history of spontaneous pain;
2. presence of sinus tract;
3. periapical bone swelling;
4. continuous bleeding after amputation of coronal pulp tissue;
5. no pulp tissue remaining when the pulp chamber was accessed;
6. pus discharge from the canal;
7. evidence of a radicular pathologic lesion with or without caries involvement; and
8. presence of inter-radicular or periapical radiolucency.

Each tooth had to meet any one of the criteria. Selected teeth were divided randomly into treatment groups, according to a table of randomization.

Teeth were excluded when one of the following criteria was present:

1. unrestorable tooth;
2. tooth with pathological lesion extending to the successor's tooth germ; or
3. tooth with evidence of extensive internal/external pathological root resorption.

Technique

All pulpectomy procedures were performed by one investigator. A single-visit pulpectomy procedure was performed using a modification of the technique described by O'Riordan and Coll.[11] Every pulpectomy visit was started by the same protocol for each tooth. The procedures were as follows. First, a preoperative periapical radiograph was taken using the XCP instrument. The tooth was anesthetized and isolated with a rubber dam. Before gaining access, all caries was excavated by a large round bur. The pulp chamber's roof was removed with a no. 330 tungsten-carbide bur in a high-speed handpiece. The pulp chamber was cleaned using a slow-speed no. 4 round bur. Based on the radiographic measurement, the appropriate root canal stopper was placed in position on the broaches and Hedstrom files (Dentsply, Maillefer CH-1338 Ballaigues, France). Complete extirpation of any remaining pulp tissue was carried out using barbed broaches.

The root canal was enlarged, starting with a size 15 hedstrom file used in pull-back action. The investigator symmetrically increased the canal's diameter up to size 35 for mesiobuccal/distobuccal canals of primary maxillary molars and for mesiobuccal/mesiolingual, distobuccal/distolingual canals of primary mandibular molars. The palatal canal of the primary maxillary molar was enlarged up to size 50. All instrumentation was kept 1 mm short of the apex. The root canal was irrigated with 2 ml normal saline after each instrumentation size, which was carried out with a 21-guage needle attached to a 10-mL syringe. After completing instrumentation, the root canal was irrigated with 10 mL of physiological saline. The canal was then dried by using appropriately sized paper points. Paper points slightly moistened with one fifth diluted formocresol (Tricresol and Formalin, CH-1800, Vevey, Switzerland) were placed in each canal for 5 minutes.

A homogenous mixture of ZOE (Temrex, Freeport, NY), according to manufacturer instructions, was used for filling the root canals. The paste was transported into the root canals for each tooth using one of the randomly assigned assessed techniques, either:

1. a lentulo spiral (size 25 for mesial and distal canal and size 40 for palatal canal) mounted in a contra-angle slow-speed handpiece; or
2. a hand-held lentulo spiral.

When the lentulo spiral was held by hand, it was inserted into the canal with clockwise rotation, accompanied by a vibratory motion to allow the material to reach the apex,

and then withdrawn from the canal, while simultaneously continuing the clockwise rotary motion. When lentulo spiral was used in a slow-speed handpiece, it was inserted into the canal, rotated in a clockwise direction, and withdrawn gently from the canal while still rotating. A rubber stopper was used to keep the lentulo spiral 1 mm short of the working length, and the process was repeated 5 to 7 times for each canal until the canal orifice appeared filled with the paste.

The pulp chamber was covered with a rapid-setting ZOE cement (Dentsply Caulk, Dentsply International Inc, Milford, Del) and a no. 3 cotton pellet (Roeko, Roeko D-89122, Langenau, Germany) was used to spread the intermediate restorative material (Caulk IRM, Dentsply Caulk, Dentsply International, Inc, Milford, Del) on the pulpal floor. All pulpotomies were completed in one visit. The tooth was restored with a stainless steel crown (Ion Ni-Cro, 3M Unitek, St. Paul, Minn) at the same visit. A postoperative radiograph was immediately taken using the XCP instrument with the same setting as the preoperative radiograph.

Follow-up

The teeth were examined clinically and radiographically after 6 months. Three teeth belonging to the group obturated by a lentulo spiral mounted in a slow-speed handpiece could not be evaluated at the 6-month follow-up because the patients did not retun for follow-up. The subjective, clinical, and radiographic findings at the pre- and postoperative examinations were recorded.

