

Identification of Hormonal Status in Rats' Blood with Diseases of Soft Tissues of Parodontium

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Abstract.

Identification of hormonal status of rats' blood with periodontal diseases was presented in this paper. The necessity of identification of parathyroid hormone level and calcitonin in this group of rats was determined. The highest level of parathyroid hormone was detected in rats with gingivitis that can indicate defects in bony tissue of parodontium, activation of osteoclasts and resorption. The smallest level of parathyroid hormone was observed in rats with dental alveolitis. It also indicates defects of metabolism in connective tissue and it is important to indicate adaptive mechanisms tension and loss of adaptation reservoir. Analogical correlation was detected during investigation of calcitonin level during dental alveolitis, periodontitis and gingivitis.

Identification of parathyroid hormone level and calcitonin in rats' blood indicates the significance of hormonal factor in pathogenetic mechanisms of the development of metabolic imbalance.

Regulation of parathyroid hormone in blood of rats will indicate normalization of metabolism of connective tissue during periodontal diseases.

One of the main symptoms of osteoporosis development in soft tissues of parodontium is morphological changes of relative area of trabecula and enlargement of intratrabecular space.

Keywords: parathyroid hormone, calcitonin, periodontitis, gingivitis, dental alveolitis.

Major part of diseases is accompanied by significant disorders of hormonal status. Data of literature indicates metabolic imbalance of glucocorticoids, parathyroid hormone, calcitonin, sex hormones and others [1, 2, 4, 6]. These hormones are modulators of metabolism of connective tissue and play key role in the development of sclerotic changes. The role of hormones in the pathogenesis of diseases of soft tissues of parodontium has not studied yet.

The aim of the paper was to determine the content of parathyroid hormone and calcitonin in rats' blood with periodontal disease.

Materials and methods. Experiments were done on 80 nonlinear rats with body weight 200,0 – 220,0 g. Animals were divided into four groups: the first group contained intact rats (control group), the second group contained animals with experimental periodontitis, the third one included animals with experimental gingivitis and the fourth one contained animals with experimental alveolitis. The content of parathyroid hormone was determined by «Parathyroid hormone radioimmunoassay» set (France). Parathyroid hormone concentration in examined probes was detected based on indices by calibration curve. Calcitonin was defined by «Calcitonin ELISA» set (DRG, USA). The set was designed for quantitative definition of concentration of calcitonin in blood serum by solidphase enzyme multiplied immunoassay. Spectrum of examined concentrations was from 0 to 1000 pg/ml. Set sensitivity was 1 pg /ml.

Experimental periodontitis in rats was caused by diet with high level of carbohydrates [7]. Experimental gingivitis was modeled in two stages: firstly dysbacteriosis was caused in oral cavity (intra-gastric administration of lincomycin in the dosage of 60 mg/kg during 5 days) with consequent local damage of gums and tissues of vestibule of the mouth by applications of bee venom suspension (1 mg/kg in the dosage of 2 ml) [5]. Experimental dental alveolitis was caused by V.A. Havrylov [3] after previous microbic sensibilization by bacteria which were detected in sockets of extracted teeth.

Statistic difference of results was done depending on character of division in such way: if divisions were near to normal one analysis was done by using methods of variation statistics, programmes package «Statistica 8.0» - and statistic method two-way ANOVA (Fisher LCD post-hoc test); if they were different from normal one. Differences were determined by groups by «Kruskal-Wallis ANOVA and median test». Correlation analysis was done by «Statistica 8.0» using parametric and nonparametric methods depending on character of division. The same package was used during factor analysis. During the first stage the most possible number of factors was detected, during the next ones torsion was done by algorithm «Varimax normalized».

All experiments were done according to European convention about vertebral animals that are used for experimental and other scientific aims (Strasbourg, 18.03.1986).

Results. Further peculiarities were detected during the investigation of levels of parathyroid hormone and calcitonin in rats' blood (table 1).

