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BONE DENSITY CHANGES IN PATIENTS WITH PERIODONTAL DISEASE

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ABSTRACT

Common radiologic exams offer information about the presence and type of marginal bone loss, but they cannot provide any data on the bone density assessment. **Materials and methods** We selected 69 CT scans of patients with different degrees of the supporting periodontal tissue diseases, and measured the interdental septum density. **Results** The present study confirms the dental CT scanning utility in diagnostic imaging of the proximal, interdental bone. The results of the mean alveolar bone density measurements in different depths of the interdental septum show that its correlation with periodontal diseases becomes evident between at a depth of 3 up to 5.5mm. **Conclusion** Classic or volumetric CT scanning provide valuable data on the interdental bone density, information that cannot be obtained with the same accuracy by any other classic radiologic exam.

Key words: periodontal disease, interdental alveolar density

INTRODUCTION

Common radiologic exams (Ortopanthomography and apical x-rays) offer information about the presence of marginal bone loss, its type (vertical or horizontal) and size, evaluated in mm or reported to the root or tooth length. As they are bidimensional images of tridimensional structures, it is obvious that they have certain limits regarding the number of osseous walls of the vertical bone defects and their relationship with the interradicular area, especially when considering upper molars. This fact, which influences the right diagnostic choice and the optimal treatment solution (regenerative/resective therapy), can be objectivised by classic or volumetric computed tomography (CT) analysis which offers extremely important data on the alveolar bone and interdental septum density.

The aim of this study is to evaluate the utility of dental CT as a diagnostic exam of deep periodontal tissue diseases and of its prognosis by assessing interdental septum density.

MATERIALS AND METHOD

We selected 69 CT scans of patients with different degrees of deep periodontal tissue diseases, in order to realize a complex periodontal rehabilitation, to place dental implants or to investigate the infrabony position of impacted tooth, before orthodontic treatment. Although the CT scanning wasn't performed for periodontal assessment only, all the study patients presented a certain degree of periodontal disease. CT scans were performed using Somaton Emotion by Siemens, at the EXPLORA-RX Centre in Iasi, Romania. SYNGO software (eFilm software by Merge eMed) was utilized to measure the bone density in different points, on certain areas and

the distances in mm (Fig. 1).

Patients with general diseases, pathological lesions of the maxillary bones and those under medication that influences the bone metabolism were excluded from the study.

As interdental bone density assessment was performed only on the homologue teeth, we excluded from our study the teeth without homologues on the CT scans. We also excluded the teeth on which we couldn't perform the measurements because of the artefacts caused by the brackets and metal restorations.

The study lot included 35 women and 34 men, aged between 17 and 73 years old.

The program allows direct measurements in Hounsfield units (HU) of the mean density in the central area of the interdental septum.

We chose the middle of the septum to avoid the errors given by the possible measurement inclusion of an area of the closest teeth, taking care that the measured area includes several central osseous trabeculae.

We registered the size in mm of the horizontal bone loss, the presence or absence of dental caries, the presence of fixed orthodontic treatment, endodontic treatments, periapical lesions and dental crowns.

We excluded the vertical bone loss sites because at the interdental septums of those areas, on horizontal section, the measurement at the middle of the septum would have given false results as it was partially missing.

RESULTS AND DISSCUTIONS

The age distribution of patients is presented in table 1 and Fig. 2.

The results of the mean alveolar bone density measurements in different depths of the interdental septum, according to the age group are presented in the following lines.

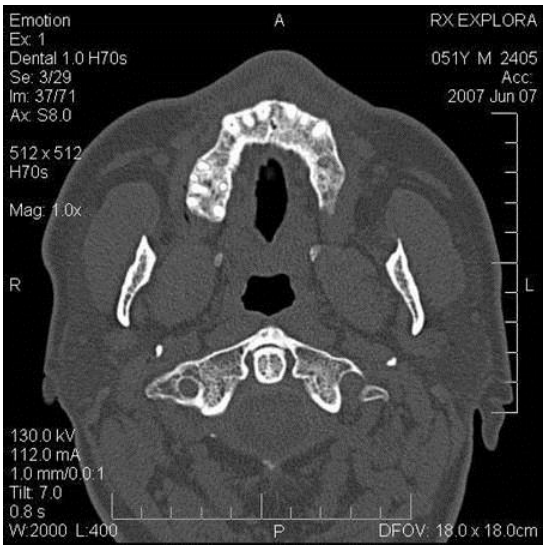

Fig. 1. Pac CG. CT horizontal section.

Age group	Number of cases
<20 years	5
21-30 years	12
31-40 years	18
41-50 years	23
>51years	11

Table 1. The age distribution of the study group

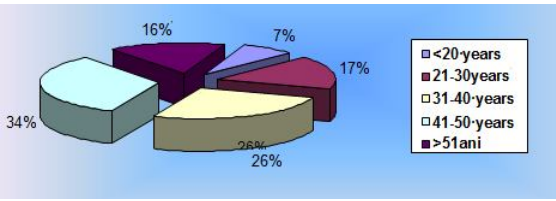

Fig. 2. The age distribution of the study group

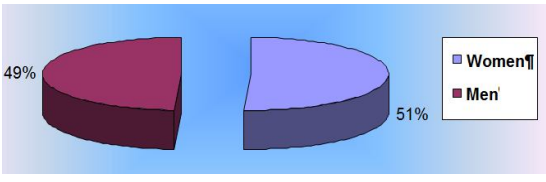

Fig. 3. The sex distribution of the study group

It is obvious that this correlation becomes evident > 3mm depth of the interdental septum up to 5.5 mm depth, fact illustrated in table 2.

