Central Asian Journal of Medicine

MORPHOLOGICAL AND HISTOMORPHOMETRIC CHARACTERISTICS OF THE THYROID GLAND OF WHITE OUTBREED RATS

Muattar Sh. Karimova [1], Shukhrat J. Teshaev [2]

1 Free applicant of of Bukhara State Medical Institute, Bukhara, Uzbekistan
E-mail: 1990oncologist@gmail.ru

2 Doctor of Medical Sciences, Professor, Rector of Bukhara State Medical Institute, Bukhara, Uzbekistan
E-mail: 1970morphologist@gmail.ru

ABSTRACT

Thyroid pathology is the second most common endocrinopathy after diabetes mellitus. The number of patients with temporary and permanent disabilities due to thyroid pathology is growing. Early diagnosis of morphological changes in pathologies of the thyroid gland and increasing the effectiveness of treatment are undoubtedly carried out with knowledge of the normal parameters of the thyroid gland. This article examines the morphological and histomorphometric characteristics of the thyroid gland of purebred rats.

Key words: morphology, thyroid gland, purebred rats, histomorphometry.

INTRODUCTION

Due to the growth of endocrine pathology throughout the world, much attention is paid to the morphology of the thyroid gland. Pathology of the thyroid gland is second only to diabetes mellitus [5, 9]. Pathology of the thyroid gland is a sign of poor ecology. The most important morphophysiological structure of the thyroid gland is the tissue microregion, which unites a group of follicles and the interfollicular space with the autonomous blood and lymph circulation system. When the thyroid gland is exposed to pathogenic factors, the structures of the tissue microregion are most damaged, reducing its role in ensuring morphological and metabolic changes in tissues and organs [1-]. The parenchyma of the thyroid gland itself consists of a system of thyrocytes, among which there are two main

types - follicular and interfollicular cells. The first forms follicles that have the ability to accumulate hormonally active substances outside the cell. The latter is involved in the proliferation of the thyroid parenchyma, forming interfollicular islands between the follicles. The morphogenetic potential of stromal-parenchymal relationships is determined by the ratio of follicular epithelial tissue, colloidal and interstitial. Currently, there is increasing interest in the study of structural changes and mechanisms of damage to the endocrine system under the influence of various pathological factors - physical, chemical, medicinal factors [Anvarova Sh.S., Niyazova N.F., Zhoraeva S.D., Inoyatova O.N., 2017]. It is difficult to overestimate the importance of the thyroid gland for the human body [Starkova I., 2012]. In addition to thyrocytes, the main cell population that makes up the follicular section of the gland, it includes the second largest group of cells - calcitoninocytes (parafollicular or C-cells) [6, 7, 8]. They are of neurogenic origin and belong to the APUD system, which is a population of cells distributed in various organs and producing various biologically active substances, which is considered as a diffuse neuroendocrine system [Smirnova T.S., 2009; Sazonov V.F., 2014]. Parafollicular cells are located in small groups in the interstitium of the thyroid gland and/or lie in the basement membrane between thyrocytes (intraepithelial), but never limit the cavity of the follicle. Their maximum number is concentrated in the central sections of each section of the thyroid gland, which are called the “C-cell region”. Parafollicular cells make up no more than 1% of the thyroid epithelium. They are 2-3 times larger than thyrocytes, have a polygonal or slightly elongated shape, have larger and lighter nuclei, 1-2 dense nuclei and the cytoplasm contains small agyrophilic granules [Volkov V.P., 2014].

Materials and methods of research.

For experimental studies, 4-month-old white male rats weighing 164-172 g were selected. All laboratory animals were obtained from the same vivarium and were carried out on non-white rats under the age of 4 months. Adult (4-month-old) white rats were kept in standard vivarium conditions with relative humidity (50-60%), temperature (19-22°C) and light regime (12 hours dark and 12 hours light). During the storage, destruction and anatomical dissection of laboratory animals, all biological safety rules and ethical principles of working with laboratory animals were strictly observed. Permission was obtained from the Ethics Committee of the Ministry of Health of the Republic of Uzbekistan to conduct experiments on laboratory animals (white rats). To study the morphological parameters of the organs of laboratory animals, research methods widely used in experimental studies (anatomical dissection) were used. All histological preparations were viewed using a trinocular microscope HL-19 (China) with software. The main

objects of the study were histological paraffin blocks prepared from thyroid tissue of purebred rats and tissues cut on a microtome. The preparation of histological preparations consisted of 4 stages and was carried out using traditional methods. To prepare the preparations, a mechanical rotational microtome YD-315 (China) was used; prepared sections were stained with hematoxylin and eosin and viewed under a trinocular microscope.

