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Journal of Dental Health Oral Disorders & Therapy

Review Article

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Oral manifestations of menopause

Abstract

The aim of this review paper is to identify the reflection of menopause on the oral region and the impact of these manifestations on clinical applications. During menopause, ovarian function declines and the production of sex steroid hormones reduces significantly affecting the oral tissues and periodontal structures leading to osteoporosis, chronic inflammation of the gingiva, increased risk of tooth loss, concurrent periodontitis, oral discomfort, xerostomia, burning mouth syndrome and many other manifestations. Hormonal Replacement Therapy is used to relieve the previously mentioned complications. The effects of HRT will be reviewed as well. Menopause is a normal physiologic event in women, in which there's a cessation of menses. It takes from five to ten years and terminates with a sharp decline in female hormone levels. The decrease of estrogen production in postmenopausal women leads to many physiological changes, like: hot flashes, sweating, osteoporosis, cardiovascular diseases, cognitive changes, urogenital infections, skin changes and vaginal dryness. The fact that periodontal tissues are significantly influenced by sex steroid hormones relies on the increased incidence and severity of periodontal diseases during periods of hormone fluctuations, retention and metabolic conversion of sex steroid hormones and the presence of steroid hormone receptors in the periodontium. The periodontal tissues are highly affected by the endocrine system where they are influenced by androgens, progestins and estrogens.[1] Estradiol is the most potent estrogen and is secreted by the ovary, testis, placenta and certain peripheral tissues. Estrone is also secreted by the ovaries. In premenopausal women, estradiol is the most profuse hormone; while in postmenopausal women, estrogen is the most abundant hormone in the plasma. Progestrone has been reported as an antagonist of estrogen as it reduces its number of receptors in target tissues. During menopause, ovarian function declines and the production of sex steroid hormones reduces significantly affecting the oral tissues and periodontal structures leading to increased susceptibility to chronic inflammation of the gingiva, and alveolar bone loss. Moreover, hormones changes may lead to cardiovascular diseases accompanied by xerostomia which will increase susceptibility to dental caries and Candida infection. Many other oral changes occur during menopause period such as pain and burning in oral cavity, mucosal atrophy and oral dysesthesia. Post menopausal estrogen deficiency causes bone loss in the long bones and vertebrae. It was reported that this osteoporotic effect increases the probability of odontia by three times than in normal females as a result of alveolar bone resorption due to systemic osteoporosis. Moreover, the presence osteoporosis and concurrent periodontitis may exaggerate the response to dental plaque characterized by abnormal, painless, dry, shiny, thin gingival bleeding called concurrent senile atrophic gingivitis which might progress to menopausal gingival stomatitis. Certain diseases can amplify the mentioned manifestations like Sjogren Syndrome, Pemphigus Vulgaris, Burning Mouth Syndrome and Trigeminal Neuralgia.[2] In order to prevent or at least alleviate these manifestations, Hormonal Replacement Therapy (HRT) and Vitamin D and Calcium supplements are used.

Volume 7 Issue 4 - 2017

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Received: January 30, 2017 | **Published:** May 31, 2017

The role of female hormones

The main two female hormones are estrogen and progesterone; both have a very important function in concern to the oral cavity. Estrogen was thought to have an effect only on the of reproductive tissue but it was found to have receptors in bone, endothelial cells, ligaments and gingival tissues, it was also discovered to have a reductive effect on the keratinized gingival tissue which will lead to reduced effectiveness of the oral epithelium as a barrier.[1] In case of post menopausal women secretion of both of these hormones is drastically reduced leading to oral symptoms in concern of their function. Postmenopausal women who undergo estrogen replacement therapy had less tooth and oral bone loss than postmenopausal women who are not undergoing hormone estrogen replacement therapy. Meisel et al.,[3] randomly selected participants who were evaluated to test different hypotheses that could explain the paradox between periodontal health and number of teeth present among men and women. Diagnostic periodontal parameters, attachment loss, and number of teeth were determined. Urinary Excretion of collagen cross-links was measured, environmental and behavioral risk factors were assessed. Results revealed that there's an inverse relation between the number of children born and the number of teeth. In postmenopausal women treated with estrogen, the number of teeth present was higher than in men of the same age, while in women not taking estrogen, the number of teeth was lower. Women's behavior is less risky than men's and this explains why women have better periodontal status. There was a crude relation between the number of teeth and age in women without children in comparison to those having given birth to one or more children. In all age groups, mothers who gave birth to one or more children have lost more teeth than childless women. The number of teeth was reduced by nearly one tooth with every child born. By determination of excretion of collagen deoxypyridinoline cross-links as an indicator of osteoporosis, women had higher bone turnover rate, which is reduced by estrogen supplementation. In a comparison

between men above 50 years of age, and postmenopausal women with and without HRT, it was found that only women who didn't take estrogen after menopause have fewer teeth than men. The use of hormonal therapy supplements reduced the urinary deoxypyridinoline excretion and the extent of attachment loss, thus associated with the increase in number of teeth.[3]

