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Dentistry

OSTEOPOROSIS AND ALVEOLAR BONE LOSS: A REVIEW

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ABSTRACT

This paper is a summary of the published studies on the possible association between osteoporosis and alveolar bone loss. Osteoporosis and low bone mass are considered as a major public health problem. It has been shown that proper nutrition plays a key role in the prevention and treatment of osteoporosis; nominating calcium and vitamin as the most important micronutrients. The mandible like other bones of the body has a series of anatomical landmarks that can serve as radiographic indicators. Using these indicators it is possible to evaluate changes in bone with respect to its quantity or quality by different methods of taking images. Osteoporosis is a significant problem of the elderly, especially post-menopausal women. Studies indicated that women had lower mandibular bone mineral content (BMC) than men and that age-related loss of bone was more pronounced in women after the age of 50 years than in men of the same age, as was the case for the rest of the body. Higher bone resorption was detected in women with a higher number of pregnancies. Also, the higher educated the patient, the less bone resorption. Women with a background of backaches had more bone resorption to those who did not have this backache background. Finally, it was recognized that it would be possible to clear the quality dimension of the process of mandibular bone resorption.

INTRODUCTION

Description Of Osteoporosis And Its Incidence :

Osteoporosis is a complex, multifactorial chronic disease that can progress silently for decades until characteristic fractures result late in life. Because symptoms are rare until a fracture occurs, few people are diagnosed in time to receive effective therapy. As a result, many individuals experience disability and decreased quality of life subsequent to fracture.

The exact cause of the increase in bone fragility is not known, but it is thought to include both changes in bone quality, quantity, and architectural configuration. Approximately one third of women aged 65 or older will have one or more vertebral fractures. By the year 2050, people over 65 years of age will constitute 22% of the total population, and people over 85 years will compromise 5% of the population. [1] Perhaps the earliest suggestion of an association between osteoporosis and oral bone loss was made in 1960. [2]

RISK FACTORS :

Low bone mass in the skeleton, which increases the risk of osteoporotic fracture, also may be associated with periodontal bone loss and tooth loss. Osteoporosis and periodontal disease share several common risk factors, including older age, smoking and perhaps insufficient dietary intakes of calcium and vitamin D. [3]

Relationship between osteoporosis, oral signs, body mass index and age, and to assess the possibility of using these parameters as an indicator of post-menopausal osteoporosis.

The oral signs were panoramic-based mandibular indices, such as cortical width, cortical index, panoramic mandibular index and mandibular crest resorption degree; the number of teeth and fractal dimension analysis.

Osteoporotic patients were more likely to have altered mandibular cortex morphology than non-osteoporotic patients and age is an important risk factor for osteoporosis. [4]

HUMAN STUDIES :

Geometric measures of the metacarpal bone were found to be significantly correlated to the number of teeth with attachment loss > 4mm. [5] In a follow-up study, the same metacarpal index was used. For 40 edentulous women and 40 edentulous men, no significant relationship between the metacarpal index and

percent resorption of the alveolar ridge was found for men nor for women in a multiple regression analysis that considered age and years edentate- postmenopausal status and was not given nor considered. [6]

Cortical thickness at the gonion was determined with panoramic radiographs in 180 men and women and found to be fairly constant from age 15 to 69, except for men and women over 60 years of age, for whom there was a slight decrease in cortical thickness for men and a marked decrease for women. It was suggested that cortical thickness might be a useful parameter to evaluate in determining metabolic bone loss and that a gonial cortical thickness of less than 1 mm was an indicator of metabolic bone loss. [7;8] In a 18 month panoramic study of 100 randomly selected female patients who qualified and were included in the study. The aim of this study was to determine the thickness of the mandibular angular cortex on the right and left sides of women as well as bone resorption in different age groups using panoramic radiography. Using a questionnaire, the selected subjects were asked questions about their education, job, marital status, number of pregnancies, age, menopausal status, and history of backaches. It became clear an increase in age will increase bone resorption, and this process is related to a decrease in the sexual hormones of women. Higher bone resorption was detected in women with a higher number of pregnancies. Also, the higher educated the patient, the less bone resorption. Women with a background of backaches had more bone resorption to those who did not have this backache background. Finally, it was recognized that it would be possible to clear the quality dimension of the process of mandibular bone resorption. [9]

