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Morphologıcal characterıstıcs of glands with s-shaped curvature ın general excretory duct on the walls of the human urınary bladder

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Abstract
The wall elements of the tubular organs were investigated by different scientific works. However, the general excretory duct apparatus of the small glands in the walls of urinary bladder has not been examined for its age, individual or genital characteristics.The aim of the research is to investigate the general excretory duct of the glands in the urinary bladder wall, its direction, morphological changes (width, diverticulum, S-shaped curvature, and ect.) and frequency, age, individual and regional characteristics in postnatal ontogenesis.The investigation was carried out on 34 cadavers using macro-microscopic and histological methods. According to the results of the investigation, in the 1st mature period of postnatal ontogenesis, the quantity and density of all glands of the urinary bladder and the area and the quantity of excretion cells of the alveoli increase, also the proximal portions of the ductal apparatus of the glands expand. These signs are closely related to the "morphological equivalent of function". The general excretory duct of the glands on the urinary bladder wall has a straight direction or a curvature arc. Some glands also form an S-shaped curvature in old age. In contrast, the distal part of the general ductus dilates in the elderly and is expanding near the duct foramen. The quantity of the glands with S-shaped curvature on the urinary bladder, compared with newborns, increases in the 1st period of adulthood by 8.3 times ($p < 0.05$), in older people by 9.6 times ($p < 0.05$), in senile age 12.5 times ($p < 0.05$). The individual minimum and maximum percentages of glands with an S-shaped curvature of the general excretory duct in the urinary bladder gradually increase from the neonatal period to senile age.The exclusion of the minimum and maximum values of the glands that make the general duct S-shaped curvature in the urinary bladder wall also increases in maturity and old ages. The diapers on the wall of human urinary bladder glands having a general excretory duct with S-shaped curvature or bulb-shaped widths are also characterized by regionality. Our studies have shown that the quantity of these glands is less in the upper third of the bladder wall than in the middle and lower third of all age groups in postnatal ontogenesis. In this aspect, like the sphincters of the tubular and cavitated organs, the sphincters of the urinary bladder are correct in a similar structure plan (triple muscle and compressed nerves, veins) direction the urine and prevent urinary reflux - urine escaping back to the ureters and kidneys. This is related to the location and functional-morphological proximity of the urethral sphincters and internal urethral sphincter in the lower third of the urinary bladder.

Keywords: postnatal ontogenesis, urinary bladder, gland, generally excretory duct, S- shaped curvature

Introduction
The structure of the glands in the walls of different inner organs, the laws of their morphogenesis have been studied in sufficient details [5, 6, 8, 10]. In the literature, there are a large quantity of works devoted to age, field, regional and individual characteristics of the glands of tubular and hollow organs [1, 3, 7]. They also have established the principles of the structure of the excretory ducts of the glandular apparatus. The ducts of the glands of the wall of the bladder and their age, regional and individual characteristics in the literature are not well understood [4, 11, 12]. The excretory ducts of the glands located in the thickness of the wall of the inner organs, including the urinary ones, which can be the entrance gate for penetration into of the genetic foreign material. The latter are not always washed out during secretion, due to asynchrony of secretion [8, 9]. These problems are especially important in elderly people, when urinary incontinence and other dysuric phenomena, cystitis become not only a medical, but also a social problem [4].

Purpose of the Investigation
The aim of the investigation is to determine the morphological – age, regional, individual features of the excretory ducts of the human urinary bladder glands in different age periods of postnatal ontogenesis – from newborn to senile period, without a pathology to device urine-genital.

Material and Methods
On 34 preparations of the bladder wall obtained from the corpses of people of different ages, we studied the ductal apparatus of the glands, after staining with a 0.05% methylene blue solution by D.R. Sinelnikov. The investigated material, which was divided into groups, according to the generally accepted scheme of age periodization. Urinary bladder ducts were examined in three (upper, middle, and lower) parts of the organ. 100% took the total quantity of the glands on the prepares. To obtain micropreparations of the bladder glands, sections with a thickness of 5-7 μm were stained with hematoxylin-eosin, according to van Gieson, Weigert, Kreiberg, selectively the SIR reaction. The percentage and the arithmetic means value of glands with an S-shaped bend of the general excretory duct were calculated for each part of the bladder. Using the ocular mesh, the area of the mouths of the glands excretory ducts was also studied.

