

## THE USE OF CBCT-PAI INDEX IN THE ASSESSMENT OF CHRONIC PERIAPICAL LESIONS

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### ABSTRACT:

The aim was to assess the CBCT-PAI index performance in the chronic periapical lesions diagnosis and evolution monitoring before and 3 months post-treatment. Material and methods. The study was performed on a group of 10 teeth diagnosed with chronic periapical lesions. CBCT were recorded before and after 3 months of endodontic treatment. Ez3D 2009 Plus software allowed the accurate measurement of bone lesions before and 3 months after treatment. The changes of CBCT-PAI index after endodontic treatment were assessed by recording mean values, minimum and maximal values. Results. CBCT-PAI mean value lowest decrease was recorded for the coronal-apical slice (18.62%), while CBCT-PAI highest decrease was recorded for buccal-lingual slice (28.44%). Regarding maximum and minimal values, CBCT-PAI lowest decrease was recorded for the coronal-apical slice (2.71%), while CBCT-PAI highest decrease was recorded for the buccal-lingual slice (39.70%). Conclusions. CBCT-PAI index can be used as a reliable and accurate tool in the diagnosis and the assessment of periapical lesions post-treatment evolution.

### INTRODUCTION.

In the endodontic field, the imagistic exam is essential both for diagnosis and long-term assessment of treatment results. The radiographic exam represents most used method despite some limits bi-dimensional images related to geometric distortions, anatomic variations, various angles of X-rays cone, low radiographic contrast.

Despite his advantages related to ability to produce tridimensional pictures of teeth and bone tissues associated with reduced scanning time and lower radiation dose, the use of computer-tomograph in endodontics is rather limited to the research field (1). The presence

of incipient chronic periapical lesions on CBCT images can change the endodontic diagnostic,

treatment prognostic and treatment plan (2,3). In 2008 Estrela et al. introduced a new index, adapted for the CBCT examen in endodontics (CBCT-PAI) (4). The authors consider this index as useful both in the decrease of negative false diagnostic incidence and the increase of accuracy in epidemiologic studies related to chronic periapical lesions.

The aim of study was to assess the CBCT-PAI index performance in the chronic periapical lesions diagnosis and monitoring of evolution before and 3 months post-treatment.

# MATERIAL AND METHODS.

The study was performed on a group of 10 CPL (6 bicuspsids and 4 molars) diagnosed in a 8 patients group study (age 23-40; 8 feminine sex, 2 masculine sex), treated in Clinical Medical Base of Dental Medicine Faculty, U.M.F. "Gr.T.Popa" Iassy (fig.1.a-b). The initial diagnosis was performed using clinical exam and panoramic radiographs. CBCT images were obtained using PaX-Uni3D (VAT PANO04, VATECH) and Ez3D 2009 Plus software. CBCT parameters were settled for 20 seconds exposure time, 85 kV, 5mA. All patients were treated using standardized mechanic and chemical treatment followed by

Ca(OH)<sub>2</sub> paste for 14 days. The root fillings were performed by cold lateral condensation technique and Endoflas sealer (Sanlor) with antibacterial properties. The coronal restorations were performed using glass ionomer Ketac Molar (3M/ESPE) and composite resin Filtek250 (3M/ESPE). CBCT images were assessed in corono-apical, mesial-distal, buccal-oral slices using CBCT-PAI index (fig.2.a-b). Ez3D 2009 Plus software allowed the accurate measurement of bone lesions before and 3 months after treatment. The changes of CBCT-PAI index after endodontic treatment were assessed by recording mean values, minimum and maximal values were recorded for each slice.

