AZERBAIJAN REPUBLIC

On the rights of the manuscript

ABSTRACT

of the dissertation for the degree of Doctor of Science

MACROMICROSCOPIC ANATOMY, REGULARITIES OF MORPHOGENESIS OF SMALL GLANDS AND LYMPHOID FORMATIONS OF THE VAGINAL VESTIBULE IN HUMAN'S POSTNATAL ONTOGENESIS AND IN EXPERIMENT

Specialty: 3241. 01 «Human Anatomy»

Field of science: «Medical sciences»

Applicant: **Sabina Vaqif gizi Shadlinskaya**

Baku – 2021

The work was performed at Azerbaijan Medical University Department of Human Anatomy and Medical Terminology at the Scientific Research Center

Scientific consultant: Doctor of Medical Sciences, professor
Balakishi Mamadali oglu Huseynov

Official opponents: Corresponding member of ANAS, foreign member of RAS, Doctor of Biological Sciences, Professor
Arif Mammad oglu Mammadov
Doctor of Medical Sciences, Professor
Vasilya Sharifyanovna Vagapova
Doctor of Medical Sciences, Professor
Mubariz Gasim oglu Allahverdiyev
Doctor of Medical Sciences, Professor
Leyla Musa gizi Rzaguliyeva

One - time dissertation council BED 2.08 of Supreme Attestation Commission under the President of the Republic of Azerbaijan operating at Azerbaijan Medical University

Chairman of the one-time dissertation council:
Doctor of Medical Sciences, professor
Eldar Kocheri Gasimov

Scientific secretary of the one-time dissertation council:
Doctor of Medical Sciences, professor
Agasamid Babasamid Isaev

Chairman of the scientific seminar:
Doctor of Medical Sciences, professor
Nariman Tofiq Movsumov

İMZANI TƏSDİQ EDİRƏM
Azərbaycan Tibb Universitetinin
ELMİ KATİBİ
Tibb elmləri doktoru, professor
Nazim Adil oğlu Pənahov
08. 07. 2021

GENERAL REVIEW OF THE WORK

The relevance of the topic. Currently, malignant lesions of the vagina are the most important medical and social problem; they are characterized by frequent rapid growth and metastasis, lead to the deterioration in the quality of life and often lead to death.[1]

The glands of the vaginal vestibule are affected by fibro-adenomatous pathology, are exposed to abscesses, diverticulitis, polyps in the vagina are common.[2]

It should be noted that the glands of the digestive and respiratory organs are studied to a much better degree, compared with the glands of the walls of the organs of the genitourinary apparatus. Especially small glands of the vaginal vestibule are not studied. In the scientific literature, there is almost no data on the number and size of the small glands of the vaginal vestibule, on their relationships with the lymphoid tissue of this area.

There are completely no materials on the age-related transformations of these glands, their structural features in different phases of the ovarian-menstrual cycle.

There are no morphological data on the structural and dimensional parameters of the glands at abnormalities in the development of internal female genital organs.

The lymphoid apparatus of the vaginal vestibule of women, at the norm, and with the indicated developmental abnormalities, has also not been practically studied from the anatomical point of view. There is no data on the structural and dimensional features of lymphoid tissue in different parts of this organ.

Despite the large amount of morphological data accumulated in recent years on the mechanisms of influence of balneological

---

[1.] Di Gilio, A. Rapid growth of myxoid leiomyosarcoma of the vulva during pregnancy a case report / A.Di Gilio, G.Cormio, L.Resta, [et al.] // International Journal of Gynecological Cancer, – 2004, 14(1), – p.172-175

[2.] Heller, D. Pseudoangiomatous stromal hyperplasia of the vulva presenting as a polypoid vulvar lesion / D.Heller, S.Aisner, V.Fitzhugh [et al.] // Journal of Lower Genitaltract Disease, – 2013. Oct; 17 (4). – p.5-7.

factors,[3,4] the effect of naphthalan oil on the morphology of glandular and lymphoid structures of the vaginal vestibule has not been studied until recently.

Detailed knowledge of the mechanisms of morphology and physiology of glands, lymphoid formations under the influence of naphthalan baths can help develop adequate criteria for timely medical examination of patients in need of spa care.

The study aimed to obtain complex macromicroscopic data on the small glands and the lymphoid apparatus of the vaginal vestibule in the human's postnatal ontogenesis in the norm, with some anomalies of the internal genital organs and in the experiment.

Research objectives:

1. To study the topography, syntopy, and dimensionally-quantitative indicators of the small glands of the vaginal in the age aspect.

2. To study microanatomy and topography of lymphoid tissue of the vaginal vestibule and lymphoid-glandular relationships in postnatal ontogenesis.

3. To analyze the morphological features of the small glands of the vaginal vestibule and lymphoid tissue of this area in women of reproductive age in different phases of the ovarian-menstrual cycle.

4. Identify and quantify the complex of involutive changes and the timing of their detection in small glands and lymphoid tissue of the vaginal vestibule.

5. To reveal the structural features of the small glands of

[4.] Мовсумов, Н.Т. (Movsumov, N.T.) Морфогенез желез гортани человека в норме и в эксперименте при некоторых бальнеологических воздействиях: / автореферат дисс. доктора медицинских наук. / – Тбилиси,2004,– 35с.

[5.] Гусейнов Б.М. (Guseynov B.M.) Морфологические особенности желез и лимфоидных структур трахеи и главных бронхов у человека в постнатальном онтогенезе и в эксперименте у крыс при воздействии водных процедур с разным солевым составом: / автореферат дисс. доктора медицинских наук. / – Баку, 2011. – 40с.

the vaginal vestibule and its lymphoid apparatus with some anomalies in the development of internal genital organs.

6. To determine the structural changes in the small glands and lymphoid apparatus of the vaginal vestibule of rats after the course action of naphthalan baths.

Research methods. On total preparations of the vaginal vestibule, the glands of the vaginal vestibule were investigated according to the macromicroscopic method of R.D.Sinelnikov. The microanatomy of glands and lymphoid structures was studied on microscopic preparations. The prepared sections were stained with hematoxylin-eosin, hematoxylin-picrofuxin according to van Gieson. Also, the silvering reaction according to Grimelius was selectively performed. The histochemical methods of stains were performed to determine the nature of secretion after appropriate preparation. (according to Kreiberg, PAS-reaction). The digital data obtained during the study were subjected to statistical processing. The calculations were carried out in the programs of the statistical package MS EXCEL-2016 and SPSS-22.

The following provisions are presented for defense:

1. The vaginal vestibule throughout postnatal ontogenesis is characterized by the presence of pronounced glandular and lymphoid apparatus. Small glands of the vestibule are characterized by significant anatomical variability; in the reproductive period, their size-quantitative indicators change during the ovarian-menstrual cycle.

2. In the distribution of small glands of the vestibule and lymphoid formations of this region, a anteroposterior gradient is observed: regardless of age, size, the number of glands, the total number of cells in the lymphoid row, sizes of lymphoid nodules increase in the anteroposterior direction (towards the anus).

3. The periods of maximum development of the lymphoid and glandular apparatus of the vaginal vestibule were determined (lymphoid tissue in early childhood, glands in 22-35 years), which is expressed in the greatest variety of forms of glands,

their significant number, and size, in the total number of cells of the lymphoid series, etc. The complex of involutive changes in these anatomical formations had been specified (a decrease in the size and number of glands, an increase in their stroma, an expansion of the duct apparatus, a decrease in the proportion of lymphoid nodules with germinal centers, and the total number of cells of the lymphoid series).

4. It was shown that with abnormalities of the internal genital organs against the background of the anatomical preservation of the vaginal vestibule, its small glands, and lymphoid tissue are in a state of "morphological regression" (the size of the glands, the expression of their parenchyma, the number of cells of the lymphoid series are reduced, the processes of cell destruction processes in lymphoid tissue are activated, etc.).

5. It is proved that the course experimental effect of naphthalan baths activates the formation of small glands in the vaginal vestibule of rats. This is manifested by an increase in the thickness and area of the initial part of the glands, the number of initial parts in its composition, an increase in the content of the gland parenchyma, the diameter of the common excretory duct, an increase of the content of lymphoid tissue, thickness, length and area of lymphoid nodules, number of cells in the lymphoid row, in lymphocyte's percentage and, cells in a state of mitosis.

The scientific novelty. On a significant sectional material, the shapes, size, and quantity indicators (density, length, width, thickness, and area of the initial sections) of the glands of the vaginal vestibule in different sections of the walls of this organ were determined. From a quantitative point of view, the forms of individual variability of the small glands of the vestibule are estimated.

It was proved that the number and size of glands, regardless of age, increase in the walls of the vaginal vestibule in the anteroposterior direction (towards the anus), which is

combined with the unidirectional increase in the number of lymphoid tissue - in the number of lymphoid nodules and, in the total number of cells of the lymphoid row.

It was revealed that the glands are constantly presented immediately after birth, also their active secretory function at this age was revealed. It was established that the number and size of the glands of this area progressively increase by the 1st period of adulthood. A complex of involutive changes in the small glands of the vaginal vestibule was revealed, manifested by a gradual decrease in their total number and size, expansion of the excretory ducts, and replacement of the parenchymal component with the stroma. The beginning of these changes falls on the 2nd period of adulthood, after which they begin to gradually increase.

A morphological and morphometric assessment of the lymphoid apparatus of the vaginal vestibule was performed throughout postnatal ontogenesis. It was proven the presence of all morphogenetic forms of lymphoid tissue in the norm (diffuse lymphoid tissue, lymphoid nodules without and with a germinal center). The lymphoid formations of the vaginal vestibule acquire maximum development in early childhood. Then involutive transformations are gradually noted.

Materials are presented on the close microsyntopic interrelationship of glands and cells of the lymphoid row in the walls of the vaginal vestibule, especially expressed in early childhood, 1st and 2nd childhood, puberty, adolescence, and adulthood.

It is shown that the morphofunctional state of lymphoid tissue and small glands in women of reproductive age substantially changes during the ovarian-menstrual cycle. So, the greatest development of glands, lymphoid structures, and the severity of lymphoid-glandular relationships is observed in the secretory phase, the smallest - in the desquamation phase, and in the proliferation phase, they occupy an intermediate position.

It was proved that with abnormalities of the internal genital organs (in combination with the anatomical preservation

of the vaginal vestibule), small glands and lymphoid formations of this area are in a state of "morphological regression" (the size and number of glands and, the number of lymphoid nodules with germinal centers decrease, the cell processes of the destruction of lymphoid tissue increase, etc.).

It was found that a course experimental effect of naphthalan baths activates the formation of small glands of the vaginal vestibule of rats. This is manifested by an increase in the number and size of the glands. As a result of these effects, the content of lymphoid tissue increases in the walls of the vestibule (the proportion of lymphoid nodules with a germinal center, thickness, length and area of lymphoid nodules, the number of cells in the lymphoid row, the percentage of lymphocytes, cells in a state of mitosis).

The theoretical and practical significance of the study. The theoretical significance of the obtained data is determined by a significant expansion of knowledge about the glandular and lymphoid apparatus on the vaginal vestibule of women, which will allow revealing previously unknown questions regarding these most important anatomical formations that provide processes of local homeostasis and immunity in this area.

The practical significance of the study lies in the fact that the data obtained can be useful to pathophysiologists (to optimize the pathogenesis of numerous vaginal pathologies), gynecologists (to improve the quality of treatment of various nosological forms of this area).

Dimensional indicators of the structure of the glands and lymphoid tissue of the vaginal vestibule women of different ages in the norm will be the standards (normative) with which biopsy and sectional materials can be compared in cases of vaginal pathology.

The results can be used in further research, to allow developing and scientifically substantiating the prevention and treatment of various diseases that clinicians deal with in balneological practice.

The significance of the obtained scientific information can hardly be overestimated in terms of its use in the educational process - for teaching students in morphological disciplines, and residents in the specialty "obstetrics-gynecology".

The resulting materials can be reflected in monographs and summaries on issues related to diseases of the genital organs, as well as morphological exocrinology and immunomorphology.

