Periodontal Pocket Depth in Relation to Salivary Osteonectin among Osteoporotic Old Adult Women

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Abstract

Background: *Osteoporosis is a systemic skeletal disorder characterized by compromised bone strength The association between systemic osteoporosis and periodontal health remains controversial many studies found a relationship between clinical measures of periodontal disease and salivary levels of osteonectin asit is essential for normal bone mass. This study was conducted to measure salivary osteonectin in relation to periodontal pocket depth among osteoporotic women and compared to control group.*

Materials and Methods: *60 females aged 60-65 years attending Al-Yarmook Teaching Hospital were included in the present study , The 30 patients diagnosed with osteoporosis by measuring bone density at the spine and femur with a dual-energy X-ray absorptiometry at T-score of >2.5, and 30 women without osteoporosis with T-score of<-1 (control group). The periodontal health condition was assessed using periodontal pocket depth . Stimulated salivary samples were collected under standardized condition, according to the criteria of Tenovuo and Lagerlöf, (1994). The saliva was analyzed for estimation of glycoprotein*

(osteonectin) by using Enzyme-linked immunosorbent assay (ELISA).

Results: *The data of the present study illustrates that the mean rank value of probing pocket depth (PPD) was found to be higher among control group than osteoporotic women but the difference was not significant in addition the mean rank value of both ≥4 and ≥5 thresholds of PPD was found to be higher among osteoporotic women than control groups, while opposite figure was found concerning PPD ≥3, however all these differences were statistically not significant. Analysis among osteoporotic group revealed that the salivary osteonectin correlate very weakly not significantly in positive direction with all threshold*

Conclusions: *The Osteoporosis associated with decreased bone mineral density had an effect on oral health status, leading to an increase in periodontal disease. This was slightly affected by changes in salivary osteonectin. Therefore old adult women may need special oral health preventive and educational programs.*

Keywords: Osteoporosis; pocket depth; salivary osteonectin.

Introduction

Aging in combination with intrinsic and extrinsic factors accelerates the decline in bone mass that predisposes to osteoporosis [1]. Osteoporosis is a chronic systemic skeletal disease characterized by low bone mass and micro architectural deterioration with a consequent increase in the bone fragility and susceptibility to fracture 2].

Periodontitis is an infectious disease results from extension of the inflammatory process initiated in the gingiva to supporting periodontal tissues results in loss of connective tissue and bone support and is a major cause of tooth loss in adults. Pathogenic microorganisms in the biofilm, genetic and environmental factors, behavioral and social risk factors contribute to the cause of these diseases[3-5].

Osteoporosis and periodontitis are very prevalent diseases and are most common in middle-aged and elderly women. These diseases are related as both damage bone tissue and share common risk factors. A hypothesis was raised that systemic imbalance in bone resorption and deposition might manifest itself in the alveolar bone earlier than in other bones[6]. The skeletal bone loss in osteoporosis accelerates the decrease in bone density in oral bone[7]. The importance of cooperation between rheumatologists and dentists should be emphasized due to a new concept of bone resorption by inflammation mediators both during osteoporosis and periodontitis[8]. Osteoporosis, though not being the initial cause of periodontitis, has been shown to be a risk indicator that may contribute to the progression of periodontal disease[9].

Saliva can be used as a diagnostic fluid in medicine; many of these salivary components appeared to be useful biochemical markers of the evolution of dental disease [10]. Various biochemical markers are available for a specific and sensitive assessment of the rate of bone formation and bone resorption of the skeleton such as osteonectin[11].

Osteonectin is a matricellular protein regulating matrix assembly, osteoblast differentiation, and survival. The researchers indicated that osteonectin is essential for normal bone mass[12-14].

Osteonectin also plays role in cell attachment, migration, proliferation and differentiation[12]. Many studies found a relationship between clinical measures of periodontal health and salivary levels of osteonectin[15-17]. The association between systemic osteoporosis and periodontal health condition remains controversial[18]. The need for deeper understanding of the influence of osteoporosis on periodontal health among old adult women and their relations with salivary osteonectin because there is no previous Iraqi study concerning these relations, it was decided to conduct this study. Data gained may be useful for planning preventive programs. The aims of this study were to assess the periodontal pocket depth in relation of salivary osteonectin among osteoporotic group and compared with control group.

Subjects and Methods

The sample of the present study consisted of study group that include 30 old adult women30 with osteoporosis (aged 60_65 years) and control group that include 30 women with healthy bones matching in age, both study and control group were patients attending Al-Yarmook Teaching Hospital. The patients diagnosed with osteoporosis by measuring bone density at the spine and femur from dual energy x-ray absorptiometry (DEXA- scan) by using T-score measurements as according to World Health Organization (WHO) [19]: T score: < -1 is considered normal, T score: > -2.5 are considered osteoporosis.