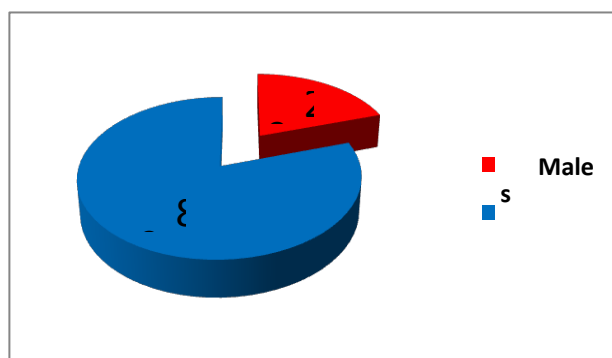


Fig.1.a. Distribution related to sex

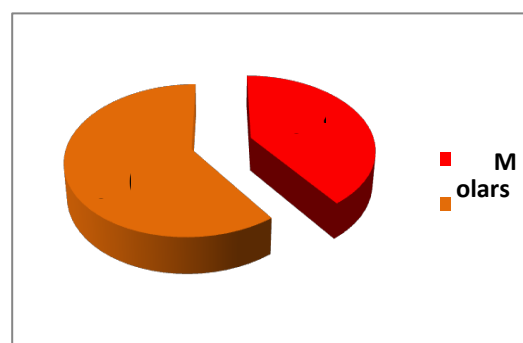


Fig.1.b. Distribution related to dental group

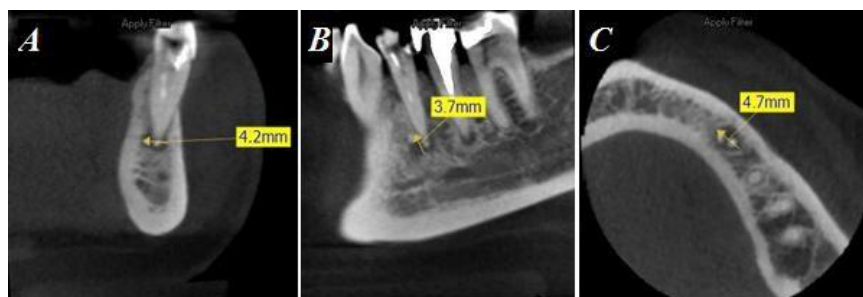


Fig.2.a. C.M., age 40. Periapical granuloma 4.3. Initial CBCT



Fig.2.b. C.M., age 40. Periapical granuloma 4.3. CBCT 3 months after treatment Results.

For the entire study group, the percent of CBCT-PAI index 4 decreased from 60% before endodontic treatment to 40% after 3 months of endodontic treatment (fig.3.a-b)

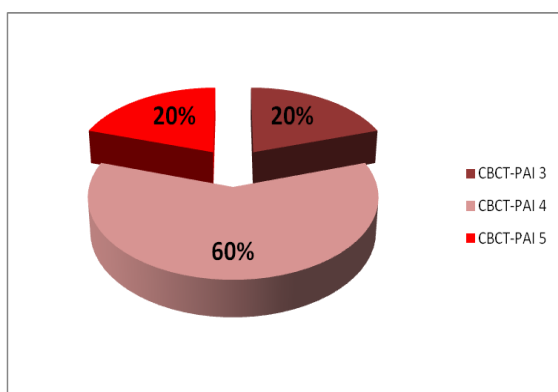


Fig.3.a. CBCT-PAI before treatment

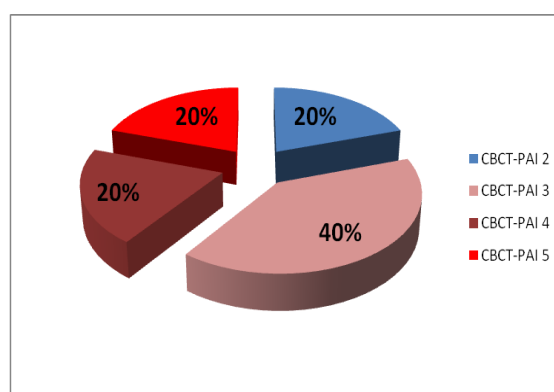


Fig.3.b. CBCT-PAI 3 months after treatment

In the coronal-apical slice, CBCT-PAI decrease was between 2.71%-28.57% with a 18,62% mean value (fig.4.a.). In the buccal-lingual slice, CBCT-PAI decrease

was between 14.29%-39.70% with a 28,44% mean value (fig.4.b.). In the mesio-distal slice, CBCT-PAI decrease was between 4.26%-33.90% with a 19.79% mean value (fig.4.c.).

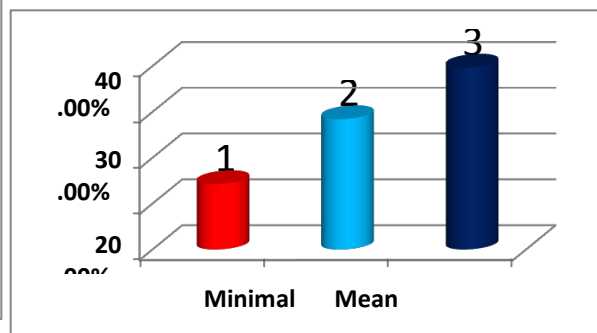
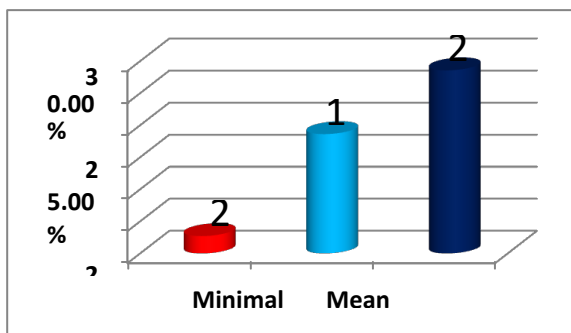
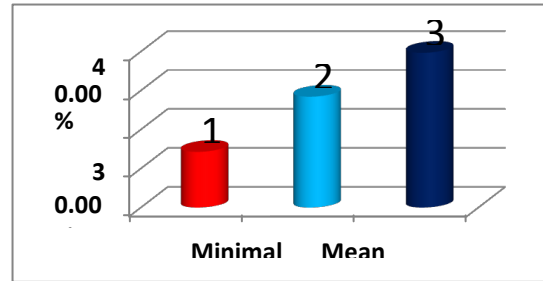
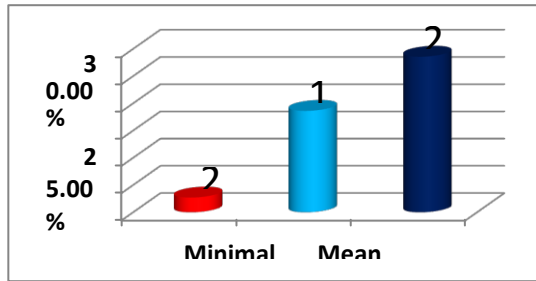


