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*Digital radiography as an aid in qualification  
for a successful endodontic re-treatment*

Recently many dentists more and more often take up endodontic re-treatment. Such decision is influenced not only by latest developments in endodontic instruments, but also by considerable progress in the field of radiological diagnostics.

Endodontic re-treatment is much more difficult than first time treatment. It depends on many factors such as morphology of root canals, presence of supernumerary canals, as well as the course of previous endodontic treatment. Considerable problems are caused by proper restoration of patency of previously treated root canals. The removal of materials used as final filling of root canals, such as gutta-percha cones or cements, silver pins is often complicated. Similar difficulties are caused by elements of prosthetic appliances such as crowns, crown inlays and root pegs, broken and residual endodontic instruments. Moreover, frequently there is found obliteration of root canals, which were not correctly prepared and filled during primary endodontic treatment. Leaving of improperly treated teeth for a longer time in the oral cavity may lead to the development of periapical lesions, which often require prolonged treatment.

Although currently we possess considerable knowledge of complications resulting from improper endodontic treatment, not all improperly treated teeth may be re-treated. Friedman and Stabholz (3) affirm that criteria of qualification of teeth for endodontic re-treatment are as follows: appearance of spontaneous pain, pain as a response to vertical or horizontal percussion, pain on pressure in the apical region, presence of sinus tracts, periapical lesions on radiograms as well as teeth planned as prosthetic supports having insufficiently filled root canals.

The main aim of endodontic re-treatment is improvement of the quality of root canal filling, which should be tightly filled both in longitudinal dimension (closing of apical foramen) and in diagonal dimension (closing of lumen of dentine canalicules) (4).

The purpose of the study was evaluation of possibilities of endodontic re-treatment on the basis of digital radiography examinations in the own material.

#### MATERIAL AND METHODS

In 24 patients aged 23 to 61 (12 females and 12 males) on the basis of intraoral radiograms taking using Digora Soredex (Finland) digital radiography system and paralleling technique previously endodontically treated teeth were qualified for re-treatment (Fig. 1). For this purpose there was evaluated the state of periapical tissues of examined teeth, correctness of filling of root canals system (in longitudinal and diagonal dimensions), the degree of curvature of roots, possible obliteration or perforation of a root (Fig. 2). There were applied all available options of image post-processing i.e. negative images, positive image transformations, tomosynthesis, filters (pseudo-three-dimensional images) (7). Patency of root canals was evaluated subjectively on a radiogram



Fig. 1. Intraoral radiogram of tooth 15 qualified for endodontic re-treatment



Fig. 2. Obliteration of buccal mesial root canal and perforation of palatal root canal did not allow for correct endodontic re-treatment



Fig. 3. Root canal of the tooth 35 is not patent in subjective evaluation of the radiogram

(Fig. 3) and in dubious cases there were performed density measurements of the root canal as an objective method of assessment of radiological tissue density (Fig. 4). Moreover, there was noted the presence of broken and residual endodontic instruments and in such case there was observed their localisation and possibility of removal.

The correctness of endodontic re-treatment was evaluated on a radiogram taken directly after root canal filling as well as on an X-ray obtained after several months from the end of treatment (Fig. 5). In order to acquire comparable and reproducible radiograms there were used special positioning rings (2) for paralleling technique.

As positive result of endodontic re-treatment there was assessed the image of correctly filled root canals with no radiological signs and symptoms of failure on radiograms taken directly after

root canal filling as well as lack of symptoms of inflammatory lesions on long-term follow-up X-rays with the simultaneous absence of subjective and objective complaints in clinical examination (Figs. 6, 7).