A verbal consent form was obtained from each participant enrolled in this study. The age of the participant was recorded according to the last birthday[12]. Any subjects with medical disorders and current use of medications were not included in the study [13, 14]. The probing pocket depth was measured with calibrated periodontal probes (William's probes) at four surfaces of all examined teeth except the third molars. The distance from the gingival margin to the most apical extent of the probe inserted into the gingival crevice as close as possible to the long axis of the tooth was recorded. The sites for measurements were mid-buccal, mid-palatal, mesiobuccal and distobuccal lines. No pressure was used; the probe was allowed to fall by its own weight[20, 21].

The collection of the stimulated salivary samples from the patients was performed under standardized conditions according to the instructions cited by Tenovuo and Lagerlöf [22] , The salivary samples were centrifuged at $10{,}000^{x}$g at 2-8° C for 15 minutes. The clear supernatant was separated by micropipette and was stored at (- 20°C) in a deep freeze and further assessment for osteonectin level in saliva was done by special osteonectin kit (CUSABIO) using ELISA technique which is a quantitative sandwich enzyme immunoassay technique (Enzyme-linked immunosorbent assay). These results were obtained in traditional unit (ng/ml). Statistical Analysis and processing of the data were carried out using SPSS version 18.

Result

In the present study, sixty females were examined. They were 30 females with osteoporosis and the control group that include also 30 females. After verification and assessment of the data, it's been found that the data were not normally distributed including depth with its severity.

Table 1: Pocket depth (median and mean rank) among osteoporotic women and control groups.

Pocket depth *(mm)*	Osteoporotic women		Control group		Statistical difference		
	Median	Mean Rank	Median	Mean Rank	Mann-Whitney U	Z. test	(p-value)
PD	0.00	28.47	0.03	32.53	389.00	-0.96	0.34

The data of the present study illustrates that the mean rank value of probing pocket depth (PPD) was found to be higher among control group than osteoporotic women but the difference was not significant ($p>0.05$) (table1).

The extent (mean rank percentage of sites) of periodontal pocket depth with different thresholds of severity among osteoporotic women and control groups are illustrated in Table 2 The mean rank value of both ≥4 and ≥5 thresholds of PPD was found to be higher among osteoporotic women than control groups, while opposite figure was found concerning PPD ≥3, however all these differences were statistically not significant ($P>0.05$).

Table 2: Extent (Mean rank percentage of sites) of periodontal pocket depth according to different thresholds of severity among osteoporotic women and control groups

PPD(mm)	Osteoporotic women		Control group		Statistical difference		
	Median	Mean Rank	Median	Mean Rank	Mann-Whitney U	z-test	P-value
≥3	0.00	28.47	1.00	32.53	389.00	-0.96	0.34
≥4	0.00	31.10	0.00	29.90	432.00	-0.48	0.63
≥5	0.00	31.55	0.00	29.45	418.50	-1.08	0.28

Correlation coefficients of salivary osteonectin with periodontal pocket depth according to different thresholds of severity are seen in Table 3. Analysis among osteoporotic group revealed that the salivary osteonectin correlate very weakly not significantly in positive direction with all threshold (≥3, ≥4, ≥5) mm, while among control group, the correlation were very weak not significant in positive direction with ≥3, ≥5, but negative with ≥4mm.

Table 3: Correlation coefficients of salivary osteonectin with periodontal pocket depth according to different thresholds of severity among osteoporotic women and control groups

PPD (mm)	Osteoporotic women			Control group		
	Osteonectin			Osteonectin		
	r	p	Sig.	r	p	Sig.
≥3	0.15	0.42	NS	0.06	0.76	NS
≥4	0.14	0.48	NS	-0.05	0.81	NS
≥5	0.07	0.71	NS	0.03	0.87	NS

Discussion

Aging is the accumulation of changes in a person over time; it is an important part of all human societies reflecting the biological changes that occur[23].

The periodontal diseases are highly prevalent diseases results from extension of the inflammatory process initiated in the gingiva to supporting periodontal tissues results in loss of connective tissue and bone [4,5]. In the current study Periodontal Disease Index (PDI) was done according to [20]. This index is widely used in both epidemiological and controlled studies due to their easy, validity and feasibility. As well as they allow the assessment of the state by severity [24]. According to the periodontal condition of the current study, data analysis finds that in spite of no significant differences in all signs of periodontal disease (PPD, CAL) between women with osteoporosis and control groups but the mean value of these parameters especially the more sever grades of PPD (≥4, ≥5) seems to be higher in diseased group, this in agreement with others [25-29] .

