

Osteoporosis and its dental impact

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ABSTRACT

Osteoporosis is an infection that influences fundamentally women, however, can likewise happen in men. It is described by lost bone mineral thickness (BMD) and frequently comes full circle in a crack of the hip, wrist, or potentially vertebrae. The analysis of osteoporosis is regularly made by utilizing bone thickness estimations. They are regularly communicated in relative terms (T-scores and Z-scores); the Z-score is the quantity of standard deviations from the age-coordinated normal estimation of solid ladies. A low Z-score shows that the bone thickness is lower than it ought to be for a patient's age and sex. Osteoporosis is characterized as a BMD loss of 2.5 standard deviations or more beneath the buildup mean. Osteoporosis can be dealt with by an assortment of strategies, the most widely recognized being the utilization of estrogen, with or without progestin or progesterone. The utilization of estrogen alone is alluded to as estrogen substitution treatment and the mix hormone substitution treatment. Different medications utilized as a part of the treatment of osteoporosis are the particular selective estrogen receptor modulators (SERMs) and the bisphosphonates. SERMs seem to offer a large number of the positive advantages of estrogen with less unfriendly consequences for the bosom or uterus. As of late, a randomized, 2-fold visually impaired investigation of about 3000 ladies found no general advantage in diminishing coronary illness for those taking estrogen. Indeed, in the main year of estrogen utilize, coronary illness was higher in this gathering than in those taking fake treatment. The connection between systemic BMD and periodontal status has been explored. In a few patients, there is a connection between a diminishing of mandibular bone mass and tooth misfortune. In others, there is no such connection. Those postmenopausal ladies taking hormone substitution treatment had more prominent tooth maintenance and a decreased probability of edentulism. A current report has discovered no connection between clinical connection levels and BMD of the lumbar spine. Numerous conceivable elements add to the improvement of osteoporosis and periodontal maladies. It is hard to set up an immediate connection between tooth misfortune, bone misfortune, and loss of connection coming about due to periodontitis and diminished BMD related with osteoporosis; however, considers are progressing.

KEY WORDS: Bones, Correlation, Dentistry, Mandible, Maxilla, Osteoporosis

INTRODUCTION

Osteoporosis is an insidious and progressive systemic bone disease characterized by low bone mass, microarchitectural deterioration of osseous tissue resulting in back pain and stooped posture which leads to an incremented risk of fractures. This disease has definite adverse effects on both tooth stability and residual alveolar crest preservation. As the depleted bone is more prone to the injurious impact of mechanical forces, residual ridge resorption (RRR) is more prevalent in these patients. Hence, the prosthodontic management of a patient with osteoporosis should be

aimed at ameliorating the prognosis by modification of the routine treatment plan with reduction of the forces which causes progressive bone resorption. Both males and females are affected during their lifetime but are more prevalent in postmenopausal women. It is evident that a moiety of all postmenopausal women will have an osteoporosis cognate fracture.^[1]

Definition

Osteoporosis has been defined as “a disease characterized by low bone mass and microarchitectural deterioration of bone tissue, leading to enlarged bone fragility and a consequent increase in fracture risk” by the World Health Organization in the year 1994. It is a disorder where the bone mineral density is 2.5 standard deviation below the mean peak value in puerile adults.^[2]

Access this article online

Website: jprsolutions.info

ISSN: 0975-7619

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Received on: 16-08-2018; Revised on: 22-09-2018; Accepted on: 18-10-2018

Classification

Osteoporosis is divided into primary osteoporosis (having unknown cause) and secondary osteoporosis (having traceable etiology). Primary osteoporosis is further relegated as Type-I postmenopausal (between 50 and 70 years of age) and Type-II age cognate (>70 years of age affecting both trabecular and cortical bone).^[3] Osteoporosis can be further divided into localized and generalized osteoporosis. The generalized can be primary or secondary osteoporosis.

Epidemiology

It occurs in about 1/3 of the western female population above the age of 65 years. It is estimated that over 200 million people ecumenical suffer from this disease. A high prevalence of fragility fractures has been described in Caucasian population, especially in non-Hispanic Caucasians and lower rates have been found in ebony populations. In Europe, the Scandinavian countries have the highest prevalence of fragility fractures.^[4]

Clinical Features

The chief clinical manifestations include vertebral and hip fractures but can occur at any skeletal site. The clinical manifestations of spinal fractures include loss of height, incremented scoliosis, consequential back pain, and constrained range of kineticism. The dental manifestations include the cortex at the mandibular angle gets distinctly thinner and cannot be optically discerned well at the anterior margin of ramus and in the maxilla, it is minimal along the alveolar crest.^[5]