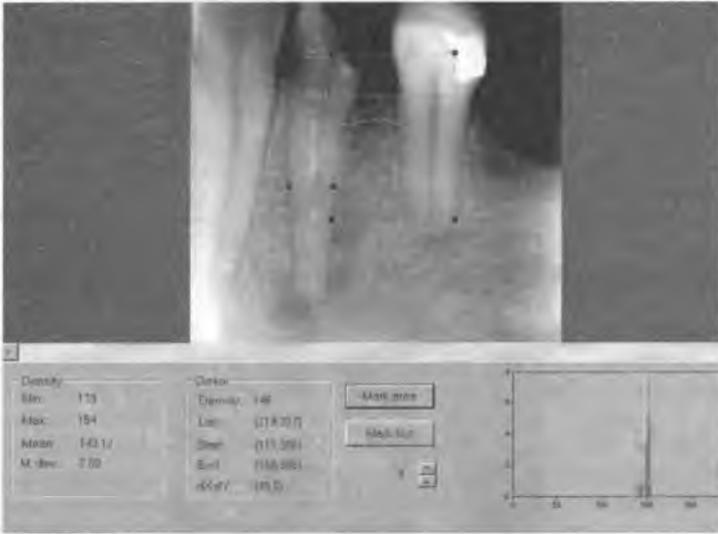


Fig. 4. Density measurements of the same case showed decrease of density profile along the root canal. Therefore an attempt at re-treatment was taken up



Fig. 5. The same tooth after 6 months from completed re-treatment



Fig. 6. Intraoral radiogram of tooth 26 qualified for endodontic re-treatment



Fig. 7. Distal buccal root canal as well as palatal root canal were correctly re-treated, while obliteration of mesial buccal root canal was the reason of failure of the treatment



Fig. 8. Intraoral radiogram of tooth 26 qualified for endodontic re-treatment



Fig. 9. Failure of endodontic re-treatment

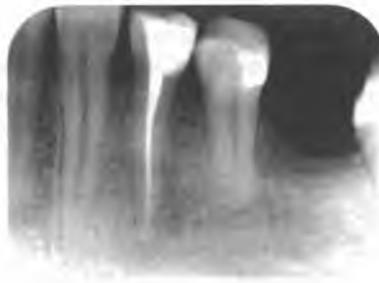


Fig. 10. Follow-up radiogram after 6 months from the end of the treatment. There is visible regeneration of bone structure in the area of earlier periapical inflammatory lesion

## RESULTS

On the basis of results of digital radiography examination 77 teeth were qualified for endodontic re-treatment (Fig. 8). Among them there were 22 teeth with curved root canals, 15 teeth with obliterated root canals, and in 5 cases a residual broken endodontic instrument was found. Two broken endodontic instruments were removed, while in 3 cases removal of the instruments was not possible. In 2 cases root perforation was found. In the remaining cases root canals were straight and radiologically patent. As many as 39 teeth qualified for endodontic re-treatment were the cause of periapical inflammatory lesions, including 16 simple granulomas, 2 cystic granulomas, 3 radicular cysts and 8 cases of chronic fibrous inflammation.

Among 77 teeth qualified for endodontic re-treatment after this treatment 68 (88%) were considered as correctly re-treated, but in 9 other cases the result of the re-treatment was negative. In 2 cases it was not possible to accurately fill root canals due to their excessive curvature, in 4 cases due to obliteration of root canals (Fig. 9); in 3 cases it was not feasible to remove broken and residual endodontic instruments during re-treatment.

On radiograms taken on follow-up visits several months after termination of the treatment, no new periapical lesions were found, while in all cases of pre-existing periapical pathologies the lesions were undergoing regression (Fig. 10).

## DISCUSSION

According to Allen et al. (1) the prognosis of preliminary endodontic treatment is better than in case of re-treatment and equals about 94%, while the success of endodontic re-treatment may be achieved in about 85% of cases. Similar observations were presented by other authors and were confirmed by the own study. Piątowska et al. (6) found negative results of endodontic re-treatment in 15% of cases, while in 85% of re-treated teeth the results were positive. Endodontic re-treatment concerned mainly molar teeth and lack of success was caused by faults in evaluation of morphology of the treated teeth. Also prosthetic appliances, silver pins, broken endodontic instruments, cements and pastes of different hardness impeded correct preparation of root canals (4). In the quoted study the measurements of root canal length were carried out by means of Ingle and Nichols method, while in the own material these measurements were carried out using distance measurements on calibrated digital radiograms in the Digora Soredex digital radiography system (5).