The quality of the root canal filling was defined as:

1. underfilling—all the canals were filled more than 2 mm short of the apex;
2. optimal filling—one or more of the canals having ZOE ending at the radiographic apex or up to 2 mm short of the apex; and
3. overfilling—any canal showing ZOE outside the root (modification of Coll and Sadrian).[2]

The treatment was judged to be successful when the clinical and radiographic criteria were fulfilled with no subjective recordings of pain and sensitivity (Table 1).

Evaluation

All assessments were performed by both authors, who were blind as to the treatment group. The teeth were examined clinically and radiographically by both authors independently and then reviewed together. If there was disagreement, the case was discussed until final agreement was reached. If the disagreement continued, the lower ranking was used.

The data were analyzed to assess the success rate of the 2 methods of obturation using the Mann-Whitney test. The Kruskul-Wallis test and chi-square test were used to assess the effect of the root canal filling's quality on the success rate.

Results

Twenty-four healthy children (14 males and 10 females) with a mean±SD age of 6.71±1.28 and a range of 4½ to 9 years, received 50 single-visit ZOE pulpectomies in primary molars. Of these 24 children, 18 (11 males and 7 females) with a mean age of 6.78±1.27 received 25 pulpectomies in which ZOE was inserted into the canals with a lentulo spiral mounted in a slow-speed handpiece. Another 17 patients (10 males and 7 females) with a mean age of 6.74±1.44 received 25 ZOE pulpectomies in which the obturation material was inserted into the canals by a hand-held lentulo spiral.

Four primary maxillary first molars (16%) were included in each obturation method. Additionally, 4 (16%) and 5 (20%) primary maxillary second molars were obturated by a lentulo spiral mounted in a slow-speed handpiece and a hand-held lentulo spiral, respectively. For primary mandibular first molars, 12 (48%) were obturated by a lentulo spiral mounted in a slow-speed handpiece and 8 (32%) were obturated by a hand-held lentulo spiral. For primary mandibular second molars, 5 (20%) were obturated by a lentulo spiral mounted in a slow-speed handpiece and 8 (32%) were obturated by a hand-held lentulo spiral.

Table 1. Clinical and Radiographic Criteria of Successful Treatment

No abnormal mobility	Preoperative pathologic inter-radicular and/or periapical radiolucencies resolved
No sensitivity to percussion	No new postoperative pathological radiolucencies developed
No swelling	No pathological internal or external root resorption

Table 2. Clinical Findings Preoperatively and 6 Months Postoperatively

	Clinical situation									
	Preoperative					Postoperative				
Obturation method	Pain	Percussion tenderness	Swelling	Fistulas	Mobility	Pain	Percussion tenderness	Swelling	Fistulas	Mobility
Lentulo spiral mounted in slow-speed handpiece	6	3	0	1	5	0	0	0	0	1
Lentulo spiral hand-held	9	4	2	3	10	0	0	0	1	3

There was no difference in the:

1. mean ages or distribution of sexes between the 2 groups;
2. distribution of maxillary and mandibular teeth; and
3. distribution of first and second molars.

After 6 months, 3 teeth belonging to the group obturated by the lentulo spiral mounted in a slow-speed handpiece could not be evaluated.

Clinical and radiographic evaluation

The teeth involved in the present study were evaluated after 6 months from the time that pulpectomies were performed. Most of the clinical symptoms and preoperative radiographic findings had subsided post pulpectomy in both groups (as shown in Tables 2 and 3). The clinical and radiographic success rate was 96% (21/22 teeth) and 91% (20/22 teeth) for teeth in the group obturated by the lentulo spiral mounted in a slow-speed handpiece, respectively. Teeth obturated by the hand-held lentulo spiral had a 92% (23/25 teeth) and 72% (18/25 teeth) clinical and radiographic success rate, respectively. With these differences in the success rate, however, there was no significant statistical difference between the 2 techniques (Table 4). Preoperative, immediately postoperative, and 6-month postoperative radiographs of selected cases are presented in Figures 1 to 4.

The overall 6-month follow-up clinical and radiographic success rates of the 47 teeth obturated by the 2 techniques were 94% (44/47 teeth) and 81% (38/47 teeth), respectively. This also indicated the success rate of the single-visit pulpectomy without considering the obturation method. No attempt was made to statistically compare the clinical and radiographic success rates.