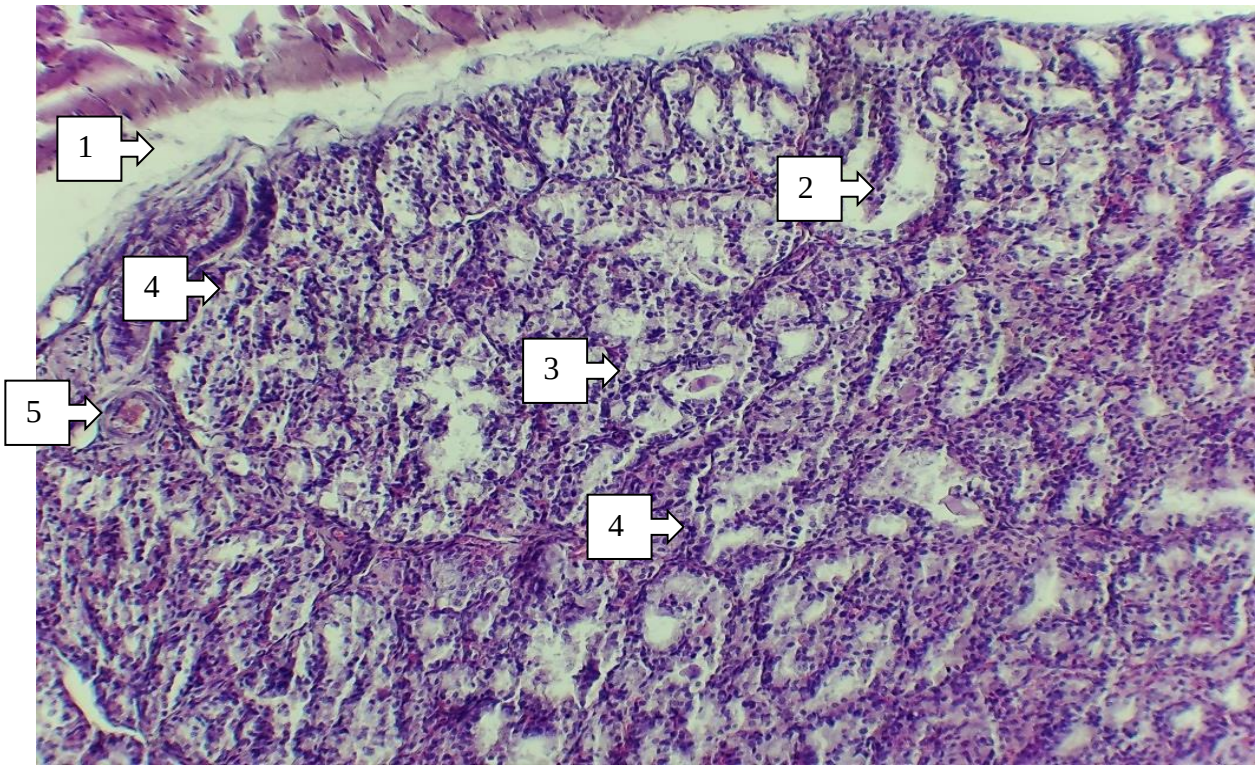
In laboratory conditions, thyroid tissue was isolated from purebred rats, the organ was fixed in a 10% neutralized formalin solution, frozen for 72 hours, then washed in running water for 2 hours, passed through alcohol of increasing concentration for dehydration, and paraffin was poured into the g. The works were prepared. Sections with a thickness of 5-8 microns were prepared from them and the general histological structure was studied by staining with hematoxylin-eosin dye. The sections were examined under a Leica light microscope and photographs of the required areas were taken. Micropreparations were photographed under a microscope with dimensions 4x10, 10x10, 40x10, 100x10.

Before cutting and shaping the paraffin blocks, the paraffin was cut into squares (dewaxing). To do this, paraffin sections were successively transferred into O-xylene, and then into alcohols of decreasing degrees of purity (from 100° to 70°), and then washed with distilled water. Sections prepared in this way were stained with hematoxylin and eosin. The prepared blocks were stained, the structure of the thyroid gland was clearly observed under an HL-19 trinocular microscope with software designed for observing biological microobjects, and the altered areas of tissue structures were photographed. For staining, we used traditional dyes used to prepare a large number of histological preparations. To do this, the pieces were successively passed through a mixture of 1/3 O-xylene, descending alcohols (from 100° to 70°), and then placed in distilled water. Sections prepared in this way were stained with hematoxylin and eosino. To do this, the sections were placed in a hematoxylin solution for 3-5 minutes, then in distilled water for washing and differentiation. After the nuclei acquired a purple color (controlled under a microscope), they were counterstained in an eosin solution for 1.5 minutes, washed with distilled water and dehydrated in high concentration alcohols (70-100°). In addition, they were placed sequentially in 2/3 O-xylene and poured into Canada balsam to stop the effect of alcohol solutions and lighten the blocks.