Risk Factors

Sundry risk factors for osteoporosis are grossly categorized into modifiable and non-modifiable factors. Habits such as smoking, sedentary lifestyle, and intestinal disorders which lead to inadequate absorption of Ca, P, deficiency of Vitamin-D, and renal disorders can be modified to reduce the risk of osteoporosis, whereas non-modifiable risk factors include age, gender, familial history, menopausal status, and ethnicity.^[6]

Computer Aided Densitometric Image Analysis

It is a practical method to measure the change in bone density of alveolar crest. It is the comparison of two serial images that are acquired with standardized projection geometry and equalized for the density differences in the images, which gives depth of lesion in the buccolingual direction. Thus, it represents the volumetric description of the density change.^[7] Oral bone loss assessment: The cortical part of mandible is more dependent on general bone loss than the trabecular portion or the remaining height of the alveolar process. The buccal cortex in the region distal to the phrenic foramen has been reported to correlate

better with skeletal mineral density values than the lingual cortex. Oral signs of osteoporosis might be manifested by exorbitant alveolar ridge resorption, tooth loss, chronic destructive periodontal disease, referred maxillary sinus pain, or fracture. Resorption of alveolar bone is influenced by the astringency of underlying periodontal disease and quality of the denture if the patient is a denture wearer. Dental panoramic radiographs are routinely used in the screening of dental diseases. The incidental findings detected on panoramic radiographs may be used to identify women who have no vigilance of their low bone mineral thickness (BMD). A number of mandibular cortical indices, including the mandibular cortical index and panoramic mandibular index, have been developed to assess the quality of mandibular bone mass and to observe the signs of resorption on panoramic radiographs for the identification of osteopenia.^[8,9] Dental considerations in osteoporosis: Some studies have experimentally concluded that in postmenopausal women, BMD is cognate to interproximal bone loss and pointed at osteopenia as a possible risk factor for periodontal disease. Women with low BMD and high calculus apposition had more preponderant clinical gingival affixment loss than in women with mundane BMD and kindred calculus apposition. Serum estroidal supplementation reduces gingival inflammation and affixment loss which is the cause for early loss of teeth in early menopausal osteoporotic women.^[10] Taguchi *et al.* suggested that the loss of posterior teeth may be with a decrease not only in alveolar bone height but also withal alveolar BMD.^[11] RRR in consummate denture patients is a biological phenomenon which results as a decrease in biomechanical loading on bone which reduces the stresses within and on the periosteal surface of the bone leading to resorption. Literature review of the past 15 years demonstrates the relationship between RRR and BMC. Hirai *et al.* betokened that osteoporosis vigorously affects reduction of the residual ridge in edentulous patients. Several other studies additionally concluded a paramount mandibular ridge height and local or systemic bone loss.^[12]

Osteoporosis and RRR

RRR after tooth loss is a well-described biological reaction. A decrease in biomechanical loading on bone reduces the stresses within the bone and results in resorption within the bone and its periosteal surface. The single case-control study seems to designate that BMC status in the jaws is lower in patients with symptomatic osteoporosis than in salubrious age and menopausal age-matched females and that osteoporosis may engender a risk factor for rigorous resorption of the maxillary residual ridge, while this relationship is not clear-cut in the mandible.^[13]

Osteoporosis and Implant Fortified Overdentures

Overdentures fortified by implants amend the masticatory force and thus the loading on the mandibular bone compared to that of conventional full dentures. Hutton *et al.* performed a multinational and multicenter study involving 133 persons treated with implant fortified overdentures in the mandible and/or maxilla.^[14] The results designate that persons with inferior bone quality (very thin cortical bone with low-density cancellous bone of poor vigor) and pronounced alveolar ridge resorption at the implant site show the highest risk of implant failure. Another study seems to betoken that low BMC status in the forearms may be a risk factor for implant failure after bone grafting in the maxilla. The above studies failed to demonstrate a relationship between the implant failure and age. The mandibular osteoporosis before implant treatment may present a peril for minor accentuation of peri-implant marginal bone loss but not implant failure within 5 years. Hence, considering the above studies, the implant fortified overdentures are the treatment of cull after total tooth loss due to their bone-sparing effect and may additionally be recommended to persons with osteoporosis.^[15-17]