Experienced greater ridge resorption after ridge augmentation than did the 11 women without indications of metabolic bone loss (cortical thickness 1 mm). [10] Quantitative CT (QCT) was first used to study oral-osteoporosis interrelationships in 1989. (1) Regardless of the technique used, scout views, and slice position documentation must be kept and used in subsequent examinations to reduce precision error. Reported precision for QCT ranges from 1-3% in very controlled settings and 4-5% for clinical environments. [11]

Evidence Linking Osteoporosis And Alveolar Bone Loss :

In a study of 286 perimenopausal women, no significant differences between dentate and edentate women could be

detected with lumbar bone mineral density (BMD) measurements determined by DPA nor with metacarpal index measures. [12] The skeletal measures were not correlated with number of teeth, pocket depth, nor alveolar bone loss (determined from vertical bitewing radiographs). Although age or years since menopause was not significantly correlated with pocket depth nor number of teeth, years. [1] In the investigation was done for 57 women taking estrogen and 171 controls, there was less tooth loss, attachment loss and established periodontitis for the estrogen group than for the controls, but none of the differences were statistically significant. [13]

It seems that there are seven major reasons why there is a lack of consensus among most published studies of osteoporosis and oral bone loss:

- (1) most studies were cross-sectional in nature, with a lack of control for factors affecting bone,
- (2) samples were usually severely biased, being either convenience samples or being chosen from health (including dental health) conscious women,
- (3) sample sizes were small,
- (4) tooth loss was used as the dependent variable although the causes of tooth loss were unknown (that is, teeth could have been extracted for many reasons other than bone loss),
- (5) definitions for osteoporosis varied among studies,
- (6) methods used to measure oral bone were of insufficient precision and accuracy to make the measurements needed, and
- (7) measurements of oral bone varied as to location measured and types of measurements made. [1]

The diagnosis of osteoporosis is often made by using bone density measurements. They are often expressed in relative terms (T- scores and Z-scores); the Z-score is the number of standard deviations from the age matched average value of healthy women. A low Z score indicates the bone density is lower than it should be for a patient's age and sex.

Osteoporosis is defined as a BMD loss of 2.5 standard deviations or more below the established mean. [14]

ASSESSMENT OF OSTEOPOROSIS :

The association between osteoporosis and oral health remains a matter of controversy.

It is important to confirm whether there is a role of osteoporosis in bone loss in the jaws, periodontal diseases tooth loss, and other oral tissue changes. Clinical information concerning systemic osteoporosis and animal studies reporting possible associations between osteoporosis and changes in the dental and oral tissues were included. The review focus was on studies involving (1) methods for assessing bone mineral density (BMD); (2) methods for assessing osteoporosis- related changes in intraoral sites; (3) associations between mandibular BMD and skeletal BMD; (4) changes in the jaws, periodontal tissues, and temporomandibular joint concurrent with osteoporosis; (5) changes in the oral tissues following estrogen deficiency; and (6) effects of estrogen hormone replacement therapy and/ or calcium and vitamin D on oral health. Evidence from prospective studies supports the contention that individuals with osteoporosis may be at increased risk for the manifestations of oral osteoporosis; however, such risk is not definitively proven. Studies suggest that findings on dental panoramic radiographs may be used to detect individuals with low BMD. [17]

To educate the patients, dentists should be knowledgeable about the oral manifestations of osteoporosis and should collaborate with other health care providers to reduce the possible destructive effects of osteoporosis on the patients' oral health. [18]