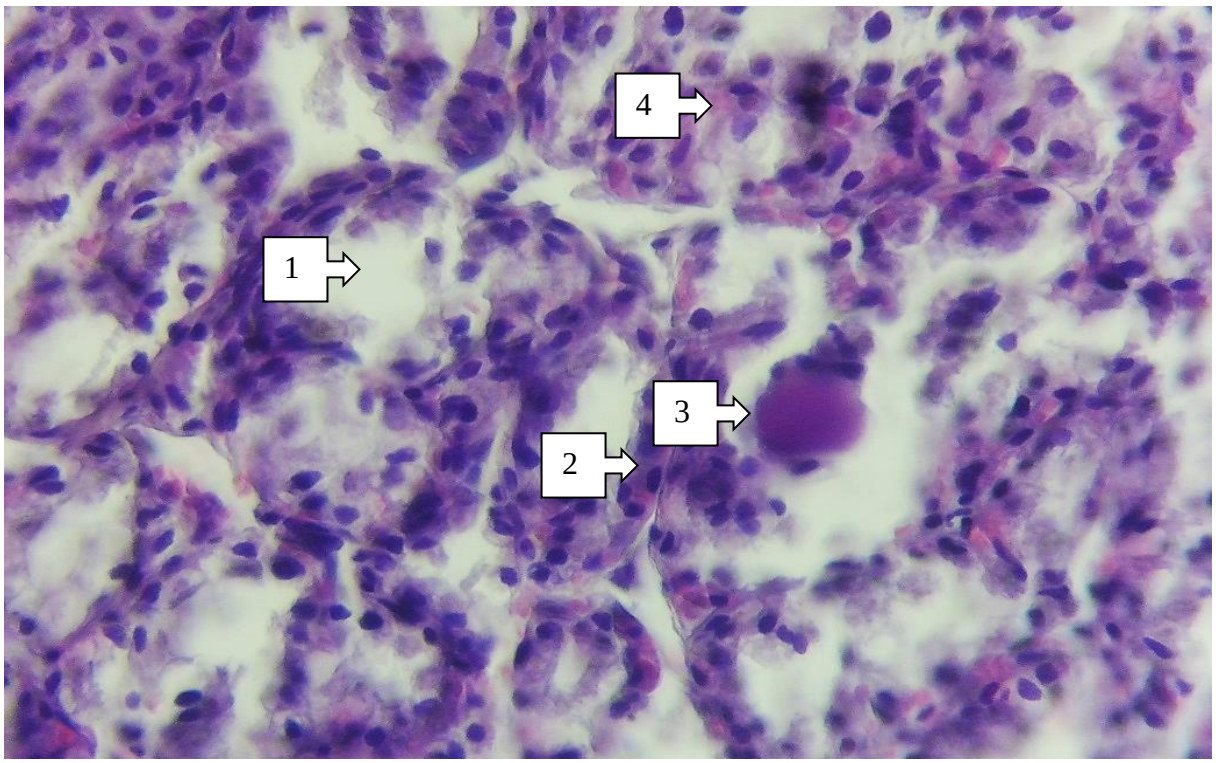
Research results

When studying the histomorphometric parameters of the thyroid gland of outbred rats, attention was paid to the following indicators: the diameter of the capillaries located in the thyroid gland, the numerical density of the capillaries, the area of the total capillaries on the section, the height of the thyroid epithelium, the

diameter of the follicles, the surface of the follicles. The percentage of thyroid epithelium, colloid and stroma in the follicle was taken into account (Fig. 1, 2).



(Figure 1) Microscopic picture of the thyroid gland of an outbred rat. Size 10 x 20. 1. Capsule of the thyroid gland. 5 Artery



(Figure 2) Microscopic picture of the thyroid gland of an outbred rat, magnification 20x40 1. Follicle 2. Thyrocyte cells of the follicle wall. 3. Colloidal 4. C cells.

