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Dynamics of indicators of sex hormones of blood and saliva in patients with wedge-shaped defect of teeth

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In connection with an unidentified etiology of a wedge-shaped defect of teeth, the problems of early diagnosis of this disease are of particular importance, which would make it possible in time to form an effective set of measures for the treatment and prevention of the further development of this pathology. This study was aimed to identify the features of the hormonal status of saliva in men and women with a wedge-shaped defect of the tooth. The most statistically significant factors accompanying the formation of wedge-shaped defects were the presence of endocrine pathology detected by the study of saliva and blood. In patients with a wedge-shaped defect of the teeth decreased the levels of free testosterone and estradiol in saliva. Thus, patients hormonal level should be controlled during prevention and/or treatment period.

Keywords: wedge shaped defect; teeth, sex hormones; saliva; odontoblasts; endocrine pathology.

INTRODUCTION

Numerous studies have shown that the incidence of hard tissue diseases of teeth of non-carious origin significantly increased to 75–83%. The structure of non-carious teeth lesions is getting younger every year. The wedge-shaped defects of the teeth are diseases of the hard tissues of the teeth of non-carious origin. This is a fairly common disease that is currently in a tendency to spread [1, 2, 5].

Researchers turned to the study of this pathology [7, 11, 12]. But it should be noted that, in comparison with the study of the problems of caries and periodontal diseases, the works devoted to the study of the prevalence, etiology, pathogenesis, as well as the clinic of wedge-shaped defects of teeth, are relative. Most of the research on this issue was conducted in the 60-80 years, at the same time; insufficient attention is paid to its study.

According to various authors, the cause of the formation of wedge-shaped defects of the teeth remains insufficiently studied. Treatment recommendations for this disease remain controversial [6, 8].

All this testifies to the relevance and importance of the study of all issues relating to this disease, and necessitates research on the study of wedge-shaped defects of teeth.

There are various theories of the occurrence of wedge-shaped defects of teeth. One of them is the theory of mechanical grinding of teeth with a hard brush or using abrasive pastes [9, 10]. These factors can exist together or separately. The erosive theory of the occurrence of wedge-shaped defects of teeth speaks about the abuse of acidic products. There is an opinion that in the occurrence of a wedge-shaped defect, a violation of the mineralizing function of the oral fluid is important. Enamel demineralization begins at a pH of the oral fluid of 5.5. Thus, the development of wedge-shaped defects of the teeth leads to a gradual loss of hard tissue, characterized by pain caused by temperature, chemical and mechanical stimuli. Most often, patients complain of aesthetic defect and pain. Because of the pain, they decrease the level of oral hygiene, which increases the risk of other diseases. Therefore, hyperesthesia with wedge-shaped defects of teeth occurs in 82-90% of cases and is most pronounced in young and middle-aged people.

Present methods of prevention and treatment of wedge-shaped defect of teeth (WSD) are symptomatic and pathogenetic in nature, aimed at increasing the

mineralization and strengthening of hard tooth tissues, as well as at removing the effects of hyperesthesia in WSD. However, they do not fully take into account possible violations of the resistance of hard dental tissues. Complexity in the treatment of WSD is absent. Thus, over the past decades, insufficient scientific data on the prevalence of wedge-shaped defects in young patients have been identified. It is also advisable to determine the factors associated with this pathology, and to establish the relationship between them.

Currently, with the advent of new technologies and equipment, it is possible to study the characteristics of the composition of saliva and provide relevant data, which will determine the new view on the etiology of wedge-shaped defects and on the characteristic features of oral fluid in young patients with this type of non-carious lesions, including in the process remineralizing therapy. The study of the content of free hormones in saliva is additional to the clinical symptomatology and an important biochemical marker for the diagnosis of possible disorders in various systems of the body.

t is known that testosterone is involved in the processes of differentiation and growth of cells with androgen receptors. Meanwhile, the literature indicates the presence of androgen receptors in the multi-layered flat epithelium of the oral mucosa and in the nuclei of the odontoblasts of the dental pulp. Studies by Pechersky AV (2007) showed that with a decrease in testosterone levels, a compensatory increase in the expression of androgen receptors is observed. Consequently, androgen deficiency can affect the development of atrophic changes in the mucous membrane of the oral cavity and bone tissue destruction. Evidence of this is the research conducted by G.Ye. Solov'eva-Savoyarova, V.A. Drozhzhina (2008), who revealed a bright manifestation of non-carious lesions (wedge-shaped defects) in women after fifty years while reducing the estrogen-forming function of the ovaries, which indirectly may indicate the influence of sex hormones on the development of wedge-shaped defects of the tooth.

In connection with an unidentified etiology of a wedge-shaped defect of teeth, the problems of early diagnosis of this disease are of particular importance, which would make it possible in time to form an effective set of measures for the treatment and prevention of the further development of this pathology. In the early stages of the disease, it is important to use minimally invasive research methods. The study of saliva is an infrequently used diagnostic method, however, it provides information both on the processes occurring in the oral cavity and on the state of the organism as a whole. Based on the above, we decided to identify the features of the hormonal status of saliva in men and women with a wedge-shaped defect of the tooth.

