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MACROMICROSCOPIC CHARACTERISTICS OF INDIVIDUAL AND AGED VARIABILITY OF THE GLANDS OF THE VAGINAL VESTIBULE

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ABSTRACT — Our study aimed to obtain data on the age and individual characteristics of the glands of the vaginal vestibule in postnatal human ontogenesis.
MATERIAL AND RESEARCH METHODS. By the macromicroscopic way, the small glands of the vaginal vestibule wall were investigated in cadavers of 163 women of different ages without pathology of the urogenital system. The total number, length, width, density of location, the area of the initial section, the diameter of the common excretory duct of the glands, the number of glands with ampoule-widened excretory ducts, and glands were determined.
THE RESULTS OF THE STUDY. The conducted macromicroscopic examination made it possible to reveal that the maximum number and size of small vestibular glands are determined in the 1st period of adulthood. Starting from the 2nd period of adulthood and up to old age inclusive, there is a decrease in these indicators. The minimum level of individual variability in the size and number of small glands of the vestibule is characteristic in ontogeny for the neonatal period.

KEYWORDS — Glands, vaginal vestibule, sample preparations, common excretory duct, initial parts.

INTRODUCTION

Morphological exocrinology is in the focus of the attention of anatomists, histologists, pathologists, and clinicians of various specialties. This is due not only to the need to expand theoretical knowledge, but also to decipher the pathogenesis of numerous nosological forms, in the development of which the small glands of hollow organs are involved [1].

As is known, the source of adenogenic vaginal cancer is the epithelium of the small vaginal glands [2]. The glands of the vaginal vestibule are also affected by fibroadenomatous pathology [3], they are exposed to abscesses, diverticulitis [4], and polyps of the vestibule of the vagina are not uncommon [5].

Despite this, among the meager work carried out on the study of the glands of the genitourinary apparatus, there is almost no work on the topic of the glands of the vaginal vestibule. The only targeted research on the macromicroscopic anatomy of the vestibular small glands was carried out only in the middle of the XX century [6].

The study aimed to obtain data on the aged and individual characteristics of the glands of the vaginal vestibule in human postnatal ontogenesis.

MATERIAL AND METHODS

By the macromicroscopic way, the small glands of the vaginal vestibule wall were investigated in 163 women of different ages who died or died from accidental causes, without pathology of the urogenital system. On the cadavers, the area of the vaginal vestibule was excised by dissection. On the preparations obtained, the vaginal vestibules were stained according to the method of R.D. Sinelnikov [7]. For this, the vaginal area was excised from the cadaver by dissection. To make an anatomic resection, the actual material was placed in a 0.5% solution of acetic acid with 0.05% methylene blue solution in tap water. The glands in this solution were stained for 24–36 hours. Then, within 24–30 hours, the vaginal preparation was fixed in a saturated solution of ammonium molybdate. Then the preparation was placed in glycerol and fixative solution, where the bleached preparation was preserved.

After that the glands were examined in transmitted and reflected light using a forehead magnifier and an MBS-9 microscope (magnification 8–64×). The vaginal vestibule was preliminarily divided by transverse threads into anterior, middle, and posterior thirds. All measurements of the study were taken separately in the above zones.

During the macromicroscopic study, the total number of glands, the number of glands with ampoule-widened excretory ducts, the number of glands with ampoule-widened excretory ducts, and the density of the glands were counted.

The length, width, area of the initial department and the diameter of the common excretory duct were measured. We also analyzed the percentage of glands with a different number of initial departments (the total set of glands on the total preparation was taken as 100%).

The digital data obtained in the course of the study were subjected to statistical processing. The mean

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), within a group with the first parameter (P_1), within a group with a maximum (P_2). For a preliminary assessment of the difference between the variation series, the parametric Student's t-test was used. Further, to compare and determine the reliability of quantitative differences in groups and subgroups, the nonparametric rank U-Wilcoxon (Mann-Whitney) test was used [8].

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

RESEARCH RESULTS

Glands on total preparations 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) thirds of the wall of the vaginal vestibule. The glands are located singly or in groups and do not form longitudinal rows.

At the macro-microscopic level, the initial departments and excretory ducts are revealed in the glands. The shape of the initial departments of the glands is diverse, more often ovoid or rounded.

Initial departments of various numbers are identified in the composition of glands. Their number varies from one up to four or six and more. According to our data, the maximum number of initial departments of a single gland reaches 15.

The results of a study of the age characteristics of the glands of the vaginal vestibule in women normally showed that the glands are constantly (in 100% of cases) determined already in newborns.

The number of glands of the vaginal vestibule in early childhood by 1.5 times (P <0.05), in adolescence by 2.0 times (P <0.05), and in the 1st period of adulthood by 2.8 times (P <0.05) is more than in newborns. This parameter in elderly age is 1.4 times (P <0.05), in senile age, it is 1.7 times (P <0.05) less than in the 1st period of adulthood (Table 1).

