

MANDIBULAR CORTICALLY THICKNESS AS INDICATOR IN OSTEOPOROSIS SCREENING

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ABSTRACT

Systemic bone density variations have also echoed in maxillary bones, those being affected by osteoporosis with rest of the skeleton and radiological changes in their morphology are identifiable with panoramic radiographs.

Purpose Correlation between assessments of age in women patients with the presence and the level of osteoporosis degree, and also with the impaired level of osseous edge at mandible. **Material and methods** In this study we selected two groups: first group study consisted in 12 postmenopausal women patients, aged between 54 and 71 years, diagnosed with osteoporosis and the second group, as group control, included 13 women patients, aged between 55 and 78 years, also in postmenopausal status health, but without osteoporosis. The osteoporosis diagnosis was based on non-invasive methods (ultrasonography at distal phalanges of the hand), and other laboratory investigations which results were significant in the quantification of bone mineral density. Clinical periodontal health indicators assessments were recorded in datasheets, by medical transcriptions, and all cases were submitted for panoramic digital radiographs examination. Correlations between age woman's patient, the presence of osteoporosis and the impaired level of osseous edge at mandible were analysed using linear regression and a t-test (two-tailed). **Results and discussion** After mandible cortical thickness measurements (MCT) for each patient in both study groups, we've obtained the thickness average at 3.5 mm (0.4 OR) for control group (group 1) and thickness average at 2.3 mm (0.5OR) for the group with osteoporosis (group 2), and each group could be classified in one of the erosion categories C1 - C3 in infraosseous mandible basal bone. **Conclusions** Determination for MCT can be used as a method in patients' selection with postmenopausal osteoporosis or prone to osteopenia.

Keywords: osteoporosis, menopause, bone maxillary, mandible cortex thickness

INTRODUCTION

Dental radiographs are widely used in dental treatments. Therefore, a radiological method for assessing bone mineral density can be used as a screening tool in detecting forms of osteopenia or osteoporosis echoed in maxillary bones [1, 3, 4].

Osteoporosis is not an etiologic factor for periodontal disease but is a cofactor, which may aggravate periodontitis [3]. Severe osteoporosis that drastically reduces bone mineral content of the maxillary bones is directly related to level of epithelial insertion

loss in case of periodontal damage [7].

Generalized bone loss can involve maxillary, leading to accelerated resorption of alveolar bone [8]. At patient with osteoporosis, compromised bone mass and osseous density may be associated with bone loss rounded to teeth, or into edentulous ridge [9-11].

Recent studies support the hypothesis that systemic bone loss may contribute to tooth loss in healthy individuals, and that women with low bone density appears to have fewer restant teeth in dental arches, than the control

group [12, 13]. Basically it was found that women with increased postmenopausal symptoms have three times greater risk to becoming edentulous than control group [4].

Although, alveolar resorption was initially regarded as local issues, favoured by local inflammation and mechanical factors, in the light of recent studies, the implications of systemic factors it was observed more and more [5], with a close relationship between alveolar bone loss and osteoporosis [5, 6].

To study the morphological changes of the mandible colligated with osteoporosis [7], the assessments for basilar edge thickness and integrity, this means internal resorption, infraosseous and cortically resorption.

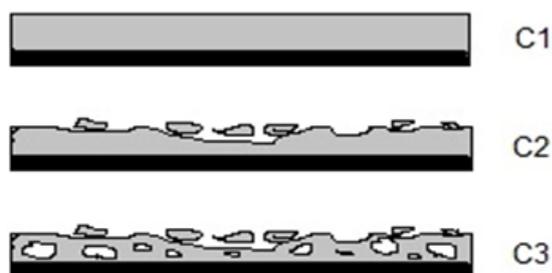
Some bone parameters, the height of alveolar bone and trabecular bone architecture are less studied. Internal and cortical trabecular resorption related with osteoporosis is a widely known phenomenon in the rest of the skeleton [17].

Purpose

The purpose of this study is to present the relevance of qualitative method for assessing bone mineral density of maxillary bones.

MATERIAL AND METHOD

We selected a group of 12 postmenopausal women patients, aged between 54 and 71 years old, diagnosed with osteoporosis and another group patients as control group were included 13 women patients, aged between 55 and 78 years old, without postmenopausal



Mandible cortical index (Fig. 1) quantifies

osteoporosis. The osteoporosis diagnosis was performed in a separate medical centre, based on non-invasive methods (ultrasonography at distal phalanges of the hand), and other laboratory investigations which results were significant in the quantification of bone mineral density. Were excluded from study all patients with pathological history that could influence bone mineral density, hyper or hypo hyperthyroidism, diabetes type I and II, osteomalacia, fluorosis, thyrotoxicosis and chronic renal failure. Patients consented to participate in this study and submit to required laboratory examinations, and give a personal written consent.

