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Review Article

Postmenopausal Osteoporosis and Periodontal Disease- A Review

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Abstract: A possible relationship between periodontal disease and osteoporosis has been elicited in various cross sectional and longitudinal studies. Osteoporosis is an age related condition which results in decrease in bone mineral content and structural changes are seen in bone. Post menopausal women are more prone to osteoporosis due to deficiency in estrogen, which in turn causes decrease in mandibular bone mineral content. Hence this article presents a review in relation to association between osteoporosis and periodontal disease.
Keywords: menopause, osteoporosis, periodontal disease.

INTRODUCTION

Periodontal disease results from complex interplay between the specific bacteria found in dental plaque, and the host tissues. Inflammation is the central pathologic feature of periodontal disease, and bacterial plaque is the etiologic factor responsible for inducing the host inflammatory processes [1]. Periodontitis as mentioned is an inflammatory disease characterized by loss of connective tissues and alveolar bone (AAP 1986).Osteoporosis and osteopenia are characterized by reductions in the bone mass and may lead to skeletal fragility and fracture. In 1994 the World Health Organization defined osteoporosis as a bone mineral density level more than 2.5 standard deviations below the mean of young, normal women [2].

The increase in frequency of osteoporosis with age was greater in women, from 5% at age 50-54, to 24% at age 75-79. For men this was10% at age 50-54 years, rising to 18% at age 75-79 years. In addition, postmenopausal women experience yet another phase of bone loss, that is, an accelerated loss as a consequence of the estrogen deficiency associated with menopause. Trabecular bone, being more metabolically active than cortical bone, is lost disproportionately faster rate during this post- menopausal phase of bone loss [3].

LITERATURE REVIEW:

Wactawski-Wende and colleagues [4] in a study of 70 postmenopausal women, found a significant relationship between alveolar crestal bone height as a measure of periodontitis and skeletal osteopenia (femur and lumbar spine) measured by DXA. This relationship was seen after controlling for possible confounders such as dental plaque, years of menopause, and smoking. In addition, there was a relationship between osteopenia at the hip and probing attachment loss in this same group.

Similarly, von Wowern and colleagues [5] in a case-control study comparing 12 female patients with osteoporotic fractures and 14 normal women reported significantly greater periodontal attachment loss in the osteoporotic women compared with the normal women. They found that the osteoporotic women had less mandibular bone mineral content, as measured by dual photon absorptiometry, than the 14 normal women. The mandibular bone mineral content values were 2 SD below the mandibular bone content for young reference (normal) women in 92% of the osteoporotic group and in 64% of the control group, suggesting that a high proportion of the control group also suffered from mandibular osteopenia.

Relationship Of Skeletal Osteopenia To Mandibular Bone Mineral Density

It has long been postulated that mandibular bone density may be indicative of systemic bone mineral density. In a classic series of studies, Kribbs

and colleagues addressed this relationship in both normal and osteoporotic women. kribbs *et al.;* in 1990,1989, 1983 in a cross- sectional study showed that osteoporotic group had less mandibular bone mass and density also total body calcium, bone mass at radius, and bone density at spine correlated with mandibular mass.

Tooth Loss and Osteoporosis

In a 7-year longitudinal study, rate of systemic bone loss was a predictor of tooth loss in postmenopausal women. For each 1 % per year decrease in whole body BMD, the risk for tooth loss quadrupled. Decreases in BMD at the femoral neck and spine resulted in a 50% and 45% increased risk of tooth loss respectively. Collectively, this evidence indicates that osteoporotic women have lost significantly more teeth, and more are edentulous compared with no osteoporotic women [6]. Thus, women that are at risk for or suffer from osteoporosis are also at risk for tooth loss. Gomes-Filo IS and colleagues studied 139 postmenopausal women; 48 in the case group (with periodontal disease) and 91 in the control group (without periodontal disease). The diagnosis of periodontal disease was established following a complete clinical examination using measurements of probing depth, gingival recession and hyperplasia, clinical attachment loss, and bleeding index, and confirmed by panoramic radiography. The diagnosis of osteoporosis was made by reviewing densitometry reports obtained previously. Descriptive, stratified, and logistic regression analyses were applied to the data collected. Comparison of proportions was performed using the Chi-square and Fisher tests. The authors concluded that osteoporosis and low educational levels have a greater chance of having periodontal disease than do those without osteoporosis [7].

Richard A. Reinhardt and colleagues, in a study comprising 59 moderate/advanced adult patients with periodontitis and 16 non-periodontitis subjects, all within 5 years after menopause at baseline, were included in the study. Serum estradiol levels (E2) were measured yearly by 125I radioimmunoassay, and osteopenia/osteoporosis was determined by dual energy x-ray absorptiometry (DEXA) of the lumbar spine. Posterior interproximal clinical measurements were obtained every 6 months for the periodontitis patients, including explorer detectable supragingival plaque, bleeding on probing (BOP) and relative clinical attachment level (RCAL). Baseline probing depths, smoking history, and demographic data also were collected. Authors concluded E2 supplementation (serum E2>40 pg/ml) is associated with reduced gingival inflammation and a reduced frequency of clinical attachment loss in osteopenic/osteoporotic women in early menopause [8].

Renee M. Brennan et al in a cross-sectional study of 1,329 postmenopausal women recruited from the Buffalo Women's Health Initiative Observational Study, systemic bone density was measured at the spine, hip, forearm, and whole body by dual-energy x-ray absorptiometry, and a complete oral health examination was conducted. The data showed evidence of an association between osteoporosis and one measure of periodontal disease severity, clinical attachment loss [9].

