The effect of prenatal action of dexamethasone on morphological changes of the thyroid gland stromal compartment in juvenile rats

Fedosieieva O. V., Bushman V. S.
Zaporizhzhia State Medical University, Zaporizhzhia, Ukraine

The thyroid gland is important for the normal functioning of the body, and is the largest endocrine organ, which among the endocrine glands will be the first in the process of embryogenesis. In recent decades, the prevalence of thyroid pathologies of various origins among the world's population has reached critical proportions. The use of glucocorticoids during pregnancy remains a debatable issue in obstetrics today, as they can both positively and negatively affect the processes of organ morphogenesis and be the cause of pathological conditions in the postnatal period. It is known that the entry of cortisol from mother to fetus through the placenta is controlled by enzymes produced by the latter. However, synthetic glucocorticoids, such as dexamethasone, can freely cross the blood-placental barrier and cause changes in postnatal immunity and disease in the future. The thyroid gland, having a relatively "simple" basic structure depending on the level of activity and the period of ontogenesis, exhibits various forms of morphological organization. Ideas about the structure and function of the thyroid gland were formed in the course of centuries of its study. Modern experimental and technical capabilities of the study of the body provided information about the structural and functional features of the thyroid gland and the numerical relationships of its structures at different levels of the organization. The aim of the study was to establish the features of the morphogenesis of the rats' thyroid gland from 60 to 120 days of life after prenatal exposure to dexamethasone. Statistical analysis of the results was performed using a personal computer based on the Windows XP operating system using the statistical package "Statistica for Windows 6.0" (StatSoft Inc., Serial number № AXXR712D833214FAN5), Excel (Microsoft Office, USA). Methods of variation statistics were used. All research results were recorded in journals and protocols of primary documentation, as well as with the use of electronic media. Significance of differences between groups was assessed using Student-Fisher t-test for a confidence level of at least 95 % (p <0.05). During the study it was found that in the juvenile period the morphological structure of the rats' thyroid gland of intact and control groups is finally formed, in the parts of which the peripheral and central parts with rather high sclerosing index (6.20 and 6.46, respectively) can be microscopically distinguished due to prevalence. the percentage of parenchymal component (60.82±1.13 % and 61.44±0.71 %) above the stroma (9.86±1.02 % and 9.53±0.94 %). The study of material obtained from animals prenatally exposed to dexamethasone showed a violation of the morphogenesis of histoarchitectonics of the thyroid gland with the formation of a lobular structure of its particles due to an increase in stromal component (23.63±0.88 %), which was expressed in a decrease in sclerosis index (2.364), but there was a compensatory increase in the percentage of follicular epithelium on the 120th day of life (55.87±0.79 %) compared with the 90th day (49.24±1.25 %), without morphological signs of functional disorders.

Key words: thyroid gland, dexamethasone, morphogenesis, experiment, stromal component, rat.
The effect of prenatal action of dexamethasone on morphological changes of the thyroid gland stromal ...
control. But despite almost the same indicators of parenchymal elements in all study groups, the index of sclerosis in the thyroid gland of the experimental group was 1.4 times lower than in animals of the control group, indicating an increase in the content of the stromal component of the organ.

On the 90th day of life there was a moderate swelling of the interparticle stroma, there was dilation of blood vessels. The content of collagen fibers, as well as mast cells, fibroblasts and fibrocytes in the thyroid gland of animals of the experimental group (Fig. 2a) increased in comparison with similar indicators in the control and intact groups. The follicles were mostly medium and large. It should be noted the high level of colloid accumulation in the lumens of the follicles, as well as its sparseness and low color intensity in the experimental group of animals (Fig. 2b).