Clinical radiological assessment

We used a type Planmeca Promax 3D OPG at 15 mA, 54 - 84kV for 12s in a private radiology centre in Bucharest.

Clinical periodontal health indicators assessments we recorded in datasheets, by medical transcriptions, and all cases were submitted for panoramic digital radiographs examination. We used the same device in all patients, with digital image recording, for a more accurate reference.

For radiological evaluation of jaw morphology, following indicators are used [16]:

- Cortical thickness lower menton hole (MI)
- Panoramic mandible index (PMI)
- Gonium index (GI)
- Mandible cortical index (MCI)
- Ante-gonium index (AI)
- Bone quality index (BQI)

Fig. 1 Mandible cortical index (MCI) of internal edge (intracortically)

- C1 – internal edge (endosteal) of cortical is regular and smooth on both sides
- C2 – endosteal edge semi lunar defects (lacunars resorption) or seems to form cortical remnants (one, two or three layers) on one side or both
- C3 - cortical layer formed cortical endosteal important residues and is clearly porous [17]

mandible basilar erosion. Women patients with

osteoporosis have an increased frequency of basilar erosion than the rest [14, 15]. *Klemetti et al* [1993] classify the basilar edge aspect of the mandible, as it appears on panoramic radiographs, distally to the foramen menton, as follows (quality evaluation).

A specialized software supplied with digital OPG x-rays permitted us to make measurements for the thickness of the basilar - MCI (mandible cortical thickness) as (quantitative assessment). The results were collated in the table 1.

Next figures reveal in comparative situation (right-left) a porous appearance of the edge in the endosteal mandible (C3) with reduced thickness associated (1.9 mm) in a patient with postmenopausal osteoporosis (right figure), and in left, a patient in menopause onset, with more homogeneous endosteal mandible edge (C1) and more thick (3.9 mm).

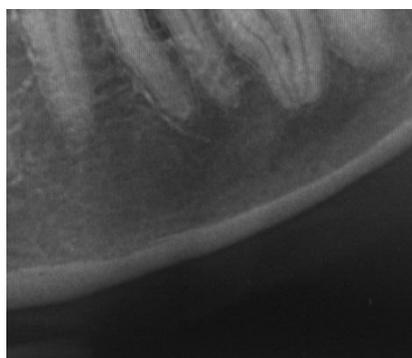


Fig. 2. MCT image without basal osteoporosis 4.1 mm (C1)

Table 1. Mandible cortical thickness in the two groups studied

No.	Lot without osteoporosis		Lot with osteoporosis	
	Age (years)	MCI (mm)	Age (years)	MCI (mm)
1	54	4,2	56	2,9
2	56	4,1	58	2,9
3	57	3,9	62	3,1
4	57	3,4	62	2,7
5	58	3,7	65	1,7
6	61	3,6	67	2,4
7	63	3,6	69	2,2
8	64	2,9	71	1,8
9	66	3,4	73	1,9
10	69	3,8	75	2,1
11	70	3,2	77	2,5
12	70	3,5	78	1,5
13	71	2,9		

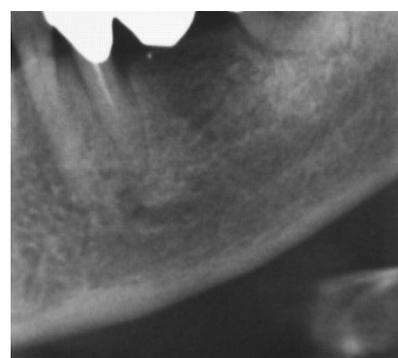


Fig. 3. MCT image with basal osteoporosis 1.9 mm (C3)

RESULTS AND DISCUSSION

Relations between age, osteoporosis manifestation of and impaired level of endosteal edge in mandible were analysed using linear regression and a t-test (2-tailed).

The main peculiarities of the studied group are presented in the table 1. The study group included a total of 25 women patients, at postmenopausal status, among them 13 were without osteoporosis phenomena, and 12 with

osteoporosis phenomena. The age average was 62.8 ± 6 years in postmenopausal group without osteoporosis phenomena and 68 ± 7.2 years in group with osteoporosis. The weight average was ranged around 58.7 ± 5.1 kg in normal group, and 54.0 ± 4.2 kg, in the group with osteoporosis. Also, the height average was 162.2 ± 7.9 cm in the first group and 161.1 ± 7.2 in the second group.