The approbation of the dissertation materials. The main provisions of the dissertation were reported at the XII Republican Scientific Conference of Doctoral Students and Young Researchers (Baku, 2018), at the International Scientific Conference dedicated to the 100th anniversary of the Department of Human Anatomy and Medical Terminology of the Azerbaijan Medical University (Baku, 2019), at the XIII Republican Scientific Conference of Doctoral Students and Young Researchers (Baku, 2019), at the XV Congress of the International Association of Morphologists (Khanty-Mansiysk, 2020), at the International Scientific-Practical Congress dedicated to the 90th anniversary of the Azerbaijan Medical University (Baku, 2020), at the XXV National Congress of the Bulgarian Anatomical Society with international participation (Pleven, 2021), at the joint meeting of the staff of the Department of Human Anatomy and Medical Terminology and the Scientific Research Center of Azerbaijan Medical University (Baku, 2021), as discussed at the scientific seminar of the one-time dissertation council BED 2.08 of the Higher Attestation Commission the President of the Republic of Azerbaijan operating on the basic of the Azerbaijan Medical University of (Baku, 2021).

Putting the results into practice. The results of the study were put into practice at the departments of Human anatomy and the medical terminology, Histology, embryology and cytology, Physiotherapy and medical rehabilitation of the Azerbaijan Medical University.

The publications. According to the materials of the work

published 37 scientific works (25 journal articles, 11 conference materials, 1 thesis). Of these, 13 journal articles were published abroad «Journal of Morphology and Anatomy»-Brussels, (Belgium), «Archiv Euro Medica», Hannover (Germany), «Морфология» - St. Petersburg (Russian Federation), «Морфологические ведомости» - Samara (Russian Federation), «Журнал Анатомии и Гистопатологии» - Voronezh (Russian Federation), «Сеченовский вестник» - Moscow (Russian Federation), «Медицинский вестник Башкордостана» - Ufa, (Russian Federation), «East European Science Journal» - Warsaw (Poland), «International Journal of Medicine Research» - Delhi (India), «Астана медмциналыг журналы» - Astana (Kazakhstan), «Экспериментальная и клиническая медицина» - Tbilisi, (Georgia). Some of the articles are published in journals that are included in international citation and indexation systems (WOS, SCOPUS, РИНЦ).

Volume and structure of the dissertation. The dissertation is presented on 330 pages (329422 characters) of the computer set. It consists of the following sections: «Introduction» (volume: 16453 characters), «The main content of the dissertation» (volume: 254648 characters), «Conclusion» (volume: 54080 characters), «Inferences» (volume: 3116 characters), «Practical recommendations» (volume: 1125 characters), «List of used literature».

The section «The main content of the dissertation» consists of 3 chapters: Chapter I - «Literature review» (volume: 81589 characters), Chapter II - «Material and research methods» (volume: 14828 characters), Chapter III - « Research results» (volume: 15823 characters).

The list of used literature consists of 288 sources, including 2 in Azerbaijani, 178 in Russian, and 108 in other languages.

MATERIAL AND RESEARCH METHODS

The object of the study was the glands and lymphoid structures of the walls of the vaginal vestibule obtained from the corpses of 120 women of different ages, from the neonatal period to senile age (inclusive). According to age periods, the material was subdivided according to the generally accepted scheme of the age periodization of the generally accepted, proposed by and Arshavskiy I.A.[5] The distribution of actual material by age group is presented in the diagram.

On total preparations of the vaginal vestibule by macromicroscopy, small vestibular glands were examined in 74 cases. By histological and histochemical methods, glands and lymphoid formations of the vaginal vestibule were studied in 46 women (diagram).

The main number of observations was made up of people who were practically healthy during life, whose death occurred due to various injuries - 78 cases, asphyxia - 27 cases, acute poisoning - 15. The total sample did not include cases when, during the forensic (pathoanatomical) examination, concomitant (competing) cases of diseases of the immune system and urogenital system were revealed.

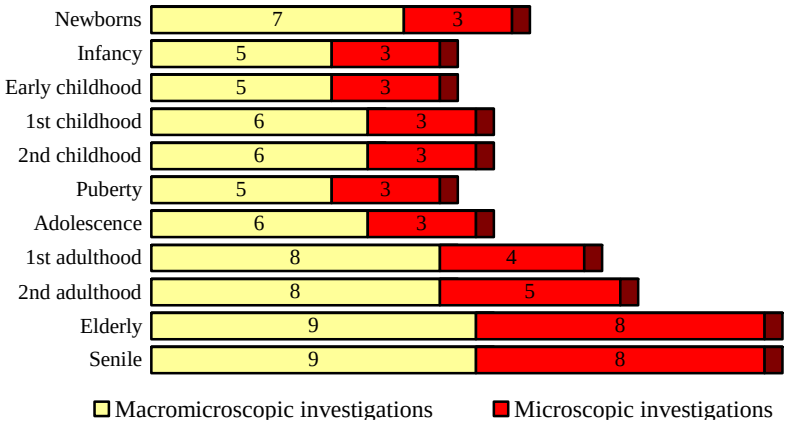
In women of reproductive age (23 cases) or the prefabricated group, glands, and lymphoid tissue of the vaginal vestibule were studied depending on the state of the ovarian-menstrual cycle (secretion phase - 8 cases, proliferation phase - 7 cases, desquamation phases - 8 cases). The phases of secretion and proliferation were differentiated by histological examination of the ovaries. Controversial cases in terms of detecting the phase of the cycle were not included in the sample.

Also, with a microscopic method, glands and lymphoid formations of the vaginal vestibule were additionally examined in newborn girls (combined group) with abnormalities of the internal

---

[5] Аршавский, И.А. (Arshavskiy, I.A.) Основы возрастной периодизации / И.А.Аршавский. – Ленинград: Наука, – 1975. – с.65-67

Diagram.
Distribution of material by age groups



genital organs, in the absence of visual disturbances in the structure of the vaginal vestibule. The following types of anomalies were included in this group: unilateral aplasia of the uterine tube - 5 cases, absence of the right ovary - 1 case, congenital torsion of the right ovary - 1 case, two-horned uterus -1 case.

The actual research material was collected in the morgues of the Association of Forensic Medicine and Pathological Anatomy of the Ministry of Health of the Republic of Azerbaijan and the Department of Human Anatomy and Medical Terminology of the Azerbaijan Medical University. The material was obtained in the autumn-winter period. The duration from the moment of death to the start of manufacture of the preparation did not exceed 6-10 hours.

In the experimental part of the work, the effect of naphthalan baths on the glandular and lymphoid structures of the walls of the vaginal vestibule was studied. This part of the work was performed on 90 sexually mature rats (females) of the Wistar line, aged 3-4 months, having a mass of 180-320 g at the beginning of the experiment. Rats were selected as a biomodel, given their

physiological adequacy, resistance to infection, ease of maintenance, low cost.[6] The conditions for all experiments were as close as possible to the medical ones, i.e. the procedures were carried out according to the schemes generally accepted in kurortology and balneology. Course impacts were carried out based on the Scientific Research Center of the Azerbaijan Medical University. Rats were divided into the following groups: 1. Rats that received naphthalan baths — 30 animals. 2. Rats that received freshwater baths - 30 animals. 3. The control (intact) group - without exposure (30 rats).

The total duration of the course exposure is 20 days. The duration of each bath is 8 to 10 minutes. Rats were placed in a bath filled with naphthalan oil, heated to a temperature of 37 - 38°C. Previously, rats were adapted to bathing in the bathtubs to eliminate the stress response. Rats were removed from the experiment simultaneously by decapitation. The keeping of animals and their euthanasia are carried out following the EU Directive on the Protection of Animals Used for Experimental and Scientific Purposes (86/609 CE). After rat euthanasia of the experimental and control groups, micropreparations were made from the walls of the vaginal vestibule, similarly at autopsy of a human corpse.

The glands of the vaginal vestibule were examined on total preparations by the macromicroscopic method of R.D.Sinelnikov[7] For this, at preparation, the vaginal area was excised from the corpse. Further, for the manufacture of a total preparation and subsequent study of the topography and macroscopic anatomy of the glands, the actual material was placed in a 0.5% solution of acetic acid with a 0.05% solution of methylene blue in tap water. The glands in this solution were stained for 24-36 hours.

On total preparations, the glands were examined in transmitted

---

[7.]Западнюк, И.П. (Zapadnyuk, I.P.) Лабораторные животные / И.П.Западнюк, В.И.Западнюк, Е.А.Захария – Киев:Вища школа,1983. – 383с.

[8.]Синельников, Р.Д. (Sinel'nikov, R.D.) Материалы к макро-микроскопии вегетативной нервной системы и желез слизистых оболочек и кожи / Р.Д.Синельников. – Москва: Медгиз, – 1948. – 408 с.

(backlight from below) and reflected light, for this we used a head magnifier and an MBS-9 stereo microscope (magnification 8-64x). The vaginal vestibule was previously divided by transverse threads into the anterior, middle and posterior thirds. All measurements were separately carried out in the above zones.

During the macromicroscopic study of the glands, their total number, the density of the location of the glands (the number of glands in the area of 0.5 cm^2 of the wall), and the number of glands with ampoule-widened excretory ducts were counted. The length, width, area of the initial section, the diameter of the common excretory duct, and the 1^{st} order excretory duct were measured using an ocular ruler. We also analyzed the percentage of glands with a different number of initial sections, the area of the lumen of the orifice of the common excretory duct.

By the length of the initial department, we understood its size corresponding to the length of the vaginal vestibule. The transverse distance between the two most remote extreme zones at the initial department was considered its width. The number of glands in the area of 0.5 cm^2 of the wall was determined after the application of a transparent film on the surface epithelium with subdivision into corresponding squares.

On total preparations, the size-quantitative indicators of the glands were studied in each third of the organ wall and each age group.

Microanatomy, microsyntopy of glands and lymphoid structures, their relationships were studied using the same microscopic preparations.

For the study of glands and lymphoid formations by histological methods, pieces were excised after macromicroscopic preparation of the corpses of women at the level of the anterior (proximal), middle and posterior (distal) third of the vaginal vestibule.

The material was fixed in 10% neutral formalin, selectively in Carnoy fluid. Fixed pieces after alcohol treatment were poured into

paraffin. 5-7 microns thick transverse sections were made from these pieces.

The prepared sections were stained with hematoxylin-eosin, hematoxylin-picrofuxin according to van Gieson, according to Weigert, and the silvering reaction according to Grimelius[8] (to detect argyrophilic reticular fibers) was selectively performed. In some cases, in the manufacture of micropreparations, histochemical stain was carried out after appropriate preparation to determine the nature of secretion (according to Kreiberg, PAS-reaction).[9]

Using the Biolam stereo microscope for small glands of the vestibule, the thickness of the initial department (the difference between the least and most distant extreme points from the covering epithelium, the area of the initial department at the section, and the area of the initial part and the number of glandulocytes in its composition, the percentage of stroma in the section of the initial department (the entire area of the initial department of the gland in the section was taken as 100%).

For lymphoid tissue of the walls of the vaginal vestibule, the percentage of lymphoid nodules with a germinal center was determined (the total set of lymphoid nodules was taken as 100%), and the length, width and area on a section of lymphoid nodules with and without a germinal center, length, width and area were calculated germinal centers, the total number of cells of the lymphoid series (their number on an area of 880 μm²) as part of diffuse lymphoid tissue, lymphoid nodules without a germinal center, in the centers of germinal and mantle of lymphoid nodules. The percentage composition of lymphoid formations (different morphogenetic forms of lymphoid tissue) was determined: lymphocytes, plasmocytes, macrophages, eosinophils, mast cells, neutrophils, reticular cells, cells with a mitosis picture, and lymphoid cells in a state of

---

[8].Grimelius, L., Wilander, E. The importance of silver impregnation for the study of endocrine cells of the gut and pancreas // Invest Cell. Pathol. – 1980, 3, – p.3-12.
[9].Волкова, О.В. (Volkova, O.V.) Основы гистологии с гистологической техникой / О.В.Волкова, Ю.К.Елецкий. – Москва: Медицина, – 1982, – 304 с.

degeneration.

On micropreparations, the size-quantitative indicators of the glands and lymphoid structures of the vaginal vestibule, as on total preparations, are determined in every third of the organ wall and in each age group.

Part of the micropreparations was photographed under the same conditions and regime, in a MicroOptix optical microscope (Germany) with a Topica TP1002DS mounted video image system. When working on the images, we used the specialized Canvas vector program for Windows 2007.

The digital data obtained during the study was subjected to statistical processing. At the same time, general recommendations for medical and biological research were observed.[10]

The average values of the obtained samples (M), standard errors (m), minimum (min), maximum (max) values of the series were calculated. A comparison was made between groups (P), sequentially within a group (P_0), inside a group with the first parameter (P_1), inside a group with a maximum (P_2). The confidence interval (CI), the upper (UB) and, the lower boundaries (LB), the coefficient of variation (CV), the standard deviation (σ-sigma) of the indicators were determined. If the coefficient of variation (CV) did not outweigh 10%, then the variation was considered weak, if it was from 11 to 25%, it was considered average, if it was exceeded 25% as strong when exceeding 50% - asymmetric. For a preliminary assessment of the difference between the variational series, the parametric criterion t - Student was used. Further, for comparison and determination of the significance of quantitative differences in groups and subgroups, the nonparametric Wilcoxon U-test (Mann-Whitney) was used.[11]

---

[10].Гланц, С.Т. (Glants, S.T.) Медико-биологическая статистика (перевод с английского языка) / С.Т.Гланц. – Москва: Практика, – 1999. – 200 с.

