ENDOSSEUS IMPLANTS IN OSTEOPOROSIS

Cristian Ratiu[1], Andrea Herczeg[2], Sanda Casian[3]

REZUMAT

Obiective: Integrarea implantelor endoosoase în osteoporoza sistemică poate prezenta riscuri datorită pierderii masei si densității osoase care afectează întreg scheletul, inclusiv oasele maxilare. Scopul lucrării este de a estima modificările la nivelul maxilarelor în osteoporoza sistemică, precum și integrarea implantelor. **Material si metode:** Am luat în studiu 23 de cazuri la care am estimat modificările osoase maxilare în osteoporoza sistemică, folosind ortopantomografia coroborată cu DEXA și am inserat implante madibulare. **Rezultate:** examinând ortopantomografiile, am găsit modificări ale cortexului mandibular inferior de tip C-2 la 9 pacienți și de tip C-3 la 7 pacienți. Analizele DEXA arată că, din cei 9 pacienți cu cortex C-2, 2 au prezentat osteoporoză sistemică (22,2%), respectiv 4 din cei 7 cu cortex C-3 (57,1%). Inserarea implantelor s-a soldat cu un singur eșec la un pacient cu cortex C-3 și scor T-3,4 la DEXA. **Concluzie:** În osteoporoză utilizarea ortopantomografiei avertizează asupra modificărilor osoase, care însă nu constituie o contraindicație absolută pentru inserarea implantelor mandibulare.

Cuvinte cheie: osteoporoză, maxilar, mandibulă, radiografie panoramică. cortex mandibular

ABSTRACT

Objectives: Osseointegration of dental implants in systemic osteoporosis may involve risks because of bone and density loss which occurs in the entire skeleton. The aim of this study was to asses jaw changes in systemic osteoporosis and also implant osseointegration. **Material and methods:** We have studied 23 patients by estimating osteoporotic bone changes in jaws, using panoramic radiographs; further implants were placed. **Results:** When panoramic radiographs were examinated, we have found mandibular inferior cortex changes type C-2 in 9 patients and type C-3 in 7 patients. Performing DEXA, 2 of 9 patients with cortex C-2 (22,2%) and 4 of 7 cortex C-3 (57,1%) have shown systemic osteoporosis. Implant placement failed in one case, of a pacient with C-3 and T-3,4 score in DEXA. **Conclusions:** We have concluded that panoramic radiographs warn us about bone changes in systemic osteoporosis, which therefore is not an absolute contraindication for mandibular implants.

Key Words: osteoporosis, maxillary, mandibular, panoramic radiography, mandibular cortex

INTRODUCTION

Implant therapy in systemic osteoporosis appears in certain textbooks of implantology as an absolute contraindication, which is relative in others' opinion, or is not even mentioned, although it is a disease characterized by the loss of bone mass and bone density in all bones, including the jaws.[1-4]

[1] Department of Implantology,[3] Department of Restorative Dentistry, Faculty of Pharmacy, Oradea University, [2] Private Office, Satu Mare

Correspondence to:
Cristian Ratiu, 23 Moscovei str, 410001, Oradea
Email:ratiu_cristian@yahoo.com

Received for publication: Jul 28, 2007. Revised: Sep 14, 2007.

In osteoporosis the metabolism is impaired, so theoretically implants osseointegration is hard to be achieved. In spite of this, systemic osteoporosis doesn't mean that jaws can't integrate endosseus implants, so it shouldn't be an absolute contraindication of implant therapy. Although it was established a correlation between systemic bone loss, bone mass and bone density loss in jaws, no connection between systemic osteoporosis and implant's failure was established.[4]

The diagnosis of osteoporosis is still a difficult problem, referring to the radiological modifications that appear when the bone mass loss is 30-35%, which in jaws occurs as: thin and porous mandible cortex and radiological density decrease.[5,6]

A review of cross-sectional studies, in vitro, of bone morphometric analyses, has shown that the bone structure of the normal dentate jaw, in older individuals, is characterized by relatively thin porous cortical bone

lamellae with an endosteal spongiosation, as in other bones, and these age-related cortical changes tend to be more marked in females than in males. However, the pronounced interindividual and regional variations in the amount of cancellous bone in jaws mask gender and age related decrease in cancellous bone mass which has been demonstrated in other cancellous parts of the skeleton.[7]

