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BIOCHEMICAL SUBSTANTIATION OF TREATMENT OF PERIODONTAL DISEASES IN PATIENTS WITH PSYCHOSOMATIC STRESS

Abstract. *In the development of periodontal diseases the presence of psychological stress in patients is important. This should be taken into account in case of comprehensive treatment of patients with periodontal diseases. To treat periodontal diseases in these patients effectively, it is necessary to substantiate experimentally the effectiveness of the proposed complex of adrenoblockers. Objective: experimentally substantiate the effectiveness of the proposed complex of adrenoblockers for the treatment of periodontal diseases. Methods: To substantiate the effectiveness of the proposed complex of adrenoblockers for the treatment of periodontal diseases an experimental study was conducted on animals. Adrenaline stress was simulated in rats by oral application of gel with adrenalin in the dose of 0,36 mg/kg during 10 days. Lincomycin was introduced with drinking water in the dose of 60 mg/kg. The gel of adrenoblocators (zokson + nicergoline and sibazon) was introduced by application in the dose of 0,6 mg/kg. The contents of glucose, triglycerides, total cholesterine and Malone dialdehyde (MDA), the activities of urease, lysozyme, elastase and catalase were determined in the blood serum. Results: The conducted experimental studies have shown that the development of adrenalin stress causes in animals the increase of the level of elastase, malonic dialdehyde. At the same time, the activity of catalase, antioxidant-prooxidative index decreases. The adrenoblocator gel reduced activity of urease and MDA content, but increased the activity of catalase and antioxidant-prooxidative index. Conclusions. Oral application of gel with adrenoblocators intensified anti-dysbiotic action more then quertulyne, but yielded anti-inflammation and antioxidative actions to quertulyne after common introduction of adrenaline and lincomycin. Thus, application of gel with adrenoblockers produces an anti-inflammatory effect, but more definitely normalizes the processes of lipid peroxidation.*

Key words: *periodontal diseases, adrenaline stress, adrenoblocator, inflammation, antioxidant.*

Introduction. Periodontal diseases belong to the most spread human diseases including generalized periodontitis resulting in the largest loss of teeth. In Ukraine occurrence of periodontitis is from 92% to 98% [7, 9]. In recent years sickness rate of periodontitis (generalized periodontitis) among young people has increased. At the age of 19-24 the sickness rate is 30%, at the age of 25-30 – more than 60% [3, 8, 13, 16].

Possible interrelations between psychological stress and periodontal diseases are of a special importance among etiological factors. Stress is known to provoke the development of periodontal diseases and generalized periodontitis in particular [10, 11, 17, 20]. A high level of anxiety and rate of periodontal diseases were found among students taking exams [19, 21]. It is indicative of a possible negative effect of psychological stress on the condition of the periodontal tissues [18].

The investigation of 350 Ukrainian residents performed by us before demonstrated that

deterioration of health was found in 301 (86,0%) those asked. 126 (36,0%) of individuals had general chronic diseases. 221 (63,14%) of those asked had negative levels of adaptation, 94 (26,86%) of individuals considered their condition unsatisfactory. Therefore, 204 (58,29%) of those asked were unsatisfied with their health, and 146 (41,71%) of them considered it to be satisfactory.

Thus, one group – 204 (58,29%) of those asked considered their health to be unsatisfied, and the second group – 146 (41,71%) individuals considered their health to be satisfactory.

Certain interrelations were found between the level of anxiety and periodontal diseases.

To elaborate adequate methods of treatment experimental studies were conducted. With the purpose to reduce negative effects of psycho-emotional stress on the body of patients a complex of pharmacotherapy was suggested: zokson (0,002 g once a day), nicergoline (0,005 g three times a day), sibazon (0,005 g once a day).

Materials and methods. The objective of the

experimental study was to determine comparatively the effect of the suggested complex of adrenoblockers (zokson + nicergoline + sibazon) [5, 6] and anti-dysbiotic agent quertuline (quercetin + inulin + calcium citrate) [4] on biochemical parameters of the blood serum.

To perform experimental studies the model of adrenaline stress was chosen (5,6). Assessment of the model demonstrated that introduction of lincomycin causes decrease of catalase activity in the blood serum and general cholesterol content, which increase in case of adrenaline stress. Introduction of lincomycin with adrenaline stress provokes decrease of lysozyme, increase of dysbiosis and activity of elastase inflammation marker.