[11].Боровиков, В.П. (Borovikov, V.P.) Популярное введение в современный анализ данных в системе STATISTICA / В.П.Боровиков.–Момква:Телеком, – 2015. – 288с.

The calculations were carried out in the programs of the statistical package MS EXCEL-2016 and SPSS-22.

The results of the study were documented. To illustrate the data obtained, 64 tables, 12 diagrams, 43 photographs of micro-preparations were used.

THE RESEARCH RESULTS AND THEIR DISCUSSION

Despite the relevance of obtaining data on the morphogenesis and structural-functional characteristics of the glands and lymphoid formations of the vaginal vestibule of a human in postnatal ontogenesis, we had studied many questions of this profile for the first time. As a result of macromicroscopic and microscopic studies on the actual material, we first performed a comprehensive morphological assessment of the small glands of the vaginal vestibule and lymphoid structures of this area in women throughout the entire postnatal ontogenesis - from the neonatal period to the senile period (inclusive). The individual, age-related variability of these most important structures is investigated; a complex of their dimensional indicators is revealed. For the first time, the morphological characteristics of the glands were studied depending on the phase of the ovarian-menstrual cycle.

Priority is our data on the structural features of the glands and lymphoid formations of the walls of the vaginal vestibule with abnormalities of the internal genital organs and after the impact of the naphthalan baths.

An adequate understanding of the revealed patterns of morphogenesis of glands and lymphoid structures, previously unknown, are not only of theoretical and biological importance, but also fundamentally important for the development of pathophysiology, immunology, clinical medicine, and, above all, gynecological practice. The structural analysis showed that the walls of the vaginal vestibule have developed glandular and lymphoid apparatus.

Glands during macromicroscopic studies and a view from the integumentary epithelium of the vaginal vestibule are defined as dark anatomical formations located on a lighter background of the surrounding wall. The contours of the glands are well defined.They are present both in the anterior (closest to the external opening of the urethra) and in the middle and posterior (closer to the anus) third of the wall of the vaginal vestibule. They are located singly or in groups and do not form longitudinal rows, usual for the mucous membranes of many internal organs

At the macro-microscopic level, the initial sections (one or more) and excretory ducts are revealed in the glands. The shape of the initial sections of the glands is varied, more often ovoid or round. On several numbers of preparations at high magnification, the initial parts are determined in the initial section, which has compact rounded contours. Sometimes the initial sections form clusters (complexes). If one gland has several initial sections, the first-order excretory duct departs from each of them, when connected, a common excretory duct is formed, which opens with a rounded, oval, or slit-like orifice on the surface of the integumentary epithelium.

M.R.Sapin et al. (2001)[12] indicate that the excretory ducts of the small glands of the walls of the hollow internal organs can be preforming anatomical pathways for this, given the asynchrony of the secretory process, periodic weakening of secretion (for example, during involution of the glands), antigenic materials are not always washed out of the lumen of the gland.

In the course of the common excretory duct in some small glands of the vestibule (12.5 ± 0.5% in newborns; 23.4 ± 1.2% in the 1st period of adulthood; 34.2 ± 2.3% in senile age), S-shaped bends are formed.

It is believed that the presence of such extensions is a compensatory mechanism for the accumulation of secretion

---

[12].Сапин, М.Р. (Sapin, M.R.) Малые железы пищеварительной и дыхательной систем / М.Р.Сапин, Д.Б.Никитюк, В.Б.Шадлинский, Н.Т.Мовсумов. – Элиста: Джангар, – 2001. – 135 с.

(under conditions of age-related hyposecretion of the gland) with its possible simultaneous elimination if necessary. On the other hand, in the field of ampullar expansions, conditions are created for the stagnation of the secret and its infection.[13]

According to the aims and objectives of the study, we on total preparations have studied the age-related characteristics of the glands of the vaginal vestibule. The analysis showed that the small glands of the vaginal are fully formed by the time of the birth of the child, capable of active secretion, which is associated with a qualitative change in vital activity immediately after birth, the need to implement a protective function concerning the integumentary epithelium of the vaginal vestibule (from mechanical damage, micro-organisms, etc.).

In newborn girls, there are 54±1.74 glands in the walls of the vaginal vestibule (from 41 to 62 individually). The density of the glands at this age is maximum during postnatal ontogenesis (3.7 ± 0.17 glands on an area of 0.5 cm^2). The length of the initial section of the glands at this age is 0.19 ± 0.01 (0.16-0.22) mm, the width is 0.16 ± 0.01 (0.12-0.19) mm, the area (on the transverse wall section) – 400.2 ± 18.3 mm^2 10^{-4}, the diameter of the common excretory duct – 23.6 ± 0.64 μm. In newborn girls, the glands are quite uniform in shape. Glands with one initial section prevail (87.9 ± 1.1%). Glands with two initial sections are detected in 5.7 ± 0.2%. with three - in 3.7 ± 0.3%; glands of complex shape - with four initial sections are rarely determined - in 2.7 ± 0.5%.

The number of small glands of the vestibule of the vagina in early childhood is 1.5 times greater ($P<0.05$), in puberty – 2.0 times more ($P<0.05$), and in the 1st period of adulthood – 2.8 times more ($P<0.05$) than in newborns. This parameter is 1.4 times less in elderly age ($P<0.05$), in senile - 1.7 times less ($P<0.05$) than in the 1st

---

[13].Никитюк, Д.Б. (Nikityuk, D.B.) Многоклеточные железы стенок пищеварительной и дыхательной систем (вопросы функциональной морфологии) / Д.Б.Никитюк, Л.Л.Колесников, В.Б.Шадлинский – Воронеж: Научная книга, – 2017. – 279 с.

period of adulthood.

The localization density of the small glands of the vaginal vestibule compared with newborns in early childhood increases by 1.03 times (P>0.05), in puberty – 1.1 times (P>0.05), in the 1st period of adulthood – 1.1 times (P>0.05). This indicator in elderly age decreases by 1.4 times (P<0.05), in senile age - by 2.6 times (P<0.05).

We analyzed the length of the initial sections of the glands on the preparations of the vestibule. The length of the initial part of the small glands of the vestibule in early childhood in girls is 1.4 times (P<0.05), in puberty – 2.6 times (P<0.05) and in women in the 1st period of adulthood – 3.7 times (P<0.05) more than in newborn girls. This indicator in elderly age is 1.3 times less (P<0.05), in senile – 1.6 times (P<0.05) less than in women in the 1st period of adulthood.
According to the data obtained, the width of the initial section of the small glands of the vestibule in early childhood is 1.4 times (P<0.05), in puberty – 2.6 times (P<0.05) and in women 1st period of adulthood – 3.5 times (P<0.05) more than in newborn girls. This indicator in elderly age is 1.3 times (P<0.05), in senile age – 1.4 times (P<0.05) less than women in the 1st period of adulthood.

The area of the initial section of the glands of the vaginal vestibule increases in early childhood – 1.2 times (P>0.05), in puberty – 1.7 times (P>0.05), in the 1st period of adulthood - 2.2 times (P>0.05), compared with newborn girls.

Compared to the 1st period of adulthood, the considered sign in elderly women decreases by 1.4 times (P>0.05), in senile age - by1.4 times (P>0.05).

The diameter of the common excretory duct of the glands in early childhood, in comparison with the value of this indicator in newborns, increases 1.3 times (P<0.05), puberty - 1.4 times (P<0.05), 1st period of adulthood – 1.7 times (P<0.05), and elderly and senile age – 1.8 times (P<0.05).

Thus, the study of age-related characteristics of the size-quantitative indicators of the glands of the vaginal vestibule on total

preparations showed that from the neonatal period to the 1st period of adulthood, the number of glands, length, width, and area of the initial section increases. At this age, the shape of the glands is most diverse, which is also typical for the glands of the majority of the mucous membranes of the hollow organs of the urogenital apparatus, respiratory and digestive systems.[3,4,14,15]

We have revealed age-related variability in the percentage of glands with different numbers of initial sections. So, at the vaginal vestibule, the percentage of glands with one initial section in early childhood decreases by 1,1 times ($P<0.05$), in puberty by 1.4 times ($P<0.05$), in the 1st period of adulthood 1.7 times ($P<0.05$), compared with newborn girls. In elderly age, the percentage of such glands increases by 1.4 times ($P<0.05$), compared with the 1st period of adulthood.

The relative number of glands with two initial sections in early childhood increases 1.6 times ($P<0.05$), in adolescent girls – 2.5 times ($P<0.05$), in the 1st period of adulthood – 4.7 times ($P<0.05$), compared with newborns. This indicator in senile age is 1.4 times less ($P<0.05$) than in people of the 1st period of adulthood.

The percentage of glands with three initial sections in early childhood increases 2.2 times ($P<0.05$), in puberty – 3.4 times ($P<0.05$), in the 1st period of adulthood – 4.6 times ($P<0.05$). In senile age, the content of such glands in the area under consideration decreases by 1.3 times ($P<0.05$), compared with the 1st period of adulthood.

The percentage of glands with four or more initial sections in the vaginal vestibule in early childhood increases 1.1 times ($P<0.05$),

---

14. Аллахвердиев, М.К. (Allakhverdiev, M.K.) Структурно – функциональная характеристика и закономерности морфогенеза железистого и лимфоидного аппаратов внепеченочных желчевыводящих путей человека в постнатальном онтогенезе: / автореферат дисс. доктора медицинских наук. / – Баку, 2007. – 40 с.

15. Джаббарова, Н.Р. (Dzhabbarova, N.R.) Морфологические особенности желез женского мочеиспускательного канала в постнатальном онтогенезе: / автореферат дисс. доктора медицинских наук. / – Баку, 2007. – 21с.

in puberty – 3.3 times (P<0.05), in the 1st adulthood – 5.0 times (P<0.05), compared with newborns. The number of these glands in senile age in the walls of this area is generally 1.9 times less (P<0.05), compared with the 1st period of adulthood.

In senile age, the shape of the glands (their exterior) is also simplified - the percentage of glands with three, four, or more initial sections (glands of complex shape) decreases, and the content of glands of a simple form increases - with one initial section. Simplification of the "exterior" of the glandular apparatus is also typical of the walls of other hollow internal organs of the urogenital apparatus, digestive and respiratory systems.[15]

On total preparations, we studied the percentage (relative) representation of those glands whose common excretory duct has a local ampoule-like expansion.

In early childhood, the percentage of glands with ampoule-like expanded excretory ducts is 3.9±0.62.

The percentage of glands with ampoule-like expanded excretory ducts in puberty is 1.9 times (P<0.05), in the 1st period of adulthood – 5.5 times (P<0.05), in elderlies – 8.9 times (P<0,05). in seniles – 10.5 times (P<0.05) more than in early childhood.

According to our data, starting from the 2nd period of adulthood and up to senile age, inclusive, there is a decrease in the indicated size and quantitative indicators of the glands of the vaginal vestibule. Throughout the entire postnatal development of a person, the density of localization of small glands of the vaginal vestibule decreases, and the diameter of the common excretory duct increases.

The study of microanatomical preparations showed that the initial sections of the glands of the vaginal vestibule are located in the mucous membrane, the microenvironment for them is connective tissue (collagen, elastic) fibers and cells of the lymphoid series.

In the initial section, the initial parts and proximal sections of the duct apparatus are revealed, lined with a single-layer epithelium with rounded nuclei located in the basal and middle parts of the epithelial cell.

The glandulocytes, which form the initial part, have a predominantly prismatic and cubic shape, with basal nuclei. The cavity near the apical parts of glandulocytes is predominantly filled with secretion, which, when stained according to Kreiberg, will acquire an azure-blue color, and when performing a PAS-reaction, it becomes crimson.

The intercalated excretory ducts begin directly from the initial parts, passes into the striated ducts. The excretory ducts near (outside) the initial sections are lined at first with a bilayer, and near the integumentary epithelium of the vaginal vestibule with a multilayer epithelium.