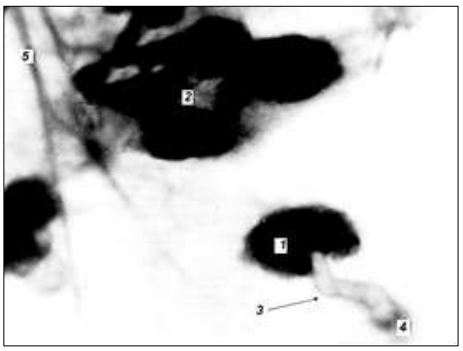

Fig 1: The combination of the group and single location of the glands of the urinary bladder in a man 72 years old. The upper third. View from the integument epithelium. 1-single location of the gland; 2-group arrangement of glands; 3-S-shaped bend of the common excretory duct; 4-mouth of the common excretory duct; 5-intraorgan nerves. By R.D. Sinelnikov metod. Increase 30x.

Research Results and Discussion

After staining, the glands acquired a dark color and have clear contours (fig.). They count from one to seven alveoli departments. The excretory duct of the first order departs from each department. When they are connected, a general excretory duct is formed, which is directed to the integumentary epithelium, where it opens with foramen on the surface of the plica and between the plica. In this regard, the ductus is the entry gate of foreign particles to the internal environment of the body. Morphological differences in different ages of the postnatal ontogeny related to this probably affect the course of the disease [8, 11]. The ducts of the glands have a rectilinear and arcuate direction, expanding towards the mouth of the glands ducts, especially in the elderly and senile age, an ampoule-shaped expansion, S-shaped bends and lateral diverticula (fig.). The ducts of the glands are in close microtopographic relationships with lymphoid formations - lymphoid nodules without reproduction centers and diffuse lymphoid tissue. Lymphoid formations, performing a protective function, surround the excretory ducts, and prevent the penetration of microorganisms and foreign antigens through them deep into the walls of the organ. Foreign antigens are not always washed away by secret. This is due to asynchrony and the presence of biorhythms in the secretory process [9]. In the 1st mature period of postnatal ontogenesis, the quantity all glands of a urinary bladder and of a secretory cell – glandulocytes, their area of the alveoli increase, together with that, the proximal sections of the general ductus of the glands expand (diagram 1). Obviously, the identified features are "morphological equivalent functions", i.e. maximum secretory activity of the gland. Therefore, the expansion of its excretory duct (2.5 times, $p < 0.05$) provides optimization of the drainage function of the gland. According to the authors, the maximum development of the glands of the mucous membranes of the predominant majority of hollow and tubular internal organs also occurs at 22-35 years of age, when their size, quantity and secretory activity are most pronounced [8.9]. In the walls of the urinary bladder the quantity of the glands, in comparison with newborn children, increases in early childhood – by 1.2 times ($p > 0.05$), in adolescents – by 1.6 times ($p < 0.05$), in the 1st maturity period – 2.0 times ($p > 0.05$). In the walls of the bladder the density of glands (diagram 2), in comparison with newborn children, decreases in early childhood - 1.3 times ($p > 0.05$), in teenage - 1.9 times ($p < 0, 05$), in the 1st period of mature age - 2.3 times ($p < 0.05$), in the elderly it decreases 3.5 times ($p < 0.05$), in senile age - 6.6 times ($p < 0.05$). However, the mouth of the generally duct has a maximum area in old age (diagram 3). So, according to the study, age-related features characterize the macroscopic and microanatomical parameters of the ducts of the glands of the bladder. The area of the mouth of the excretory duct throughout postnatal ontogenesis is constantly increasing, which is typical for other exocrine glands. This feature is characteristic of all parts of the urinary bladder wall. Thus, the area of the generally ducts of the glands in old age increases compared with newborns, in the upper and middle third of the wall by 4.2 ($p < 0.05$), the distal third by 3.4 ($p < 0.05$), and in general the urinary bladder 3.9 times ($p < 0.05$, diagram 3).

At the same time, the percentage of the urinary bladder glands with S-shaped bends, ampoules, and lateral blind diverticula on the generally excretory duct increases in old age (diagram 4, table). The quantity of the glands with S-shaped curvature on the urinary bladder, compared with newborns, increases in the 1st period of adulthood by 8.3 times ($p < 0.05$), in older people by 9.6 times ($p < 0.05$), in senile age 12.5 times ($p < 0.05$). In senile and old ages compared with newborns, the percentage of glands with S-shaped curvature in general duct increases in the upper third of the wall by 11.9 ($p < 0.05$), in the middle third by 14.2 ($p < 0.05$), the lower third and the area of sphincters in 14.7 ($p < 0.05$), and in the whole urinary bladder 13.9 times ($p < 0.05$) (table). Apparently, the mucous secretion of the glands of the bladder in the areas of sphincters is secreted more due to the influence of micros calculi, foreign substances, which are always present in the urine even in healthy people [11]. The presence of ampoule-shaped extensions has a compensatory-adaptive value. So, they are able to fulfill the function of peculiar reservoirs, where the secretion of glands accumulates. This is especially important in the elderly, senile ages, i.e. in conditions of involuntary hyposecretion of the gland [8, 9, 11].

