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RESEARCH ARTICLE

Mandibular radiomorphometric parameters of women with cemento-osseous dysplasia

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Objective: To compare the radiomorphometric parameters of mandibular trabecular and cortical bone of females with and without cemento-osseous dysplasia (COD).
Methods A retrospective cross-sectional paired study was conducted. Digital panoramic radiographs were obtained from females diagnosed in a public service of Oral Medicine. The participants were divided into two groups of 50 subjects each: females with a diagnosis of COD (COD group) and females without a diagnosis of COD (non-COD group), randomly chosen from the image database and paired for age. The radiomorphometric parameters analyzed were: mandibular cortical width (MCW), fractal dimension (FD) and mandibular cortical index (MCI). The paired *t*-test and Wilcoxon test were used to compare MCW and FD values and the McNemar-Bowker test compared the MCI.
Results The mean age of both groups was 46.84 ± 11.38 years. The median MCW index was 3.12 mm (2.15–4.55) for the COD group and 3.52 mm (1.90–4.70) for the non-COD group ($p = 0.034$). The mean FD value of the COD group (1.2039 ± 0.0926) was lower than that of the non-COD group (1.2472 ± 0.0894) in the anatomical region of the interest of mandibular cortical bone ($p = 0.031$), while no difference was detected in alveolar trabecular bone. The C3 degree of MCI was more frequent in the COD group ($p = 0.009$).
Conclusion: Females with COD had lower values of radiomorphometric parameters in mandibular cortical bone than females of the same age without COD. These results suggest that, in addition to the dental care recommended in the literature, COD females also require more attention and screening for low bone mineral density.
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Introduction

Cemento-osseous dysplasia (COD) is a common fibro-osseous lesion of unknown etiology, in which normal bone adjacent to the dental periapices is progressively replaced with fibrous tissue and amorphous poorly vascularized calcifications. According to site and number, the lesions are classified as: periapical (anterior), focal (posterior), and florid (various regions).[1] There is a predilection for females of African and Asian descent in the fifth decade of life, while the condition is less common among Caucasian females.[2,3] Usually, COD is asymptomatic and requires no intervention. However, infection may occur when the lesions are exposed to

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the oral environment. Patients should maintain careful oral hygiene and avoid tooth loss and surgeries in the affected regions.

The age of females with COD is similar to that of females frequently detected with low bone mineral density (BMD).[4,5] All females, with or without COD, undergo changes in bone metabolism due to hormonal imbalance during the post-menopausal period. In this phase, there is greater predisposition to osteoporosis and risk of fracture. The gold-standard examination for the determination of BMD is dual-energy X-ray absorptiometry (DXA) that measures the BMD of the lumbar spine and proximal femur region, but the high cost of this procedure does not permit its routine use in all patients. Bone loss can be detected in skeletal bones; in trabecular bone there is a decrease of connectivity, while in cortical bone there can be thinning and/or porosity.[5] Due to cost of DXA and the detection of changes in jaw bones, many researchers have used routine imaging dental examinations as a source of screening for systemic bone diseases such as osteoporosis.[6,7]

Correlation of panoramic measures with DXA has been confirmed regarding mandibular cortical width (MCW), mandibular cortical index (MCI) and, fractal dimension (FD).[8–10] MCW is also a quantitative index, measured adjacent to the mental foramen region.[11,12] FD is a mathematical method used to quantify complex structures such as trabecular bone[13] based on a computer program that provides an FD value for the region of interest (ROI) selected in the radiographic images. In contrast, MCI is a qualitative index that evaluates porosities present in the mandibular cortical bone at three degrees: C1, C2 and C3. In general, lower MCW and FD values are attributed to subjects with low BMD and with C2 and C3 degrees of MCI.[7,8,14,15]

Panoramic radiographs of individuals with diagnoses of anemia,[16] chronic renal disease,[17] diabetes,[10] and osteodystrophy[18] have been evaluated with radiomorphometric indices in order to determine if systemic manifestations can modify the trabecular and cortical bone pattern. The trabecular bone of patients with local conditions such as temporomandibular disorders[9] and hypodontia[19] has also been evaluated.