The stroma of the glands is formed by loose fibrous connective tissue and contains cells of the lymphoid series. According to our data, cells of the lymphoid series, singly or in the form of lymphoid accumulations, lymphoid nodules, are almost constantly contained near the initial sections of the small glands of the vaginal vestibule, as well as in the form of cords and clusters in the stroma of the initial parts, near the glandulocytes (near their basement membrane).

These cells form "guard posts" (term of M.R.Sapin)[16], that respond to the receipt of foreign antigenic material (dust, drug antigens, microorganisms) through the excretory ducts into the depths of the organ walls, i.e. into the internal environment of the body.

This arrangement of glands and lymphoid formations is also observed in the walls of other hollow organs. So, according to the data of B.M.Huseynov (2011)[4], cells of the lymphoid row are detected near the venules and they are especially numerous, near the glands of the trachea and main bronchi. The cells of the lymphoid row form lymphoid nodules near the excretory ducts of the glands (especially near their openings), surround the excretory ducts like a corolla from several rows (2-4) of cells, and are located near the initial sections of the glands.

[16.]Сапин, М.Р. (Sapin, M.R.) Иммунная система, стресс и иммунодефицит / М.Р.Сапин, Д.Б. Никитюк.– Элиста:Джангар,– 2000,– 184с.

The revealed close microsyntopic connections between the glandular epithelium and lymphoid tissue allow us to confirm the validity of the use of the terminological phrase “glandular lymphoid associations” as applied to the walls of the vaginal vestibule.

On microanatomical preparations of the glands of the vaginal vestibule, in addition to morphological features, the age-related transformation of the size-quantitative indicators of these structures was also studied. So, in newborn girls, the thickness of the initial section of the glands is 33.4±1.1 microns. This indicator, in comparison with newborn girls, increases in early childhood - by 1.2 times ($P<0.05$), in puberty - by 1.5 times ($P<0.05$), in the 1st period of adulthood – 1.6 times ($P<0.05$). Compared with the 1st period of adulthood, this indicator of the glands of the vaginal vestibule in elderly women decreases 1.6 times ($P<0.05$), in senile age – 1.8 times ($P<0.05$).

In newborn girls, the area of the initial section of the glands of the vaginal vestibule is $400.2\pm18.3 mm^2\ 10^{-4}$. This indicator increases in early childhood - by 1.2 times ($P>0.05$), in puberty - by 1.7 times ($P>0.05$), and in the 1st period of adulthood - by 2.2 times ($P>0.05$), compared with newborn girls. In comparison with the 1st period of adulthood, the considered sign in elderly women decreases 1.4 times ($P>0.05$), in senile age – 1.6 times ($P>0.05$).

On transverse microsections of the vaginal vestibule wall, we studied the number of initial parts in the composition the initial section of the glands. Newborn girls have 10.5±0.9 initial parts in the initial section of the glands. This indicator increases in early childhood by 1.6 times ($P<0.05$), in puberty – 2.2 times ($P<0.05$), and in the 1st period of adulthood – 2.8 times ($P<0.05$), compared with newborn girls. Compared with the 1st period of adulthood, this indicator in the elderly period decreases by 1.4 times ($P<0.05$), and in senile age – 1.7 times ($P<0.05$).

In newborn girls, the area of the initial part of the glands is $26.0\pm1.1\ mm^2 \cdot 10^{-4}$. This indicator for the glands of the vaginal vestibule in comparison with newborn girls in early childhood

increases by 1.2 times (P>0.05), in puberty – 1.5 times (P>0.05), and in the 1st period of adulthood 1.8 times (P>0.05). Further, this indicator gradually decreases. The indicator under consideration decreases in elderly age, compared with the 1st period of adulthood, by 1.1 times (P>0.05), in senile age – 1.3 times less (P>0.05).

On transverse microsections of the vaginal vestibule wall in women of different ages, we analyzed the number of glandulocytes (secretory cells) determined in the initial part of the glands of this area. In newborn girls, 12.3±0.6 glandulocytes are determined in the initial part of the glands. The considered indicator, in comparison with newborns in early childhood, increases by 1.2 times (P>0.05), in puberty 1.3 times (P>0.05), in women in the 1st period of adulthood 1.5 times (P>0.05). In elderly age, in comparison with the 1st period of adulthood, this indicator decreases by 1.2 times (P>0.05), and in senile age - by 1.3 times.

We studied age-related changes in the amount of stroma in the initial section of the glands of the vaginal vestibule. When the total area of the initial section of the glands on the cut was taken as 100%, the stroma of the initial section of the glands in newborn girls is 3.9±0.4%. The stromal content in early childhood is similar to that in newborns. This parameter in puberty is 1.8 (P>0.05), in the 1st period of adulthood 5.9 (P>0.05), in elderly women – 9.3 (P>0.05), in senile age - 10.8 times more (P>0.05) than in newborn girls.

Thus, during the entire postnatal ontogenesis, an increase in the specific gravity of the gland stroma is observed. Also, in women of the 2nd period of adulthood and elderly age, adipose tissue is revealed in the stroma, the content of which significantly increases in elderly age. The excretory ducts of many glands in women of senile age groups form cystic enlargements.

According to M.R.Sapin, all these signs are the morphological equivalent of a decrease in the secretory activity of the glandular apparatus.[12]

The same qualitative changes are characteristic of the glands of the larynx,[4] trachea, and bronchi,[5] biliary tracts,[14] female urethrae,[15]

and pharynx.[17]

In the investigation, in addition to the small glands of the vaginal vestibule, we also studied the lymphoid apparatus of this organ. So, in the mucous membrane of the vaginal vestibule microanatomical methods had been used to determine all morphogenetic forms of lymphoid formations - lymphocytes in the integumentary epithelium, diffuse lymphoid tissue located mainly subepithelial, as well as lymphoid nodules.

A significant part of the lymphoid nodules has a germinal center, which indicates the active antigen effect of the lymphoid formations of the mucous membrane of this anatomical region.[16]

Lymphoid formations are located mainly near the initial departments of the glands, accompanying their excretory ducts in the form of a corolla of three to five rows of cells of the lymphoid series. In the stroma of the initial departments, cells of the lymphoid row are also located in the form of strands separating the adjacent initial sections. They are located in the form of fields of irregular shape, which are oriented in the loose fibrous connective tissue of the stroma located between the groups of the initial sections (between the lobules of the gland).

According to M.R. Sapin, D.B. Nikityuk (2000),[16] cells of the lymphoid series near the initial sections of the small glands exercise immune surveillance over the processes of secretion. Also, this microtopography is explained by the fact that these cells (plasmatic) secrete immunoglobulins A (secretory immunoglobulin).

We have established that the intensity of the glandular-lymphoid relationship is not the same during postnatal ontogenesis. Such relationships are least pronounced in newborn children, to the maximum extent from early childhood to the 1st period of adulthood. In elderly and senile ages, the number of lymphoid cells near the

---

[17]·Гасымова, Т.М. (Gasymova, T.M.) Структурная характеристика желез и лимфоидных образований глотки человека в постнатальном онтогенезе и в эксперименте: / автореферат дисс. кандидата медицинских наук. / – Баку, 2015. – 24с.

initial sections and in the stroma of the glands is less in number and they are determined episodically.

This is probably not accidental, given the maximum quantitative development of lymphoid formations, predominantly in early childhood, the active hormonal activity of the body in the reproductive period, and general withering of the immune system in the elderly and senile ages.[18]

In qualitative terms, all lymphoid formations of the walls of the vaginal vestibule are represented by the same set of lymphoid cells with a significant predominance of lymphocytes, numerous plasma cells, macrophages, reticular cells involved in the formation of the stromal component of lymphoid structures. In the composition of lymphoid formations, cells with signs of mitosis are always determined, the presence of which reflects the processes of lymphocytopoiesis, a few mast cells, cells in a state of degeneration. Thus, the cellular composition of lymphoid formations of the walls of the vaginal vestibule as a whole corresponds to other peripheral organs of the immune system. [3,4,14,17]

The lymphoid apparatus of the vaginal vestibule, as well as its small glands, is, in general, fully formed at birth. In newborns, all morphological forms of lymphoid formations are constantly present - diffuse lymphoid tissue, lymphoid nodules without, and with a reproduction center.

From early childhood to the 1st period of adulthood, intercellular associations are typical for the walls of the vaginal vestibule, i.e. the macrophage-lymphocytic and plasmacytic-lymphocytic complexes (lymphocytes around a macrophage and a plasma cell).

The functional purpose of such complexes, according to the assumption of Sapin M.R., Nikityuk D.B. (2000)[16] in the exchange of information between cells of the lymphoid series, is necessary

---

[18.] Аминова, Г.Г. (Aminova, G.G.) Строение собственных желез пищевода у людей пожилого и старческого возрастов // – Санкт - Петербург: Морфология, – 2014. –т.146, № 4, – с.37-42

for the formation of an immune response.

We analyzed the number of lymphoid nodules with a germinal center in the total population of lymphoid nodules in the walls of the vaginal vestibule in women of different age groups. In newborns, the number of lymphoid nodules with a germinal center is 7.5 ± 0.6. Compared with this indicator of newborn children, its value in early childhood increases 1.4 times ($P<0.05$), in puberty - 5.6 times ($P<0.05$), in women 1st period of adulthood – 10.6 times ($P<0.05$). Further, this indicator decreases. Compared with the 1st period of adulthood, its value in elderly women decreases 1.9 times ($P<0.05$), in senile age – 1.8 times ($P<0.05$).

We investigated the age characteristics of the area of the lymphoid nodule with the germinal in the walls of the vaginal vestibule of the vagina. Compared with this indicator in newborn children (51.5 ± 1.4 mm^2 $\cdot10^{-4}$), its value in early childhood increases 1.9 times ($P<0.05$), decreasing further during ontogenesis. Compared with early childhood, its value in puberty decreases 1.4 times ($P<0.05$), in women of the 1st period of adulthood – 1.8 times ($P<0.05$), for elderly women it decreases 2.4 times ($P<0.05$), in senile age – 2.4 times ($P<0.05$).

Using the morphometric method, we studied age-related features of the length of lymphoid nodules with and without a germinal center. Compared with the length of the lymphoid nodule with the germinal center in newborns (77.5 ± 3.5mm), its value is increased in early childhood by 1.8 times ($P<0.05$), decreasing further during ontogenesis. Compared to early childhood, its value in puberty is decreased by 1.1 times ($P<0.05$), in women of the 1st period of adulthood - by 1.2 times ($P<0.05$), in elderly women by 1.5 times ($P<0.05$), in senile age – 1.8 times ($P<0.05$).

Compared with the length of the lymphoid nodule without a germinal center in newborn children (67.5 ± 3.5mm), its value in early childhood increases by 1.9 times ($P<0.05$), decreasing further during ontogenesis. Compared to early childhood, its value in puberty decreases by 1.1 times ($P<0.05$), in women of the 1st period

of adulthood - by 1.2 times (P<0.05), in elderly women – 1.4 times (P<0.05), in senile age – 2.0 times (P<0.05).

Compared with a newborn, in early childhood, the density of the location of cells of the lymphoid series (their number in the cut area of 880 sq μm) for diffuse lymphoid tissue increases by 1.3 times (P<0.05), for lymphoid nodules without a germinal center – 1.3 times (P<0.05), in the germinal centers of lymphoid nodules by 1.3 times (P<0.05), in their mantle zone by 1.4 times (P<0.05). In subsequent age groups, there is a decrease in this indicator.

During postnatal ontogenesis, the cellular composition of lymphoid formations in the vaginal vestibule also changes. In early childhood, in all lymphoid formations, the maximum content of lymphocytes is noted. Their amount is 68.2±1.4% in diffuse lymphoid tissue, 69.1±1.4% in lymphoid nodules without germinal centers, 66.6±1.4% in germinal centers lymphoid nodules, and their mantle zone 65.6±1.4%. At this age, the level of cells with a picture of mitosis is 4.8-8.8%, degenerative cells – 1.2±0.2%. Typical intercellular associations are observed (macrophage surrounded by lymphocytes, etc.). Starting from the first childhood, reduction processes occur in lymphoid formations, which are most pronounced in the senile age. So, in the senile age, compared with early childhood, there is a decrease in the relative content of lymphocytes: in diffuse lymphoid tissue - by 1.2 times (P<0.05), in lymphoid nodules without germinal centers of reproduction, germinal centers and mantle of lymphoid nodules – 1.3 times (P<0.05). The number of cells of the lymphoid series in the state of mitosis is significantly reduced. In senile age, in different morphogenetic forms of lymphoid formations, the number of these cells is 1.0-1.5% (at an early age – 4.8-8.8%). A decrease in the level of lymphocytopoiesis corresponds to a simultaneous increase in the processes of cell destruction in lymphoid tissue. The number of degenerating cells of the lymphoid row in old age is 5-8% (in early childhood – 1.3-1.5%). The intercellular associations between the cells of the lymphoid row (macrophage surrounded by lymphocytes, lymphocytes around the

plasma cell), typical for an early age, almost completely disappear in the senile age.