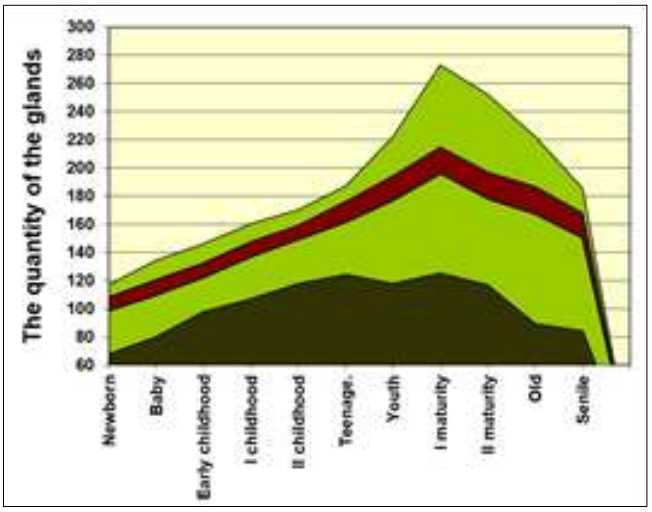

Diagram 1: The quantity of the urinary bladder glands in different periods of postnatal ontogenesis.

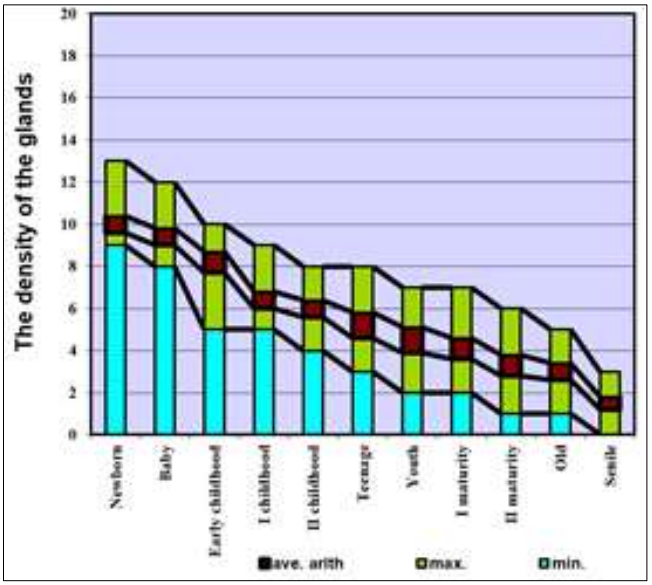

Diagram 2: The density of the urinary bladder glands in different periods of postnatal ontogenesis.

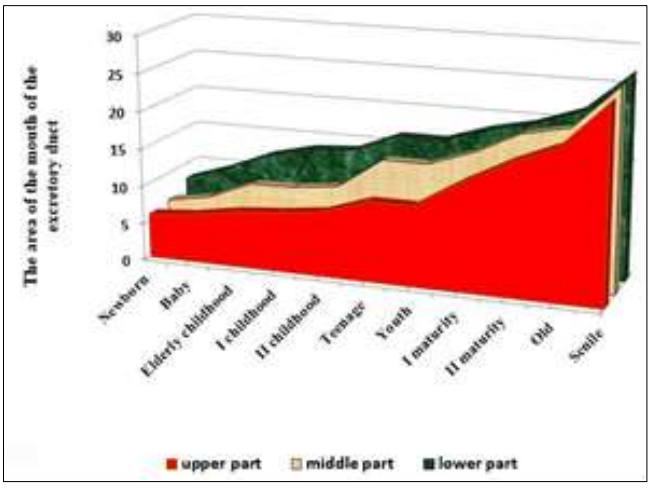

Diagram 3: The area of the mouth of the generally ducts of the urinary bladder glands in different periods of postnatal ontogenesis.