Prosthetic Management

Humphries *et al.* conducted a study on bone resorption of mandibular alveolar bone in elderly edentulous adults and they concluded that women >50 years with osteoporosis required incipient dentures 3 times more frequently than women of same age. Reducing the stresses on the bone by modifying the treatment plan with concrete precautions are considered in these patients.^[18] Curtis *et al.* reported that most sizably voluminous amount of resorption has been shown to occur in the midlateral aspects of the body of the mandible, while less resorption occurred anteriorly. It was withal reported that the clinical height of the region distal to the noetic foramen was more proximately correlated with the general bone loss status than the anterior region.^[19] While fabricating the removable dentures, the main area of focus should be on reduction of the forces on residual ridge. Mucostatic or open mouth impression techniques, selective pressure impression technique, should be employed to reduce mechanical forces while impression making, semi-anatomic or non-anatomic teeth with narrow buccolingual width should be culled. Optimal use of soft liners, elongated tissue intervals by keeping the dentures out of mouth for 10 h a day can be advised. While fabricating fine-tuned partial denture in periodontally compromised abutments, it may expedite the bone loss in osteoporotic patients. Hence, the fabrication of fixed partial denture should follow the treatment of osteoporosis rather than preceding it. Established systemic osteoporosis does not implicatively insinuate that a jaw bone is

unsuitable for osseous integration nor is it an absolute contraindication to implant therapy. Dao *et al.* and Becker *et al.*, in studying the sodality between premenopausal and postmenopausal women and implant failure, did not find a higher failure rate for implants placed in women older than 50 as compared with women younger than 50 or between women and men older than 50.^[9,15] Augat *et al.* found more number of maxillary implant failures than mandibular implants in postmenopausal women.^[8] They found that postmenopausal women not taking hormone supersessions had the highest failure rates. They reasoned that because osteoporosis affects trabecular bone more than cortical bone and the maxilla has more trabecular bone content than the mandible, the maxilla is more susceptible to the effects of systemic osteoporosis. During dental implant therapy, it may be sapient to be cautious with maxillary implant treatment orchestrating. Reduced bone density does affect the treatment orchestrating surgical approach, length of rejuvenating, necessitates need of progressive bone loading, and hydroxyapatite coating on implants. Daily calcium uptake should be up to 1500 mg/day pre- and post-surgically.^[20-22]

Clinical Pertinence

Osteoporosis is a health condition that greatly affects the bones, debilitates them, and makes them capable of fracture facilely. Besides hampering overall health and well-being, osteoporosis withal has a direct relationship on oral and dental health. Holahan CM *et al.*, osteoporosis: Its prosthetic considerations - a review one should realize that the disease can hamper jawbones. It additionally triggers dental and oral health issues including gum or periodontal diseases and loss of teeth. The dental and oral effects of osteoporosis incline to affect more women than men. It should additionally be noted that even if someone has no teeth and does not wear dentures, the effects of osteoporosis can still affect dental and oral health. Bone impuissance and loss may additionally affect the body ridges that hold dentures in the congruous position, resulting in poor-fitting dentures. Studies additionally show that sufferers of the disease are at risk of requiring incipient dentures more often than those who have vigorous, salubrious bones.^[23] Osteoporosis has a major impact on the part of the jawbone fortifying the teeth, which is most likely to cause tooth loss or mobility. Low bone density in the jaw triggered by osteoporosis can additionally lead to other dental issues. For instance, women suffering from osteoporosis are most likely to experience difficulties linked to ill-fitting or loose dentures. The results of sundry oral and dental surgical procedures are withal less than desirable for these women.^[24] Osteoporosis has been suggested as a risk factor in dental implant failure, but data fortifying such a link are inhibited.

Klemetti has reported that the habits and conditions that elicit the development of general bone loss in the skeleton may perturb the functional harmony of the masticatory system and thus may increase the possibility of temporomandibular disorders.^[25] Randomized clinical studies reported implant failure in patients with osteoporosis after menopause. Studies that contraindicate the utilization of implants in patients with osteoporosis infer that the impaired bone metabolism led to reduction of bone rejuvenating around the implants. Other authors believe that the presence of osteoporosis is not a definitive condition to contraindicate the therapy with dental implants. In osteoporotic patients, the dentist should perform an opportune treatment orchestrating, modifying the implant geometry, and use more astronomically immense implant diameter and with surface treatment. Thus, osteoporosis is not a contraindication for implant surgery because a precise analysis of bone quality by denotes tomography is performed. The best way to handle this quandary is to evade delaying or deferring dental treatments. Conventional dental visits are essential in redressing quandaries in oral and dental health caused by impuissant bones. A salubrious lifestyle is obligatory in reinforcing and maintaining good bone health.

CONCLUSION

Osteoporosis is a debilitating disease with consequential physical and psychological consequences. Quality of life can be significantly diminished. A healthy diet, weight-bearing exercises and medications can help prevent bone loss or fortifying already damaged bones. Osteoporosis has potential prosthodontics implications with associated bone loss, tooth loss, and TMJ pathology. Studies denoted a relationship as visible in panoramic radiographs between osteoporosis and resorption of crest of the residual ridge. The mandibular indices can be used as an early detection implement. The prosthodontist by identifying the features would be at an advantage enabling to refer patient for bone density screenings for early diagnosis and subsequent treatment of disease.

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Source of support: Nil; Conflict of interest: None Declared