Some studies have linked low BMD of the mandible and the peripheral skeleton with alveolar bone loss of the mandible and tooth loss. Clinicians have started to focus on some mandibular panoramic indices, such as mandibular cortical index and mandibular cortical thickness, for the identification of elderly individuals who should undergo BMD assessment. In comparison with peripheral BMD measurement equipment in the medical field, the dentist will be able to identify osteoporotic elderly individuals by means of dental panoramic radiographs taken for the diagnosis of the teeth and the jawbones without additional cost. It is likely that the clinician may estimate the future risk of tooth loss in elderly individuals with periodontitis and osteoporosis by panoramic radiographs. [19]

It is considered the most common metabolic bone disease, and it constitutes a major public health problem. Given the evidence that alveolar processes provide the bony framework for tooth support, the decline of skeletal mass has to be correlated with an increased risk of oral bone loss and has a negative consequence on tooth stability. [20] The imbalance in coupling of bone remodeling causes skeletal osteopenia and osteoporosis. Different studies indicate that the skeletal bone loss in osteoporosis accelerate the decrease in bone density in oral bone.

Although the differences in etiology between the two diseases some studies showed that treatment of osteoporosis improved the periodontal health. Further investigation of the mechanisms behind the relationship between osteoporosis and periodontitis may lead to common treatment strategies. [21]

CONCLUSION :

The literature suggests a relationship between oral bone loss and skeletal osteoporosis. The study of determine if a relationship exists among alveolar bone loss, alveolar bone density, second metacarpal density, salivary and gingival crevicular fluid interleukin 6 (IL- 6), and IL-8 concentrations in premenopausal and postmenopausal healthy women receiving estrogen therapy. [24]

Postmenopausal women on estrogen therapy had higher salivary IL-6 concentrations than premenopausal women. Alveolar bone densities were also strongly correlated to second metacarpal densities. Changes in alveolar bone density and levels of bone resorptive cytokines in saliva may be secondary to changes in menopausal status. These changes may predispose loss of alveolar bone with resultant loss of teeth. [24]

Epidemiological studies have shown that post-menopausal women who do not use an estrogen supplement have fewer teeth than those who do. The changes in the dentition of post menopausal women might be due to alveolar bone alterations by estrogen deficiency. [25]

According to epidemiological research [26], the oral health status of the aged has a dramatic impact on their quality of life in a variety of physical, social, and psychological ways. Tooth loss is associated with deterioration of the systemic health of the elderly through changes in their dietary intake. Thus, it is essential for dentists to take active steps to preserve older patients' teeth, and to help them maintain their masticatory function. [27]

The activities of osteoblasts and osteoclasts are controlled by a variety of hormones and cytokines, as well as by mechanical loading. Most importantly, sex hormones are very crucial for keeping bone mass in balance, and the lack of either estrogen or testosterone leads to decreased bone mass and increased risk for osteoporosis. The prevalence of osteoporotic fractures is increasing dramatically in the Western part of the world and is a major health problem in many countries. In the

present review, the cellular and molecular mechanisms controlling bone remodeling and the influence of sex hormones on these processes are summarized.[28] Osteoporosis has a direct relationship with malnutrition; the low consumption of calcium in life can cause the maximum reduction of bone mass. This could result in an increased risk of bone fracture. Continuous production of bone matrix by osteoblasts requires that sufficient protein be absorbed from the intestines. A low protein diet, vitamin C deficiency, and a high level of vitamin A can cause osteoporosis.

Finally, if we can identify the osteoporotic process using a basic panoramic radiography measurement technique, then it is possible to intercept the progress of the disease through early warning and treatment.

From the results of this study, it can be concluded the thickness of the mandibular angular cortex can be used as an index for bone resorption. A healthy lifestyle has multiple benefits for the mouth and throughout the body. Dental professionals can play a role in preventing osteoporosis by reinforcing this message.[3

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