

Incidence of Flare-ups and Evaluation of Quality after Retreatment of Resorcinol-Formaldehyde Resin (“Russian Red Cement”) Endodontic Therapy

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The purpose of this retrospective study was to evaluate the quality of treatment and incidence of flare-ups when teeth with resorcinol-formaldehyde resin are retreated in a postgraduate endodontic clinic. Fifty-eight cases were included in this study. Obturated and unfilled canal space was measured on radiographs. Forty-eight percent of the total canal space was filled before retreatment; 90% was filled after retreatment. After retreatment, obturations were rated as optimal in 59%, improved in 33%, unchanged in 6%, and worse in 2%. Seven patients (12%) had postretreatment flare-ups. Data were statistically analyzed using the Cochran-Armitage Test for Discrete Variables. No statistical difference in the incidence of flare-ups was found in teeth that before treatment had more than half the canal space filled compared to teeth with less than half, cases with pre-existing periradicular radiolucencies compared to cases with normal periradicular appearance, symptomatic cases compared to asymptomatic cases, or cases with optimal fillings after retreatment compared to less than optimal cases. It was concluded that teeth with resorcinol-formaldehyde fillings might be retreated with a good prognosis for improving the radiographic quality, but a higher than normal incidence of flare-ups may occur.

Dental providers face a treatment-planning dilemma when they evaluate endodontically treated teeth in which the obturation appears radiographically to be inadequate. The potential benefits of retreatment must be compared with potential risks. Cases where patients are asymptomatic and there is no radiographic evidence of pathosis are especially challenging, because observation also is an option. Van Nieuwenhuysen et al. (1) offered guidance for cases obturated with gutta-percha or silver points. Retreatment was completed on 612 symptomatic roots with inadequate obturation. The quality of retreatment was classified

as good in 52%, improved in 34%, unchanged in 11%, and worse (ledges, broken instruments, apical perforations) in 3%. They concluded that the risk of treatment complications was relatively low.

A concern that has received limited attention in the literature is the risk of immediate postoperative sequela after retreatment. Walton and Fouad (2) defined a “flare-up” as the occurrence of severe pain and/or swelling after an endodontic treatment appointment, requiring an unscheduled visit and active treatment. He reported that 3.5% of 145 retreatment patients had flare-ups compared to 3.1% of 795 patients receiving original treatment. In a similar study Imura and Zuolo (3) reported 2.9% of 415 retreatment patients had flare-ups compared with only 0.7% of 597 initial treatment patients. Both authors reported a significantly higher incidence of flare-ups in patients with preoperative symptoms or with radiolucent lesions.

Placement of resorcinol-formaldehyde (RF) resin material in pulp chambers and root canals has been one of the preferred methods of endodontic therapy for many years in Eastern Europe, Russia, and China (4). The consistency of the filling material in these fillings varies from soft to “brick hard.” In the latter case, retreatment can be more difficult than retreatment of teeth obturated using traditional methods (5). The materials in RF resin are more irritating than conventional obturating materials, which could increase the potential for flare-ups after retreatment. The purpose of this study was to determine the immediate treatment result and incidence of flare-ups after retreatment of teeth with RF resin fillings.

MATERIALS AND METHODS

Dental records of patients treated in the postgraduate clinic at the UNMC College of Dentistry from January 1995 to May 2002 were screened and 34 patients who had retreatment of at least one tooth with RF resin fillings were found. Records were reviewed and the reason for retreatment (symptoms versus restorative) and occurrence of flare-ups (pain or swelling requiring an emergency visit) were recorded.