In an experimental study, it was found that at 120th days of animal life, the structural organization of the thyroid gland of animals of the intact and control groups was identical, but significantly different from that of animals that received prenatal dexamethasone. In animals of intact and control groups, the morphological organization of thyroid structures was a parenchymal type of structure and it was possible to distinguish the central and peripheral parts of the particles, although clear boundaries between them were not visualized, and the criterion was the size of follicles on the periphery are larger in size (Fig. 3a). The relative indicators of stroma content and sclerosing index did not differ statistically significantly relative to the previous study period in the above groups (see Tab. 1). In the experimental group of animals that were prenatally exposed to dexamethasone, the lobes of the thyroid gland had a lobular type of structure (Fig. 3b). Despite this morphological picture and the increase in the percentage of stroma compared to the previous period by 4.07% and compared to the control by 14.09%. The sclerosing index decreased slightly (1.064

<table>
<thead>
<tr>
<th>Animals age</th>
<th>Animals group</th>
<th>The relative content of the thyroid structural components, %</th>
<th>Sclerosis index</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Follicular epithelium</td>
<td>Colloid</td>
</tr>
<tr>
<td>60 days</td>
<td>I</td>
<td>65.93±1.34</td>
<td>23.81±0.93</td>
</tr>
<tr>
<td></td>
<td>II</td>
<td>66.31±0.92</td>
<td>23.25±0.44</td>
</tr>
<tr>
<td></td>
<td>III</td>
<td>61.75±0.84*</td>
<td>24.42±0.61</td>
</tr>
<tr>
<td>90 days</td>
<td>I</td>
<td>66.24±0.82</td>
<td>22.33±0.74</td>
</tr>
<tr>
<td></td>
<td>II</td>
<td>66.45±1.16</td>
<td>21.61±0.33</td>
</tr>
<tr>
<td></td>
<td>III</td>
<td>49.24±1.25*</td>
<td>30.16±0.58*</td>
</tr>
<tr>
<td>120 days</td>
<td>I</td>
<td>60.82±1.13*</td>
<td>27.91±0.92*</td>
</tr>
<tr>
<td></td>
<td>II</td>
<td>61.44±0.71*</td>
<td>28.46±0.47**</td>
</tr>
<tr>
<td></td>
<td>III</td>
<td>55.87±0.79*</td>
<td>20.3±1.23*</td>
</tr>
</tbody>
</table>

Note: * - significant difference from control, p<0.05; ** - significant difference in comparison with the previous term p<0.05. I - intact group of animals, II - animals of the control group, III - animals of the experimental group prenatally exposed to dexamethasone.

Fig. 1. Rats thyroid gland of the 60th day of life of control (a) and experimental (b) groups. Staining by the Van Gieson method. Magnification x200.

Table 1. The relative content of the structural elements of the rat’s thyroid gland in the juvenile period of life.
times) compared to the previous period due to an increase in the percentage of follicular epithelium relative to the previous period, but compared to the control group, this figure was almost 3 times lower (see Tab. 1).

**Discussion**

According to the study, dexamethasone, which enters the blood-placental barrier, affects the formation of connective tissue in the thyroid gland and the formation of its morphological type in the postnatal period. There are conflicting data in the literature on the effect of glucocorticoids on connective tissue and collagen formation [1, 9, 12]. Thus, most studies aimed at studying the effect of glucocorticoids on connective tissue in the postnatal period indicate their inhibitory effect on connective tissue proliferative processes [10, 11]. However, a group of scientists studying the effects of glucocorticoids in the mother-fetus system found an increase in the distribution density of fibroblasts in the dermis of newborn rats and an increase in the number of fibroblast mitoses, and later similar data were obtained in the liver [19-21]. Studies have shown that glucocorticoids can stimulate the synthesis of collagen and non-collagen proteins in the cultivation of vascular smooth muscle cells [5, 14]. Scientists in a study of histopathological changes in the heart after neonatal treatment with dexamethasone found an increase in collagen in the heart of rats for 50 days after birth [7]. Thus, the data obtained are a continuation of the study of the prenatal effect of dexamethasone on the morphogenesis of organs and connective tissue in the thyroid gland, which has a similar trend in the study of a number of parenchymal organs.

**Conclusions**

1. During the study it was found that in the juvenile period the morphological structure of the rats' thyroid gland of intact and control groups is finally formed, in the lobes of which the peripheral and central parts with rather high sclerosing index due to the predominance of the percentage of...
parenchymal component can be microscopically distinguished.

2. A study of material obtained from animals prenatally exposed to dexamethasone showed a violation of the morphogenesis of histarchitectonics of the thyroid gland with the formation of the lobular structure of its particles due to an increase in stromal component, which was expressed in a decrease in sclerosing index, but compensatory increase without morphological signs of functional disorders.

References


[23] Fedosieieva O. V., Bushman V. S.