The average for mandible cortex thickness measured in each group, was at 3.5 mm (0.4 SD) for normal group (group 1) and 2.3 mm

(0.5 SD) for the group with osteoporosis (group 2). The average calculated for group 2 (with osteoporosis) it is obviously lower.

Both indices capacity, MCI (mandible cortical index) and MCT (mandible cortical thickness), to differentiate the groups considering osteoporosis are indicated in the Table 3.

As it is shown in Table 3, in 8 women patients mandible cortical index was normal at C1, that means integrity of cortical internal edge mandible, with average mean at 3.8 mm MCT (0.3 SD), in 4 women patients the index MCT was at C2 type, with mean average at 3.3 mm (0.3 SD) and one case with MCT at C3 type (thickness of 2.9mm).

Meanwhile, in postmenopausal patients group with osteoporosis we found only 2 of them with MCI at C1 (endosteal edge of the mandible integral), MCT average mean at 3.0 mm (0.1 SD), 6 women patients had type C2, with MCI average at 2.3 mm (0.4 SD) and 4 women patients had MCI at C3 type with 2.0

mm (0.4 SD) media MCT.

Considering that after analysing data obtained for the two groups with and without osteoporosis showed that there is a difference statistically significant mandible cortical thickness, relative to their morphological types ($p < 0.05$).

With a linear regression analysis for mandible cortical thickness colligated with age, we obtained its' evolutions trend, noting that with age increasing, MCT tends to decrease for both groups, normal and with osteoporosis.

This study aimed to put in evidence a simple way to reach the practitioner, for achieving a screening type in patients for the presence of osteoporosis, with a guide through qualitative and quantitative characteristics of basilar mandible, and in suspicions cases, to use one of the established methods for determining bone mineral density, such as ultrasound or DEXA (Dual Energy X-ray Absortimetry).

Table 2. Mean average mandible cortex thickness in the two groups studied

Lot Features	Lot menopause	Lot menopause
	without osteoporosis	with osteoporosis
No. of patients	13	12
Age	62,8±6,0	68±7,2
Height	162,2±7,9	161,1±7,2
Weight	58,7±5,1	54,0±4,2
MCT	3,5±0,4	2,3±0,5

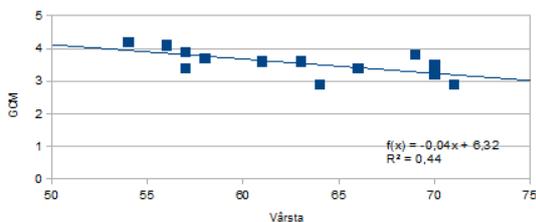


Fig. 4. MCT values according to age group without osteoporosis

Devlin et al [23] showed that the MCT

Table 3 – MCT mean average and statistically significant correlation in the two groups studied

Cortex Md	No. women patients	Average MCT ± SD (mm)	P value	
C1	Normal	8	3,8±0,3	0,00*
	Osteoporosis	2	3,0±0,1	
C2	Normal	4	3,3±0,3	0,00*
	Osteoporosis	6	2,3±0,4	
C3	Normal	1	2,9±0	0,00*
	Osteoporosis	4	2,0±0,4	

*Correlation is statistically significant at $p < 0.05$.

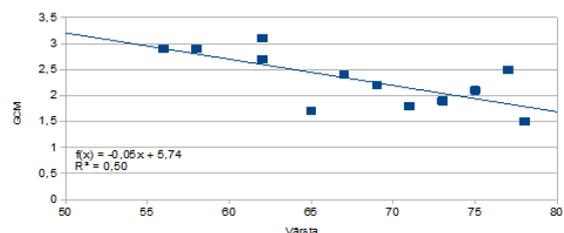


Fig. 5. MCT values according to age group with osteoporosis

efficiency was higher than MCI to detect

osteoporosis on a panoramic radiograph and that there is no additional benefit in the combination of the two methods of investigation. The authors argue that only patients with MCT <3mm should follow the more detailed investigations on osteoporosis and bone mineral density.

Horner et al [24] demonstrated that mandible cortical thinning rounded to menton hole below 3mm, measured on a panoramic radiograph; it is associated with osteopenia or vertebral level measured at the femoral neck.

As other authors have shown [12], general dentist should refer patients to a specialized center for determining bone mineral density in postmenopausal women patients that are suspected osteoporosis dental panoramic radiographs based on the analysis.

CONCLUSIONS

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