

PERIODONTITIS AND OSTEOPOROSIS

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Summary. Periodontitis and osteoporosis are two diseases found in both male and female population worldwide. The main characteristic of the two diseases is their increased intensity with age. Periodontitis is associated with resorption of the alveolar bone. Osteoporosis, as the highest degree of osteopenia, is characterized by bone loss leading to structural bone transformation. The association between periodontitis and loss of the oral bone due to osteoporosis is continually being examined. The aim of the paper is to examine the condition of periodontal tissue in patients suffering from osteoporosis. Fifty patients were examined. The experimental group included 25 patients who were diagnosed with osteoporosis on the basis of the absolute and T-values. Clinical parameters for the evaluation of periodontal condition included plaque index, gingival index, hemorrhage index, periodontal index and tooth loss. The results showed a positive correlation between osteoporosis and tooth loss, while the clinical parameters showed significant differences between patients with osteoporosis and those without it. In conclusion, it can be said that osteoporosis has a significant role in development of periodontitis, as the loss of the oral bone due to osteoporosis can change the process of disease and contribute to a greater tooth loss. In this mutual relationship, some other factors affecting the two diseases should be considered. It is apparent that both diseases should be diagnosed as soon as possible and that it is necessary that a close cooperation between general practitioners and dentists is paramount to prevention and maintenance of optimal health of patients.

Key words: Periodontitis, resorption of bone tissue, osteoporosis

Introduction

Periodontitis (PD) and osteoporosis (OP) are two diseases that are encountered in a substantial part of both male and female population worldwide. These two diseases are characterized by increased intensity with age. Osteopenia together with osteoporosis is bone reduction resulting from misbalance between resorption and bone formation, with resorption tending to increase. This disorder leads to demineralization of bones, which is clinically manifested through pain, deformities, and bone fracture. Fracture risk depends on the absolute density of bone minerals (1). The rate of the loss of bone minerals is twice higher in women than in men, as a result of lack of estrogen in women in post-menopausal period. Disappearance of the cortical bone is usually 2-3% per year and the trabecular bone 4.8% per year (2).

Periodontitis is defined as an inflammation of supporting teeth tissues, usually followed by a progressive destructive course and leading to the loss of the periodontal ligament and alveolar bone. Destructive processes in periodontal tissues jeopardize the stability of tooth-tooth decay and eventually fall out (3). Periodontitis is a major cause of tooth loss and edentulism in adults (4).

Both periodontitis and osteoporosis represent major health problems all around the world, especially in the elderly population. Although a possible association between PD and tooth loss due to osteoporosis is continually being examined, the issue of the role of osteoporosis in the onset and development of periodontitis still remains unsolved. Determining the association between these two diseases will be vital to their prevention and therapy.

The Aim of the Study

The aim of the study was to examine the condition of periodontal tissues in people who were diagnosed with osteoporosis and to compare the results with periodontal tissues in people not suffering from osteoporosis.

Material and Methods

During the study 50 people were examined, 25 of whom were in the experimental group consisting of patients diagnosed with osteoporosis on the basis of the absolute value and T-score. The examined people were mainly females (24:1), aged between 35 and 75. All the patients were diagnosed with periodontitis that had not been treated previously. These patients underwent a

regular medical treatment in "Zelengora" Rehabilitation Center in Niška Banja.

The control group comprised 25 people diagnosed with periodontitis but not with osteoporosis. These patients were also treated at the Department for Oral Medicine and Periodontology, Dental Clinic, Niš. They had not been treated for periodontitis either. Controls were of similar age structure as the experimental group (32-75). The clinical parameters used for determining the condition of periodontal tissues included: plaque index (Pli), calculus index (Izk), concremente index (Ikon), periodontal index (PDI), gingival index (Gi) and bleeding index (Ikrv). Concomitantly, the number of lost and extracted teeth was notified. All the clinical parameters were determined according to the valid standard protocol (3). Conventional radiography was not used due to its shortcomings. Shortening or prolonging X-rays, physiological variations in contrast and density, as well as super-positions of anatomic structures, make this method useless in determining destruction and treatment of the alveolar bone, while lacking in a programme for densitometry.

Results

The clinical results of the condition of periodontal tissues are shown in Table 1.

The groups under examination consisted of the same number of patients of similar age. The absolute values of patients with osteoporosis ranged between 0.737 and 1.031 and T-score between -1.2 and -3.7.

Concerning the number of lost teeth, it is apparent that the number of lost teeth in patients with osteoporosis is greater. On average, the number of lost teeth per person is 11.6 in the experimental group, and 6.7 in controls.

The periodontal index, representing the condition of the entire periodontal tissue, shows similar distribution. Its average value is 4.8 in osteoporotic patients 5 in controls.

