

# A 1 year follow-up of a molar root canal treatment using periapical radiographs and CBCT

Sinziana Adina Scarlatescu<sup>1</sup>, Irina Gheorghiu<sup>2</sup>, Alexandru Andrei Iliescu<sup>3</sup>, Paula Perlea<sup>1</sup>, Bogdan Pricop<sup>1</sup>, Anna Maria Pangica<sup>4</sup>, Stefan Manea<sup>4</sup>

<sup>1</sup>Department of Endodontics, Faculty of Dental Medicine, “Carol Davila” University of Medicine and Pharmacy, Bucharest, Romania

<sup>2</sup>Department of Restorative Odontotherapy, Faculty of Dental Medicine, “Carol Davila” University of Medicine and Pharmacy, Bucharest, Romania

<sup>3</sup>Department of Oral Rehabilitation, Faculty of Dental Medicine, University of Medicine and Pharmacy Craiova, Romania

<sup>4</sup>Department of Endodontics, Faculty of Dental Medicine, “Titu Maiorescu” University, Bucharest, Romania

## ABSTRACT

CBCT offers many significant advantages in dentistry, while the periapical radiographs provide a cheaper technique and a lower radiation compared to CT scan. The aim of this clinical case was to compare the outcome 1 year after root canal treatment, using digital periapical radiographs versus CBCT. Tooth 46 with necrotic pulp and periapical periodontitis was rotary prepared and filled using continuous wave condensation and AH Plus. X-rays and CBCT scans were made both before and after the treatment, at 1 year recall. On x-ray the lesion appeared to be healed, while on CBCT one can still see a smaller lesion, so the tooth is healing. The increased accuracy of CBCT offers the most relevant information for the outcome of endodontic treatment.

**Keywords:** periapical radiographs, CBCT scan, endodontic treatment

## INTRODUCTION

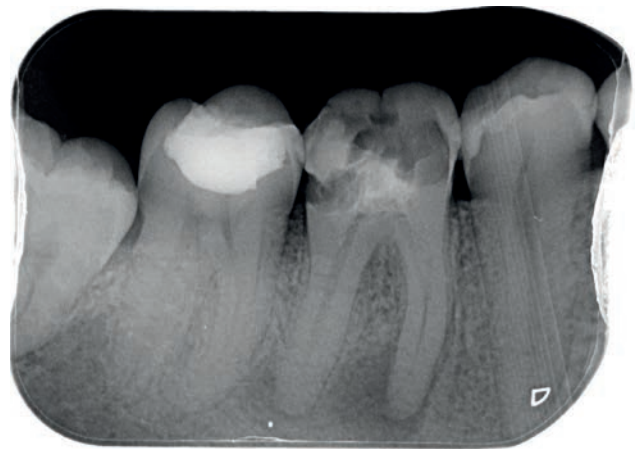
Cone beam computed tomography provides significant advantages in dentistry, clearly displaying detailed 3-D reconstructions structures of the examined region [1]. On the other hand, the x-rays offer a cheaper and simple technique, a lower radiation compared to CT scan, but not provide 3D information. Moreover, the other bones can sometimes absorb the radiation and block significant diagnostic data [2].

When it comes to evaluate the outcome of endodontic treatment, the best results are offered by CBCT because the increased accuracy of CBCT images identifies the evolution of periapical radiolucency in a more objective assessment [3].

### Clinical case

A 36-years male presented to the dental office for coronal filling in the first lower molar, without any

symptom. An objective exam revealed no sign of vitality at this tooth. At radiograph examination one can see a great loss of periapical tissue, classified as PAI 4 score (Figure 1).