Radiographs taken for initial (resin obturations) and posttreatment (gutta-percha obturations) evaluations were used, of which all were taken using a paralleling technique. They were placed on the surface of a dental X-ray viewer (Realist Inc., Menomonee

TABLE 1. Comparison of flare-up rate with different variables

Variable	No. and % Flare-ups	p value
Less than 1/2 the length filled initially (n = 31)	4 12.9%	1.000
More than 1/2 the length filled initially (n = 27)	3 11.1%	
Optimal fillings after retreatment (n = 34)	6 17.6%	0.2211
<Optimal fillings after retreatment (n = 24)	1 4.2%	
Periapical Radiolucency before retreatment (n = 20)	5 25%	0.0590
Widened PDL before retreatment (n = 16)	1 6.3%	
Normal PDL before retreatment (n = 22)	1 4.5%	0.6908
Asymptomatic patients before retreatment (n = 35)	5 14.3%	
Symptomatic patients before retreatment (n = 23)	2 8.7%	

Falls, WI), which magnifies the film ~10 times. Two experienced endodontists completed the following measurements using a millimeter ruler:

Percentage of Canals Filled and Quality of Obturation

The length of obturated canal was measured by starting at the coronal orifice and measuring to the apical-most extent of the filling. The length of unobturated canal(s) was measured from the apical-most extent of the filling to a point 1-mm from the radiographic apex of the root. In teeth with fillings in at least one canal, but which also had unfilled canals, the length of completely unfilled canals was added to the unfilled total. The percentage of filled canals was calculated by adding the filled and unfilled totals and dividing by the filled total. Teeth that originally had less than half the canals filled were arbitrarily placed in group I and teeth with half or more of the canals were placed in group II.

After retreatment quality of obturation was rated as optimal if 100% of the canals were filled, improved if the percentage of canals filled was increased by at least 10%, unchanged if the increase in percentage of canals filled was <10%, and worse if an iatrogenic perforation or separated instrument occurred.

Measurement of Radiolucencies

The width of the apical periodontal ligament (PDL) spaces was measured and compared to the width of lateral PDL spaces. If apical widths were two to three times that of the lateral PDL the cases were classified as having a widened PDL. Cases with larger apical radiolucencies were classified as having periradicular radiolucency (PRRLO).

All measurements and calculations were made independently by two researchers. If results were within 10% of each other they were averaged and recorded. If results were not within 10% the researchers re-evaluated the measurements and attempted to reach a mutual agreement. If agreement could not be reached the case was discarded.

The incidence of flare-ups and quality of fillings after retreatment was expressed as a percentage of total teeth evaluated. The influence that pre- and postoperative quality of obturation, preoperative symptoms, and preoperative apical status had on the incidence of flare-ups was compared statistically using the Cochran-Armitage Permutation Test for Discrete Variables. Differences of $p < 0.05$ were considered statistically significant.

RESULTS

Sixty teeth met the criteria for inclusion in this study. Five teeth had resin pulpotomies and the other 55 had at least some resin in at least one canal. Excluding teeth with pulpotomies, there were 23 unfilled canals initially, of which all but four were located and obturated during retreatment.

In five cases nonsurgical retreatment was not completed: one because the operator was unable to negotiate any of the canals; two because the operator was unable to remove the paste; and two because nonrestorable furcal perforations were discovered. The latter two cases were extracted and excluded from this study. The two teeth in which the paste could not be removed were treated surgically. The case in which no canals were negotiated was placed on recall for observation. All three of these cases were included in this study.

Two other perforated teeth were included in this study; one had a preexisting furcal perforation, which was repaired, and one had an apical perforation that occurred during retreatment. Retreatment was completed on both cases and neither had a flare-up.

On initial presentation 23 teeth were symptomatic and 35 asymptomatic. Five teeth had a coronal pulpotomy only, 23 had filling in at least one canal and at least one canal unfilled, whereas the remaining 30 teeth had filling material in all the canals.

Evaluators were able to agree on measurements in all cases. Thirty-one teeth had <50% of the canal filled initially (group I), whereas 27 had 50% or more of the canal filled (group II). Twenty-two teeth had a normal PDL space, 16 had widened PDLs, and 20 had PRRLOs.