Effects on gingival tissues

Estrogen has been found to increase epithelial keratinization, stimulate fibroblast proliferation and the proliferation of basal epithelial cells with a specific basal membrane area of the gingiva, and thus increase the number of gingival epithelial cells. Therefore postmenopausal women (estrogen deficient) might exhibit accordingly a decreased epithelial keratinization of marginal gingiva, and desquamation of gingival tissues (as in benign mucous membrane pemphigoid and lichen planus) where gingiva decreases in size and has a smooth surface with mottled appearance. These observations are specifically reported in poor middle-aged women who would subsequently suffer from irregular or early ceased menopause.[1]

Effects on the alveolar bone and osteoporosis

Osteoporosis is a skeletal condition in which there is a decrease in the mineral density (mass/volume unit) of normally mineralized bone. It is the most common metabolic bone disease affecting 75 million people in United States, Europe, and Japan.[4] It's a reduction in bone mass with deformity, pathological fractures that are usually accompanied with pain, caused by the uncoupling of bone formation/ resoption process, either by exaggerated resorption, reduced bone formation, or both combined together. According to the World Health Organization, Osteoporosis has two main categories, primary and secondary. Primary osteoporosis is further subdivided into three types. Type I post menopausal osteoporosis, Type II age related osteoporosis and Type III idiopathic osteoporosis. As for the secondary osteoporosis causative factors or diseases can be acknowledged.[5] It is well-known that estrogen deficiency plays an important role in the etiology and pathophysiology of osteoporosis and bone loss by limiting the osteoblasts physiological activity compared to osteoclasts leading to increased level of resorption over restoration of bone. It is possible to diagnose osteoporosis through mandibular radiomorphometric measurements in postmenopausal women. This will aid in the early diagnosis of osteoporosis due to the fact that the oral cavity and jaws are more frequently radio-graphed than other parts of the skeletal system. Vlasiadis et al.,[6] conducted a study on postmenopausal women in order to use the mandibular anatomical indicators on panoramic radiographs to evaluate the bone resorption in different age groups of women to determine the presence of osteoporosis. In this study authors relied on the fact that osteoporosis affects the craniofacial and oral structures in the same rate it affects the total body. Results indicated that a decrease in the T-score at the lumbar spine and a decrease in mandibular cortical width (MCW) is associated with an increase of menopausal age. A decrease by 1 mm in the mandibular cortical width (MCW) increases the susceptibility of moderate or severe erosion of cortex by 96%. An increase in one unit in number of teeth loss increases the susceptibility of moderate or severe erosion to 6%. Females who have suffered fracture have less number of teeth than those who didn't. Postmenopausal women lose their teeth after the age of 50. Teeth that are more frequently lost are first and second mandibular and maxillary premolars, anterior teeth and canines.[6] eneralized bone loss due to osteoporosis makes the jaws susceptible to accelerated alveolar bone resorption. Decreased mass and density of maxilla and mandible, in osteoporotic patients, might be accompanied with increased rate of bone loss in edentulous ridges or around the tooth. Alekna et al.,[8] assessed the relationship between bone mineral density and radiographic mandibular height to determine whether bone mineral density of lumbar area is linked to the residual alveolar ridge height of mandible, compare residual alveolar ridge height of the mandible in premenopausal and postmenopausal groups, and to determine the influence of age to the height of mandibular body. Results showed that the height of mandibular body and the height from the lower border of mandible to lower border of the mental foramen, in all women, didn't correlate with age and term of menopause. There wasn't a significant difference between the total height of mandibular body, the height from the lower border of mandible to the lower border of mental foramen, and the mandibular ratio indices in bone mineral density groups. Index of mandibular ratio correlated with the total height of mandibular body and the height from the lower border of mandible to the lower border of mental foramen.[7] Klemetti et al.,[8] conducted studies on the relationship between oral bone loss and indicators of osteoporosis where the investigators studied the height of residual ridge and Bone Mineral Density (BMD) of trabecular bone of mandible which is assessed by Quantative Computer Tomography in 74 of 355 postmenopausal women. They measured BMD of lumbar spine and femur using (DEXA) and compared it to mandibular BMD, but found that both BMD values don't correlate with each other.[8] Binte et al.,[9] studied 355 edentulous postmenopausal women to determine the number of teeth, time of last extraction and height of alveolar ridges. Time of teeth loss and the number of teeth were not correlated with generalized density, while clinical height was related to bone density in some regions.[9] Several studies had shown that estrogen promotes tooth retention. Taguchi et al.,[10] conducted a study on Japanese women, 330 postmenopausal Japanese women were evaluated according to the relationships among the number of teeth remaining, oral bone height and porosity, bone mineral density of lumbar spine and femoral neck, estrogen use status and its duration. There was significant difference between users and nonusers in number of total and anterior teeth, oral bone height and porosity, bone mineral density of lumbar spine and femoral neck. Multiple regression analysis showed that the duration of estrogen use was significantly associated with the number of total and posterior remaining teeth, independent of age and oral bone height. Tooth retention could be promoted by estrogen, through neither strengthening periodontal attachment, but not increasing bone height nor decreasing oral bone porosity. On the other hand during menopause estrogen levels decrease which induces osteoporosis. Moreover the alveolar bone height decreases and therefore reduces the support and retention of teeth in their sockets through the dental attachment apparatus. This suggests that long-term estrogen replacement therapy prevents tooth loss in post- menopausal women.[10] Periodontitis is one of the most ubiquitous diseases. It's defined as an inflammatory disease of specific bacteria origin that will influence the supporting structures of the teeth. The two main dental issues that are related to osteoporosis in post menopausal women, relationship between progress of periodontal disease and progress of osteoporosis and the success of implants in post menopausal women. Recent studies suggest that postmenopausal osteoporosis is a risk indicator in periodontal disease in postmenopausal white women.[11] Osteoporosis is a concern in the field of removable prosthodontics, especially in the conditions affecting the mandibular residual ridge. Postmenopausal osteoporotic women may need new dentures more frequent than women without osteoporosis. Because successful dental implants depend only on sufficient bone density and