The plaque index values, which show the condition of oral hygiene, are almost identical: 1.3 in the experimental group and -1.2 in control subjects.

The tree indexes - Pli, Izk, Ikon – represent the condition of oral hygiene. The values we obtained for them demonstrate a very bad maintaining of oral hygiene.

The calculus index is the same in both groups, i.e., - 1.6, while Ikon is 1.3 in the experimental group and 1.2 in controls.

As far as the gingival index is concerned, there is a difference. In the experimental group its value is 0.9, while in controls it is 1.4. A relation was established with the bleeding index in patients with osteoporosis. The value is a bit lower (0.9) in experimental subjects, but higher (1.5) in control subjects. The difference in the values of Gi and Ikrv is significant.

All but two patients from the experimental group had not been previously treated for periodontitis. An examination showed that the experimental group had been treated with both osteoporosis medicaments and some other medication, depending on the patient's general condition.

Table 2. Osteoporosis medicaments and medicaments for additional therapy

Drugs for osteoporosis		Other drugs for osteoporotic patients	
Alpha D ₃	Kaltegal	Prinorm	Ranisan
Alendronat	Chlorochin	Presolol	Dilacor
Osteopor	Resorchin	Nifelat	Verapamil
Fosamax		Moralis	Bromazepam
		Diklofen	Soli zlata
		Bensedin	

Discussion

Periodontitis includes infection and a form of illnesses associated with specific pathogenic bacteria existing in the subgingival area. Of a great number of bacteria, *Porphiromonas Gingivalis* and *Actinobacillus Actinomycetemcomitans* are capable of invading periodontal tissues and are considered highly virulent microorganisms (3).

The onset and progression of periodontal infection can be significantly modified by local and systematic conditions, known as "risk factors". Local factors are various and directly related to periodontal tissues. They accelerate the invasion of bacteria and development of dental plaque. Systemic risk factors have been considered recent epidemiological studies (2,5,6). Risk factors include diabetes mellitus (7) and smoking (8). These two risk factors are related to the onset and progression of periodontitis and they are extremely important when periodontitis prevention and therapy are to be considered. Recent studies have demonstrated the existence of some other potentially important periodontal risk factors. Along with stress, sex, age and genetic factors (9),

Table 1. Clinical results of condition of periodontal tissues

Groups	Sex		Age	Absolute values	T-score	Number of lost teeth	PDI	Pli	Izk	Ikon	Gi	Ikrv	Periodontitis therapy	Osteoporosis therapy	Other therapy
	F	M													
I	24	1	35-75	0.737 1.031	-1.2 -3.7	x = 11.6	x = 4.8	x = 1.6	1.6	1.3	0.9	0.9	2	24	21
II	24	1	32-75	-	-	x = 6.7	x = 5	x = 1.5	1.6	1.2	1.4	1.5	-	-	13

osteopenia (osteoporosis as a consequence of estrogen deficit) is considered a risk factor (10,11). According to some studies, osteoporosis may be a very important factor of tooth loss (6,12).

Kribbs et al. (13) compared patients with osteoporosis and without it and found out that the osteoporotic group comprised more subjects with no teeth or with a greater number of lost teeth (13). Our results correspond to Kribb's findings, as they show that, on average, the loss of teeth per patient in the osteoporotic group is more pronounced ($x = 11.6$ teeth per patient), compared to the control group in which the average loss of teeth, is 6.7 per patient. Compared to Kribb's results, which show that tooth loss is 6.9 in osteoporotic people and 4.5 in non-osteoporotic subjects, our results show greater loss. This can be accounted for by poor oral health in the groups under examination as it was noticed that the patients had not received any periodontal treatment. The same condition was confirmed by the plaque index values, calculus index, and Ikon. Poor oral hygiene destroys the condition of periodontal tissues.

A direct relation between osteoporosis and destruction of periodontal tissues, established by measuring the loss of the inter-proximal alveolar bone in post-menopausal women, was presented by Wactawski et al. (12). As densitometry was not performed in our study, and x-rays, as a method of destruction evaluation, was not used due to its shortcomings, only the case of clinically evident alveolar bone loss with extreme retreat of the gum – recession and tooth prolonging – was shown. These clinical findings confirm the hypothesis that osteoporosis leads to inter-dental alveolar bone reduction per volume unit. Thus, a jeopardized bone is less dense and subject to resorption during periodontal inflammation (14). It has been suggested recently that total skeleton mass reduction is directly related to mandibular bone density reduction in osteoporotic women (13,14).

The fact that it is women who mainly suffer from this illness, as confirmed in our study as well, can be explained not only by the cumulative age effect but also by secondary factors that relate the tooth loss effect to ovarian function loss. Moreover, the number of lost teeth is greater in osteoporotic than in non-osteoporotic women.