Fig.4.a. CBCT-PAI decrease in coronal-apical slice lingual slice

Fig.4.b. CBCT-PAI decrease in buccal-lingual slice

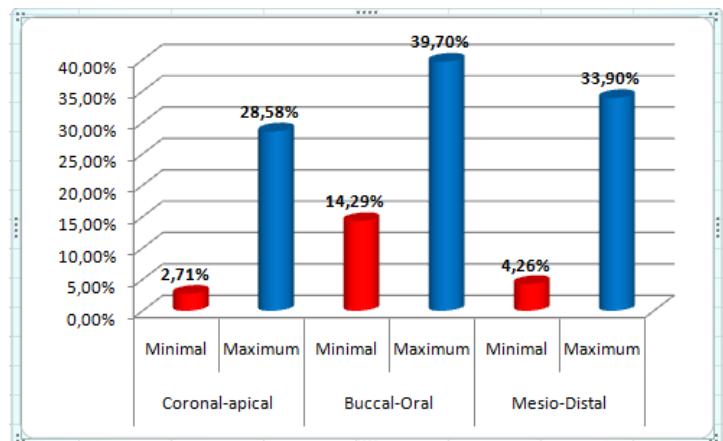
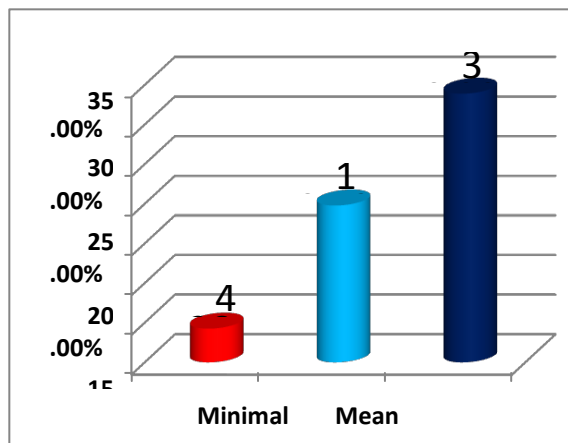


Fig.4.c. CBCT-PAI decrease in mesio-distal slice

Fig.5. CBCT-PAI decrease 3 months post-treatment

Comparing all values in all tridimensional plans, CBCT-PAI lowest decrease was recorded for the coronal-apical slice (2.71%), while CBCT-PAI highest decrease was recorded for the buccal-lingual slice (39.70%). Regarding mean values, CBCT-PAI lowest decrease was recorded for the coronal-apical slice (18.62%), while CBCT-PAI highest decrease was recorded for buccal-lingual slice (28.44%) (fig.5).

## DISCUSSIONS.

The disappearing of radiographic

radiotransparence, following the endodontic therapy, is the only prove of the root canal disinfection efficacy and sealing maintenance by root filling (5). However, 1 year post-treatment the complete absence of periapical radiotransparence on CBCT images was observed only in 16% cases (6). There is no consensus regarding the success or failure in the treatment of chronic periapical lesions. Wu MK. et al. (2011) sustain that success should be associated to the values 1-2 for CBCT-PAI indices (7). Estrela et al. (2014) demonstrated that 10 months after endodontic treatment, 54% teeth with chronic periapical granuloma presented complete periapical healing on CBCT images, while 19% were associated with partial healing (8). Ambica K. et al. (2013) demonstrate the effectiveness of CBCT-PAI index in the monitoring of chronic periapical healing (9). Also ther studies demonstrate CBCT accuracy in the post-treatment volume changes monitoring (10, 11). Abella et al. (2014) sustain that CBCT images represent "true" status of periapical tissues both before treatment and after treatment (12).

Our study demonstrated the importance of the long-term monitoring of the endodontic therapy results, as short-term monitoring can be insufficient to prove complete healing. However it is difficult to compare the results with data literature due to differences in diagnosis criteria, treatment strategies, selection of chronic periapical lesions, choice of root fillings endodontic sealers, sample size, monitoring time. Despite limitations given by short-term monitoring, our study proved the advantages of CBCT diagnostic and the use of CBCT-PAI index.

## CONCLUSIONS.

CBCT-PAI mean value lowest decrease was recorded for the coronal-apical slice (18.62%), while CBCT-PAI highest decrease was recorded for buccal-lingual slice (28.44%).

CBCT-PAI lowest decrease was recorded for the coronal-apical slice (2.71%), while CBCT-PAI highest decrease was recorded for the buccal-lingual slice (39.70%).

CBCT-PAI index can be used as a reliable and accurate tool in the diagnosis and the assessment of chronic periapical lesions post-treatment evolution.

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