The mineral content of the mandible is low in patients with osteoporotic fractures so that BMD (bone mineral density) of the mandibular bone is related with osteoporosis that is a low skeletal BMD, even if the conformity at other different levels of the skeleton is reduced. Using densitometry, the major part of the researchers, but not all of them, found that the optic radiological density of the mandible is grown in patients with osteoporosis and is related with low vertebral BMD. This was found, analysing osteoporotic women, compared with non-osteoporotic women of the control group and with women who had antecedents of osteoporotic vertebral fractures. The decrease of the alveolar bone density in the cortex and sub-cortex was also related with osteoporosis and it was also emphasized in longitudinal studies, which indicates bone mass decrease in jaws of osteoporotic patients.[6]

The correlation between bone mineral content/ bone mineral density in different skeleton sites and the jaws is too inaccurate for predicting these changes in the jaws. This was confirmed by the author's findings when analyzing this relationship in groups of individuals of similar gender and age, collected from previous studies.[7]

Table 1. Relationship between bone mineral content in standard sites of the mandible and forearm bones in groups of young normal adult females and males below under 44 years of age, elderly females and males between 64-80 years of age. Number of individuals (n), Spearman rank correlation (R) and corresponding coefficient of correlation (r).[8]

Groups	n	R	r
Young females	50	0.33**	0.34
Young males	50	0.51*	0.52
Elderly normal females	40	0.5*	0.52
Elderly females with osteoporotic fractures	24	0.56*	0.59
Elderly normal males	24	0.31***	0.32

*p < 0.01; **p < 0.05; ***p > 0.10

The aim of this study is to detect the radiological bone changes in jaws because of systemic osteoporosis and on the other hand to asses how can these changes impair implants osseointegration.

MATERIAL AND METHODS

There were studied 23 postmenopausal women over 50 years, ages between 50-80 years, who have asked for mandibular implant therapy.

Panoramic radiographs were used to show osteoporotic bone changes in jaws and DEXA (dual x-ray enery absortiometry) in order to asses bone changes in hip and lumbar spine.

a). In order to asses bone for implant therapy, **panoramic radiographs** with 1.25 magnification were taken, which provide a uniform magnification in all the cases and decrease interpretation errors.

We have estimated the characteristics of mandibular inferior cortex (MIC) to asses jaws osteoporotic bone changes from many other methods because 24.5% from patients with cortex type C-2 and 45.8% from patients with cortex type C-3 had osteoporosis measured by DEXA at lumbar spine.[8]

Using MIC bone changes in mandible is estimated in concordance with the classification of Klemetti et al. as followed:[9]

- C1- normal, the endosteal margin of the cortex is even and sharp at both sides; (Fig. 1)

- C2 - mildly to moderately eroded cortex, the endosteal margin shows semi lunar defects (lacunar resorptions) and/or seems to form endosteal cortical residues on one or both sites; (Fig. 1)

- C3 - severely eroded, the cortical layer forms heavy endosteal cortical residues and is clearly porous. (Fig. 1)

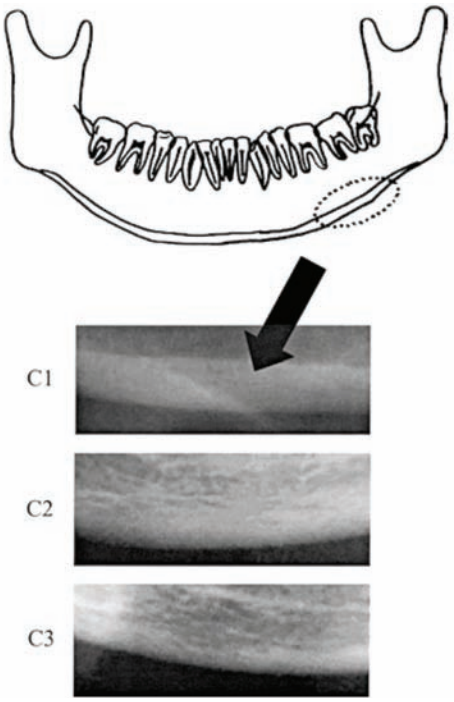

Figure 1. Classification of mandibular inferior cortical appearance.

b). **DEXA** (dual x-ray energy absortiometry) is the gold standard in osteoporosis diagnosis. We have estimated bone changes using T score, because it includes bone changes due to natural bone mass loss and those produced by etiological factors of osteoporosis. Values between –1 and –2.5 means osteopenia and values < -2.5 meaned osteoporosis in examined site.

Due to the correlation of systemic osteoporosis with mandibular bone changes, in order to certify that these changes are due to systemic osteoporosis I subjected the patients with cortex type C-2 and C-3 to hip and lumbar spine DEXA .