Other results obtained in our research (Pli value: -1.6 in the experimental group, 1.5 in controls; PDI: -4.8 and 5.0 ; Izk: -1.6 and 1.6 ; and Ikon: 1.3 and 1.2 .) are the same for patients both with and without osteoporosis. The results show a difference in the values of Gi and Ikrv. Their average value in a normal bone is $x = 1.4$, while lower values are registered in osteoporotic patients ($x = 0.9$). This difference in inflammation intensity and bleeding level could be accounted for by the fact that, in addition to regular osteoporosis ther-

apy (Table 2), osteoporotic subjects take some of the non-steroidal anti-inflammatory drugs that decrease gingival inflammation intensity and are used as additional periodontal treatment along with medicaments (9).

A significant connection between periodontitis and osteoporosis can be confirmed by the action of proinflammatory cytokines and prostaglandins. Since these mediators develop in both periodontitis (15) and osteoporosis (16), there is a possibility of double connection between these two diseases. Cytokines such as interleukin-1 (IL-1) and interleukin-6 (IL-6), tumor necrosis factor (TNF), as well as prostaglandins (PGE), have a stimulating effect on the bone resorption, since they affect differentiation of osteoblasts from precursor cells (17). The effect of osteoporosis on periodontitis can be partly explained by the increased number of created proinflammatory cytokines and prostaglandins during osteoporosis.

However, periodontitis, as a chronic inflammatory disease, which influences the appearance of proinflammatory cytokines through its pathogen bacteria, could be at the same time the source of osteoporosis. This hypothesis is becoming more and more relevant and should be proved in the future. In addition, a close cooperation between doctors – rheumatologists and periodontologists – is necessary. By treating periodontitis, mediators of inflammation and bone resorption are decreased and development of osteoporosis is thus retarded.

Conclusion

Periodontitis and osteoporosis, as two most widely spread diseases worldwide, have a lot in common, the fact that needs further study.

In osteoporotic people, a greater loss of teeth is evident, which in turn leads to the onset of edentulism.

The clinical parameters considered in the study showed no difference between the groups, so they are not considered important factors of correlation between these two diseases.

There is a difference in Gi and Ikrv values due to non-steroidal anti-inflammatory drugs.

The cause of tooth loss is difficult to determine, since it is not clear whether it is due to osteoporosis or some forms of periodontitis.

Further studies will help in better understanding the role of osteoporosis and other risk factors in the onset and progression of periodontitis and its effects on periodontal therapy.

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.

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PARODONTOPATIJA I OSTEOPOROZA

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Kratak sadržaj: *Parodontopatija i osteoporoza su dve bolesti koje se javljaju kod velikog broja svetske populacije, i ženskog i muškog pola, sa karakteristikom da se pojačavaju sa godinama starosti. Parodontopatija je praćena resorpcijom alveolarne kosti. Osteoporoza, kao najjači stepen osteopenije, karakteriše se gubitkom koštane mase, što dovodi do strukturne promene kosti. Veza između parodontopatije i gubitka oralne kosti zbog osteoporoze se stalno ispituje. Cilj ovog rada bio je da se ispita stanje parodontalnih tkiva kod pacijenata sa osteoporozom i uporedi sa stanjem onih osoba koje ne boluju od osteoporoze. Ispitano je 50 pacijenata. Eksperimentalnu grupu od 25 osoba činili su pacijenti sa postavljenom dijagnozom osteoporoze na osnovu apsolutne vrednosti i T-vrednosti. Druga grupa od 25 osoba bila je kontrolna grupa sa Parodontopatijom kao jedinom dijagnozom. Od kliničkih parametara za procenu stanja parodonta određivan je plak indeks, gingivalni indeks, indeks krvarenja, parodontalni indeks i gubitak zuba. Rezultati su pokazali pozitivnu korelaciju između osteoporoze i gubitka zuba, dok ostali parametri nisu pokazivali značajnu razliku između pacijenata sa osteoporozom i onih bez osteoporoze. U zaključku se može reći da osteoporoza ima ulogu u razvoju parodontopatije jer gubitak oralne kosti kao rezultat osteoporoze može da menja proces bolesti i doprinese većem gubitku zuba. U ovoj uzročnoj vezi treba razmatrati i druge faktore koji mogu da utiču na ove dve bolesti. Jasno je da obe bolesti treba što pre otkriti i preventivno delovati uz usku saradnju lekara opšte medicine i stomatologa sa ciljem održavanja optimalnog zdravlja pacijenata.*

Ključne reči: *Parodontopatija, resorpcija koštanog tkiva, osteoporoza*