**FIGURE 1.** 46 preop x-ray, apical periodontitis, PAI 4 score

### Corresponding author:

Sinziana Adina Scarlatescu

E-mail: sinziana.scarlatescu@umfcd.ro

### Article History:

Received: 4 December 2023

Accepted: 8 December 2023

PAI is a visual radiographic index defined by Ørstavik et al., 1986, consisting of five scores representing a scale from healthy periapical bone to destructive apical periodontitis [10]. Scores 1 and 2 represent healthy periapical bone and scores 3, 4 and 5 represent apical periodontitis, as follows [4]:

Score 1: health periapical tissues

Score 2: slight increase of periapical space

Score 3: bone structural changes with some reduced loss, characteristic of apical periodontitis

Score 4: well-defined radiolucency

Score 5: radiolucency with great expansions in adjacent tissues.

The treatment was done in 2 appointments. In the first appointment, after local anesthesia at Spix spine, a gingivectomy was made and the coronal walls were reconstructed using Luxacore Z Dual (DMG). Copious irrigation with 5.25% NaOCl and 17% EDTA were applied, followed by rotary instrumentation using R25 (VDW) and ProTaper Next systems (Dentsply Sirona) till X3 instrument (30.07) on mesial canals and X4 instrument (40.06) on distal canal. The tooth was temporary coronal sealed with Coltosol F (Coltene).

The patient was encouraged to make a CBCT. On the initial CBCT scans we can see also the large radiolucency, but without destruction of cortical bone (Figures 2 a, b, c).

After 48 hours, in the second appointment the root canal disinfection and chemo-mechanical preparation have been completed and US agitation was made using E5 tip on Woodpecker device set at power 1 (Woodpecker). In the end the tooth was filled using warm vertical condensation technique with a master X3 cones on mesial canals and master X4 cone on distal canal and AH Plus sealer (Dentsply) (Figure 3). The permanent coronal restoration was performed by applying Luxacore Z Dual (DMG).

The patient was called at 1 year for checking the results of the treatment. At that point the clinical symptoms were absent, the tooth was completely functional and covered by a metal-ceramic crown and the radiograph showed a completely healed lesion, with normal periapical tissues (Figure 4). The result was classified as PAI 1 and the treatment was considered a success.