Digital radiography systems seem to be an optimum tool in evaluation of intraoral radiograms of endodontically treated teeth. Due to many image post-processing options they allow not only subjective, but also objective analysis of radiograms (7). It is also feasible to carry out distance measurements that are crucial in the course of endodontic treatment as well as density measurements. Density measurements are the only objective tool allowing correct analysis of radiographic image (8).

## CONCLUSIONS

1. Digital radiography is extremely helpful in decision on endodontic re-treatment.
2. A considerable number of cases of endodontic re-treatment is successful.
3. Digital radiography image post-processing options are useful in determination of root canal length as well as in determination of the presence of endodontic instruments in root canals.

## REFERENCES

1. Allen R. et al.: A statistical analysis of surgical and nonsurgical endodontic retreatment cases. *J. Endod.*, 15, 261, 1989.

2. Cieślińska-Wilk G.: Narząd zucia. In: Radiologia. Diagnostyka obrazowa. Rtg, TK, USG, MR i radioizotopy, pod red. B. Pruszyńskiego, PZWL, Warszawa 1999.
3. Friedman S., Stabholz A.: Endodontic retreatment – case selection and technique Part I. Criteria for case selection. J. Endodont., 12, 28, 1986.
4. Ledzion S., Piątowska D.: Współczesne poglądy na ponowne leczenie endodontyczne. Mag. Stom. 11, 14, 1995.
5. Marchut T.: Możliwości wyznaczania długości roboczej kanałów korzeniowych w leczeniu endodontycznym zębów: praca doktorska, AM Lublin 2004.
6. Piątowska D. et al.: Ocena możliwości ponownego leczenia endodontycznego na podstawie doświadczeń własnych. Czas. Stomat., 50, 451, 1997.
7. Różyło-Kalinowska I.: Możliwości diagnostyczne przy zastosowaniu zaawansowanego oprogramowania do obróbki obrazów cyfrowych w radiologii stomatologicznej. Twój Mag. Med. Stom., 8, 53, 2003.
8. Różyło-Kalinowska I. et al.: Badania radiodensytometryczne w ocenie korzeni zębów objętych zmianami zapalnymi okółowierzchołkowymi. Czas. Stom., 55, 688, 2002.

### SUMMARY

The aim of the study was to evaluate the possibilities of successful endodontic re-treatment. In 24 patients aged 23 to 61 there were assessed previously endodontically treated teeth. For endodontic re-treatment 77 teeth were chosen. On the basis of radiograms success of filling of root canals was evaluated immediately after root feeling and in long-term follow-up. Possibilities of successful re-treatment were found in 88% of own cases. Digital radiography is extremely helpful in qualification for successful endodontic re-treatment.

### Radiografia cyfrowa w kwalifikacji do ponownego leczenia endodontycznego

Celem pracy była ocena możliwości ponownego leczenia endodontycznego. U 24 pacjentów w wieku od 23 do 61 lat oceniano stan zębów wcześniej leczonych endodontycznie. Do ponownego leczenia endodontycznego zakwalifikowano 77 zębów. Na zdjęciach radiologicznych oceniano poprawność wypełnienia kanałów korzeniowych bezpośrednio po wypełnieniu oraz po kilku miesiącach od zakończenia leczenia. Możliwość ponownego poprawnego leczenia endodontycznego stwierdzono w 88% przypadków. Radiografia cyfrowa jest niezwykle pomocna w kwalifikacji zębów do udanego ponownego leczenia endodontycznego.