According to İ.O.Makarov et al. (2012) the weakening of the immune defense (local immunity) in the walls of the vaginal vestibule during aging is accompanied by the growth of several nosological forms (kraurosis of the vagina, etc.). [19]

Thus, in contrast to small glands, the maximum peak of development of the lymphoid apparatus of the vaginal vestibule occurs in early childhood, which is typical for other peripheral organs of the immune system - lymphoid formations of the trachea and main bronchi,[4] extrahepatic biliary tract,[14] pharynx, [17] intestines.[20]

Starting from the first childhood, gradual involutive changes occur in the lymphoid formations of the vaginal vestibule.

We revealed the presence of a gradient throughout the entire postnatal ontogenesis of size and quantitative indicators of small glands. It is manifested by an increase in the number and size of glands, and a decrease in the percentage of simple glands (with 1-2 sections) in the anterior-posterior direction - from the pubis to the anus. So, in the posterior third of the wall of the vaginal vestibule, in comparison with its anterior third, the total number of small glands, depending on age, increases 1.6-2.2 times ($P<0.05$), the density of the glands 1.2-2.1 times($P<0.05$), the length of the initial department of the glands - a 1.5-2.4 times($P<0.05$), the width of the initial department - 1.9-2.3 times ($P<0.05$), the external diameter of their common excretory duct by the 1.1-1.2 times ($P<0.05$), the number of the glands with ampoule-like enlargement excretory ducts 1.1-1.4 times($P<0.05$), the thickness of the initial department - 1.1-2.2 times

---

[19.]Макаров, И.О. (Makarov, I.O.) Неопухолевые заболевания вульвы / И.О.Макаров, Е.А.Чулкова, Н.А.Шешукова, [и др.] // Акушерство, гинекология и репродукция, – Москва: – 2012. №2, – с. 14-17.

[20.]Хатамов, Э.А. (Khatamov, E.A.) Топография и микроскопическая анатомия лимфоидных узелков в стенках кишечника человека в постнатальном онтогенезе: / автореферат дисс. кандидата медицинских наук./ – Москва, 1985. – 16 с.

(P<0.05), the number of the initial departments in the initial section 1.4-1.8 times (P<0.05), the square of the cavity of the initial part (on the section) – 1.2-1.4 times (P<0.05), the number of the glandulocytes – 1.1-1.4 times (P<0.05). Perhaps the presence of anterior-posterior gradient increase in the glandular mass, reflecting a unidirectional increase in the secretory activity of the glands, can be explained by the high probability of infection of the vaginal vestibule (rectal microflora); it is known that the secretion of glands has bactericidal and bacteriostatic activity. [15]

Our studies have shown that during postnatal ontogenesis and in lymphoid formations of the vaginal vestibule there is a gradient of size and quantitative indicators. It is manifested by an increase in the direction from the anterior to the posterior third of the organ wall, dimensional and quantitative indicators of lymphoid nodules and diffuse lymphoid tissue.

Given the association of glands and lymphoid tissue (their joint location, etc.), it becomes a clear and unidirectional increase in the size of lymphoid formations, the density of the cells of the lymphoid row, growing in the direction to the anus. According to our data, depending on age, in the walls of the posterior third of the vaginal vestibule, compared with its anterior third, the area of the lymphoid nodule with the germinal center increases by 1.3-1.5 times (P<0.05), without the germinal center – 1.1-1.6 times (P<0.05), the area of the germinal center gets larger (at the section) – 1.1-1.7 times (P<0.05).

In the walls of the posterior third of the vaginal vestibule, in comparison with its anterior third, the length of the lymphoid nodule without a germinal center is 1.3–1.5 times longer (P<0.05), and for nodules with a germinal center by 1.2–1.5 times (P<0.05). In the posterior third of the vaginal vestibule, in comparison with its anterior third, the density of the cells of the lymphoid row in the composition of both diffuse lymphoid tissue and lymphoid nodules without a germinal center increases by 1.2-1.6 times (P<0.05), in the germinal centers of lymphoid nodules – 1.1-1.5 times (P<0.05), in their mantle zone by 1.3-1.7 times (P<0.05). At the same time,

according to our data, gradient changes in the qualitative composition of lymphoid tissue are not observed in the walls of the vaginal vestibule.

It should be noted that a gradient change in the size and quantitative parameters of glands and lymphoid structures is also typical for other internal organs: larynx,[4] trachea, and main bronchi,[5] extrahepatic biliary tracts,[17] female urinary bladder,[19] pharynx,[20] and fallopian tubes.[23]

We have found that the number, size of glands, and lymphoid formations of the vaginal vestibule are individually variable. The level of variability (the amplitude of the variational series of indicators) in the glands predominantly increases during postnatal ontogenesis. For example, compared with newborn girls, the maximum and minimum individual values of the length of the initial section of the small glands of the vaginal vestibule at 22-35 years are 1.7 times ($P<0,05$), the width of the initial section is 1.6 and 1.8 times respectively ($P<0.05$), the diameter of the common excretory duct was 1.4 and 1.9 times ($P<0.05$) larger.

According to M.Q.Allakhverdiev (2007),[14] B.M.Guseynov (2011),[4] N.R.Dzhabbarova [15] in the shape, size and quantity of the gland in the walls of the extrahepatic biliary tract, trachea, and main bronchi, urinary bladder, female urethra, the same is characterized by significant individual anatomical variability. According to these researchers, the individual structural features of the glands are least pronounced in the neonatal period and most in the elderly and senile age.

Significant individual variability in the shape and size of the glands of the mucous membranes of hollow internal organs is one of the patterns of their morphogenesis.[16]

The lower level of individual variability in the dimensional parameters of the glands in newborn girls and early childhood is possibly associated with the uniformity of the child's living conditions (hygiene, use of diapers, bed rest). The maximum level of these indicators, possibly, depends on the characteristics of personal

hygiene, the level of intimate relationships, past diseases, and other factors.[16]

The minimum and maximum value of the number, length, and area of lymphoid nodules with and without a germinal center, the density of cells in the composition of diffuse lymphoid tissue and lymphoid nodules both in the vaginal vestibule as a whole and in its anterior, middle and posterior thirds increases from the neonatal period to the 1st period of adulthood and then decline to the elderly, senile age.

The amplitude of the variation series of these signs of lymphoid structures in newborn girls, in early childhood, in most cases, is greater than in senile age.

We had provided the first to study the morphological state of small glands and lymphoid formations of the vaginal vestibule of the women of the reproductive age and also investigated the dependence of this state on the phase of the ovarian-menstrual cycle. The actual material of the combined group was analyzed (girls and women of reproductive age; of which the secretion phase - 8 cases, the proliferation phase - 7 cases, desquamation phases - 8 cases). The data are given for the vestibule of the vagina as a whole, without dividing it into areas.

According to our data, in girls and women of the 1st period of adulthood, the dimensional indicators of the glands of the vaginal vestibule, and therefore their functional activity, are maximum in the secretion phase, minimum in the desquamation phase, and occupy, basically, an intermediate position in the proliferative phase. So, the area of the initial department of the glands (on the cut) in the walls of the vaginal in the secretory phase of the cycle, compared with the proliferative phase, is 1.04 times greater ($P<0.05$), and compared with the desquamation phase, 1.09 times ($P<0.05$).

The thickness of the initial section of the glands in the walls of the vaginal vestibule in the secretory phase of the cycle, compared with the proliferative phase, is 1.16 times greater ($P<0.05$), and compared to the desquamation phase – 1.19 times ($P<0. 05$).

The area of the initial part of the gland in the walls of the vaginal vestibule in the secretory phase of the cycle, compared with the proliferative phase, is 1.17 times greater ($P<0.05$), and compared with the desquamation phase, 1.34 times ($P<0.05$).

The number of glandulocytes in the initial part of the gland in the walls of the vaginal vestibule in the secretory phase of the cycle, compared with the proliferative phase, is 1.24 times higher ($P<0.05$), and compared with the desquamation phase – 1.70 times ($P<0.05$).

The individual minimum and maximum values of all these indicators of small glands in the walls of the vaginal vestibule in women of reproductive age in the secretory phase of the ovarian-menstrual cycle are greater, in the desquamation phase are less, and in the proliferative phase, they occupy an intermediate position.

According to A.Khem, D. Kormak (1983)[21] these differences are associated with the level of estrogens in the blood, which have a trophic function. It is minimal in the desquamation phase, maximal in the secretory phase of the ovarian-menstrual cycle.

It is known that in the desquamation phase, the level of progesterone in the blood in women is the lowest (on average 0.6 ng/ml), in the proliferation phase it is 20 times higher (12.0 ng/ml), in the secretion phase, the highest progesterone level is noted (31.4 ng/ml).[22]

Taking into account the biological effects of progesterone (secretory transformation of the endometrium, its proliferative activity, activation of the secretory activity of the glands of the female genital area, etc.)[23], the revealed differences in the

---

[21.] Хэм, А. (Khem, A.) Гистология. (перевод с английского языка) / А.Хэм, Д.Кормак. – Москва: Мир, – 1983. – 293 с.

[22.] Demir, B. Progesterone change in the late follicular phase affects pregnancy rates both agoinst and antagonist protocols in normoresponders: a case-controlled study in ICSI cecles / B.Demir B., I.Kahyaoglu, A.Guvenir [et al.] // Gynecological Endocrinology, – 2016. 35(5), – p.361-365.

[23.] Patel, B. Role of nuclear progesterone receptore isoforms in uterine pathphysiology / B.Patel, S.Elguero, S.Thakore [et al.] // Human Reproduction Update, – 2015. 21(2), – p.155-173.

indices of the glandular apparatus of the walls of the vaginal vestibule in different phases of the ovarian-menstrual cycle become clear and explainable.

We have revealed for the first time that the size-quantitative indicators of lymphoid formations and the vaginal vestibule change significantly during the ovarian-menstrual cycle. Thus, in the secretion phase, the proportion of lymphoid nodules containing a reproduction center (85.3 ± 0.7 of the total number of lymphoid nodules) is greater than in the proliferation phase (1.20 times, $P<0.05$) and desquamation (in 1.30 times, $P<0.05$).

In the secretory phase, the area (66.2 ± 3.2мм$^2\cdot10^{-4}$) and length (130.7 ± 2.5μm) of the lymphoid nodule with the multiplication center in the walls of the vaginal vestibule are greater than in the proliferation phase (respectively 1.10 times, $P>0.05$ and 1.20 times, $P<0.05$) and in the desquamation phase (1.10 times for both indicators; $P<0.05$).

The area (6.1 ± 2.9мм$^2\cdot10^{-4}$) and length (120.6 ± 2.9 μm) of the lymphoid nodule without a germinal center in the walls of the vaginal vestibule in the secretory phase is greater than the proliferative (1.20 times, $P<0.05$ and 1.10 times, $P>0.05$) and the desquamation phase (1.50 and 1.10 times, $P<0.05$, respectively).

The area of the center of the proliferation of lymphoid nodules, according to our data, also in the secretion phase (48.4 ± 3.0мм$^2\cdot10^{-4}$) is slightly larger than in the proliferative (1.05 times, $P>0.05$) and desquamation (in 1.10 times, $P>0.05$) phase.

The total number of cells of the lymphoid series in the composition of all lymphoid formations of the walls of the vaginal vestibule is also the maximum in the phase of secretion, minimum - in the phase of desquamation. Thus, the density of these cells in the composition of diffuse lymphoid tissue in the secretion phase (30.1± 0.8 on an area of 880 μm^2) is higher than in proliferative (1.20 times $P<0.05$) and desquamation (in 1.40 times $P<0.05$) phase. In the composition of lymphoid nodules without a germinal center, the density of cells in the secretion phase (34.0 ± 1.4) is greater tha

in the proliferation phase by 1.08 times (P>0.05) and in the desquamation phase by 1.10 (P<0.05). The localization density of lymphoid cells in the germinal centers in the secretion phase (30.6±1.2) is 1.30 times higher than in the proliferation and desquamation phase (P<0.05). The same indicator in the mantle zone of lymphoid nodules with a germinal center in the secretion phase (36.1±0.8) is greater than the proliferation phase (1.10 times, P<0.05) and the desquamation phase (1.20 times, P<0.05).