The length of the initial section of the glands in girls of early childhood is 1.4 times (P <0.05), at puberty 2.6 times (P <0.05), and in women at the 1st period of adulthood, 3.7 times (P <0.05) more than in newborns. This indicator for the glands of the vaginal vestibule at the elderly age is 1.3 times (P <0.05), at senile age is 1.6 times (P <0.05) less than in women at the 1st period of adulthood (Table 2).

According to the data obtained, the width of the initial department in early childhood is 1.4 times (P <0.05), at puberty — 2.6 times (P <0.05), at the 1st period adulthood 3.5 times (P <0.05) more than newborn girls. This indicator at the elderly age 1.3 times (P <0.05), at senile age 1.4 times (P <0.05) is less than in the 1st period adulthood.

The area of the initial department of glands increases in early childhood by 1.2 times (P> 0.05), at puberty by 1.7 times (P1> 0.05), at the 1st period adulthood by 2.2 times (P> 0.05), compared with newborn girls. In comparison with the 1st period adulthood, the considered indicator at elderly aged women decreases 1.4 times (P> 0.05), at senile age — 1.4 times (P> 0.05).

We have identified age-related variability in the percentage of glands with different numbers of initial departments of the glands of the vaginal vestibule. So, the percentage of glands with one initial department in early childhood decreases by 1.1 times (P <0.05), at puberty by 1.4 times (P <0.05), at the 1st period adulthood 1.7 times (p <0.05), compared with newborn girls. In senile 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 departments in early childhood increases 1.6 times (P <0.05), at puberty — 2.5 times (P <0.05), at the 1st period of adulthood — 4.7 times (P <0.05), compared with newborn girls. This indicator in senile age is 1.4 times less (P <0.05) than in the 1st period of adulthood. The percentage of glands with three initial departments in early childhood increases by 2.2 times (P <0.05), at puberty — 3.4 times (p <0.05), at 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 departments in early childhood increases by 1.1 times (P <0.05), at puberty — 3.3 times (P <0.05), at the 1st period of adulthood — 5.0 times (P <0.05), compared with newborns. The number of these glands at senile age is 1.9 times less (P <0.05), compared with the 1st period of adulthood.

We have found that the number and size of the glands of the vaginal vestibule are individually variable. The level of variability (the amplitude of the variation 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 department of the small glands of the vaginal vestibule at 22–35 years 1.7 times (P <0.05), the width of the initial department are 1.6 and 1.8 times respectively (P <0.05), the diameter of the common excretory duct are 1.4 and 1.9 times (P <0.05) are larger.

The individual minimum and maximum size-quantitative indicators of the glands in the walls of

Table 1. *The total number of small glands of the vaginal vestibule (the number of orifices of the excretory ducts on the surface of the mucous membrane) in women of different ages*

Age	N	Part of the vaginal vestibule, the number of the small glands			
		Anterior third	Middle third	Posterior third	The vaginal vestibule in general
Newborns (from 1 to 10 days)	7	14±0,81 8–18	18±0,54 16–22	22±0,56 16–26	54±1,74 41–62
Infancy (from 10 days to 1 year)	5	18±0,62 12–23	24± 0,75 16–29	26± 0,87 18–33	68± 1,74 48–77
Early childhood (1–3 years)	5	22±1,09 15–26	28± 1,18 21–33	32± 1,50 24–39	82± 4,62* 69–111
1st childhood (4–7 years)	6	23±0,87 17–26	30± 1,09* 24–35	36± 1,61 26–42	89± 5,35* 73–126
2nd childhood (8–11 years)	6	25±1,1* 19–28	35±1,45* 25–39	42±1,31* 35–49	102±5,12* 79–128
Puberty (12–15 years)	5	28±1,11* 22–35	36±1,02* 32–42	44±1,11* 36–49	108±4,50* 81–133
Adolescence (16–20 years)	6	30±0,35* 26–34	38±0,47* 33–45	47±0,65* 38–54	115±2,75* 92–157
1st adulthood (22–35 years)	8	36±0,55* 28–42	52±0,46* 45–56	64±0,72* 52–69	152±2,70* 121–185
2nd adulthood (36–55 years)	8	32±0,37* 25–36	43±0,41* 37–49	54±0,75* 46–67	129±1,16* 111–142
Elderly (56–74 years)	9	24±0,41 18–31	36±0,42* 28–43	45±0,50* 35–52	105±1,16* 86–124
Senile (75–90 years)	9	18±0,36 13–24	32±0,41* 26–38	39±0,63* 30–48	89±1,61* 68–113

Note. *Here and in the following table means: 1. n — number of observations; 2. Statistically significant difference within the group with the first parameter: * — P <0.05*

Table 2. *The length of the initial department of the small glands of the vaginal vestibule of the vagina in women of different ages (mm)*