MATERIALS AND METHODS

To solve the tasks, two series of physiological and clinical studies were conducted with the participation of 72 patients with a wedge-shaped defect of a tooth aged from 18 to 45 years. The diagnosis of WSD was made on the basis of complaints from patients, data of anamnesis, examination and determination of clinical indices - papillary-marginal-alveolar (PMA) in S. Ragsch modification (1960), gingival bleeding index (BI) when probed by HR Muhlemann (1971) as modified by I. Cowell (1975) and Hygiene Index (HI) by JR Green, JR Vermillion (1964). Assessment of the nature of the adaptation reactions of the organism was carried out according to the method proposed by L.Kh. Garkavi (L.H. Garkavi, 2006).

The study of hormones in saliva was carried out in the diagnostic laboratory of TSDI and Republican Scientific Practical Center for Sports Medicine. Blood was taken in the morning strictly on an empty stomach from the cubital vein to vacutainers at Bekton Dickinson BP (England). The content of testosterone was carried out by the ELISA method on the apparatus of the company ROSH-COBAS-411, using the kits of the company "HUMAN" and expressed in units of mmol/l.

Statistical processing of the results of the study was carried out using the Microsoft Excel XP, Statistica 6.0. Programs and included descriptive statics, an assessment of the significance of Student’s differences and a correlation analysis with an assessment of the reliability of the correlation coefficients. In assessing the significance of differences, a value of <0.05 was used.

RESULTS AND ITS DISCUSSION

Based on clinical studies, 72 people were diagnosed with a wedge-shaped defect, and the symptom of hyperesthesia was determined to a lesser extent. 11 (16%) patients complained about the increased sensitivity of hard dental tissues. According to the examination, wedge-shaped defects of the teeth developed against the background of atrophic gastritis, gastric erosion and reflux gastritis. It was found that the wedge-shaped defects of hard tooth tissues were most often located on the canines and premolar of the lower jaw (34.2% and 24.8%) on the right and left. This pathology of hard dental tissues was absent on the molars of both the lower and upper jaw. The teeth of the upper jaw are less frequently affected than the teeth of the lower jaw. The study of the depth of the wedge-shaped defects of the teeth showed the heterogeneity of this indicator, and it depended on the location of the tooth in the jaw. So, wedge-shaped defects

with a small depth of up to 0.2 mm were rarely determined. More often wedge-shaped defects with a depth of 4 mm or more, which were located on the teeth of the lower jaw. One of the symptoms of wedge-shaped defects is the hypersensitivity of dental tissues, which is characterized by short acute tooth pain, arising from various kinds of irritants (temperature, tactile, chemical). According to our data, 88% of patients suffering from wedge-shaped defect of teeth have pathology of periodontal tissues, of which 56.1±5.81% of diseases of periodontal tissues with impaired periodontal attachment and in 43.9±4.98% there were no violations of periodontal attachment.

In the scientific literature there are mostly fragmentary information about hormonal changes in the body of men and women during stressful effects on the body. Therefore, many questions remain unresolved regarding the hormones of the hypothalamic-pituitary-ovarian hypothalamic-pituitary-adrenal system with damage to the tissues of the tooth, in particular the wedge-shaped defects of the tooth occurring in men and women. Multidirectional opinions about the causes of this pathology, indicate the relevance of the topic and serve as the basis for conducting this study.

Analysis of the results of the research presented in the table showed the presence of endocrine pathology in the examined individuals with WSD of teeth.

Table 1: The dependence of the presence of wedge-shaped defects from endocrine pathology.

Subject	**The presence of endocrine pathology**		**Lack of endocrinepathology**		**Total**
	Men	**Women**	**Men**	**Women**	
Patients with WSD of teeth	79%(57)	82% (59)	21% (15)	18% (13)	100%(72)

At the same time, the results of the study showed that 79% of men and 82% of women in the group with a wedge-shaped defect had a relative deficiency of testosterone and estradiol, and only in 21% of men and 18% of women the level of the hormone in the blood serum corresponded to the values of healthy individuals.

The study of the hormonal status of blood in the examined persons, in particular, in men and women, showed a peculiar dynamics in healthy individuals and patients with a wedge-shaped defect of a tooth. As can be seen from the results of studies, 79% of men and 82% of women of the wedge-shaped defect group had a relative deficiency of testosterone and estradiol, and only in 21% of men and 18% of women the level of the hormone in the blood serum corresponded to the values of healthy individuals.

Consequently, the examined individuals with a wedge-shaped defect of the teeth have a low level of sex hormones, both in relation to standard values and in comparison with persons of the same age, but not having non-carious lesions of the teeth.