According to Shadlinskaya S.V (2009)[24], indicators of lymphoid formations (the number and size of lymphoid nodules, the density of the cells of the lymphoid series, etc.) in the walls of the fallopian tube are hormonally dependent. Thus, they increase in the secretion phase, occupy an intermediate position in the proliferation phase, and are minimal in the desquamation phase. Moreover, in the desquamation phase, a decrease in the thickness of the epithelial layer of the mucous membrane of the fallopian tube is also observed.

It should be noted that a large number of lymphoid formations in women of reproductive age were shown earlier in the study of the lymphoid apparatus of the rectosigmoidal part of the colon.[25]

According to Guseynov B.M. (2011)[4], sex characteristics of the structural organization of lymphoid formations in the walls of the trachea and main bronchi are observed only in women of reproductive age. In the female sex, in comparison with the male sex, there is a higher percentage of large and small lymphocytes, cells with patterns of mitosis, plasma cells, but a smaller number of medium lymphocytes and cells in a state of degeneration.

Estrogen is one of the most important hormones during puberty

---

[24.] Шадлинская, С.В. (Shadlinskaya, S.V.) Функциональная морфология лимфоидного аппара-та маточной трубы в норме, при контралатеральной аплазии и при трубной беременности: / автореферат дисс. кандидата медицинских наук. / – Баку, 2009. – 21 с.

[25.]Хушкадамов, З.К. (Khushkadamov, Z.K.) Структурная характеристика лимфоидного аппарата ректо-сигмоидального отдела кишечника человека в постнатальном онтогенезе: / автореферат дисс. кандидата медицинских наук./ – Душанбе, 2004. – 27 с.

and is essential for sexual differentiation.

It was found that estrogens affect the modulation of immunological reactions, which simultaneously lead to the activation of the reticuloendothelial system and depression of cellular immunity.[26]

The mechanisms of estrogenic immunoregulation are more pronounced in the adult female body. The complex mechanisms responsible for this regulation are carried out through direct chemical interaction with lymphoid cells, as well as with non-lymphoid tissues, which leads to the release of soluble immunoregulatory factors.[27]

Estrogens regulate the expression of T-lymphocytes in epithelial cells, affect the development and function of T-helpers, in particular, the ability of these cells to produce cytokines. It has been proven that the level of estrogens (estrone and estradiol), which determine the activity of proliferative processes of the endo – and myometrium and vaginal epithelium, is minimal in the desquamation phase and significantly higher (1.5-2.0 times) in the secretion phase.[28]

We have revealed significant changes in the glandular and lymphoid apparatus of the vestibule of the vagina of newborn girls assigned to the combined group (8 observations) with anomalies of the internal genital organs. In all girls, the vaginal vestibule remained anatomically intact. The comparison group consisted of girls without these anomalies.

The significance of our research is determined by the fact that in recent years, targeted examination with the use of modern

---

[26.] Alicia, A. Divergent mechanisms for tropic action of estrogens in the brain and peripheral tissues / A.Alicia, J.Jason, E.Madeline [et al.] // Brain Research, – 2011. 1379, – p. 119-136.

[27.] Mauvais-Jarvis, F., Clegg, D., Hevener, A. The role of estrogens in control of energy balance and glucose homeostasis // Endocrine Reviews, – 2013. 34(3), –p. 309-338.

[28.] Monteiro, R., Teixera, D., Calhau, C. Estrogen signaling in metabolic inflammation // Mediators inflammation, – 2014. 61, – p.17-19.

diagnostic research methods in clinical practice often reveals various anomalies of the internal genital organs.[29,30]

At the same time, the pathological anatomy of the vaginal vestibule during these processes has hardly been studied, and as applied to the glands and lymphoid structures of the vaginal vestibule before our study, the data were completely absent.

The studies have revealed a significant regression in the formation of small glands of the vaginal vestibule with anomalies of the internal female genital organs. So, in particular, with these anomalies in the glands of newborn girls, cystic enlargements of the duct apparatus, mainly the common excretory duct, are revealed on 1/5-1/6 of the microscope preparations.

Dilatation of the ducts, the presence of lateral diverticula and ambulatory extensions may reflect a violation of the drainage function of the duct apparatus; contribute to the stagnation of secretions, and its infection.[16]

With anomalies of the internal female genital organs, the glandular-lymphoid relationship is disturbed.

We analyzed the size-quantitative indicators of the small glands of the vaginal vestibule in newborn girls, in which there were anomalies in the development of the internal female genital organs.

In newborn girls with anomalies of internal female genital organs, the thickness of the initial departments of the glands in the anterior third of the vaginal vestibule is 1.7 times ($P<0.01$), in it's middle and posterior third – 1.3 times ($P<0.01$) and in the organ as a whole – 1.4 times ($P<0.01$) less, the area of the initial department of the glands (on a cut) in the anterior third of the vaginal vestibule by 1.9 times ($P<0.001$), in the middle and posterior third – 1.7 times

---

[29.] Цимарис, П., Кароунцос, В., Делегеороглу, Е. (Tsimaris, P., Karountsos, V., Delegeoroglu, E.) Обследование, тактика ведения и лечение врожденных аномалий влагалища в пубертатном периоде // – Москва: Репродуктивное здоровье детей и подростков, – 2019. № 2, – с. 25-35.

[30.] Jacquinet, A., Millar, D., Lehman, A. Etiologies of uterine malformations // Am. J. Med. Genet., – 2016, 170(8), – p. 2141-2172

(P<0.001) and in the organ as a whole – 1.7 times (P<0.001) less, the number of initial parts on the cut of the initial department of the glands in the anterior third of the vaginal vestibule is 1.9 times (P<0.001), in the middle third – 2.3 times (P<0.001), in the posterior third – 1.7 times (P<0.001) and in the organ as a whole – 1.9 times (P<0.001) less.

The area of the initial part of the glands in the anterior third of the vaginal vestibule is 1.2 times (P<0.01), in the middle third – 1.3 times (P<0.001), in the posterior third – 1.4 times (P<0.001) and in the organ as a whole – 1.3 times (P<0.001) less, the number of glandulocytes on the cut of the initial part in the anterior third of the vaginal vestibule is 1.5 times (P<0.05), in the middle third – 1.2 times (P<0.05), in the posterior third – 1.3 times (P<0.05) and in the organ as a whole - and 1.3 times (P<0.05) less than these indicators of the group comparisons.

On the contrary, with these anomalies, the percentage of the stroma in the initial section of the glands in the anterior third of the vaginal vestibule is 5.0 times (P<0.001), the middle third is 4.9 times (P<0.001), and the posterior third is 5.5. times (P<0.001) and in the organ as a whole – 5.3 times (P<0.001) more, the diameter of the lumen of the common excretory duct of the glands in the anterior third of the vestibule by 2.0 times (P<0.001), in the middle third by 1.8 times (P<0.001), in the posterior third by 1.5 times (P<0.001) and in on the whole – 1.7 times (P<0.001) more, compared with similar indicators in the comparison group.

Similar data were obtained by Б.М.Гусейнов (2011)[4] when studying small glands of the trachea with partial atresia of this organ. The author found that with atresia in the walls of the trachea, there is a decrease in the length, number, area of the initial sections, and the proportion of the parenchyma in the glands.

According to our data, the lymphoid apparatus of the vaginal vestibule in congenital anomalies of the internal female genital organs, as a rule, is represented by lymphoid nodules and diffuse lymphoid tissue. Both in the main group and the comparison

group, lymphoid nodules are observed along its entire length of the vaginal vestibule, many of which have a germinal center.

The cellular composition of all lymphoid formations of the vaginal vestibule of newborn girls with anomalies of the internal female genital organs is mainly represented by lymphocytes, there are macrophages, plasma cells, cells in a state of degeneration. In the case of anomalies, there are no typical intercellular associations in the composition of lymphoid formations, in contrast to the comparison group, or they are single.

With anomalies of the internal female genital organs, significant regression of the size-quantitative indicators of the lymphoid structures of the vaginal vestibule is determined.

So, in newborn girls with these anomalies, the percentage of lymphoid nodules in the anterior third of the vaginal vestibule wall is 2.5 times ($P<0.001$), in the middle third of the wall – 2.7 times ($P<0.001$), in the posterior third of the wall – 2.5 times ($P<0.001$) and in the organ as a whole – 2.6 times ($P<0.001$) less, the area of the lymphoid nodule in the anterior and middle wall of the vaginal vestibule is 1.5 times ($P<0.001$), in her back third walls by 1.8 times ($P<0.001$), and in the organ as a whole by 1.6 times, ($P<0.001$) less, the length of the lymphoid nodule in the anterior third of the vaginal vestibule wall by 1.4 times ($P<0.001$), in the middle wall – 1.7 times ($P<0.001$), in the posterior wall – 1.9 times ($P<0.001$) and in the organ as a whole – 1.7 times ($P<0.001$) less than in the group comparisons.

According to Г.Г.Аминова (2009),[18] the insignificance of the severity of lymphoid tissue may indicate a lack of functional maturity and inability to adequately support the processes of local immunity.

The revealed structural and dimensional changes correspond to a decrease in the content of lymphoid cells in all morphogenetic forms of lymphoid formations. So, compared with the control group, with anomalies of the internal female genital organs, the density of the location of cells of the lymphoid row decreases in diffuse

lymphoid tissue by 1.9 times (P<0.001), in lymphoid nodules without a germinal center by 1.6 times (P<0.05), in lymphoid nodules with a germinal center by 1.6 times (P<0.05) and the mantle zone of lymphoid nodules by 1.5 times (P<0.05).

With anomalies of the internal female genital organs, quantitative changes are accompanied by qualitative changes in the cellular composition of the lymphoid formations of the vaginal vestibule. Thus, in the composition of lymphoid nodules, the content of lymphocytes decreases (by 1.1-1.2 times, P<0.01), and cells of the lymphoid series in a state of mitosis (10.8-14.8 times, P<0.001). Moreover, with anomalies of the internal female genital organs, these cells in the composition of diffuse lymphoid tissue and the mantle of lymphoid nodules of the vaginal vestibule of newborn girls are detected sporadically or completely absent, which indicates a sharp suppression of lymphocytopoietic processes.

With anomalies of the internal female genital organs, the number of lymphoid cells with signs of destruction in all lymphoid formations increases significantly (6.7 times (P<0.05). Thus, with anomalies of the internal female genital organs with the preservation of the vaginal vestibule in newborn girls, the glandular and lymphoid apparatus of the vaginal vestibule undergoes significant regression. This is expressed by a decrease in the size and quantitative indicators, an increase in the proportion of the stroma, and an expansion of the excretory ducts of the glands. In the walls of the vaginal vestibule, the number, proportion, length, and area of lymphoid nodules, the density of the cells of the lymphoid series will decrease. Cell destruction in lymphoid formations increases. All the indicated information requires taking into account for a better understanding of the teratogenetic mechanisms of the emergence of these anomalies.

Our results are consistent with the data B.M. Guseynov (2011)[4]. The author found that, with partial tracheal atresia, regressive changes in the glandular apparatus of this organ are accompanied by a decrease in the "mass" of lymphoid formations.

With atresia in the walls of the organ, in contrast to the comparison group, lymphoid nodules disappear (or are detected only occasionally). Throughout the trachea, there is a decrease in the number of lymphoid cells in the diffuse lymphoid tissue, large lymphocytes, lymphoblasts, cells with a pattern of mitosis are almost not detected, which indicates a decrease in the level of lymphocyto-proliferative processes.

The experimental part of the study included an analysis of the structural characteristics of the lymphoid apparatus and small glands of the vestibule of rats after a course of naphthalan baths, which are widely and effectively used in balneological practice, including for nosological forms of gynecological profile.[31]

Such experimental-morphological studies have not been conducted before, therefore, the clinically proven effectiveness of this effect required structural justification.

After the course action of naphthalan baths in the mucous membrane of the vaginal vestibule, as in the control, by microscopic methods in rats, small glands of the vestibule are constantly determined. By visual examination, without using the morphometric method, differences with the control data are not determined. The glands are alveolar-tubular glands, with a mucous type of secretion (data were obtained according to Kreiberg, PAS-reaction). The nuclei of prismatic or cylindrical glandulocytes are bean-shaped, oval, or round. In the loose fibrous connective tissue of the stroma of the glands, there are always lymphoid formations in the form of strands of cells of the lymphoid row separating the adjacent initial parts and their groups.