The quality of the root canal filling by obturation method is presented in Table 5. Optimal filling of the root canal in primary teeth was achieved in 16 teeth (64%) using the lentulo spiral mounted in a slow-speed handpiece, and in 12 teeth (48%) using the hand-held lentulo spiral. The lentulo spiral mounted in a slow-speed handpiece resulted in underfilling 5 teeth (20%), while the hand-held lentulo spiral resulted in underfilling 11 teeth (44%). Conversely, use of the lentulo spiral mounted in a slow-speed handpiece resulted in 16% (4 teeth) overfilling, and the hand-held lentulo spiral resulted in only 8% (2 teeth) overfilling. There was no statistically significant difference, however, between the 2 techniques (P=.471).

Effects of root canal filling quality on success rate

Twenty-eight of 50 teeth (56%) were optimally filled, 16 (32%) were underfilled, and 6 (12%) were overfilled. The absence of 3 teeth during recall resulted in a drop of the number of optimally filled teeth, from 28 to 25.

The teeth optimally filled had a 92% (23/25 teeth) clinical and radiographic success rate, while 8% (2/25 teeth) showed clinical and radiographical failure (Table 6). Underfilling showed a 94% (15/16 teeth) clinical success rate and only a 56% (9/16 teeth) radiographic success rate. Also, underfilling resulted in a high radiographic failure rate of 44% (7/16 teeth). Overfilling, however, showed a 100% (6/6 teeth) clinical and radiographic success rate. According to this finding, there was a statistically significant difference between the root canal filling's quality and the radiographic success rate, which reflects the overall success rate. The teeth filled optimally or overfilled showed a higher significant radiographic success than the teeth with short root canal filling (P=0.009).

Table 3. Radiographic Findings Preoperatively and 6 Months Postoperatively

Obturation methods	Radiographic features				
	Preop furcation	Healing after 6 mos		New pathology developed	Root resorption
		Yes	No		
Lentulo spiral mounted in slow-speed handpiece*	22/25	18/22	1/22	1/22	0†/22
Lentulo spiral hand-held	23/25	18/25	5/25	2/25	1/25

*Three teeth were missed at 6 months follow-up, so the total number of teeth in this group dropped to 22 teeth.

†This tooth also counted in the new pathology developed column because it showed both criteria.

Table 4. Success Rate of the Lentulo Spiral in a Slow-speed Handpiece and Hand-held

Lentulo spiral obturation method	Clinical success		Radiographic success	
	Success	Failure	Success	Failure
Mounted in slow-speed handpiece	21 (96%)	1 (5%)	20 (91%)	2 (9%)
Hand-held	23 (92%)	2 (8%)	18 (72%)	7 (28%)
Total	44 (94%)	3 (6%)	38 (81%)	9 (19%)
P value*	.632		.104	

*Mann-Whitney U test showed no significant difference between methods of obturation according to the success rate.

Discussion

Many investigations have evaluated and compared the success rate of different root canal filling materials used for primary teeth. In vivo evaluation of the use of a lentulo spiral to fill root canals in primary teeth, however, has not been investigated. For this reason, the authors carried out this in vivo investigation to compare the efficiency of the lentulo spiral—mounted in a slow-speed handpiece and hand-held—at providing optimal filling for the root canal of primary molars. At the same time, the authors compared the quality of the root canal filling (which is a result of the technique used) to the success rate. All primary molars involved in this investigation were treated in a single-visit pulpectomy using a modification of the technique described by O'Riordan and Coll[11] after complete examination of the patient and taking standardized radiographs.

Table 5. Quality of Root Canal Filling of Lentulo Spiral in a Slow-speed Handpiece and Hand-held*

Obturation methods	Optimal filling	Underfilling	Overfilling
Lentulo spiral mounted in slow-speed handpiece	16/25 (64%)	5/25 (20%)	4/25 (16%)
Lentulo spiral hand-held	12/25 (48%)	11/25 (44%)	2/25 (8%)
Total	28/50 (56%)	16/50 (32%)	6/50 (12%)

*Mann-Whitney U test showed no significant difference between methods of obturation according to the quality of root canal filling (P=.471).

Table 6. Success Rate According to Root Canal Filling Quality

	Clinical success		Radiographic success	
Root canal filling quality	Success	Failure	Success	Failure
Optimal filling	23 (92%)	2 (8%)	23 (92%)	2 (8%)
Underfilling	15 (94%)	1 (6%)	9 (56%)	7 (44%)
Total	44 (94%)	3 (6%)	38 (81%)	9 (19%)
P value*	.776		.0009	

*Kruskul-Wallis test show significant difference between quality of root canal filling and radiographic success rate at (P<.05).