Nutrition and osteoporosis

In a review study by Bonjour *et al.;* suggested that adequate nutrition plays important role in development and maintenance of bone structures also makes them resistant to usual mechanical stresses. In addition to calcium and Vitamin D, high protein intake has a positive effect on bone density. This fact is associated with significant reduction in hip fracture incidence in a large prospective study carried out in cohort postmenopausal women. Low protein intake is (<0.8g/kg body weight/day) is often associated with hip fractures in patients [10].

In a study by Nakayama *et al.;* suggests that adequate energy intake including carbohydrates is essential to maintain bone mass deficiency in nutrients such as calcium, Vitamin D, and protein is a significant risk factor for bone loss. Excessive intake of carbohydrates results in obesity which causes metabolic diseases such as diabetes mellitus. Some indigestible carbohydrates such as inulin and oligo fructose are shown to increase availability of mineral from foods, thus beneficial to bone mass [11].

Yamagishi S *et al.;* in their review article mentioned that risk of bone fracture is increased in Type1 and2 diabetes. There is accumulating evidence to show that multiple factors could influence quality of bone and increase fragility in diabetes. Accumulation of advanced glycation products and their receptor elicit oxidative stress, evoke inflammatory response in osteoblast, osteoclast affect the fracture resistance of bone [12].

A study by Tucker K.L *et al.;* in 2009 shows although calcium and vitamin D have been primary focus of nutritional prevention of osteoporosis, recent research has clarified importance of additional nutrient and food constituents. In addition to diary, fruit and

vegetable intake has been protective factor for bone health. Several nutrients including magnesium, potassium, vitamin C, B, and carotenoids are important. Protein intake appears to benefit bone status, particularly in older adults [13].

Treatment and Prevention of Osteoporosis

***Calcium Intake*:** The 1994 NIH Conference on Optimal Calcium Intake recommended that daily calcium intake of 1,000 mg of calcium per day for premenopausal, and 1,500 mg per day for postmenopausal women should be maintained until additional research warrants revisions to such recommendations.

***Load Bearing Exercise*:** To maximize the likelihood that bone mass is maintained over a lifetime, load-bearing exercise is also necessary.

***Hormone Replacement Therapy*:** Bone loss in women occurs most rapidly in the year's immediately following menopause when natural levels of estrogen are greatly reduced. Hormone replacement therapy is designed to replace estrogen after menopause since this immediate postmenopausal period is a time of rapid loss of bone mineral density [14]. For women with a uterus, a combination of estrogen and progesterone is used, while in women without a uterus, estrogen replacement therapy (ERT) alone is employed.

Many studies have reported that HRT and ERT are efficacious in or sparing bone mineral and reducing fractures.

Bisphosphanate Therapy: Oral bisphosphonates are first-line treatment for osteoporosis, with demonstrated efficacy in increasing bone mineral density and reducing bone turnover, which reduces the incidence of fractures. The latest generation of bisphosphonate drugs, such as alendronate, decrease osteoclast numbers and activity, there by decreasing bone resorption. **Alendronate** has been shown to inhibit loss of bone density and decrease the risk of fracture, without disturbance of bone healing observed with earlier drugs [15]. **Ibandronate** is a potent, nitrogen-containing bisphosphonate which is administered once-monthly. Ibandronate has recently been approved for use in the US to treat postmenopausal osteoporosis.

CONCLUSION

Osteoporosis and periodontal diseases are bone-resorptive diseases. Osteoporosis and osteopenia are characterized by reductions in bone mass and may lead to skeletal fragility and fracture. In most women, bone mass reaches its peak in the third decade of life (age 20 to 30) and declines thereafter. This decline in bone mass is accelerated with the onset of menopause, and oral symptoms are also found in addition to the systemic manifestations of menopause. An increased incidence is observed of oral discomfort, including pain, a burning sensation, dryness, and altered taste perception, as well as a debated rise in the prevalence of periodontal disease.

While a possible relationship between osteoporosis and oral bone loss has long been postulated, the existing studies have been preliminary in nature. Longitudinal studies will make it possible to determine if the progression of periodontal disease is more rapid in patients with osteopenia than in patients with normal bone density, as it is impossible to determine if such a relationship exists from cross-sectional studies alone.

The 1992 US National Institute of Health Workshop on osteoporosis and oral bone loss recommended population based prospective studies of the association between oral bone loss and systemic bone with particular emphasis on cohorts of postmenopausal women both with and without hormone replacement therapy. Management of osteoporosis is rapidly changing field .The latest generation of bisphosphonate drugs, such as alendronate; inhibit osteoclast numbers and activity, thereby decreasing bone resorption. Alendronate has shown to decrease risk of fracture, without disturbing bone healing observed in earlier studies.[16]Longitudinal studies with further analysis of possible confounding factors for osteoporosis and periodontal disease in larger cohorts of post-menopausal women are needed. However, dentists must bear in mind that the primary etiology of periodontal disease is pathogenic bacterial plaque in a susceptible patient. Therefore, if good oral hygiene is combined with regular check-ups, the effects that any of osteoporotic factors may exert on the periodontal tissues can be minimized. Several centers are currently performing studies to better elucidate the inter-relationship between oral and systemic bone loss.

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