Using the morphometric method, we studied the size-quantitative indicators of the small glands of the vaginal vestibule in rats subjected to a course effect of naphthalan baths. Thus, the

---

[31] Кязимов, Г.А. (Kyazimov, G.A.) Инновационные технологии в нафталанолечении (бальзам нафталан для ванн) // Тезисы научных работ III Всероссийского конгресса дерматовенерологов, – Казань: 27-30 октябрь, – 2009, – с.46.

thickness of the initial department of the glands of the walls of the vaginal vestibule in rats of the experimental group as a result of the course of naphthalan baths, in comparison with the control, in the walls of the anterior third of this organ by 1.52 times (P<0.01), it's middle in the posterior third - by 1.39 times (P<0.05) and for the organ as a whole – 1.42 times (P<0.05) more. The area of the initial department of the glands (on a cut) in rats of the experimental group as a result of a course of naphthalan baths, in the walls of the anterior third of the vaginal vestibule by 1.44 times (P<0.001), it's middle third - by 1.47 times (P<0.001), the posterior third – 1.45 times (P<0.001) and for the organ as a whole – 1.45 times (P<0.001) more, compared with the control. The number of initial parts in the initial department of small glands of the vaginal vestibule in rats of the experimental group as a result of the course of naphthalan baths, in comparison with the control, in the walls of the anterior third of the vaginal vestibule is 1.48 times (P<0.001), it's middle third is 1.66 times (P<0.01), the posterior third – 1.40 times (P<0.05) and for the vaginal vestibule as a whole – 1.52 times (P<0.01) more. In comparison with the control, as a result of the influence of naphthalan baths, the number of glandulocytes in the initial part of the small glands of the vaginal vestibule was 1.5 times (P<0.001), the percentage of the parenchyma of the glands – 1.1 times (P<0.001). It can be considered that the revealed facts are the "morphological equivalent" of an increase in the secretory activity of the glandular apparatus of this area. Then, the increase in the caliber of the excretory duct of the gland is also understandable, which ensures optimization of the drainage function of the glands.

It has been conclusively established that as a result of the course action of iodine-bromine and bituminous baths, the thickness of the initial sections of the glands of the larynx[3], trachea and main bronchi[4], urinary bladder of rats increases.[32]

---

[37]·Сеидова, З.Р. (Seidova, Z.R.) Лимфоидным аппарат гортани крыс при воздействии водных процедур с разным солевым составом: / автореферат дисс. кандидата медицинских наук. / – ¬Баку, – 2001, – 23 с.

The results showed that after the course action of naphthalan baths, diffuse lymphoid tissue, as in the control, is present on all micropreparations, located mainly under the multilayered integumentary epithelium. Many lymphoid nodules have a germinal center and a mantle zone. In all lymphoid formations of the mucous membrane of the vaginal vestibule (diffuse lymphoid tissue, lymphoid nodules), lymphocytes quantitatively predominate, cells in a state of mitosis, macrophages, plasma cells are constant, in contrast to the control, eosinophils are not detected.

As part of lymphoid formations, macrophage or plasmacytic - lymphocytic complexes are always determined, as well as an in-line (rows, chains) arrangement of lymphocytes. This is typical for diffuse lymphoid tissue and lymphoid nodules with or without a germinal center.

According to our data, as a result of the course of naphthalan baths, the number of lymphoid formations in the vaginal vestibule increases. Thus, the percentage of lymphoid nodules with a germinal center in the walls of the vaginal vestibule in rats of the experimental group as a result of the course of naphthalan baths compared with the control, in the walls of the anterior third of the vaginal vestibule by 1.97 times ($P<0.001$), it's middle third - by 1.90 times ($P<0.001$), the posterior third – 1.77 times ($P<0.001$) and for the vaginal vestibule as a whole – 1.86 times ($P<0.001$) more.

It should be remembered that the presence of proliferation centers in lymphoid nodules is considered as a state of high activity of lymphoid formations, as an equivalent of the optimal state of local immunity of the mucous membranes.[16]

According to the data obtained, the thickness of the lymphoid nodule with the germinal center in rats subjected to a course of naphthalan baths, in comparison with the control, increases in the walls of the anterior third of the vaginal vestibule by 1.59 times ($P<0.01$), it's middle third - by 1.42 times ($P<0.05$), the posterior third - 1.36 times ($P<0.05$) and for the vaginal vestibule as a whole – 1.44 times ($P<0.05$). The length of lymphoid nodules with a germinal

.

center in rats of the experimental group as a result of a course of naphthalan baths, in comparison with the control, in the walls of the anterior third of the vaginal vestibule by 1.64 times ($P<0.01$), it's middle third - by 1.59 times ($P<0.01$), the posterior third - by 1.52 times ($P<0.05$) and for the vaginal vestibule as a whole – 1.57 times ($P<0.01$) more. The area of lymphoid nodules with a germinal center in the walls of the vaginal vestibule in rats of the experimental group, in comparison with the control group, increases in the anterior third of the vaginal vestibule by 1.48 times ($P<0.01$), it's middle third - by 1.60 times ($P<0.01$), the posterior third - by 1.55 times ($P<0.05$) and for the vaginal vestibule as a whole - by 1.54 times ($P<0.01$).

After the course exposure to naphthalan baths, the thickness of the germinal center lymphoid nodules in the vaginal vestibule in rats of the experimental group, relative to the control, increases 1.7 times ($P<0.05$), the length of the germinal center – 1.6 times ($P<0.001$), it's the area on the cut is 1.8 times ($P<0.05$).

Concerning the control group, after the course exposure to naphthalan baths, the thickness of the lymphoid nodules without the germinal center of the vaginal vestibule in rats of the experimental group increases 2.1 times ($P<0.05$), it's length – 1.5 times ($P<0. 05$), it's area on the cut is 1.5 times ($P<0.05$).

We analyzed the cellular composition of the diffuse lymphoid tissue of the walls of the vaginal vestibule of rats subjected to an experimental course of exposure to naphthalan baths. It was found that as a result of the effect of the course of naphthalan baths in the walls of the vaginal vestibule in rats, the number of lymphoid cells increases. So, concerning the control group, the value of this indicator in diffuse lymphoid tissue exceeds 1.4 times ($P<0.05$), in lymphoid nodules without a germinal center – 1.3 times ($P<0.05$), in germinal centers lymphoid nodules and the mantle zone – 1.4 times ($P<0.05$). According to our data, the percentage of lymphocytes in diffuse lymphoid tissue after a course of naphthalan baths is 1.09 ($P<0.05$) times higher than in the control group. The percentage of lymphoid cells with a picture of mitosis in diffuse lymphoid

tissue after a course of naphthalan baths is 1.94 times higher than in the control group (P<0.001). As a result of exposure to naphthalan baths, the percentage of lymphocytes (the most active participants in the immune defense) and cells of the lymphoid series with a picture of mitosis in lymphoid nodules without a germinal center and in germinal centers increases. According to our data, in comparison with the control group, after exposure to naphthalan baths, the percentage of lymphoid cells with a picture of degeneration in diffuse lymphoid tissue is 2.29-2.42 times (P<0.001), in lymphoid nodules without a germinal center is 1.52-2.91 times (P<0.001), in the germinal centers 2.14 times (P<0.001) decreases.

In the experimental group, the relative number of macrophages in the composition of diffuse lymphoid tissue after a course of naphthalan baths is 1.62 times (P<0.001) less than in the control group. In the experimental group, the percentage of mast cells in the composition of diffuse lymphoid tissue after a course of naphthalan baths is 2.40 times less than in the control group (P<0.001). After a course of naphthalan baths, eosinophils are absent in the diffuse lymphoid tissue of the vaginal vestibule; in the control group, these cells are constantly present, but in minimal amounts.

These results of our research do not contradict the materials of T.S.Guseynov, S.T.Guseynov (2006)[33]. The authors showed that with iodine-bromine course effects in rats in the popliteal and inguinal lymph nodes, there are tendencies to an increase in the percentage of large and small lymphocytes, the area of lymphoid nodules on the cut.

According to N.T.Movsumov (2004)[3], B.M Guseynov. (2011)[4], T.M.Gasymova (2015)[17] glands and lymphoid structures of the larynx, trachea, urinary bladder, and pharynx of rats are highly sensitive to the effects of baths with different compositions. So, after the course effects of iodine- bromine and bituminous baths, the size

---

[33.]Гусейнов, Т.С. (Guseynov, T.S.) Морфология лимфоидных образований желудка при воздействии бальнеологических факторов / Т.С.Гусейнов, С.Т.Гусейнова. – Махачкала: Наука плюс, – 2006. – 140 с.

of the initial section, and the percentage of the parenchyma in the glands of these organs increase. In the walls of organs, the length of lymphoid nodules, the number of lymphoid cells in their composition, and diffuse lymphoid tissue, especially small and large lymphocytes, cells with a picture of mitosis also increase.

It should be noted that the positive effect of the influence of naphthalan baths on the state of the respiratory and cardiovascular systems has been convincingly proven in many years of balneological practice, in the treatment of balneological procedures in various groups of the population.[34]

Considering the above, it can be concluded that at present it is necessary to revise the existing recommendations for the use of naphthalan baths in medicine in the treatment of patients and the prevention of diseases of the female reproductive system.

Thus, as a result of the complex morphological study, specific data were obtained on the patterns of morphogenesis of the glandular and lymphoid apparatus of the vestibule vagina of the human in postnatal ontogenesis in normal conditions, with some anomalies in the development of internal female genital organs and on the morphological variability of these formations in experimental animals as a result of course effects of naphthalan baths. Thus, as a result of the comprehensive morphological study obtained specific data on the patterns of morphogenesis of the glandular and lymphoid apparatus of the vaginal vestibule of the human in postnatal ontogenesis. On rare anatomical material, data were obtained on the structural state of the glands and lymphoid formations of the vaginal vestibule with anomalies in the development of internal female genital organs. Theoretically and practically important information on the morphological variability of glandular and lymphoid formations in the vaginal vestibule in experimental animals was obtained as a result of course effects of naphthalan baths.

[34.]Сизякова, Л.А. Восстановительное лечение больных затяжной пневмонией с использованием природного нафталана: / автореферат дисс. кандидата медицинских наук. / – Москва, – 2010. – 26 с.

INFERENCES

1. There are numerous tubular-alveolar glands in the walls of the vaginal vestibule; they are formed by the birth of girls [1,2,6,14,22,24]. The greatest number and size of glands have noted in the 1st period of adulthood. Involutive changes in the small glands begin from the 2nd period of adulthood, which is manifested by: decreasing in the number and size of glands, increasing in the proportion of glands with an ampoule-shaped expanded common excretory duct, and by increasing in the content of stroma, also by the decreasing of glands with four or more initial parts [3,4,6,12,13,16,21,26].

2. Lymphoid formations on the human vaginal vestibule are represented by diffuse lymphoid tissue and lymphoid nodules, located mainly near the excretory ducts and the initial parts of the glands[5,36]. Lymphoid-glandular relationships are least pronounced in newborns, and to a maximum extent in reproductive age [25,27,35].

3. The lymphoid formations of the vaginal vestibule acquire maximum development in early childhood. Then involutive transformations are gradually noted. Involution of lymphoid tissue is manifested by a decrease in the number and size of lymphoid nodules, a decrease in the content of cells of the lymphoid row, an increase in the level of degenerative processes, which progressively grows to senile age [19].

4. Throughout postnatal ontogenesis, a gradient of dimensional indicators of small glands and lymphoid formations of the vaginal vestibule is observed. It is manifested by an increase in the number and size of glands in the direction from the anterior to the posterior third of the organ wall, and an increase in the percentage of glands of a simple form (with 1-2 sections) [3,8,13,28,33]. In the same direction, the size-quantitative indicators of lymphoid nodules and the number of cells of all forms of lymphoid tissue increase [24,34].

5. The number and size of glands, lymphoid formations of the vaginal vestiule are individually variable. The level of variability (amplitude of the variation series of indicators) mainly increases during postnatal ontogenesis. The amplitude of the variational series of dimensional indicators of the lymphoid structures in newborns and early childhood is more than that of women of adulthood periods, elderly and senile ages [29,30,37].

6. Morphometric indicators of small glands and lymphoid formations of the vaginal vestibule in women of reproductive age change during the ovarian-menstrual cycle. So, in the phase of secretion of the ovarian-menstrual cycle, the number and size of glands and lymphoid formations increase, in the desquamation phase, these indicators are minimal, and in the proliferative phase, they occupy an intermediate position [9,23].