volume, it might be of good benefit to osteoporotic patients, but it should follow bone regeneration therapy. In cases where there is postmenopausal women with osteoporosis, dental implant are suppose to have a higher risk of failure due to the assumption that the impaired bone metabolism affects the mandible and the maxilla in a similar manner as the other bones. The problem with this assumption is a potential relationship between osteoporosis and decreased oral bone mass/density is still controversial as it is hard to assess whether bone quantity and quality in the mandible and the maxilla parallel those in the rest of the skeleton. Beikler at al.,[12] suggested another concern that the impaired bone metabolism by osteoporosis may affect osteointegration of the implant, but this is conflicts with the finding bone remodeling is non uniform process where it will differ from one type of bone to another, cortical and trabecular, and from one site to another in the same type.[12] Wakley & Baylink et al.,[13] found that a decrease in trabecular bone density in menopausal women will exceed that of cortical bone. Therefore mandibular implants have a higher success rate than the maxilla which consists mainly of trabecular bone.[13] Dao et al..,[14] found that implants could be placed on patients with osteoporosis as the osteoporotic fractures usually heal rapidly and are less susceptible to endocrine regulation Indicating that bone remodeling processes after implant placement on osteoporotic patients may also not differ essentially from those seen in healthy individuals.[14]

Menopause and saliva

Saliva has a very important role in protecting the oral cavity; this is accomplished by the salivary pH, buffering capacity (BC) and flow rate. When there is a decrease in salivary flow the oral cavity becomes more susceptible to disease. Individuals who suffer from low salivary flow rates have higher caries experience in comparison with individuals with normal salivary flow rate. Dural et al.,[15] assigned a group of 18 healthy postmenopausal women with age range of 48-61 years old and another control group of 20 healthy menstruating women with age range of 29-53 years old. The two groups were assisted for saliva flow rate, buffering capacity, pH of stimulated saliva and oral hygiene instruction. The results reflected that no statistically significant difference in the flow rate and buffering capacity (BC) between the two groups, but there was pH difference as the postmenopausal women showed a statistically significant lower pH values. Also the postmenopausal group had a significantly high DMFT values in comparison with the control group. So in regards of the effect of menopause on saliva there was no significant difference in salivary flow and buffering capacity of saliva, but the pH of saliva was affected with a significant lower pH recording in post menopausal women which most probably is the main cause for the increased DMFT scores. Also, xerostomia is a subjective sensation accompanied by unpleasant sensation in throat and mouth.[15]