Based on the assumption that COD is a lesion that may be related to altered local bone metabolism, and adding the age factor, it is possible that females diagnosed with COD can have lower BMD than females of the same age without the disease. Thus, the aim of this retrospective study was to compare radiomorphometric parameters of trabecular bone and cortical mandibular bone of females with and without COD in digital panoramic radiographs (DPR).

Methods and materials

Study design and radiographs

A retrospective cross-sectional paired study was conducted. The Ethics Committee of our institution Universidade Federal de Minas Gerais approved the study under protocol number 1424963. Clinical records and DPR of females assessed, diagnosed and treated in the Oral Medicine Clinic and the Oral and Maxillofacial Radiology Clinic of Universidade Federal de Minas Gerais were obtained between 2014 and 2018. COD was diagnosed by correlation of clinical, radiographic and, in some cases, histopathological data. Radiolucent, mixed or radiopaque well-defined lesions associated with the apices of lower anterior teeth were classified as periapical COD, similar lesions involving a single region of the posterior teeth were classified as focal COD, and lesions in multiple quadrants were classified as florid COD.[1]

100 radiographs from a total of 12,573 records available in the service were selected for the study. Two groups were studied: 50 radiographs of females with a confirmed diagnosis of COD (COD group) and 50 radiographs of females without radiographic signs of COD (non-COD group), randomly chosen among all individuals with radiographic records in the image database of the university. Individuals with COD were paired by age with non-COD individuals. The florid COD (47 cases) was the most frequent type in the COD group. The mean age of the females in both groups was 46.84 years (±11.38).

All DPRs were taken by the same team of operators with the same KODAK 9000C 3D® device (Kodak Dental Systems, Carestream Health, Atlanta, GA, USA) at 140 kHz, 70 kV, 10 mA, and an exposure time of 14.3 s. CS Imaging software v. 7.0.3 (Carestream Health) was used for image acquisition. Subsequently, the DPRs were saved in tagged image file format with 300 dpi and 8 bits, in the Trophy DICOM 6.3.0.0 (Carestream Dental) data bank. The inclusion criteria for the images were: good quality of the exam, correct positioning of the patient and absence of ghost images in the regions of interest of the study. DPR of the individuals in the COD group with lesion affecting the mandibular cortical bone or of individuals without a trabecular bone area that did not allow fractal analysis were excluded. Panoramic radiographs of individuals in the non-COD group with bone lesions such as cysts, tumors or radiographic changes in trabecular bone were also excluded.

Data on females's age and information about the edentulous areas in the mandible were collected. The latter was collected because edentulous areas could impair the results of fractal analysis of trabecular bone.[20] Edentulism was defined according to the study of Yasar and Akgünlü.[20] Five regions were predetermined: right molar, left molar, right premolar, left premolar, and anterior. Absence of a tooth in more than three regions defined the presence of edentulism. Edentulism was observed in 20 radiographs of the COD group and in 20 radiographs of the non-COD group. Absence of edentulism was observed in 30 radiographs of the COD group and in 30 radiographs of the non-COD group.

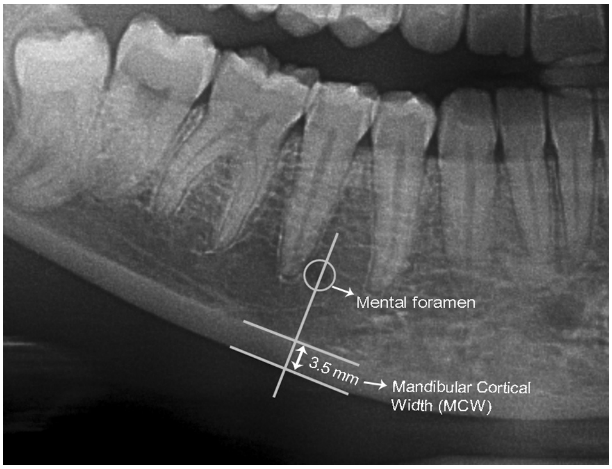

Figure 1 Cropped panoramic radiograph showing the MCW index. The mental foramen is delimited on the digital panoramic radiograph, and two parallel lines are drawn to demarcate the upper and lower edges of the mandibular cortex. A third line is drawn in the center of the mental foramen and perpendicular to the two cortical lines. The cortical width is determined by the measure parallel to the line that surrounds the two structures. MCW, mandibular corticalwidth.