An average of 48.5% of the length of the canals in the 58 experimental teeth was filled initially, whereas 90% was filled after retreatment. Only three teeth had 100% of the canals filled before retreatment. After retreatment the fillings in 34 teeth (59%) were rated as optimal, 19 teeth (33%) were considered improved, 4 (6%) were unchanged, and 1 tooth (2%) was worse. Seven of the patients had flare-ups after retreatment. Table 1 compares percentages of flare-ups occurring with aforementioned variables.

DISCUSSION

The original status of the 58 teeth was interesting; more than half the teeth had less than half the canal(s) obturated, leaving large area of unfilled canal available for bacterial to populate. Three patients had unfilled furcal perforations. All patients had the RF fillings placed while living in Russia, Eastern Europe, or China, and most reported having the treatment accomplished more than 2 years ago. In addition to the retreated teeth reported, the patients

had a total of 34 teeth that appeared to have RF fillings that were not retreated. Despite these facts only 22 teeth (24%) presented with symptoms and 29 teeth (31%) had periapical radiolucent lesions. These findings suggest that the resorcinol and/or formaldehyde in these fillings may have significant and prolonged antibacterial activity.

Before the study there was concern about the providers ability to remove the filling material while avoiding procedural errors. The present study treatment results were that 59% of the fillings were rated as optimal and 33% improved compared to the 52% optimal and 34% improved reported by Van Nieuwenhuysen et al. (1), even though retreatment is more difficult when set resin is present (5). The difference may be because of improvements in the equipment available in this study (microscopes and ultrasonics). Another explanation may be our criteria for classifying a case as "improved." In this study there were four cases with silver points, one with a broken file, and one with a broken lentulo spiral. The obstructions were not removed in five of six cases, but students were able to treat other unfilled canals in four of six cases so the cases were classified as "improved or optimal." Canals also were retrofilled in the two surgical cases, making the classifications of both cases "optimal."

Another concern was the toxicity of resorcinol and formaldehyde. If these materials were forced into the periradicular tissues during removal for retreatment, the persistent irritation could potentially cause flare-ups. The 12% incidence of flare-ups in this study may confirm those suspicions. This result compares unfavorably with the 1.6% to 3.5% reported in other studies (2, 3, 6) retreating gutta-percha fillings. The limited sample size in this study complicated statistical comparison of the variables affecting flare-ups. None of the variables analyzed were found to have a statistically significant impact.

The results did not vary with the amount of canals that were filled initially (groups I versus II), although one would expect more material to be expressed from the apex in group II. To further test this theory teeth with "optimal" fillings (which were instrumented and obturated to working length and might have more material extruded from the apex) were compared with less than optimal fillings. The flare-up rate was higher in the optimal group, suggesting that extrusion of toxic material may have been a factor.

The incidence of flare-ups in teeth with PRRLOs was higher than the incidence in teeth with normal or widened PDLs, but the result was not quite statistically significant ($p = 0.0590$). In other

studies (2, 3) the incidence was significantly higher, which suggests that bacteria remaining in unfilled canals are an important cause of flare-ups. Siqueira et al. (6) reported results after dental students treated cases using multiple visits and calcium hydroxide as an interim filling. This antibacterial strategy resulted in a 1.9% incidence of severe pain (flare-ups) after 499 initial treatment cases and 1.6% of 128 retreatment cases. In the present study calcium hydroxide was used in only five cases, two of which had flare-ups, but the sample size was too small for analysis. Further study with a larger sample size and random case selection is indicated.

The lack of statistical difference in flare-ups in symptomatic versus asymptomatic patients disagrees with both Walton and Fouad (2) and Imura and Zuolo (3), who reported that flare-ups were at least five times more likely in symptomatic patients receiving endodontic treatment. However, a recent study also reported no significant difference with symptomatic patients receiving initial treatment (7), and Siqueira et al. (6) found that the flare-up incidence was significantly higher only if patients had preoperative pain and no PRRLO. Further study of flare-ups after retreatment with a larger sample size might resolve the discrepancy.

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