In the present study, the primary molars were obturated with ZOE because it is the most commonly used root canal filling material for primary teeth and many investigations have assessed its performance. Also, the material can be easily obtained.[6,20,21]

O'Riordan and Coll[11] recommended using a paper point slightly moistened with one fifth diluted formocresol to help fix the remaining pulp tissue that could not be completely removed due to wide variations in primary molar root canals that make complete amputation of pulp tissue impossible.[22] Also, this could provide an alternative technique for those who prefer mixing ZOE with formocresol to create a high antibacterial root canal filling material—which carries the risk of direct and long-term contact of the aldehyde component with soft tissue.[23,24]

The lentulo spiral, smaller by 2 sizes from the last Hedstrom file and kept 1 mm short of the working length, was used to transport ZOE to the root canal of primary teeth. By applying this role, there were no broken lentulo spirals and each were used several times in this study. This is considered a key for safe use of the lentulo spiral. By keeping the lentulo spiral 1 to 2 sizes smaller than the master apical file to reduce the risk of fracture, there will be enough space for the lentulo spiral to rotate and there will be less chance of its becoming engaged in the narrow root canal.

Oral health policies and clinical guidelines of the American Academy of Pediatric Dentistry (AAPD) recommend that, after pulpectomy, the tooth be restored with a material that seals the tooth from microleakage.[25] In the present study, each tooth was immediately restored with a stainless steel crown. Six months postoperatively, pain or tenderness to percussion was not reported by any patient. Presence of gingival swelling in the furcation area preoperatively was reported in 2 cases in the group obturated by hand-held lentulo spiral. Three teeth had fistulas, and 10 teeth showed mobility preoperatively in the group obturated by the hand-held lentulo spiral. Of these teeth, fistula healing was reported in 2, and absence of mobility in 7.

All these findings reflected that the single-visit pulpectomy had a high ability to relieve clinical symptoms that arose from infected or necrotic pulps in primary teeth. In addition, its advantages over premature loss or space maintainers make it the treatment of choice for the severely infected or necrotic primary teeth. The preoperative clinical findings in the group obturated by the hand-held lentulo spiral, however, showed that the teeth in this group were severely infected compared to the other group, which could explain the lower success rate of the teeth in this group.

There was no significant difference between the 2 techniques, in the quality of root canal filling. There was a tendency for an optimal fill with the lentulo spiral mounted in a slow-speed handpiece, however, but there were more overfills and fewer underfills compared to using the hand-held lentulo spiral. As overfilling was seen in both techniques, other variables—such as presence of pathological or physiological root resorption—could be attributed to the extrusion of root canal filling.

In this study, 3 teeth in the group obturated by a lentulo spiral mounted in a slow-speed handpiece could not be evaluated at the 6-month follow-up. The loss of these 3 teeth may have biased the results, which showed no significant difference between the 2 techniques. Another study reported no statistically significant difference between

Figure 1a. Preoperative radiograph in the group filled with a hand-held lentulo spiral.

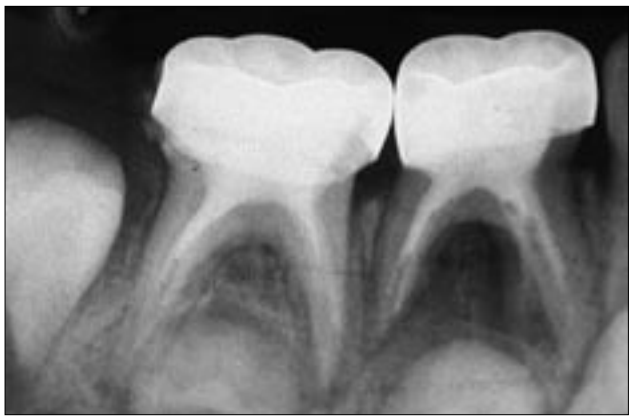

Figure 1b. Immediate postoperative radiograph. Note underfilling of both teeth.

Figure 1c. Six months postoperative radiograph. Note healing of furcation.

Figure 2a. Preoperative radiograph in the group filled with a lentulo spiral mounted in slow-speed handpiece.

Figure 2b. Immediate postoperative radiograph. Note overfilling of palatal and distal root canals.