No significant difference between groups was found (McNemar-Bowker test, $p = 115$).

All analyses were conducted under dim lighting conditions in a quiet environment using a 15'LG monitor (LG Electronics). The three radiomorphometric parameters used to compare the two groups were MCW, FD and MCI.

Mandibular cortical width

Entire DPRs were visualized and measured with the same image acquisition software, CS Imaging, with automatic correction to 22% magnification. It was not possible for the observer to be blind to the study because of the need to locate the mental foramen. MCW in the mental foramen region was measured on both sides of the cortical bone and the mean value of the right and left MCW values was defined for each individual according to methods reported in previous studies[11,12,21] (Figure 1). Two trained oral and maxillofacial radiologists independently measured the MCW in 20% of randomized radiographs of the study. The interclass correlation coefficient found was 0.94. Only one these radiologists performed the final MCW measurement.

Fractal dimension

The entire panoramic radiographic image was used for fractal analysis. Therefore, again, it was not possible for the observer to be blind to the study in order to avoid identification of the groups. 11 areas of the mandible were analyzed to evaluate the trabecular bone of the entire mandibular regions. These areas were based on the studies by Bulut et al,[22] Yasar and Akgülü,[23] Apolinário et al[24] and Kursun et al.[10] The ROI included areas of mandibular cortical and trabecular bone. To investigate whether there was a difference between ROIs, two square sizes were defined for trabecular bone: (1) squares of 50 × 50 pixels for FD measurement in the anterior region and on the right and left side of the condyle, angle, and region of molar and premolar teeth; and (2) a ROI of 100 × 100 pixels for measurement in the central region of the mandibular ramus (right and left) and anterior region of the mandible. This ROI was selected to adjust the size of the trabecular bone available for all patients, without the interference of the area lesions. List commands of the ImageJ were used to automatically predetermine ROI selection. The list commands in sequential form included *setTool* ("*polygon*") *makeRectangle* with manual choice of the coordinates (*x, y*) of each area to be evaluated in the DPR and ROI standardization (width = 50, height = 50 or width = 100, height = 100 in pixels scale). These steps were saved with the P*lugin→Macro→Record* and used in all DPRs. The anatomical ROI of the right and left mandibular cortical bone was selected with the polygonal tool of *ImageJ 1.4.3.67* (US National Institutes of Health, https://imagej.nih.gov/ij/), and comprised the region adjacent to the mental foramen up to the third molar region (Figure 2). Anatomical structures such as tooth roots or COD lesion areas were not included in the ROIs.

For FD determination, the images were processed according to the steps recommended by White and Rudolph[25] using the *ImageJ 1.4.3.67* software of public domain. Image processing included selection and cropping of the ROI, duplication of the cropped ROI, Gaussian filter application (σ-35, kernel size = 33 × 33), subtraction of the original image, addition of a gray value of 128, binarization, erodization, dilation, inversion, and finally skeletonization. The FD resulted from the width of boxes of 2–64 pixels calculated in the skeletal image. The box-counting technique was applied using a tool available in *ImageJ* (Figure 3).

The mean FD between the right and left sides was calculated for each ROI of 50 × 50 pixels (condyle, angle, molar, premolar), for a ROI of 100 × 100 pixels in the ramus region and for the anatomical ROI of mandibular cortical bone. For each ROI, a general mean FD value of trabecular and mandibular bone of each group was also determined. As done for the MCW, two calibrated oral and maxillofacial radiologists performed the FD calculation on 20% of the total sample, with interclass correlation coefficient above 0.87. However, only one oral and maxillofacial radiologist calculated the FD of the two groups.

Mandibular cortical index

The MCI was classified according to the method proposed by Klemetti et al,[26] observing the presence of erosions in the mandibular cortical bone from the mental foramen region to the third molar region. Homogeneous mandibular cortical bone without erosion was classified as C1, mandibular cortical bone with mild erosions in the superficial portion was classified as C2,

Figure 2 ROIs used in fractal analysis of a female with florid cemento-ossseus dysplasia. ROIs of 50 × 50 pixels were selected in trabecular bone of the condyle, angle, premolars, molars and anterior regions, and an anatomical ROI was drawn in the mandibular cortical bone (full line square). ROIs of 100 × 100 pixels also measured the fractal dimension of the mandible in the anterior region, right and left ramus (dashed line square).