Age	N	Part of the vaginal vestibule, the length of the initial department of the glands			
		Anterior third	Middle third	Posterior Third	The vaginal vestibule in general
Newborns(from 1 to 10 days)	7	0,11±0,01 0,08–0,14	0,22±0,01 0,17–0,26	0,25±0,01 0,20–0,29	0,19±0,01 0,16–0,22
Infancy (from 10 days to 1 year)	5	0,16±0,01 0,11–0,21	0,24±0,01 0,17–0,28	0,28±0,01 0,21–0,33	0,23±0,01 0,18–0,29
Early childhood (1–3 years)	5	0,19± 0,01* 0,14–0,25	0,29± 0,01 0,22–0,35	0,35± 0,01 0,27–0,38	0,27± 0,01* 0,23–0,35
1st childhood (4–7 years)	6	0,24± 0,010,33–0,18 *	0,33± 0,01 0,26–0,38	0,45± 0,01* 0,31–0,54	0,34± 0,01* 0,27–0,41
2nd childhood (8–11 years)	6	0,30± 0,010,43–0,22 *	0,40± 0,01* 0,27–0,48	0,55± 0,01* 0,37–0,61	0,42± 0,01* 0,30–0,48
Puberty (12–15 years)	5	0,35± 0,01*0,42–0,27 *	0,48± 0,01* 0,36–0,55	0,64± 0,01* 0,50–0,76	0,49± 0,01* 0,37–0,59
Adolescence (16–20 years)	6	0,41± 0,010,48–0,33 *	0,55± 0,01* 0,37–0,66	0,80± 0,01* 0,64–0,96	0,59± 0,01* 0,37–0,72
1st adulthood (22–35 years)	8	0,46± 0,01*0,54–0,35 *	0,76± 0,01* 0,54–0,97	0,92± 0,01* 0,68–1,12	0,71± 0,01* 0,55–0,95
2nd adulthood (36–55 years)	8	0,33± 0,010,52–0,22 *	0,70± 0,01* 0,51–0,87	0,84± 0,01* 0,68–1,03	0,62± 0,01* 0,51–0,85
Elderly (56–74 years)	9	0,28±0,010,46–0,18 *	0,57±0,01* 0,26–0,71	0,75±0,02* 0,37–0,85	0,53±0,01* 0,31–0,73
Senile (75–90 years)	9	0,26±0,010,42–0,16 *	0,45±0,01* 0,25–0,60	0,63±0,03* 0,33–0,83	0,45±0,02* 0,26–0,63

both the vaginal vestibule as a whole, and the anterior, middle, and posterior thirds of it, increase from the neonatal period to the 1st period of adulthood and then decrease to the elderly, senile age.

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

DISCUSSION

So, at the macro-microscopic level, the initial departments (one or more) and excretory ducts are revealed in the glands of the vaginal vestibule.

M.R.Sapin, D.B. D. B. Nikityuk, V. B. Shadlinski, N. T. Movsumov et al. (2001) indicate that the excretory duct of the small glands of the walls of hollow internal organs can be preformed anatomically. At the same time, given the asynchronous nature of the secretory process, periodic weakening of secretion (for example, with involution of the glands), and antigenic materials are not always washed out from the lumen of the gland [9].

The analysis showed that the small glands of the vaginal vestibule are fully formed by the time the child is born and is capable of active secretion. This is due to a qualitative change in vital activity immediately after birth, the need to implement a protective function to the integumentary epithelium of the vestibule of the vagina (from mechanical damage, microorganisms, etc.). The study on total preparations of the age characteris-

tics of the glands of the vaginal vestibule showed that from the neonatal period to the 1st period of adulthood, the number of glands, length, width, and area of the initial departments increase. At this age, the shape of the glands is the most diverse, which is also typical for the glands of the majority of the mucous membranes of the hollow organs of the genitourinary apparatus, respiratory and digestive systems [10, 11, 12].

Starting from the 2nd period of adulthood and up to senile age, inclusive, there is a decrease in the indicated size-quantitative indicators of the glands of the vaginal vestibule.

In senile age, the shape of the glands (their exterior) is also simplified — the percentage of glands with three, four, or more initial departments (complex-shaped glands) decreases, and the content of simple-shaped glands increases (i.e. with one initial department).

Simplification of the *exterior* of the glandular apparatus is also typical for the walls of other hollow internal organs of the genitourinary apparatus, digestive and respiratory systems [9].

The variability of the dimensional and quantitative indicators revealed by us is also characteristic of other glands of hollow organs. So, according to M.K. Allahverdiyev (2007), B.M. Huseynov (2011), G.A. Huseynova (2013), on the shape, size, and the number of glands in the walls of the biliary tract, urinary bladder, female urethra, trachea, and main bronchi is also characterized by significant individual anatomical variability. According to these researchers, the individual structural features of the glands are least pronounced during the neonatal period, and most - in the elderly and senile age [10, 11, 12].

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. The lower level of individual variability of 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, perhaps, depends on the characteristics of personal hygiene, the level of intimate relationships, past diseases, and other factors [1].

CONCLUSION

Thus, the performed macro-microscopic analysis made it possible to reveal previously unknown facts about the morphogenesis of the small glands of the vestibule and the individual variability of the glandular apparatus.

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