FIGURE 3. Postoperatively x-ray



FIGURE 4. 1 year recall x-ray, PAI 1, tooth seems to be healed

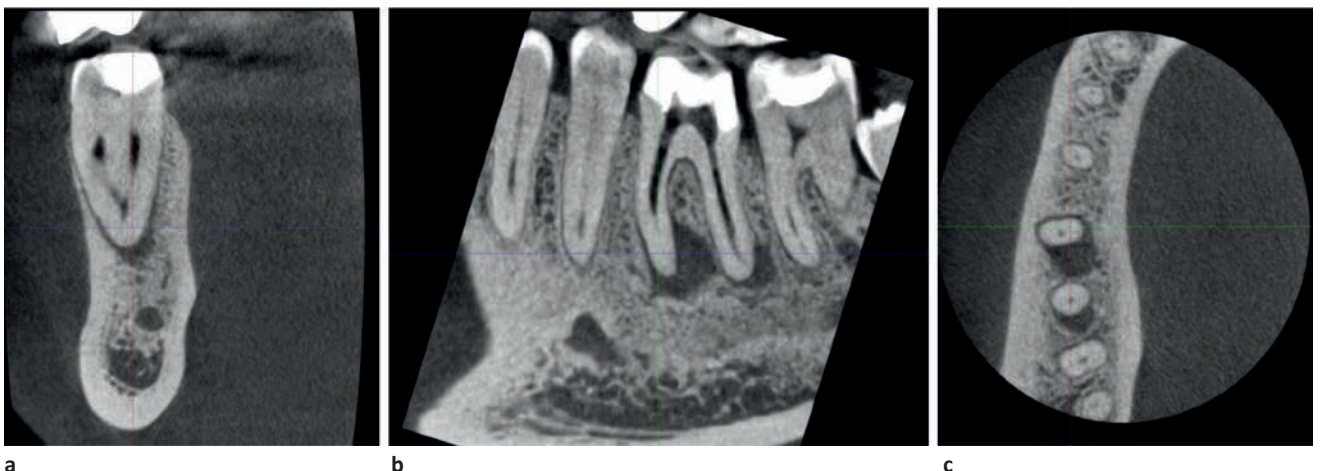
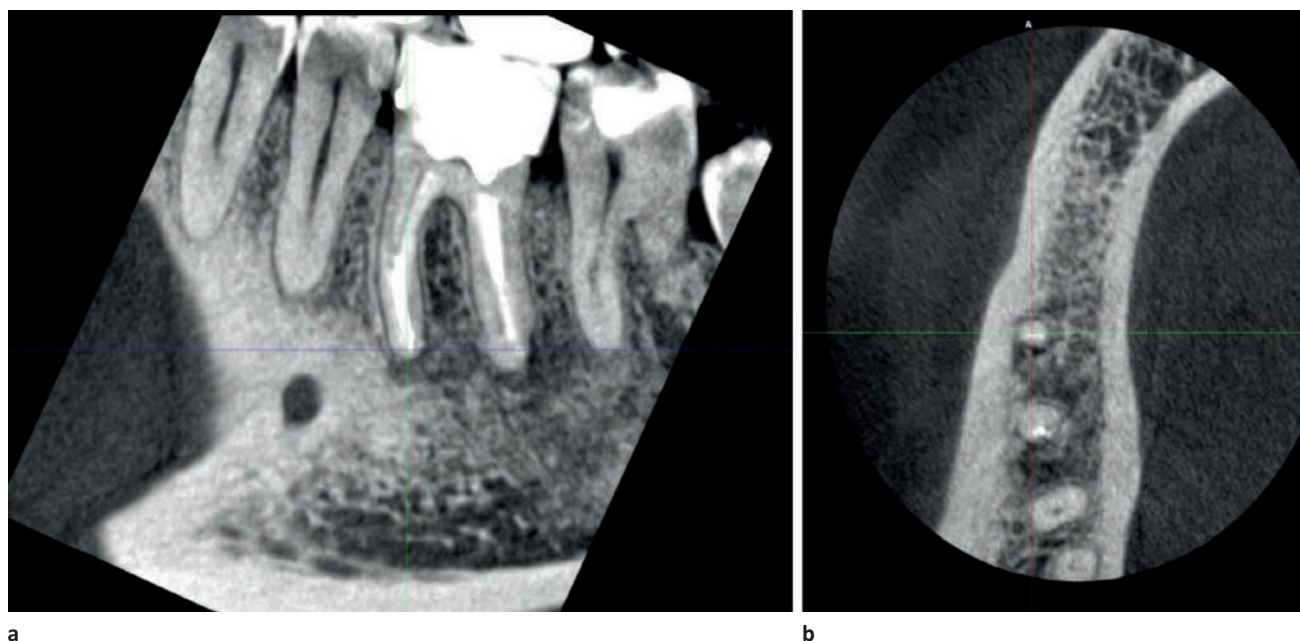


FIGURE 2. Preop CBCT, 46 with great loss of periapical tissue, PAI 4 score



**FIGURE 5.** 1 year recall CBCT, PAI 3, reduced lesion, the tooth is healing

Also, the patient was asked to make a new CBCT. But, on this second CBCT one can see a remaining lesion, smaller than the initial one, so the tooth is healing, but it is not healed (Figure 5 a, b).

## DISCUSSION

Apical periodontitis may be viewed as a time response to pulp infection from dental caries, trauma, severe attrition or abrasion [5]. In the root canal the microbes grow in adhesive biofilms that can egress into the periapex. The microbial factors and host defense create an equilibrium in the root canal systems between pathogens and host defense and therefore this fact leads to the formation of various apical periodontitis [6].