and mandibular cortical bone with numerous erosions was classified as C3. 30 days after the measurements of the quantitative variables, the MCI was classified using the Adobe Photoshop 7.0 software (Adobe Systems) of the entire DPR, with 66% zoom of the mandibular cortical bone, according to a previously reported study.[27] The DPR were encoded and the trabecular bone of both groups was blurred for blinding of the groups and non-identification by observers in MCI analyses. The images obtained were 26 × 14 cm in size, tagged image file format file, 300 dpi and 8-bits. The two mandibular cortical sides were classified, and the higher degree defined the MCI of each individual. Two calibrated oral and maxillofacial radiologists separately classified the MCI. The κ test of the assessments was 0.75. Divergent classifications were analyzed by a senior oral and maxillofacial radiologist and a consensus was reached.

Statistical analysis

A descriptive analysis was performed to show the distribution of the variables in each group. The Kolmogorov–Smirnov test (K–S) was applied in order to determine if the quantitative variables MCW and FD presented normal distribution. The paired *t*-test and Wilcoxon test were used to compare the MCW and FD values between the COD and non-COD groups. The McNemar–Bowker test was used to compare the edentulous areas and the MCI between groups. The Statistical Package for the Social Sciences (SPSS) software (SPSS® v. 20.0 for Windows) was used for all analyses.

Results

Data regarding the MCW values were not normal in the COD group (K-S, $p = 0.047$) and were normal in the non-COD group (K-S, $p = 0.200$). The median value of the MCW index was significantly lower in the COD group compared to the non-COD group (Table 1).

Regarding FD values, ROIs 50 × 50 pixels showed non-normal distribution (K–S, $p < 0.05$) in the condyle and anterior regions of one group. Total mean trabecular FD in ROI 100 × 100 pixels also showed non-normal distribution. FD of the condyle regions differed significantly between groups, with median of 1.4120 (1.0756–1.5057) for the COD group and 1.3710 (1.0684–1.4929) for the non-COD group ($p = 0.016$). In all other square ROIs, FD values showed normal distribution (K–S, $p > 0.05$), with no significant differences between groups when compared by the paired *t*-test. The anatomical ROI of mandibular cortical bone showed a significant FD difference between groups ($t = -2.050$, $p = 0.031$). The mean FD of the COD group (1.2039 ± 0.0926) was lower than that of the non-COD group (1.2472 ± 0.0894) (Table 2).

Three females in the COD group and nine in the non-COD group were classified as having MCI degree C1. In both groups, the C2 degree was the most common (26 cases in the COD group and 34 in the non-COD group). The C3 degree was observed in 21 cases of the COD group. The McNemar–Bowker test indicated a difference between groups ($p = 0.009$) (Table 3). Images of digital panoramic radiographs of COD and non-COD individuals evaluated in the study are shown in Figures 4 and 5.

Discussion

The present study evaluated the radiomorphometric parameters of females with and without COD. The mandibular cortical bone of females with COD showed lower width and lower FD values and more cases of MCI C3 degree than the non-COD group. However, most trabecular bone FD values of both groups were similar. Parameters evaluated in panoramic radiographs of post-menopausal females have shown high sensitivity and specificity for the detection of low BMD.[28] The clinical importance of the panoramic parameters is that they predict bone fragility and fracture risk, which may ultimately impair the quality of life of females. COD is a disease of the jaws with strong female predilection and with a strong association with hormonal factors.[4,29] Therefore, BMD deficiency was expected to be present in the COD group.

Panoramic radiograph is a low-dose X-radiation and low-cost exam frequently requested in clinical practice for evaluation of the oral and maxillofacial region. It is an economical and reliable tool for screening low BMD patients, since the high cost of DXA does not permit the evaluation of all females.[6,28,30] Despite limitations of distortion and image overlap, panoramic radiographs provide several types of information.[9] Patients with COD require radiographic exams not only for diagnosis, but also for follow-up. There is no definitive protocol for the follow-up period of patients with COD, but radiographic exams at intervals of 18–24 months have been reported.[31,32] In the initial stage, the lesions are radiolucent and well-defined and over time they become sclerotic. The increased radiopacity also shows a greater

