Therapy of Chronic Apical Periodontitis with Evaluation of Radiographs by Corel Photo-Paint

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SUMMARY
The aim of this study was to evaluate the radiographs in control period with Corel Photo-Paint software. The research was carried out on one root teeth of 11 patients with periapical lesions. After the endodontic treatment, radiographs before treatment, after treatment, 6 months after treatment and 1 year after treatment were compared for evaluation of repairing process. The graphic evaluation of radiographs was completed using Corel Photo-Paint. Results were analyzed by Duncan test, Dunett-c test and Dunett-t test. The used endodontic procedure reduced the causes of the chronic periapical process in control period. This was confirmed with by statistically significant difference between all combinations with Health bone, except in combination of Health bone and One year after the treatment where statistical significance was not found. In this investigation, endodontic treatment improved healing of the periapical tissue. Computerized graphic procedure for data processing of the radiographs was a satisfactory additional aid for evaluation of radiographs.

Key words: apical lesion, calcium hydroxide, graphic processing, digital radiography

2. MATERIALS AND METHODS
The investigative study of one-root teeth of the upper and lower jaws was performed on 11 patients. The majority of the patients were 19 to 35 years old. Patients were treated following the usual clinical procedure:

After inspection of the patient, digital radiographs of the affected teeth were made. The mechanical treatments of the root canal were done with engine driven endodontics NiTi instruments following step back technique. Working length for apical constriction was determined with Raypex 5 apexlocator (VDW GmbH Munich, Germany). Rinsing of the canal during preparations was performed with 3% NaOCl. At the end of preparations root canals were rinsed with 3% H2O2 following 3% NaOCl which was placed in root canal for five minutes. After drying with absorbent points the calcium-hydroxide medicament filling of the root canal using Claxyl blue (OCO-Präparate, Germany) were obtained. A correction of the medicament filling was checked with digital radiography. Calciumhydroxide were placed in root canal for two weeks. After removal of medicament filling, root canal was obturated using the technique of lateral condensation of gutta-percha and AH26 siler (Dentsply De Trey GmbH, Konstanz, Germany). A radiograph was made after obturation for the purpose of obturation control of the treated tooth.

Recalls of patients were done after six months and one year. Every treated tooth was X-rayed again.

The digital radiographs of teeth prior periapical lesions. (7) In researches, evaluation of healing process in periapical lesions was usually used by radiograph observation in research period.

In our investigation we tried one of the commonly used graphic software for personal computer to utilize evaluation of digital dental radiographs.

Aims of our research were evaluation of the clinical trials results, of endodontic treatment, on digital dental radiographs with computerized graphic software Corel PHOTO-PAINT 12 (Corel Corporation, USA).

1. INTRODUCTION
There is causality between changes in the periapex and the changes arising in the dental pulp due to infection and other etiological causes. In contrast to pulp, periradicular tissues have an almost unlimited source of undifferentiated cells that participate in inflammation as well as repair. The injury usually results in cellular damage and release of non-specific as well as specific immunologic mediators of inflammatory response. (1).

In current clinical practice the treatment of infected periapical tissue is successfully achieved by mechanical debridgement, medicament therapy, and correct obturation of root canal. Calcium hydroxide usually has been used as an intracanal medication in the treatment of necrotic teeth because of its favorable alkalinizing effect. (2, 3)

Comparative studies have shown that calcium hydroxide was superior to any other intracanal medication for the elimination of remaining bacteria. (4) It has been suggested that the action comes from diffusion of hydroxyl ions through the apical foramen (5). Hosoya et al. 2001 suggest that the time required for optimum intracanal activity when using calcium hydroxide mixtures is at least 2 weeks. (6) Ercan et al. 2007 found that a combination of calciumhydroxide and 1% chlorhexidine can be successfully used as intracanal medicament for disinfection in endodontic retreatment cases with
to the treatment, after definitive filling of the root canal and six months and one year later were compared, with the aim of following up the reparation changes in the periapical tissue. It was found that overall subjective symptoms ceased to exist during the control period. The digital radiographs were made with low radiation X-ray de Götzen xgenus and digital xgenus sensors with holder – parallel x-ray technique (xgenus digital De Gotzen Srl Via Roma,45-21057 Olgate Olona (VA)-Italy). All images were converted to Color Mode: 16-bite Color Grayscale (256 colors), and the size of the image was 1291 pixels width and 1682 pixels height. The graphic processing of radiographs was done using Corel Photo-Paint 12 software (Corel Corporation, USA). The periapical process was bordered with “masking” tool and with the software’s aid histogram number of the pixels in the “masked” part of the image was displayed. Number of mean grey level was also displayed. Evaluations of radiographs were done with the following procedure. First, on radiograph before treatment, was masked an area of healthy bone–control group. Histogram was showed a mean grey level of healthy tissue. (Figure 1a) On the same radiograph, periapical lesion was masked and histogram showed a mean grey level and number of pixels of masked area. (Figure 1b) This produced mathemati-
cal data on the size of the periapical process. The overall procedure was repeated with radiographs after obturation, with radiographs of 6 month period and radiographs of 1 year period (Figures 2a and 2b). On the histogram it is also possible to locate and define, in individual level number of grey scale, the darkest area of periapical lesion. Achieved data before and after treatment can be compared with data after recall period. In this way it can be possible to follow up reparation process in periapical tissue and calculate the level of healing in relation to the time period of the

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<th>Table 1</th>
<th>Duncan test – mean values of grey levels. grey level: Duncan. Means for groups in homogeneous subsets are displayed. a Uses Harmonic Mean Sample Size = 11.000.</th>
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<th>One Way Analysis of Variance (ANOVA), Dunnett t Post Hoc. Dependent Variable: grey level. Dunnett t (2-sided). * The mean difference is significant at the .05 level. a Dunnett t-tests treat one group as a control, and compare all other groups against it.</th>
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control and compare other groups against it.