Many studies established that CBCT is more accurate than periapical radiographs to detect periapical periodontitis (Patel et al., 2009; Sogur et al., 2009; Liang et al., 2013) [7-9]. Patel et al., 2009 assessed the outcome of primary root canal treatment after 1 year and found that the healed and healing rate using CBCT was significantly lower than those obtained when assessed with periapical radiographs [7].

Due to the limitation of periapical radiographs, the size of periapical lesion at 1 year recall in this

clinical case was underestimated when compared to CBCT. Moreover, the lesion appeared to be healed, but on CBCT scans one can still see a smaller lesion, so the tooth is healing.

When assessed with CBCT, Liang et al., 2011 stated that root filling quality and quality of coronal restorations were prognostic factors in the outcome of the treatment [10]. In our case both root canal filling and prosthetic restoration seem to be good, thus further evaluation should be done to establish the tooth evolution of periapical disease.

## CONCLUSIONS

CBCT images provided a higher degree of diagnostic accuracy. The increased precision of CBCT offers the most relevant information for the outcome of root canal treatment. Further investigation and recall must be done for checking the results of the endodontic treatment till the complete healing of periapical tissues.

*Acknowledgments:* all authors contributed equally to the manuscript.

*Conflict of interest:* none declared

*Financial support:* none declared

## REFERENCES

- Rodriguez G, Abella F, Duran-Sindreu F et al. Influence of cone-beam computed tomography in clinical decision making among specialists. *Int Endod J.* 2017;43:194-9. doi: 10.1016/j.joen.2016.10.012
- Paurazas S, Geist J, Pink F, Hoen M, Steilman H. Comparison of diagnostic accuracy of digital imaging by using CCD and CMOS-APS sensors with E-speed film in the detection of periapical bony lesions. *Oral Surg, Oral Med, Oral Pathol, Oral Radiol Endod.* 2000;89:356-62. doi: 10.1016/s1079-2104(00)70102-8
- Patel S, Brown J, Pimentel T, Kelly RD, Abella F. Cone beam computed tomography in Endodontics – a review of the literature. *Int Endod J.* 2019;52(8):1138-52. doi: 10.1111/iej.13115
- Ørstavik D, Kerekes S, Eriksen HM. The periapical index: a scoring system for radiographic assessment of apical periodontitis. *Endod Dental Traumatol J.* 1986;2(1):20-34. doi: 10.1111/j.1600-9657.1986.tb00119.x
- Ørstavik D, Pitt Ford T. Microbial infection and host responses. In: Ørstavik D, Pitt Ford T editors. *Essential Endodontology. Prevention and*

- treatment of apical periodontitis. 2nd ed. Oxford: Blackwell Munksgaard Ltd; 2008:5-9.
6. Nair PNR. Apical periodontitis: a dynamic encounter between root canal infection and host response. *Periodontol.* 2000;13:121-48. doi: 10.1111/j.1600-0757.1997.tb00098.x
  7. Patel S. New dimensions in endodontic imaging: part 2. Cone beam computed tomography. *Int Endod J.* 2009;42:463-475. doi: 10.1111/j.1365-2591.2008.01531.x. Epub 2009 Mar 2.
  8. Sogur E, Baksi B, Grondahl H, Lomcali G, Sen B. Detectability of chemically induced periapical lesions by limited cone beam computed tomography, intra-oral digital and conventional film radiography. *Dentomaxillofac Radiol.* 2009;38:458-64. doi: 10.1259/dmfr/15206149
  9. Liang Y, Jiang L, Gao X, Shemesh H, Wesselink P, Wu M. Detection and measurement of artificial periapical lesions by cone-beam computed tomography. *Int Endod J.* 2013;47:332-8. doi: 10.1111/iej.12148
  10. Liang Y, Li G, Wesselink P, Wu M. Endodontic outcome predictors identified with periapical radiographs and cone-beam computed tomography scans. *J Endod.* 2011;37:326-331. doi: 10.1016/j.joen.2010.11.032