The experiments were conducted on 21 albino Wistar rats (females, 13 months, body weight 290-330 g). Adrenaline stress was simulated by everyday application of gel containing adrenaline in the dose of 0,36 mg/kg of the body weight of animals and drinking water with lincomycin during 10 days. All the animals were divided into three groups 7 rats in each. The first group included animals with simulated adrenaline stress only. The animals from the second group (main group) in addition to adrenaline stress received everyday application of gel containing suggested adrenoblockers (zokson + nicergoline + sibazon). The duration of the experiment was 10 days. The animals from the third group (control group) in addition to adrenaline stress received everyday application of gel containing quertuline. Duration of introduction of all the agents in all the groups was 10 days. The rats were killed on the 11th day under thiopental narcosis (20 mg/kg) by means of the total blood-letting from the heart.

The content of glucose [2], triglycerides [12], general cholesterol [12], Malone dialdehyde (MDA) [1], urease activity [15], lysozyme [15], elastase [1] and catalase [1] was determined in the blood serum. According to the ratio of relative activity of urease and lysozyme the degree of dysbiosis was calculated by Levytskyi [15], and according to the ratio of catalase activity and MDA content – antioxidant-prooxidant index (API) [1]. The results were processed by standard statistical methods [14].

Results. In rats with adrenaline stress an increased level of glucose (to $7,46 \pm 0,3$ mmol/L), triglycerides (to $1,42 \pm 0,1$ mmol/L) and cholesterol (to $1,56 \pm 0,08$ mmol/L). Introduction of gel with adrenoblockers in rats from the main group

causes certain decrease of the following parameters: glucose to $7,63 \pm 0,41$ mmol/L, triglycerides – to $1,25 \pm 0,37$ mmol/L and cholesterol – to $1,85 \pm 0,11$ mmol/L. In animals from the control group similar decrease of the parameters was found: glucose to $7,15 \pm 0,22$ mmol/L, triglycerides – to $1,03 \pm 0,09$ mmol/L and cholesterol – to $1,90 \pm 0,05$ mmol/L. Reliable statistical difference between these parameter in animals from the 2nd and 3rd groups was not found ($p > 0,05$). It is indicative of the fact that activity of the suggested agents is on the level of the drug of comparison quertuline.

In rats with adrenaline stress increased level of urease microbe insemination marker (to $1,40 \pm 0,14$ mkkat/L), decreased level of protection – lysozyme (to 63 ± 3 units/L) and increased level of dysbiosis to $1,81 \pm 0,22$ units. Application of gel with adrenoblockers decrease urease activity to $0,66 \pm 0,21$ mkkat/L and increase lysozyme level to 73 ± 6 units/L. It results in considerable decrease of dysbiosis degree – to $0,74 \pm 0,20$ units. In the control group similar improvement of these parameters was found: decreased urease activity to $1,47 \pm 0,43$ mkkat/L and increased lysozyme level to 73 ± 5 units/L. Dysbiosis degree decreased to $1,63 \pm 0,18$ units. Therefore, application of gel with adrenoblockers improves reliably ($p < 0,05$) biochemical parameters of dysbiosis.

Development of adrenaline stress causes in animals changes of inflammation indices (elastase) and peroxide oxidation (Malone dialdehyde - MDA). Elastase level increases to $138 \pm 10,4$ mkkat/L, and MDA content increases to $1,06 \pm 0,06$ mmol/L. Application of gel with adrenoblockers in animals from the 2nd group results in considerable decrease of these parameters: elastase to $112,4 \pm 12,0$ mkkat/L and MDA content to $0,90 \pm 0,02$ mmol/L. Quertulin applications cause more pronounced anti-inflammatory action decreasing elastase activity to $99,7 \pm 8,9$ mkkat/L, and influence inconsiderably on the processes of peroxide oxidation decreasing MDA content to $1,01 \pm 0,04$ mmol/L. The obtained results indicate that gels with adrenoblockers demonstrate anti-inflammatory action on the level of quertuline and normalize the processes of lipid peroxide oxidation better.

In case of adrenaline stress in animals of the 1st group other parameters decrease considerably: catalase activity decreases to $0,22 \pm 0,02$ mkkat/L and API index – to $2,07 \pm 0,17$ units. Applications of gel with adrenoblockers in animals of the 2nd

group increase catalase activity to $0,30 \pm 0,01$ mkkat/L and API index to $3,33 \pm 0,21$ units. Application of gel with quertuline in animals from the 3rd group increase catalase activity to $0,37 \pm 0,03$ mkkat/L and API index to $3,66 \pm 0,25$ units. It is indicative of the ability of both examined drugs to produce a positive effect on the anti-oxidant status of the body.

Therefore, applications of gel with adrenoblockers cause anti-inflammatory action and normalize the processes of lipid peroxide oxidation better.

Conclusions. The conducted experimental studies are indicative of the fact that the suggested combination of adrenoblockers causes anti-dysbiotic and antioxidant action (more pronounced than quertuline applications), and anti-inflammatory action on the level of quertuline, a drug of comparison.