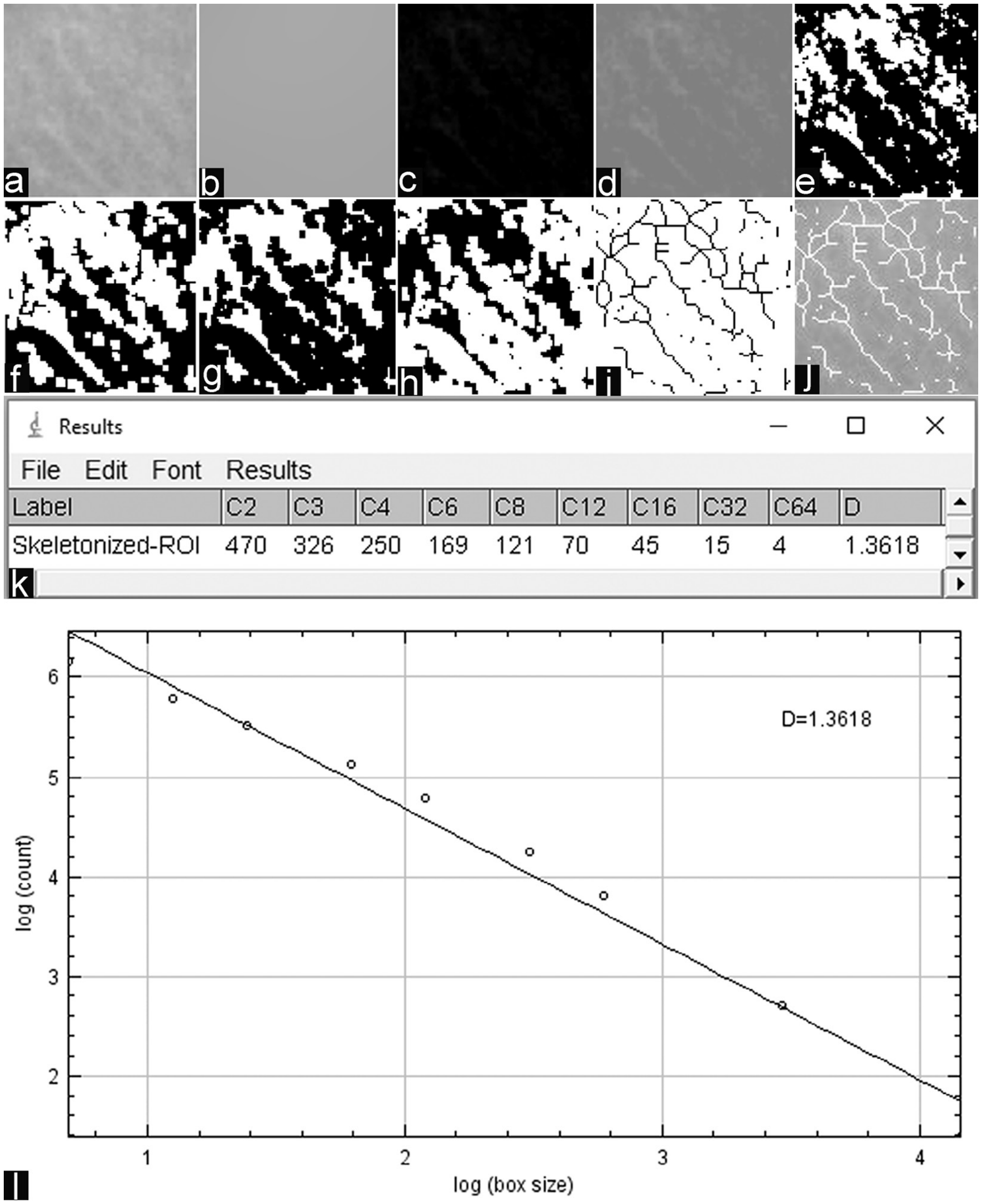

Figure 3 Stages of fractal analysis. Cropped from the region of interest (a), Gaussian filter application (σ-35, kernel size = 33 × 33) (b), subtraction of the original image (c); addition of the gray value of 128 (d), binarization (e), erodization (f), dilation (g), inversion (h), skeletonization (i, j) skeletonization overlapping the initial ROI. The results in the boxes are values of 2–64 pixel dimension (k) and graphic representation of the D value corresponding to the fractal dimension (l). ROI, region of interest.