RESULTS

From the 23 patients, 9 have presented cortex type C-2 and 7 cortex type C-3, and they were subjected to DEXA examination. There were considered only the situations with patients who had type C-2 or type C-3 mandibular cortex, because C-1 is hard to diagnose and the analyses show that only 8,7% of the patients with this type of cortex present osteoporosis.[6] (Fig. 2)

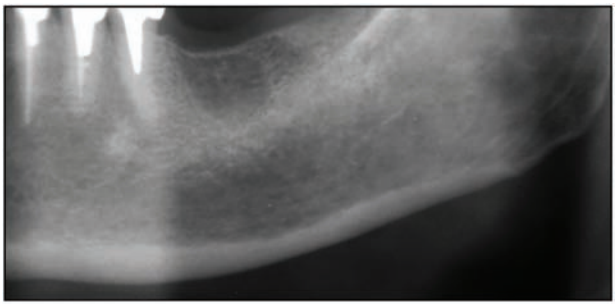

Figure 2. 57-year-old woman with normal left mandibular inferior cortex detected on dental panoramic radiograph.

The DEXA examination concluded that 2 patients with cortex C-2 (22.2%) and 4 (57.1%) patients with cortex C-3 had BMD values higher than –2.5 standard deviation to the mean (score T). (Figs. 3,4)

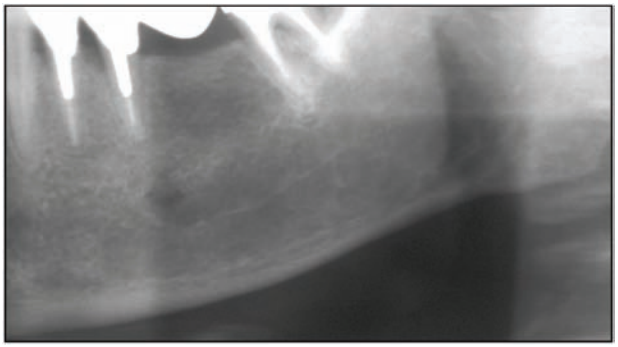

Figure 3: 58-year-old woman with mildly to moderate eroded left mandibular cortex detected on dental panoramic radiograph.

These results mean the presence of osteoporosis at the level where the measurement showed this value (hip, vertebrae). The results are in concordance with the results obtained by other authors, like SC White.[6]

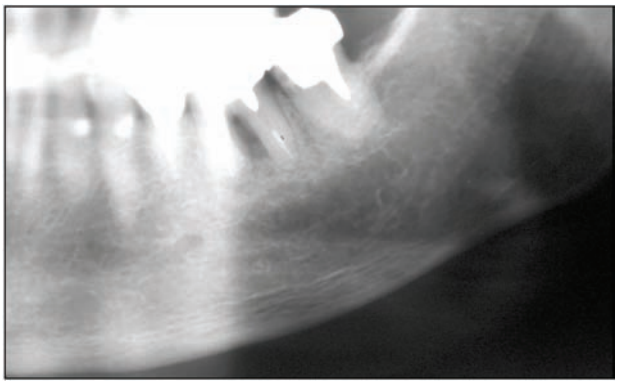

Figure 4. 59-years-old woman with severely eroded the left mandibular cortex detected on dental panoramic radiograph.

Mandibular implants were performed in all 23 patients, while in 6 patients the BMD was -2.5, below the mean peak value in young adults measured by DEXA that means osteoporosis. Failure was recorded in a single patient with osteoporosis DEXA -3.4 and cortex type C3 (success rate was 95.6%).

DISCUSSION

Assessment of jaws osteoporotic changes is a problem to debate due to the trend of aging adults (men over 50 years and postmenopausal women) for bone mass decrease progressively through bone demineralization at rate of 1% to 2% per year and in some individuals as much as 5% to 8% throughout their later life.[2]

However, the use of panoramic radiographs requires that the mandibular cortical width/structure in the measured region and the mental foramen (if used) are clearly shown and the magnification of the measured areas is similar in all cases.[10] Many studies indicate that the panoramic radiography may be an instrument for detecting women with low mineral bone density, with a high turn-over or a high risk of osteoporotic fracture using MIC.[9]

Since the panoramic radiography is often taken for the diagnosis of dental and jaw bone diseases in the current dental practice, the detection of MIC erosion may be also a tool to identify women awareness about the existence of their low bone mineral density and subsequent subjected to bone density examination by other means.[8]

A simple anamnesis of the patients over 50 years, candidates to endosseus implants, can warn us if they

are in one of the risk groups for osteoporosis. Risk factors for osteoporosis (which are similar but not identical to determinants of bone mass) include:

1. Hormonal conditions: postmenopausal women who don't receive hormone replacement therapy have a rapid skeletal bone loss for 5-10 years; similarly, a hysterectomy, including oophorectomy, induces menopause;

2. Family history: individuals with maternal history of osteoporosis or fractures have a lower peak bone mass and are more likely to suffer osteoporotic fractures;

3. Calcium intake: dietary calcium deficiency can result in 5-10% lower peak bone mass;

4. Physical inactivity;

5. Behaviors: smoking and excessive alcohol consumption results in bone loss;

6. Medication: glucocorticoids and other medications result in bone loss.[6]

The patient's framing in one of the risk groups requires great attention to the panoramic radiography examination, which is yet performed for implant therapy, when modifications of the mandibular cortex C-3 type are obvious. Further DEXA examination of the patient can warn us about a systemic osteoporosis which has implications especially in the case of maxillary implant therapy and less in the case of the mandible. The implant failure in a patient with systemic osteoporosis is not related to osteoporotic disease, because the patient was totally edentulous, there were placed two implants and one was perfectly osseointegrated.

Thus, even if osteoporosis appears more often in postmenopausal women, in studying the association between dual x-ray energy absortiometry and postmenopausal women and implant failure, did not find a higher failure rate for of implants placed in women older than 50 years as compared with women younger than 50 or between women and men older than 50.[11] Neither of these studies have differentiated between maxillary and mandibular implants, but there are studies that show a higher failure rate of maxillary implants in postmenopausal women comparatively to premenopausal women. They reasoned that because osteoporosis affects trabecullar bone more than cancellous bone and the maxilla has more trabecullar bone content than the mandible, the maxilla is more susceptible to the effects of systemic osteoporosis.[12]

CONCLUSIONS

1. Panoramic radiography, the most frequent radiological examination in implantology, is a simple and efficient mean in the assessment of the osteoporotic modifications in jaws.

2. Modifications of the endosteal margins of the mandibular cortex type C-3, represent a good method to investigate the osteoporotic affection of the jaws.

3. Skeletal DEXA (hip, vertebrae, forearm) associated with mandibular cortex modifications, call our attention to the systemic osteoporotic which includes maxillary and indicates at the same time the need of hormonal replacement therapy.

4. Osteoporosis should not be an absolute contraindication for endosseus implants therapy, but cautiousness is needed when deciding maxillary for implant placement in postmenopausal women.

REFERENCES

1. Cranin AN, Klein M, Simons A, Atlas of Oral Implantology, Second edition Mosby, Inc.St.Louis, Missouri 1999, p. 12-3.
2. Newman MG, Takei HH, Klokkevold PR, Carranza's Clinical Periodontology, Saunders Elsevier St.Louis, Missouri, 2006, p. 1098-9.
3. Sirbu I, Sandulescu M, Popovici I, Curs practic de implantologie orala, Bucuresti, 2004, p. 63-77.
4. Wood MR, Vermilyea SG, A review of selected dental literature on evidence-based treatment planning for dental implants: Report of the Committee on Research in Fixed Prosthodontics of the Academy of Fixed Prosthodontics, J Prosthet Dent 2004;11:447-61.
5. Bolosiu HD, 10 teme alese de reumatologie, Ed Medicala Universitara Iuliu Hatieganu: Cluj- Napoca, 2003, p. 275-97.
6. SC White, Oral radiographic predictor of osteoporosis, Dentomaxillofac Radiol 2002;31:84-92.
7. Wowern N, Bone mass of mandibles. In vitro and in vivo analyses. Danish Med Bull, 1986;33:23-44.
8. Takashi N, Akira T, Masahiko O, et al. Dental panoramic radiograph as a tool to detect postmenopausal women with low bone density: untrained general dental practitioners'diagnosis performance, Osteoporos Int 2003;14:659-64.
9. Klemetti E, Kolmakov S, Kroger H, Pantomography in assesment of the osteoporosis risk group, Scand J Dent Res 1994;102:88-72.
10. Wowern N, General and oral aspects of osteoporosis:a review, Clin Oral Invest, 2001;5:71-82.
11. Dao TT, Anderson JD, Zarb GA, Is osteoporosis a risk factor for osseointegration of dental implants? Int J Oral Maxillofac Implants, 1993;8:137-44.
12. August M, Chung K, Chang Y, et al. Influence of estrogen status on endosseous implant osseointegration, J Oral Maxillofac Surg, 2001;59:1285-9.