References:

1. Levitskiy AP, Den'ga OV, Makarenko OA. *Biokhimicheskiye markery vospaleniya tkaney rotovoy polosti. Metodicheskiye rekomendatsii.* Odessa: 2010. 16 p.
2. Goryachkovskiy AM. *Klinical biochemistry.* Odessa: Ekologiya; 2005. 616 p.
3. Danilevskiy NF, Sidel'nikova LF, Tkachenko AG. *Rasprostranennost' osnovnykh stomatologicheskikh zabolevaniy i sostoyaniye gigiyeny polosti rta u naseleniya razlichnykh regionov Ukrainy. Sovremennaya stomatologiya.* 2006;(2):14-6.
4. Levitskiy AP, Makarenko OA, Selivanskaya IA. *Kvertulin. Vitamin R, prebiotik, gepatoprotektor.* Odessa: KP OGT; 2012. 20 p.
5. Kononova OV. *The influence of lincomycin upon the state of periodontium in rats with adrenal stress* *Visnyk stomatologiy.* 2016;96(3):26-8.
6. Kononova OV, Borisenko AV, Levitskiy AP. *The influence of oral gels of quertulin and adrenergic blockers upon the state of periodontium in rats with adrenalin stress.* *Visnyk stomatologiy.* 2016;97(4):8-11.
7. Kosenko KM. *Epidemiolohiya osnovnykh stomatolohichnykh zakhvoryuvan' u naselennya Ukrainy i shlyakhyy yikh profilaktyky.* [avtoref dys]. K: 1994. 45 p.
8. Ostapko OI. *Naukove obgruntuvannya shlyakhiv ta metodiv profilaktyky osnovnykh stomatolohichnykh zakhvoryuvan' u ditey v rehionakh z riznym rivnem zabrudnennya dovkillya.* [avtoref dys]. Kyiv: 2011. 38 p.
9. Pavlenko OV, Antonenko MYU, Sidel'nykov PV. *Planuvannya likuval'no-profilaktychnoyi dopomohy khvorym na heneralizovanyy parodontyt na osnovi otsinky ryzyku urazhennya parodontu.* *Sovremennaya stomatolohyya.* 2009;1:56-61.
10. Tarasenko LM. *Patohenez povrezhdenyya parodonta pry stresse avtoref [dys. na zdobuttya nauk. stupenya doktora med. nauk]* M: 1986. 32 p
11. Tarasenko LM, Petrushanko TA. *Stress y parodont.* Poltava: 1999. 192 p.
12. Tits NU. *Entsiklopediya klinicheskikh laboratornykh testov.* M: Labinfarm; 1997. 459-460.
13. Tkachenko AH. *Osoblyvosti klinichnoho perebihu, likuvannya ta profilaktyky heneralizovanoho parodontytu u osib molodoho viku 18–25 rokiv [avtoref dys].* Kyiv: 2006; 20 p.
14. Trukhacheva NV. *Matematicheskaya statistika v mediko-biologicheskikh issledovaniyakh s primeneniyem paketa Statistica.* M: GEOTAR-Media; 2012. 379 p.
15. Levitskiy AP, Makarenko OA, Selivanskaya IA. *Fermentativnyy metod opredeleniya disbioza polosti rta dlya skrininga pro- i prebiotikov: metod. Rekomendatsii.* K: GFTS; 2007. 22 p
16. Chyzhevs'kyy IV. *Klinichne ta hihiyenichne obhruntuvannya profilaktyky kariyesu zubiv u ditey u promyslovo rozvynutomu rehioni.* [avtoref dys]. Kyiv: 2010. 38 p.
17. Akhter R, Hannan M, Okhuba R, Morita M. *Relationship between stress factor and periodontal disease in a rural area population in Japan.* *Eur J Med Res.* 2005;10(8):352-7.
18. Deinzer R, Granrath N, Spahl M, Linz S, Waschul B, Herforth A. *Stress, oral health behavior and clinical outcome.* *Br J Health Psychol.* 2005;10(2):269-83.
19. Omigbodun OO, Odukogbe AT, Omigbodun AO, Yusuf OB, Bella TT, Olayemi O. *Stressors and physiological symptoms in students of medicine and allied health professions in Nigeria.* *Soc Psychiatry Psychiatr Epidemiol.* 2006;41(5):415-21.
20. Pistorius A, Krahwinkel T, Willerhausen B, Bockstegen C. *Relationship between stress factors and periodontal disease.* *Eur J Med Res.* 2002;7(9):393-8.
21. Smith CK, Peterson DF, Degenhardt BF, Johnson JC. *Depression, anxiety, and perceived hassels among entering medical students.* *Psychol Health Med.* 2007;12(1):31-9.