It was detected increase of parathyroid hormone level in rats with gingivitis in comparison with control group in 1,8. The level of parathyroid hormone in rats with periodontal disease was also increased in 1,4, but in rats with dental alveolitis the level of this hormone decreased in 1,75 in comparison with control group. Comparing levels of parathyroid hormone in animals of experimental groups accurate differences were detected between rats with alveolitis and gingivitis. This level was higher in rats with periodontal disease ($p < 0,05$). Based on level of parathyroid hormone, experimental groups can be divided into such groups: the least concentration of parathyroid hormone one noticed in rats with alveolitis, higher level was detected in rats with periodontitis, the highest one was determined in gingivitis. The level of calcitonin had other indices (different ones).

Table 1

The level of parathyroid hormone and calcitonin in rats' blood during modeling of periodontal diseases ($X \pm S_x$)

Group of animals	Parathyroid hormone	Calcitonin
Intact control	7,85±1,03	8,81±0,85
Rats with alveolitis	4,48±0,68 ^{**/**}	10,80±1,44
Rats with periodontitis	11,30±3,12	9,18±0,51
Rats with gingivitis	14,20±7,51 [*]	8,38±1,03

Note: * - differences are accurate in comparison with control ($p < 0,05$); ** - differences are accurate in comparison with rats with gingivitis ($p < 0,05$). $n=20$ animals in each type of experiments

The highest level of parathyroid hormone was detected in rats with gingivitis that can indicate defects in bony tissue of parodontium, activation of osteoclasts and resorption. The smallest level of parathyroid hormone was observed in rats with dental alveolitis. It also indicates defects of metabolism in connective tissue and it is important to indicate adaptive mechanisms tension and loss of adaptation reservoir. The increased level of calcitonin in this group indicates special character of defects of sockets of the tooth after extraction. The smallest level of calcitonin in rats with gingivitis can be index of mechanisms which are different from groups with higher level of hormone.

It should be determined the increased level of parathyroid hormone in used experimental models and about development of pathogenetic mechanisms of metabolic imbalance of connective tissue of parodontium. Analogical correlation was detected during investigation of calcitonin level during dental alveolitis, periodontitis, and gingivitis.

So, received sequence of experimental models defines the significance of hormonal factor in pathogenetic mechanisms of the development of metabolic imbalance of connective tissue of parodontium. So, parathyroid hormone is one of the modulators of metabolism of connective tissue, changes of its content in blood can characterize one of mechanisms of metabolism regulation of connective tissue and one of the development of mechanisms of periodontal disease.

For objective assessment of bony tissue in rats with periodontal disease one measured the density of bony tissue during the pathology. It has been indicated in comparison with control group with average index $1,62 \text{ g/sm}^3$ this parameter in rats with dental alveolitis decreased to $1,41 \text{ g/sm}^3$ ($p < 0,05$). In rats with periodontal disease it was decrease of bony tissue ($1,43 \pm 0,04 \text{ g/sm}^3$) in comparison with group of intact control ($p < 0,05$), that confirms the defect of remodeling of bony tissue and development of osteoporosis in this group. Correlation of mass of bony tissue to diameter of sample which was taken for examination in rats with alveolitis was smaller, than in control ($p < 0,05$). In rats with gingivitis the index of this parameter didn't differ from indices of rats of control group ($p < 0,05$). It was done morphological verification of studied tissues, which detected destructive changes in connective tissue of experimental animals among which decrease of relative area of trabecula and enlargement of intratrabecular space is key symptom of the development of osteoporotic changes.

Conclusions:

1. Identification of parathyroid hormone level and calcitonin in rats' blood with periodontal disease indicates hormonal factor in pathogenetic mechanisms of the development of metabolic imbalance of connective tissue of parodontium.

2. Regulation of parathyroid hormone in rats' blood will indicate normalization of metabolism of connective tissue with periodontal disease.

3. One of the main symptoms of osteoporosis development in soft tissues of parodontium is morphological changes of relative area of trabecula and enlargement of intratrabecular space.

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