Figure 2c. Six months postoperative radiograph. Note healing of furcation and resorption of excess ZOE.

the success rate and the extent of root canal filling material (Endoflas F.S., Sanlorand cfa. S. en C.S., Colombia, South America).[14] Treatment in this retrospective study, however, was considered a success if, clinically, the tooth was asymptomatic and radiographs showed a decrease or no change in pre-existing pathologic radiolucent defects.[14]

Another limitation of the present study is the judgment as to what constituted a short fill (underfilling means all the canals were filled more than 2 mm short of the apex) vs an optimal fill (an optimal filling had 1 or more of the canals having ZOE ending at the radiographic apex or up to 2 mm short of the apex), in a tooth in which 1 canal was filled optimally and the others were very short of the apex. This study used only a 6-month follow-up, which should be considered in the interpretation of the results. In this study, both authors judged radiographs and were blind to the treatment group. The authors reviewed each case separately, then sat together to discuss their findings. If there was disagreement, then the case was reviewed again to reach final judgment. If there was disagreement, the lower rank was considered. A better methodology would have been to statistically compare the results with an inter-rater reliability examination.

The success rate of the 47 pulpectomized teeth available for recall evaluation was 94% (44/47) and 81% (38/47) clinically and radiographically. All teeth showing clinical failure also showed radiographic failure. For this reason, the radiographic success rate reflected the true success rate of a single visit pulpectomy applied in this investigation, which is considered to be 81% after 6 months follow-up. This result corresponds with previous investigations carried out on ZOE as a root canal filling material for primary teeth.[12,13,26-28]

In this investigation, age or tooth type had no significant effect on the success rate or on the quality of root canal fillings. These findings agreed with Coll et al (1985),[12] who reported that neither age nor tooth type had no significant effect on the pulpectomy success rate.

The optimally filled and overfilled root canals of primary molars in this investigation showed significant radiographic success rates over underfilling. This finding led the authors to conclude that the best technique obturation technique is the one that provides optimal filling of the root canal. The effect of root canal filling quality in the present study's success rate disagreed with Coll and Sadrian,[2] who reported a significant success rate for teeth filled to the apex (89%) and teeth filled short (87%) compared to overfilled teeth which had a 58% success rate. This study, however, agreed with Coll and Sadrian[2] in terms of the favorable success rate of optimally filled teeth.

Also, this study's findings regarding underfilling were supported by Yacobi et al,[18] who reported that underfilled canals failed significantly more than those filled completely after 12 months follow-up. All overfilled teeth in this investigation showed a 100% success rate at 6 months follow-up. Nevertheless, overfilling should not be recommended over an optimally filled root canal because ZOE irritates the periapical tissues and causes necrosis of bone and cementum. Also, when ZOE extrudes, it develops a fibrous capsule that prevents resorption.[29]

Furthermore, Coll and Sadrian[2] found that ZOE-retained material altered the paths of eruption of succedaneous teeth in 20% of the cases. Oral health policies and clinical guidelines of the AAPD stated several objectives of pulpectomy procedures in primary teeth. The first one is that there should be radiographic evidence of successful filling without gross overextension or underfilling.[25] In addition, the radiographic infectious process should resolve in 6 months, as evidenced by bone deposition in the pretreatment radiolucent areas. Pretreatment clinical signs and symptoms should resolve within 2 weeks.[25]

In the present study, overfilling was noticed in 6 teeth showing incomplete resorption of excess ZOE in 4 teeth and no decrease in size in 2 teeth after 6 months. This finding agreed with Sadrian and Coll[5]—who found that the size of ZOE filler particles decreased over time—and with Reddy and Fernandes,[28] who reported after 9 months follow-up incomplete resorption of excess ZOE material which was overfilled . Also, in the present study, migration of excess ZOE was noticed toward the inter-radicular area in 2 overfilled teeth. This is similar to the observation of Mani et al,[30] who attributed this phenomenon to a result of pressure on the erupting tooth bud and the body's defense mechanism for eliminating any foreign substance.

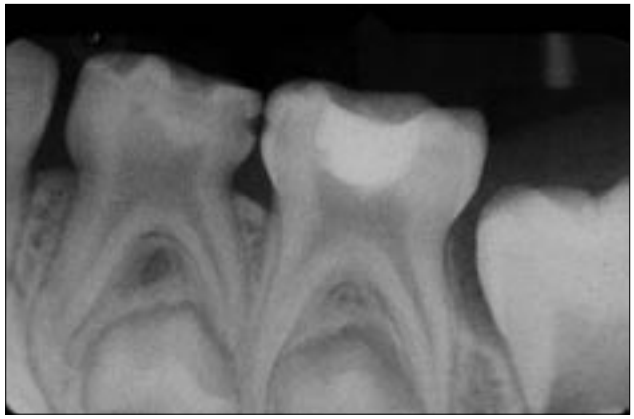

Figure 3a. Preoperative radiograph in the group filled with a hand-held lentulo spiral.