7. With anomalies of the internal female genital organs with the preservation of the vaginal vestibule in newborn girls the glandular and lymphoid apparatus of the vaginal vestibule undergoes significant regression. This is expressed by a decrease in the size and quantitative indicators, an increase in the proportion of the stroma, and an expansion of the excretory ducts of the glands. In the walls of the vaginal vestibule, the number, proportion, length, and area of lymphoid nodules will decrease, the density of lymphoid cells will decrease, and cell destruction will increase. [7,11,20,34].

8. In the experimental part of the study, it was proved that the glands and lymphoid structures of the vaginal vestibule of the rats are highly sensitive to the effects of naphthalan baths. After the application of these baths throughout the vaginal vestibule, the formation processes in the small glands are activated, the thickness, length, and area of lymphoid nodules increase, the number of lymphoid cells, the content of lymphocytes and cells in mitosis decreases, and the level of cell destruction decreases [10,15,17,18,32].

PRACTICAL RECOMMENDATIONS

1. The obtained data can be useful for pathophysiologists in the analysis of the pathogenesis of numerous pathologies of the vaginal vestibule and gynecologists to improve the quality of treatment of various nosological forms of this area.

2. The results of the study can be used in the study of biopsies of the mucous membrane of the vaginal vestibule. Thus, the structural and dimensional indicators of the glands and lymphoid formations of this organ in women of different ages can normally be standards (norms) with which biopsy and sectional materials can be compared.

3. The data obtained can be used in further research, allowing the development of study and scientifically substantiate schemes for the prevention and treatment of various diseases that clinicians deal with in balneological practice.

4. The research results can be used in reports and monographs on morphological specialties, on issues related to diseases of the genital organs, as well as exocrinology, immunomorphology, and balneology.

5. The results obtained can find application in the educational process for teaching students in morphological disciplines, residents, and doctoral students in the specialty "obstetrics-gynecology", for the training of practicing doctors.

LIST OF PUBLISHED SCIENTIFIC WORKS ON THE DISSERTATION TOPIC

1. Шадлинская, С.В., Никитюк, Д.Б., Гусейнов, Б.М. Макро-микроанатомия и некоторые количественные показатели малых желез преддверия влагалища // – Баку: Здоровье, – 2017. №5, – с. 143-146.

2. Шадлинская, С.В. Макро-микроанатомия малых желез

преддверия влагалища // Сборник научных материалов международной конференции, посвященной к 80-летию со дня рождения профессора Р.И.Асфандярова, – Астрахань: – 22-23 сентябрь, – 2017, – с. 174-175.

3. Шадлинская, С.В., Никитюк, Д.Б., Гусейнов, Б.М. Возрастные и региональные особенности формы малых желез преддверия влагалища // – Тбилиси: Экспериментальная и клиническая медицина, – 2017. №5, – с. 15-18.

4. Шадлинская, С.В., Никитюк, Д.Б., Гусейнов, Б.М. О возрастных особенностях количества и формы малых желез преддверия влагалища // – Баку: Современные достижения азербайджанской медицины, – 2017. №4, – с. 241-245.

5. Шадлинская, С.В., Макромикроскопическая анатомия и особенности морфогенеза лимфоидных образований преддверия влагалища в постнатальном онтогенезе // – Баку: Азербайджанский медицинский журнал, – 2018. №1, – с. 94-99.

6. Шадлинская, С.В., Никитюк, Д.Б. Макро микроскопическая анатомия и закономерности морфогенеза малых желез преддверия влагалища в постнатальном онтогенезе // – Самара: Морфологические ведомости, – 2018. №1, – с. 42-45.

7. Шадлинская, С.В. Структурные особенности малых желез преддверия влагалища у новорожденных девочек с аномалиями внутренних половых органов // – Воронеж: Журнал анатомии и гистопатологии, – 2018, т.7, №3, – с .87-91.

8. Shadlinskaya, S.V. Age and regional features of the glands of the vaginal vestibule // – Brussel: Journal of morphology and anatomy, – 2018. 2(2), – p. 1-3.

9. Никитюк, Д.Б., Шадлинская, С.В. Изменчивость лимфоидных структур преддверия влагалища в разные фазы овариально-менструального цикла // – Уфа: Медицинский вестник Башкортостана, – 2018. №2, – с. 47-51.

10. Шадлинская, С.В., Никитюк, Д.Б., Гусейнов, Б.М. Структурные изменения малых желез преддверия влагалища после экспериментальных нафталановых ванн // – Астана:

Астана Медициналыг журналы, – 2018. №3, – с. 227-233.

11. Шадлинская, С.В., Гусейнов, Б.М. Лимфоидные образования преддверия влагалища новорожденных девочек при аномалиях внутренних половых органов // – Баку: Биомедицина. – 2018. №2, – с. 20-23.

12. Шадлинская, С.В., Никитюк, Д.Б., Гусейнов, Б.М. Возрастные морфометрические показатели малых желез Преддверия влагалища // Материалы XIV Конгресса Международной Ассоциации Морфологов, – Астрахань: – 19-20 сентябрь, – 2018. – Санкт-Петербург: Морфология, №3, – с.311.

13. Шадлинская, С.В., Никитюк, Д.Б. Возрастные изменения и локальные особенности железистого аппарата преддверия влагалища // – Санкт-Петербург: Морфология, – 2018. №5, – с. 45-49.

14. Никитюк, Д.Б., Шадлинская, С.В. Макромикроскопическая анатомия малых желез преддверия влагалища // Сборник материалов Международной научной конференции посвященной к 85-летию со дня рождения заслуженного деятеля науки, проф. Р.А.Аскерова. – Баку: 10 май, – 2018, – с.208-209.

15. Шадлинская, С.В. Клеточный состав мантии лимфоидных узелков стенок преддверия влагалища крыс после воздействие нафталановых ванн // Görkəmli oftalmoloq-alim, akademik Zərifə xanım Əliyevanın anadan olmasının 95-ci ildönümünə həsr olunmuş “Səhiyyədə müasir nailiyyətlər” mövzusunda konfransın materialları, – Bakı: 6 aprel, – 2018, – s. 235-236.

16. Шадлинская, С.В. Содержание стромы у малых желез преддверия влагалища в разные возрастные периоды внеутробного развития человека // Azərbaycan Xalq Cümhuriyyətinin 100 illiyinə həsr olunmuş Azərbaycan Tibb Universitetində keçirilən Otorinoloringologiya üzrə Beynəlxalq Elmi-praktiki Konqresın tezisləri, – Bakı: 27 aprel, – 2018, – s.125.

17. Shadlinskaya, S.V. The course effect of the naphthalan baths on the structural changes in the lymphoid apparatus of the

vaginal vestibule of parts // – Hannover: Archiv Euro Medica, – 2018. 8(2), – p. 43-46.

18. Шадлинская, С.В. Макромикроанатомические изменения лимфоидного аппарата преддверия влагалища крыс в эксперименте после курсового действия нафталановых ванн // Doktorantların və gənc tədqiqatçıların XII Respublika Elmi Konfransının materialları. Bakı: 22-23 noyabr, – 2018,− s. 153 -155.

19. Шадлинская, С.В. Клеточный состав и микроанатомия лимфоидных образований преддверия влагалища в постнатальном онтогенезе // – Москва: Сеченовский вестник, – 2019. т.10, №1, – с. 57-62.

20. Shadlinskaya, S.V. Size parameters of glands of the vaginal vestibule with anomalies of the genital organs // – Delhi: International Journal of Medicine Research, – 2019. 4(3), – p. 18-20.

21. Шадлинская, С.В. Возрастные особенности малых желез преддверия влагалища // – Уфа: Медицинский вестник Башкортостана, – 2019. т.14, №1, – с. 59-62.

22. Shadlinskaya, S.V. Microanatomy and misrosyntopy of the glandular apparatus of the vaginal vestibule // – Warsaw: East European Science Journal, 2019. l3(43), – p.66-70.

23. Шадлинская, С.В., Гусейнов Б.М. Микроанатомическая изменчивость малых желез преддверия влагалища на протяжении овориально-мениструального цикла // – Баку: Азербайджанский медицинский журнал, – 2019. №2, – с. 89-92.

24. Шадлинская, С.В. Микроанатомия и микросинтопия железистого аппарата преддверия влагалища // – Баку: Здоровье, – 2019. №5, – с. 137-142.

25. Шадлинская, С.В. Лимфоидно-железистые взаимоотношения в стенках преддверия влагалища // – Баку: Современные достижения азербайджанской медицины, – 2019. №3, – с. 75-78.

26. Шадлинская, С.В. Микроскопия железистого аппарата преддверия влагалища в разные возрастные периоды постнатального онтогенеза // “Tibbin görən gözü” Şüa diaqnostikasının aktual problemlərinə həsr olunmuş Beynəlxalq

Elmi-praktiki Konqresın materialları, – Bakı: – 30-31 mart, – 2019, – s. 278.

27. Шадлинская, С.В. Интенсивность лимфоидно-железистых взаимоотношений на протяжении постнатального онтогенеза // Сборник материалов Международной научно-практической конференции, посвященной 100-летию кафедры анатомии человека и медицинской терминологии Азербайджанского медицинского университета. – Баку: – 10-11 декабрь, –2019, – с. 152-153.

28. Шадлинская, С.В. Градиент количественно-размерных показателей малых желез преддверия влагалища в постнатальном онтогенеза человека // Doktorantların və gənc tədqiqatçıların XIII Respublika Elmi Konfransının materialları. Bakı: – 3-4 dekabr, – 2019, – s. 278.

29. Шадлинская, С.В. О некоторых размерных показателях малых желёз преддверия влагалиша // – Bakı: Ə.Əliyev adına elmi-praktik jurnal "Elm və tibb", – 2019. №3, – s. 81-86.

30. Шадлинская, С.В. Индивидуальные особенности размерно-количественных показателей числа гландулоцитов в составе малых желез преддверия влагалища // – Баку: Журнал теоретической, клинической и экспериментальной морфологии. 2019, №3-4, с.128-132.

31. Şadlinskaya, S.V., Mövsümov, N.T. Qocalıq dövrü olan qadınların uşaqlıq borularındakı limfoid aparatın bəzi morfoloji xüsusiyyətləri // – Bakı: Nəzəri, klinik və eksperimental morfologiya jurnalı. – 2019. №3-4, – s.78-82.

32. Shadlinskaya, S.V. Features of the density of the location and changes in the cellular composition of the lymphoid formations of the vaginal vestibule of rats after a course of naphthalan baths // – Baku: Journal of life sciences and biomedicine. – 2019.1(1),–p.83-86

33. Shadlinskaya, S.V. Huseynov B.M. Qasimova T.M. [et al] Regional variability of the area of the small glands of the vestibule of vagina at different ages // Materials of the 27th International Symposium on Morphological Sciences. Annals of Anatomy, – 2020,

№ 228S, – p.44-45

34. Шадлинская, С.В. Морфологическая характеристика желез и лимфоидных образований преддверия влагалища в норме, при некоторых аномалиях внутренних половых органов и в эксперименте // – Баку: Современные достижения азербайджанской медицины, – 2020. №2, – с.84-92

35. Шадлинская, С.В. Микроанатомия лимфоидных образований стенок преддверия влагалища и лимфоидно-железистые взаимоотношения с малыми железами этого органа // Материалы XV конгресса Международной ассоциации морфологов. Ханты-Мансийск: – 19-20 сентябрь, – 2020. – Санкт-Петербург: Морфология, №2-3, – с.239.

36. Шадлинская, С.В. Микроскопические особенности топографии малых желез преддверия влагалища женщин в постнатальном онтогенезе // Azərbaycan Tibb Universitetinin yaradılmasının 90 illik yubileyinə həsr olunmuş beynəlxalqa elmi konfransın materialları – Bakı: – 10-11 dekabr, –2020, – s. 365.

37. Shadlinskaya, S.V.Macromicroscopic characteristics of individual and aged variability of the glands of the vaginal vestibule // – Hannover: Archiv Euro Medica, – 2021, 2(1), – p. 52-55.

The defense will be held on 17 september 2021 at 11^{00} at the meeting of the Dissertation council FD 2.08 of Supreme Attestation Commission under the President of the Republic of Azerbaijan operating at Azerbaijan Medical University

Address: Az 1078.Baku city, S. Vurgun street 163 (conference hall of the Department of Human Anatomy and Medical Terminology)

Dissertation is accessible at the Azerbaijan Medical University Library

Electronic versions of dissertation and its abstract are available on the official website of the Azerbaijan Medical University (https://www.amu.edu.az)

Abstract was sent to the required addresses on 8 july 2021

Signed for print: 7.06.2021

Paper format: A5

Volume: 77082 characters

Number of hard copies: 20