It is known that, after secretion into the blood, testosterone is metabolized to dihydro-testosterone (DHT) and to estradiol, and androstenedione – to dihydroepiandrosterone and estrone. Testosterone secretion is regulated by the hypothalamic-pituitary system. The formation of gonadotropin-releasing hormone by the hypothalamus and gonadotropic hormones by the pituitary gland, in turn, depends on the response of testosterone production in the testicles by the mechanism of negative feedback. The resulting testosterone inhibits the secretion of gonadotropin-releasing hormone and LH. In addition to testosterone, the inhibitory effect on gonadotropin-releasing hormone and LH secretion is exerted by testosterone metabolites: DHT and estradiol, whose formation increases with partial age androgen deficiency (Pechersky AV et al. 2003). The inhibitory effect of estrogen on the secretion of LH increases with partial age androgen deficiency, when the content of estrogen increases as the aromatase activity increases.

Table 2: Indicators of serum sex hormones in healthy individuals and patients with a wedge-shaped defect of the tooth

Hormones		Men		Women	
		Healthyfaces	Patients with WSD	Healthyfaces	Patients with WSD
Testosteronetotalnmol/l	M±m	27,3+1,58	11,8+0,93*	2,13 ±0,02	2,51±0,04*
Estradiol, nmol/l	M±m	4,01±0,51	5,27±0,42	270,4±7,58*	136,8±5,39*
Progesterone, nmol/l	M±m	1,45±0,10	1,57±0,14	1,66±0,31	1,97+0,05

Note: * - significance of differences P <0.05

As can be seen from the presented results of studies in patients with CDS, a significant decrease in sex hormones in men and women was observed. At the same time, there were no significant changes with respect to the hormone-progesterone.

The study of the content of free hormones in saliva is additional to the clinical symptomatology and an important biochemical marker for the diagnosis of possible disorders in various systems of the body. It is known that testosterone is involved in the processes of differentiation and growth of cells with androgen receptors. In the literature there is no data on the presence of androgen receptors in the multi-layered flat epithelium of the oral mucosa and in the nuclei of the odontoblasts of the dental pulp. Accordingly, the role of partial age-related androgen deficiency was not taken into account in the development of atrophic changes of the oral mucosa and bone destruction, which lead to the development of wedge-shaped defects of hard dental tissues.

Recently, numerous studies have revealed the presence of androgen receptors in a stratified squamous epithelium of the oral mucosa and in the nuclei of the odontoblasts of the dental pulp. It has also been shown that a decrease in testosterone levels leads to a compensatory increase in the expression of androgen receptors (Pechersky AV, 2007). Consequently, according to the authors, a decrease in testosterone levels affects the mechanism of the formation of wedge-like defects, which is possibly due to trophic function of odontoblasts of dental pulp, in the nuclei of which the expression of androgen receptors was detected.

Research G.E. Solov'eva-Savoyarova, V.A. Drozhzhina (2008) revealed a bright manifestation of non-carious lesions (wedge-shaped defects) in women after fifty years while reducing the estrogen-forming function of the ovaries, which indirectly may indicate the effect of sex hormones on the development of wedge-shaped defects of the tooth.

In connection with an unidentified etiology of a wedge-shaped defect of teeth, the problems of early diagnosis of this disease are of particular importance, which would make it possible in time to form an effective set of measures for the treatment and prevention of the further development of this pathology. In the early stages of the disease, it is important to use minimally invasive research methods. The study of saliva is an infrequently used diagnostic method, however, it provides information both on the processes occurring in the oral cavity and on the state of the organism as a whole. Based on the above, we decided to identify the features of the hormonal status of saliva in men and women with a wedge-shaped defect of the tooth.

As can be seen from the presented research results (Table 3), the hormonal status has its dynamics regarding the content of hormones in the oral fluid in different sexes of people.

As can be seen from the presented results of studies, in patients with KDZ, there is a decrease in the level of free testosterone by 46% in men, whereas in women we see the opposite trend.

Table 3: Indicators of sex hormones in the oral fluid of healthy individuals and patients with wedge-shaped defect

Hormone		Men		Women	
		Healthyfaces	Patients with WSD	Healthy faces	Patients with WSD
Freetestesteronenmol/l	M±m	39,08±9,12	21,08±6,31*	1,21± 2,42	2,08± 0,58
FreeEstradiol (nmol/l)	M±m	6,14±0,34	8,12±0,71*	18,9±6,68	13,07±7,51

Note: * - significance of differences P <0.05

Based on research results, as well as literary sources, it should be noted that the observed decrease in the level of free sex hormones in saliva leads to an increase in hormone-dependent receptors in odontoblasts of the tooth pulp and thus may be one of the causes of a tooth defect. Consequently, the occurring tooth defect in the examined persons on the background of dishormonal disorders in saliva is one of the indicators of metabolic disorders in the tooth tissues.

CONCLUSION

1. In the examined patients, the most statistically significant factors accompanying the formation of wedge-shaped defects were the presence of endocrine pathology detected by the study of saliva and blood
2. In patients with a wedge-shaped defect of the teeth, there was a decrease in the levels of free testosterone and estradiol in saliva.
3. Authors recommended that the treatment and prophylaxis should be started as earliest as the disease is diagnosed. Moreover, wedge-shaped defect of the teeth affects the concentration of the sex hormones and it requires controlling the level of hormones during therapy.

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