Table 1 Mandibular cortical width index of each study group

Group	*N*	*Median MCW (mm)*	*Minimum–Maximum*	p-*value*[a]
COD	50	3.12	2.25–4.55	0.034
Non-COD	50	3.52	1.90–4.70	

COD, cemento-osseuos dysplasia; MCW, mandibular cortical width; mm, millimeter.
[a]Wilcoxon Test

Table 2 Comparison of FD according to regions of interest and study groups

ROI	*Region*	*Group*	*N*	*Mean (±SD) FD*	*Median FD (Min-Max)*	p-*value*
Square 50 × 50 pixels: trabecular bone	Condyle	COD	50	1.3956 (±0.0793)	1.4120 (1.0756–1.5057)	**0.016**[a]
		Non-COD	50	1.3569 (±0.0947)	1.3710 (1.0684–1.4929)	
	Angle	COD	50	1.3902 (±0.0737)	1.3896 (1.1295–1.5104)	0.503[b]
		Non-COD	50	1.4001 (±0.0711)	1.4125 (1.2580–1.5165)	
	Molar	COD	50	1.3168 (±0.0844)	1.3154 (1.0255–1.4963)	0.350[b]
		Non-COD	50	1.2996 (±0.1082)	1.3103 (1.0007–1.4678)	
	Premolar	COD	50	1.3096 (±0.0714)	1.2979 (1.1400–1.4503)	0.855[b]
		Non-COD	50	1.3126 (±0.0741)	1.3258 (1.1173–1.4390)	
	Anterior	COD	50	1.2906 (±0.0970)	1.2890 (1.0286–1.4770)	0.798[a]
		Non-COD	50	1.2802 (±0.1259)	1.3059 (0.8996–1.4568)	
Square 100 × 100 pixels: trabecular bone	Ramus	COD	50	1.3471 (±0.0955)	1.3557 (1.0205–1.5046)	0.682[a]
		Non-COD	50	1.3335 (±0.1333)	1.3760 (0.8364–1.4853)	
	Anterior	COD	50	1.2438 (±0.0992)	1.2454 (0.9610–1.4216)	0.866[b]
		Non-COD	50	1.2772 (±0.1132)	1.2624 (0.9726–1.4385)	
Anatomic ROI	Cortical	COD	50	1.2039 (±0.0926)	1.2019 (1.0312–1.4006)	**0.031**[b]
		Non-COD	50	1.2472 (±0.0894)	1.2483 (1.0546–1.3830)	
Square 50 × 50 pixels	Trabecular total mean	COD	50	1.3461 (±0.0419)	1.3440 (1.2042–1.4154)	0.223[b]
		Non-COD	50	1.3354 (±0.0508)	1.3486 (1.2040–1.4099)	
Square 100 × 100 pixels	Trabecular total mean	COD	50	1.3127 (±0.0741)	1.3173 (1.0847–1.4184)	0.595[b]
		Non-COD	50	1.3047 (±0.0984)	1.3210 (0.9750–1.4370)	

COD, cemento-osseuos dysplasia; FD, fractal dimension;ROI, region of interest; SD, standard deviation.
[a]Wilcoxon test,
[b]Paired test T.

formation of avascular mineralized tissue.[29] A utility panoramic radiograph may exceed the area of oral and maxillofacial pathology, and dentists are encouraged to make global assessments of their patients. The evaluation of the radiographic parameters of patients with COD is recommended. In addition to being non-invasive and easily applicable methods, they can provide information about bone changes of great clinical importance.

The mandibular trabecular and cortical bone pattern of individuals with COD had not been evaluated previously. Like other individuals, females with COD have dental treatment needs, such as the wearing of prostheses, implant placement, and tooth extraction. The presence of COD lesions may contraindicate invasive procedures due to an increased risk of infection.[29,30] For the oral health providers who treat these patients, it is important to know whether the bone structure not affected by the disease has aspects of normality. In the present study, fractal analysis permitted us to evaluate the trabecular bone of females of both groups. The two

Table 3 MCI of the two groups

	MCI n (%)				
Group/MCI	*C1*	*C2*	*C3*	*N total*	p-*value*[a]
COD	3 (6.0)	26 (52.0)	21 (42.0)	50 (100)	0.009
Non-COD	9 (18.0)	34 (68.0)	7 (14.0)	50 (100)	

MCI, mandibular cortical index; COD, cemento-osseuos dysplasia
[a]McNemar–Bowker test.