3. RESULTS

The Duncan test shows mean values of grey levels. (Table 1) Dunnett C procedure showed statistically significant differences between tested combinations.

Major statistical difference was shown between healthy bone before and after treatment 40.75182 (P<0.05).

The low level of statistical difference was shown between combination Healthy bone and 6 month after treatment 22.17636 (P<0.05).

Statistical difference between groups Healthy bone and One year after treatment was not shown 5.34909 (P>0.05). (Table 2)

Dunnett (2-sided) t-tests treated one group as the control, and compared all other groups against it. Test showed statistical difference between all combinations with Healthy bone (P<0.05), except combination Healthy bone and One year after treatment statistically significances were not found (P>0.05). (Table 3)

4. DISCUSSION

In our research the used medicament in combination with engine driven root canal preparation and lateral condensation of gutta-percha as obturation reduced the cause of the chronic periapical process. This was confirmed by satisfactory reparation of the periapical tissue after the control period of six months and one year.

Aydin et al. in 2007 aimed to test the hypothesis that aggressive dentin removal through greater-tapered instrumentation reduces the intracanal bacteria more effectively than conservative dimension instrumentation. Preparation with an greater-tapered instrumentation technique did not reduce the intracanal bacteria more effectively than a more conservative instrumentation technique. (8)

Rödig et al. in 2007 compared root canal preparation using ProFile .04 and GT Rotary nickel-titanium instruments. Both systems respected original root canal curvature well and were safe to use. (9)

Agrabawi in 2006 was made prospective clinical and radiographic investigation to assess the treatment results following endodontic therapy of teeth filled with lateral condensation versus teeth filled with vertical compaction of warm gutta-percha. No statistically significant difference was found between the two techniques. (10)

Waltimo et al. in 2005 was evaluating the clinical efficacy of chemomechanical preparation of the root canals with sodium hypochlorite and interappointment medication with calcium hydroxide in the control of root canal infection and healing of periapical lesions. The study indicates good clinical efficacy of sodium hypochlorite irrigation in the control of root canal infection. Calcium hydroxide dressing between the appointments did not show the expected effect in disinfection the root canal system (11)

Sjorgen et al. in 1991 obtained good results on antimicrobial effect of calcium hydroxide in intracanal treatment of the diseased root canals. (12)

Peters & Wesselink 2002 were made a research to evaluate the healing of periapical lesions of teeth with positive and negative canal cultures at the time of obturation, and to evaluate the periapical healing of teeth treated in one visit (without) or in two visits with an interappointment dressing of calcium hydroxide. In both the treatment groups, the size of the periapical lesions reduced. (13)

Holland et al. published a study in 2003 whereby they observed healing process in dogs' teeth with apical periodontitis after root canal treatment in one or two appointments. After root canal negotiation, they were filled by the lateral condensation technique with gutta-percha points and Sealapex.

![Figure 1](image1.png)

**Figure 1** Radiograph of the tooth with chronic periapical process before treatment: a. histogram of healthy tissue with grey level of 139, b. histogram of periapical infected tissue with grey level of 104.

![Figure 2](image2.png)

**Figure 2** Radiograph of the tooth with chronic periapical process 1 year after treatment: a. histogram of periapical healthy tissue with grey level of 141, b. histogram of periapical tissue with grey level of 138.
in one appointment or after a dressing with calcium hydroxide for 7 and 15 days. It was concluded that the use of the calcium hydroxide dressing helps achieve better results than the treatment in one appointment. (15)

Ho et al. in 2003 published a research paper on in vitro study of pH changes in root dentin over the period of 2 weeks after intracanal application of calcium hydroxide. The results obtained from this research show change of pH to 11.67, three hours after application of calcium hydroxide. (16)

The success of medicament in improving the periapical healing during the investigation period of six months and one year largely depended on the extent of periradicular pathology, reparatory ability of the person treated as well as the capability to mount immunologic response.

Graphic software Corel Photo-Paint 12 was used for evaluation of digital dental radiographs. Computer technology was very helpful for evaluation of reparatory processes within the bone tissue. Use of the most commonly used commercial imaging software for personal computer was very useful for evaluating dental radiographs and it offer better work and results than some software’s specially developed for digital dental imaging only. The software’s tool histogram calculated the sizes of periapical processes selected on radiographs with respect to the resolution of the radiograph and its overall size. The histograms depicted diagram of color intensity, 16-bite Gray scales consisting of 256 colors, on the radiograph image of selected object. With the aid of diagram we were able to determine the size of periapical lesion, read the level number of the darkest color as well as number of pixels at that level.

Brockenbrough et al. 2003 successfully used DentaScan software for preoperative evaluation of patients with mandibular bone invasion of squamous-cell carcinoma. (19)

Image processing and enhancement functions are rarely incorporated in commercial software for direct digital imaging in dental radiology. Standardized terminology and increased functionality of image processing should be offered to the dental profession. (20)

During the investigation period of six months and one year, endodontics treatment caused reparatory healing of the periapical tissue.

Computerized graphic procedure of digital dental radiograph was a satisfactory help for follow-up the reparatory changes in the periapical tissue.

REFERENCES:

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