The reason behind these results might be related to the effect of the salivary osteonectin among osteoporotic group although the relations with periodontal pocket depth was statistically not significant in positive direction agree with Aksoy [30]; Trombetta and Bradshaw [14] who found that SPARC (secreted protein acidic and rich in cysteine)/Osteonectin (SP/ON)-null PDL exhibited more extensive degradation of connective tissue in the gingival tissues, Since the production of SPARC /osteonectin in these three collagen-rich structures (cementum, PDL, and alveolar bone), that affected by periodontal disease make SPARC/ osteonectin a strong candidate for improving the regeneration of periodontal attachments that are lost as a consequence of disease. Furthermore, the protein concentration found in GCF was elevated as probe depth measures increased in the sites evaluated [31].

However one must keep in mind that the majority of studies on the relationship between periodontal disease and osteoporosis have been hindered by different study populations, small sample sizes, limited control of other potential confounding factors, varying definitions of both periodontal disease and osteoporosis [9,32] this may explain some of this inconsistency in the results.

However the possible interpretation behind the non-significant differences between both groups may be due to the possible that the attachment loss occurred in younger age women (prior to menopause) and thus cannot directly be correlated to the old adult postmenopausal osteoporosis [33], and could be because dental status is dictated by many other factors like the dietary habits, socioeconomic and education status of an individual [9,34] (need further studies), Other reason could be that the present study does not include any measures of oral bone densities (to prevent CT scan hazard radiations for ethics purposes), thus limiting any possible correlation between systemic and oral bone density.

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عمق جيب اللثة وعلاقته بالبروتين اللعابي لمرضى هشاشة العظام من النساء كبار السن

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المستخلص

مقدمة: ترقق العظام حالة تتميز بانخفاض كتلة العظام خاصة في كبار السن .يمكن استخدام اللعاب كسائل للتحليل للمؤشرات الحيوية البشرية لدوره في نمو العظام مثل البروتين اللعابي (أوستيونيكتين) التي تؤدي بدورها إلى تأثير سلبي على حالة صحة الفم والأسنان.

الاهداف من الدراسة: ان الغرض من الدراسة هو تقييم مستويات العلامات البيولوجية والبروتين اللعابي (أوستيونيكتين) وتأثيره على أمراض اللثة بين كبار السن من النساء المصابات بهشاشه العظام ومقارنتهم مع اقرانهم من نفس الجنس الغير مصابات بهشاشه العظام.

المواد والطرائق: اشتملت الدراسة على مجموعة من الاناث البالغين وعددهم 60 باعمار تتراوح بين 60 -65 سنة من المراجعات لمستشفى اليرموك التعليمي , 60 انثى شخصت باصابتها بهشاشه العظام قبل اخذ اي علاج و 60 انثى تشتمل على نفس المواصفات ولكن ليس لديهم اي تشخيص بالاشعه لضعف العظم. وجمعت العينة اللعابية تحت ظروف موحدة وتم جمع اللعاب المحفز بطريقة (Tenovuo and Lagerlöf,

1994) ومن ثم تم تحليلها لتقدير البروتين اللعابي عن طريق تقنيه قياس الانزيم المناعي المرتبط) (ELISA)

النتائج: توضح البيانات الخاصة بهذه الدراسة أن نسبه مدى حدوث و عمق الجيب (PPD) وجد أعلى ضمن مجموعه النساء غير المصابات بهشاشه العظام مقارنه بالنساء المصابات، لكن الفرق لم يكن كبيرا. كما ان نسبه مدى حدوث و عمق الجيب كانت أعلى بين مجموعة النساء المصابات بهشاشه العظام في ≤ 4 و ≤ 5ملم وأقل في ≤ 3 ٠ مم. ومع ذلك لا يوجد فرق معنوي في عمق الجيب بين المجموعتين. كان مستوى البروتين اللعابي (أوستيونيكتين) أقل لدى النساء المصابات بهشاشه العظام , كما أظهرت الدراسه وجود علاقة إيجابية مع عمق الجيب وفقدان مستوى ارتفاع اللثه لدى النساء المصابات بهشاشه العظام مقارنه بغير المصابات مع عدم وجود فرق معنوي.

الاستنتاجات: هشاشة العظام المرتبطة بانخفاض كثافة العظام يكون لها تأثير على حالة صحة الفم والأسنان،مما يؤدي إلى زيادة في امراض اللثة التي تتأثر أيضا بالتغييرات في الخصائص الفيزيائية خاصة البروتين اللعابي(أوستيونيكتين) الذي كان أقل، وبالتالي تؤثر على صحة الفم بين النساء كبار السن ويحتاج الى برامج وقائية وتثقيفية في صحة الفم والأسنان.

الكلمات الرئيسية: ترقق العظام، عمق الجيب، أوستيونيكتين اللعابية.