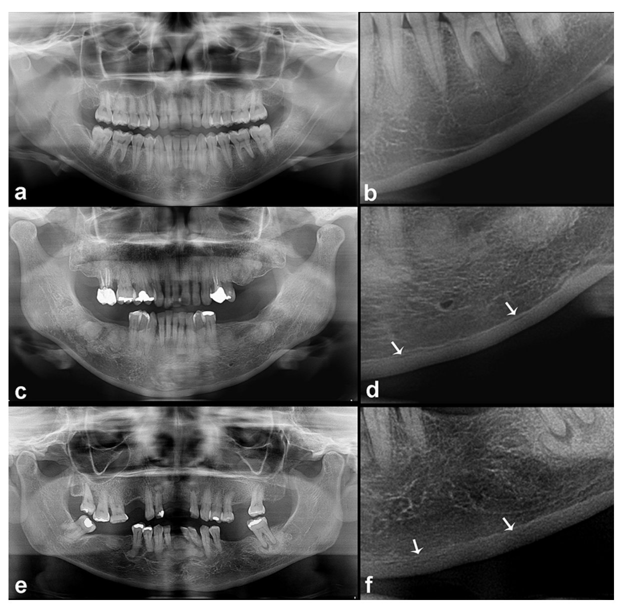

Figure 4 Images of digital panoramic radiographs of females with cemento-osseous dysplasia showing the MCI. The classification includes three degrees: C1: intact and homogeneous cortical bone without erosion (a, b); C2: few erosions (white arrows) on the upper surface of the mandibular cortex (c, d); C3: several erosions (white arrows) are observed along the entire length of the cortical bone (e, f). C2 and C3 were the most common in the COD group. MCI, mandibular corticalindex.

sizes of square ROIs showed no difference in trabecular complexity between groups, except in the condyle region. FD values were higher in the angle and condyle region than the in alveolar bone. The anterior region had the lowest FD value. These results suggest that the apparently healthy trabecular bone structure of the COD group is similar to that of females without the disease, in particular in the alveolar process of the molar, premolar and anterior regions, where COD lesions are more common. Therefore, the complexity quantified by the fractal method does not allow us to predict whether visibly normal trabecular bone regions will be affected by COD in the future.

FD quantifies self-similar structures and has been widely applied to dental images by means of the box-counting method for the evaluation of systemic therapies[13,24] and bone diseases.[16–18] Individuals diagnosed with osteoporosis, kidney disease, and sickle cell anemia have been reported to have lower FD than their healthy peers.[8,14,17] Individuals with temporomandibular disorder had significantly lower FD values in the condyle region compared to a group of healthy individuals.[9] On the other hand, in the same region, our study showed higher FD values in the COD group compared to the group without COD. The trabecular complexity of the condyle region in females with COD deserves further investigation. The presence of calcification in alveolar bone seen in COD cases may induce increased forces on the condyle, and trabecular bone may be more complex in this region. Masticatory forces may be transmitted to trabecular bone, and the presence of teeth influences the