Hosseini et al.,[16] found no significant difference between xerostomic and non-xerostomic menopause women regarding salivary flow rate. Moreover, no significant differences were found between the two groups regarding salivary chloride, sodium, potassium, magnesium, phosphate, and total protein concentration though potassium, phosphate, and total protein concentration was higher in the case group (group with oral dryness)and sodium, and magnesium concentration was higher in the control group(no oral dryness). This study showed that there is no significant difference between menopausal women with and without xerostomia in stimulated salivary flow rate. Oral dryness may not be related to lowered salivary flow rate, but there might be a relationship between calcium levels in saliva and oral dryness in menopausal women.[16]

Hormonal replacement therapy

It was demonstrated that Hormonal Replacement Therapy decreases the extent of menopause-associated mandibular alveolar bone loss and sometimes lead to an increase in bone mineral density according to the hormone dosage received.[1] Postmenopausal women who are receiving HRT are less likely to lose teeth or need dentures due to improvement of bone production. Beikler et al.,[12] found that the success rate of maxillary dental implants was decreased in women without estrogen supplementation which is also similar to the result in the postmenopausal women receiving HRT.[12] Yalçin et al.,[17] aimed the study to evaluate the relationship of menopause and Hormonal replacement therapy, alendronate (ALN), and calcium supplements on saliva flow rate, saliva pH, and electrolytes. They found that the most oral discomfort in menopausal women was oral dryness, which was significantly decreased after the hormonal replacement therapy with alendronate and calcium supplements. The oral status of non menopausal women was better than the women in menopause. Salivary flow rate decreased in the sample after HRT with ALN and Ca supplements, while saliva pH values, chloride and calcium levels weren't affected by the menopause nor by HRT. The Na+ levels increased in menopause and didn't change even after the treatment; on the other hand K+ levels decreased in menopause and remained constant after HRT.[17] Hosseini et al.,[12] found that during menopause there will be a decrease in female hormones especially estradiol. Decrease in estrogen levels that occurs in menopause, might cause an increase in salivary calcium level.[16]

Oral health and dental management in menopause; the right way to approach

In 2007, Bullon et al stated that for all post-menopausal women, thorough clinciacal inverstigation followed by detailed oral examination is essential this includes the periodontal and dental status, and salivary flow for both quantity and quality. it is critical to maintain low levels of dental plaque by using adequate oral hygiene proper instruments (interproximal brushes, dental floss, brushing frequency and technique), in association with the use of chemotherapeutic agents such as chlorhexidine digluconate. These substance reduce the accumulation of dental plaque, improves periodontal disease and prevents caries (elimination of much of the presence of Streptococcus mutans), particularly root caries, which are more frequent in elderly individuals. The use of toothpastes, varnishes or gels containing fluorides is also advised for the prevention of dental caries.

Conclusion

In conclusion, menopause has been proven that it highly affects oral and dental structures. Gingival tissues exhibit decreased epithelial keratinization of marginal gingiva and desquamation of gingival tissues. Postmenopausal women were found to have a higher risk of developing osteoporosis which is thought to be the main cause of a lot of oral complications such as periodontal diseases and limitations of dental treatments like dental implants. According to some studies, there has been significant relationship between osteoporosis and periodontitis. On the other hand, some studies didn't find a relationship between them. As for dental implants, studies showed that implants in the mandible have higher successful rate than in the maxilla due to bone type differences. Also, the bone repair process in postmenopausal osteoporotic patients is not susceptible to endocrine regulation; therefore, implants can be placed in those patients and could have good prognosis taking into consideration individual

evaluation. As for saliva, flow rate is decreased initiating state of xerostomia, oral discomfort and burning mouth syndrome. The pH level is decreased as well causing higher DMFT scores although the buffering capacity is not affected. Hormonal Replacement Therapy improves the oral manifestations except buffering capacity and flow rate of saliva. However, long-term use of HRT is contraindicated as it is associated with the increased risk of breast cancer.

Funding

None.

Acknowledgments

None.

Conflicts of interests

The author declares that there is no conflict of interest.

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