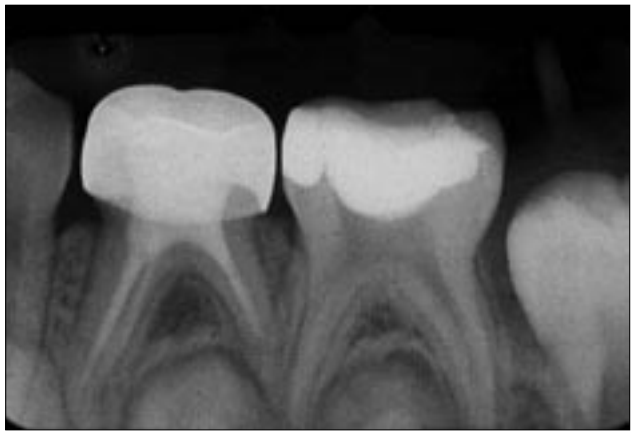

Figure 3b. Immediate postoperative radiograph. All canals were judged to be underfilled.

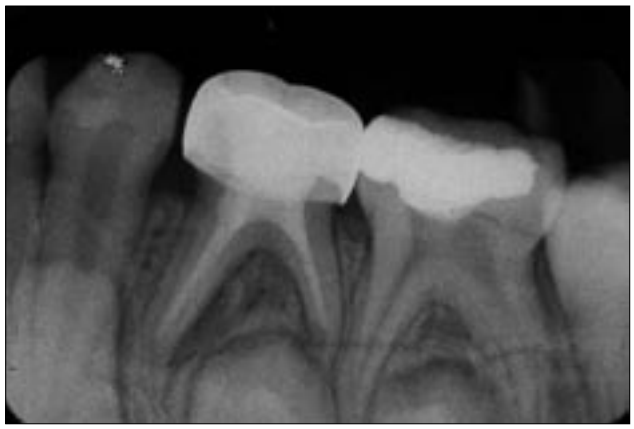

Figure 3c. Six months postoperative radiograph. Note new pathologic radiolucency adjacent to the mesial root and apical pathologic radiolucency in the distal root.

Conclusions

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

1. Considering the quality of the root canal filling or success rate, there was no statistically significant difference between the use of a lentulo spiral mounted in a slow-speed handpiece or hand-held.
2. Optimally filled and overfilled root canals showed a statistically higher success rate compared to underfilled root canals.
3. Single-visit ZOE pulpectomies resulted in an 81% success rate after 6 months.
4. Limiting the success rate to only the clinical criteria resulted in a 94% success rate.

Figure 4a. Preoperative radiograph in the group filled with a lentulo spiral mounted in slow-speed handpiece.

Figure 4b. Immediate postoperative radiograph. Note optimal filling of root canals.

Figure 4c. Six months postoperative radiograph. Note healing of furcation.

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Abstract of the Scientific Literature

Factors Related to Severe Untreated Decay in Adolescents

The purposes of this study were to identify risk factors that discriminate between adolescents with high levels of tooth decay who receive dental treatment with those who do not receive dental treatment, and to gain information to motivate avoidant adolescents with serious dental needs. The study population included all 439 students 12 to 20 years old enrolled in a southern Washington state school district. A subset of children with DMFT of 5 or more was surveyed and divided into a case group (18 children with severe involvement) and a control group (22 children). The survey included questions in 4 areas: (1) structure (eg, gender, race); (2) history (eg, past dental experience); (3) cognition (eg, fear surveys); and (4) expectation. The following variables were related to the dependent variable: (1) perceived poor personal dental health; (2) perceived poor mother's dental health; (3) negative beliefs about the dentist; (4) not planning to go to the dentist even if having severe problems; (5) not being in any club or playing on a sports team; and (6) not having a best friend. This study shows the relevance of the history and cognition variables in understanding the presence of extensive tooth decay in rural adolescents.

Comments: Information on dentistry for adolescents is limited. Studies like the aforementioned give practitioners useful information about the factors that may be related to dental disease in this age group. Dentists should encourage research in this area to better understand the factors related to adolescent dental problems and how practitioners can prevent them. **JLC**

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Skaret E, Weinstein P, Milgrom P, Kaako T, Getz T. Factors related to severe untreated tooth decay in rural adolescents: a case control study for public health planning. Int J Paediatr Dent 2004;14:17-26.

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