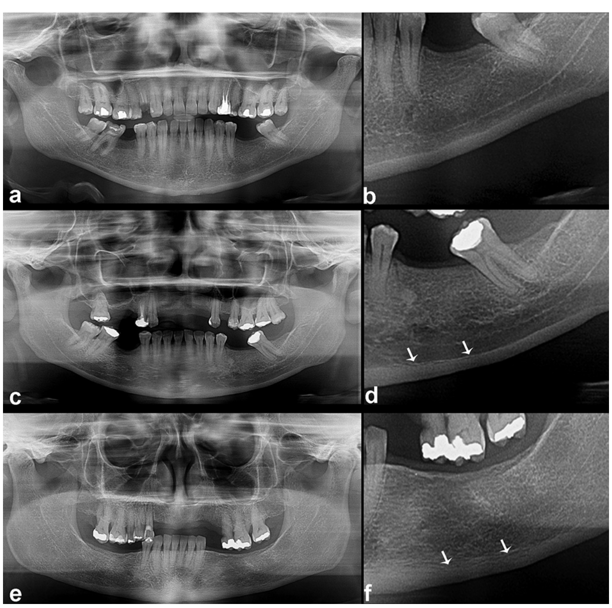

Figure 5 Images of digital panoramic radiographs of females of the non-COD group also showing the MCI. C1: intact and homogeneous cortical bone (a, b); C2 with few erosions (white arrows) in the mandibular cortex (c, d), C2 was the most frequent in the non-COD group; and C3: several erosions (white arrows) are observed along the entire length of the cortical bone (e, f). COD, cemento-osseousdysplasia; MCI, mandibular cortical index.

bone architecture, since edentulous regions have higher FD values, demonstrating more complex and homogeneous trabecular bone than adjacent tooth regions.[20] In our study, the masticatory forces on the trabecular bone did not seem to influence the FD of alveolar bone (molar, premolar), since edentulism was similar in the two groups.

Panoramic and periapical radiographs have been the most commonly used exams in studies with FD, even though evaluations with CBCT have increased recently.[33] Image processing before FD calculation aims to remove soft tissue overlap and distortion.[25] Since FD is an analysis of image texture, parameters with respect to the resolution of images and compression of data or files may affect the results.[34,35] In addition to requiring increased patient exposure to radiation, CBCT images have low resolution. Therefore, the use of panoramic radiographs has been strongly recommended.[35]

The radiomorphometric parameters used to compare groups are non-invasive and relatively easy to apply. MCW > 4 mm is commonly observed in healthy individuals.[14,28] while females with low BMD have mean MCW values below 3 mm.[7,14] Individuals with other bone metabolism diseases such as diabetes,[10] thalassemia[36] and children with imperfect osteogenesis[24] also showed less thick mandibular cortical bone. The females in the COD group with a median MCW of 3.12 mm was lower compared to females without COD, whose MCW was thicker even if below 4 mm. In the mandible, COD affects the alveolar process and hardly exceeds the mandibular canal. Thus direct damage of the lesions to the mandibular cortex is unlikely.

As a qualitative index, the presence of the COD lesion in the radiographic images may compromise the classification of MCI by the observers. Therefore, in contrast to the quantitative parameters, the blurring of trabecular bone was necessary. Several MCI erosions or C3 degree were found among females of the COD group. Changes in the mandibular cortex distally to the mental foramen are also common in females with low BMD.[7,8] The morphology of the mandibular cortical bone of the females in the COD group seems to correspond to the quantitative MCW and FD data, although the parameters are independent. The lower FD values of the anatomical ROI of cortical mandibular bone revealed poor complexity in relation to trabecular bone. However, erosion was observed, as shown by the MCI C3 results. In contrast, a study conducted on individuals with osteoporosis detected higher FD values in the C3 than in the C1 group.[23]

This analysis shows important differences between groups of females with and without COD, but it should be pointed out that many other variables, such as estrogen levels, diet, race, heredity, tobacco and alcohol consumption may interfere with bone architecture.[30] These variables were not available in the records of the present study. Serum calcium, phosphorus and alkaline phosphatase are investigated in fibro-osseous lesions in order to exclude other diseases. In COD cases, few studies have reported biochemical data and, when they did, no changes were observed.[37–39] Other markers of bone remodeling, such as osteocalcin, PTH and 25-hydroxyvitamin D could be investigated to aid in the understanding of COD and its relationship with BMD.

The main limitation of this study was the lack of DXA data. All records came from an Oral Medicine clinic, where specific medical tests were unavailable. The other limitation regards the retrospective characteristic of the study, which prevented the description of other systemic diseases in the two groups. Conditions, such as diabetes and changes of thyroid hormone may have indirectly affected bone metabolism.[6] Prospective studies including these variables are encouraged in order to obtain more robust information.

Conclusion

Considering the limitations, the findings of this study showed differences in radiomorphometric parameters between the COD and non-COD groups. Despite the similarity in trabecular bone, the main differences were observed in cortical bone. Females diagnosed with COD have lower width, lower FD value and more erosions (MCI C3) in the mandibular cortical bone than females of the same age without COD. The results presented herein suggest that, in addition to the dental care recommended in the literature, individuals with COD also require more attention and screening for low BMD.

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