The sex distribution of the lot was balanced, as the following chart shows (Fig. 3).

Although the measurements were performed up to 8mm depth from the tip of the septum, the calculations were made up to 7mm depth because, on the pilot study we observed that the bone densities beyond this limit are irrelevant (because of proximity of the maxillary sinus, mental foramen and periapical processes etc.).

The results of the correlations between the depth of the interdental septum and the mean alveolar bone density according to the age group are shown in Fig. 4. It is obvious that this correlation becomes interesting over the 3mm depth of the interdental septum up to 5.5 mm depth; fact illustrated in Fig. 5.

The present study confirms the dental CT scanning utility in diagnostic imaging of the proximal, interdental bone. Significant correlations with preceding studies on the symmetry of bone changes in periodontal diseases were obtained in our study (Mombelli & Meier, 2001; Müller & Ulbrich, 2005). CT sections in DICOM format (Digital Imaging and communications in Medicine) contain data on the bone density values, so that the software program can measure it.

Misch (1993) established a bone classification in five categories, according to their density: D1- bones with >1250 HU density, D2- bones with 850-1250 HU density, D3- bones with 350-850 density, D4 bones with 150-350 HU density and D5- values less than 150 HU.

Age (years)	0 mm	0.5 mm	1 mm	1,5 mm	2 mm	2.5 mm	3 mm	3.5 mm	4 mm	4.5 mm	5 mm	5.5 mm	6 mm	6.5 mm	7 mm
<20	261.6	404.6	529.2	517.2	478.6	418.6	349.2	336.7	287.4	264.5	266.1	268.3	334.0	292.7	268.5
20-30	340.1	625.8	855.8	889.7	877.5	792.7	661.1	600.3	573.3	537.8	529.7	511.1	510.3	492.1	480.8
30-40	238.0	509.2	587.2	590.5	562.8	508.9	482.2	457.1	413.0	337.5	348.6	374.2	329.9	355.9	324.2
40-50	197.7	392.9	548.6	608.3	593.9	579.4	543.4	483.9	456.0	476.3	392.6	379.9	307.6	290.1	436.8
>50	269.7	462.4	553.7	651.8	676.8	650.2	653.2	542.0	595.7	578.7	578.1	554.0	564.0	494.5	527.8

Table 2. The mean density of the alveolar bone in different depths of the interdental septum according to the age group

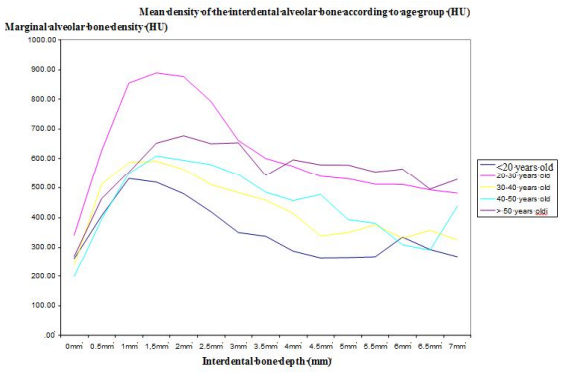

Fig. 4. Mean density of the interdental alveolar bone according to age group in different depths, starting from the tip of the septum up to 7 mm depth

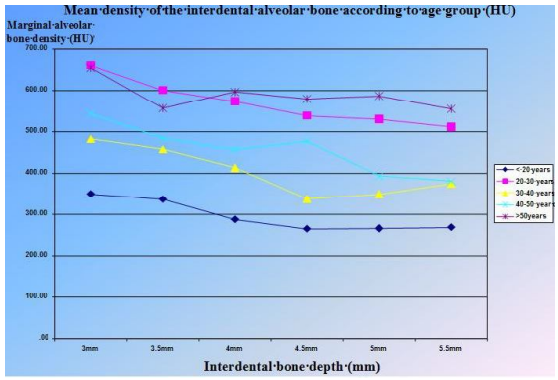

Fig. 5. Mean density of the interdental alveolar bone according to age group in different depths, starting from 3mm up to 5.5 mm depth

Misch also demonstrated that bone density measurements by CT scanning offer more precise results compared to radiologic evaluation. Therefore, bone density measurement by this method can offer more valuable data than other methods (Park et al.,

1008).

While dental CT offers tridimensional images (3D), its capacity of marking out fine details remains limited. Nowadays, fine CT multi-slice sections are capable of having sub-millimeter resolution in all three spatial dimensions (in pixels). Although the detail level remains considerably lower than compared to conventional intra-oral radiologic images, the use of CT satisfies almost all situations in which periodontal tissues images analysis is demanded by a right diagnosis.

The studies showed that CT evaluation of the infrabony pockets and alveolar bone height is reasonably precise (Mol, 2004).

CONCLUSION

CT scanning is a precise method for bone density assessment, which allows direct measurement in Hounsfield units by its software and offers important data on the quality of a major component of the deep periodontal tissues.

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