When studying the architecture of the gland, the capillary network surrounds the follicles in the form of a dense network and is tightly connected with thyrocytes. The thyroid gland was conventionally divided into central and peripheral parts. In the central part of the thyroid gland, the diameter of the capillaries is 10.78±0.14 μm, the surface number of vessels is 127.53±3.41, and their cross-sectional area is 11.78·0.11x103 μm2. When considering the ratio of the surface of the epithelium, connective tissue and vessels inside the colloid follicle, it was found that the thyroid epithelium was relatively higher and the ratio of these vessels was 9.3±0.3%. The diameter of the capillaries in the peripheral region of the thyroid gland is wider than in the central part. The vascular cross-sectional density is comparatively less in the peripheral part, and the blood supply to the surface of the thyroid epithelium of the microvasculature is less than in the central part. It has been established that the follicles located in the central part have an oval and round shape, and the diameter of the follicles is larger in the peripheral part. The height of thyrocyte cells in the follicles in the central part is prismatic, and the height of thyrocyte cells in the peripheral part is lower than in the central part, and the shape is cubic. The colloid evenly fills the follicles, the particles are barely noticeable when stained using the Van Gieson method. In short, comparing the central and peripheral parts of the thyroid gland in the control group, it was found that there are more epithelial cells in the central part, and the amount of colloidal substance is greater in the peripheral part.

Conclusions

The following results were obtained when studying the parameters of the thyroid gland of healthy outbred rats. The diameter of the capillary in the central part was 10.78±0.14 μm. The density of the capillary row is 127.53±3.41 μm in the central part and 107.42±3.87 μm in the peripheral part. The total cross-sectional area of the capillaries x 103 μm2 corresponds to 11.78±0.11 μm in the central part and 9.96±0.13 μm in the peripheral part. The relative surface of the vascular bed is 9.3±0.3 μm in the central part, 8.6±0.4 μm in the peripheral part, the height of the thyroid epithelium is 6.68±0.24 μm, in the peripheral part 5.5±0.13 μm. The diameter of the follicle is 37.98±0.26 μm in the central part, 43.27±0.14 μm in the peripheral part, the surface of the follicle is 1178.52±18.28 μm2, 1548.23±16.32 μm2 in the peripheral part. When considering the mutual ratio of the components of the follicle, the thyroid epithelium is 40.2±0.32 μm in the central part and 37.5±0.42 μm in the peripheral part. The colloid in the central part is 32.1±0.2 μm, in the peripheral part - 42.1-0.3 μm, stroma in the central part - 17.5±0.5 μm, in the peripheral part - 12.8±0.4 μm.

REFERENCES

1. Barysheva E.S. The role of microelements in the functional and structural homeostasis of the thyroid gland (clinical and experimental study) // International publication. Journal of Endocrinology. - 2010. - no. 7. - pp. 15-25.

2. Bilyanova G.Yu., Chekurov I.V., Vishnevskaya T.Ya. Morphofunctional profile of the thyroid gland of male Wistar rats within the framework of the experimental model “Hypothyroidism - stress” // News of the Orenburg State Agrarian University. - 2016. - No. 2 (58). - pp. 177-180.

3. Bobrov I.P. et al. The role of mast cells in the processes of adaptation of the lungs to single and multiple deep immersion hypothermia // Bulletin of medical science. - 2020. - no. 2 (18). - Pages 10-17.

4. Bondarev O.I., Razumov V.V., Bugaeva M.S. Differential diagnosis of focal osteoplastic formations in the lungs of miners. // Therapeutic archive. 2016; 88(3):108-110.

5. Boronikhina T.V. Physiological and reparative regeneration of the thyroid gland: problems and achievements / T.V. Boronikhina, A.N. Yatskovsky // Modern achievements of science and education - 2017. - T. 6., No. 2. - P. 101–106.

6. Bugaeva M.S. et al. Pathogenesis of morphological changes in pneumoconiosis among workers in the coal and mining industries // Occupational Medicine and Industrial Ecology. - 2018. - no. 6. - pp. 43-48.

7. Nuraliev N.A., Bektimirov A.M-T., Alimova M.T., Suvonov K.J. Rules and methods of working with laboratory animals during experimental microbiological and immunological studies // methodological manual - Tashkent, 2016. - 34 pages

8. Samusev R.P. Atlas of histology and histopathology // Textbook - Moscow, 2021. - 256 s.

9. Kononov A.V., Mozgovoy S.I., Shimanskaya A.G. Intravital pathological and anatomical diagnosis of diseases of the digestive system // Guide for doctors. – Moscow, 2019. – 70-73 pp.