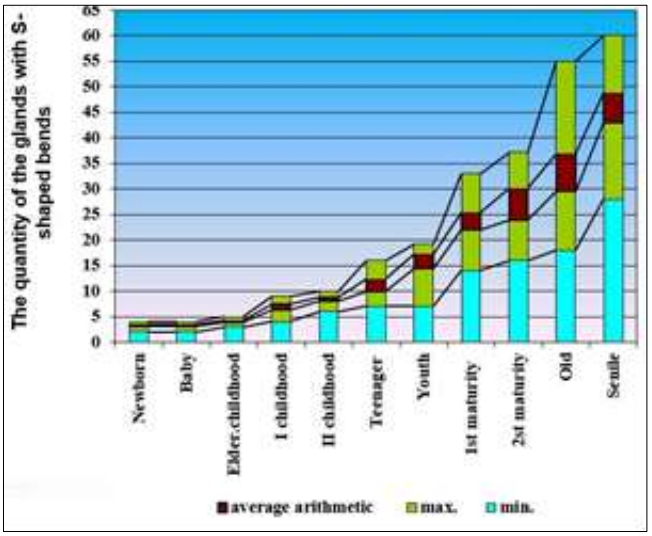

Diagram 4: The quantity of the general excretory ducts with S-shaped bends of a urinary bladder glands, in different periods of postnatal ontogenesis.

Table 1: The quantity of glands with an S-shaped curvature in general duct on different parts of human urinary bladder in postnatal ontogenesis *(X±Sx; min-max, in %)*

Age	n	The quantity of glands with an S-shaped curvature in general duct, the different parts of human urinary bladder			
		Upper part	**Middle part**	**Lower part**	**Urinary bladder**
Newborn	3	3,0± 0,3 1-4	3,2± 0,2 2-4	3,8±0,2 2-4	3,3±0,2 2-4
Baby	3	3,0±0,2 2-4	3,3±0,2 2-4	3,8±0,2 2-4	3,3±0,2 2-4
Early childhood	3	3,5± 0,2 2-4	4,0± 0,2 3-5	4,5± 0,2 3-5	4,0± 0,2 3-5
I childhood	4	5,4± 0,4 4-8	7,5± 0,4 4-9	7,9± 0,5 4-9	6,9± 0,6 4-9
II childhood	3	7,0± 0,4 5-9	8,8± 0,4 6-10	9,5± 0,4 7-11	8,4± 0,4 6-10
Teenager	3	9,5± 0,8 6-13	10,5± 1,1 7-16	13,4± 1,3 8-19	11,1±1,2 7-16
Youth	3	11,9± 1,0 6-14	15,7±1,3 8-19	19,8±1,9 8-24	15,8±1,4 7-19
I maturity	3	21,5±2,2 11-33	29,6±2,1 15-36	35,2± 2,0 22-42	28,7±1,7 19-38
II maturity	3	22,0±2,2 12-34	26,6± 3,0 14-44	32,4± 3,0 24-54	27,0±3,1 16-47
Old	3	27,2± 2,3 15-38	32,3± 3,1 17-48	37,8± 4,0 26-66	33,2± 3,7 18-55
Senile	3	35,6±2,1 24-45	45,7± 2,9 28-57	56,3±3,7 32-69	45,9±2,9 28-60

Note:
1. n - the number of the observations;
2. $X±S_x$ – the middle arithmetic;
3. min-max – individual variability;
4. % - the quantity of glands in preparation.

Morphometric analysis showed that regional features also characterize the features of the general duct of the bladder glands (see table). Therefore, in postnatal ontogenesis, compared to the upper third of the organ in the lower third of the urinary bladder, the expansion of the general duct is 1.3-1.5 ($p < 0.05$) times, and the percentage of the glands with a general duct S-shaped curvature is 1.2-1.6 times ($p < 0.05$) increases. Individual features characterize the morphometry parameters of the general duct of the urinary bladder glands. The minimum and maximum exclusions of the general gland ducts with S-shaped curvatures, ampules, and lateral blind diverticula increase during the last age of postnatal ontogenesis, their limit of variation in their ductus parameters is quite wide at the old stages.

Conclusion

1. The all glands and general excretory glands ducts with S-shaped curvature in the walls of the human urinary bladder in postnatal ontogenesis are characterized with the age features. In the 1st mature period of postnatal ontogenesis, the quantity and density of all glands of the urinary bladder and the area, the quantity of excretion cells of the alveoli increase, also the proximal portions of the ductal apparatus of the glands expand. The quantity of the glands with S-shaped curvature on the urinary bladder, compared with newborns increases in the 1st period of adulthood by 8.3 times ($p < 0.05$), in older people by 9.6 times ($p < 0.05$), in senile age 12.5 times ($p < 0.05$). In old age the general excretory duct is expanding near the duct foramen.
2. The all glands and general excretory glands ducts with S-shaped curvature in the walls of the human urinary bladder in postnatal ontogenesis are characterized with the individual features. The individual minimum and maximum percentages of glands with an S-shaped curvature of the general excretory duct in the urinary bladder gradually increase from the newborn period to senile age.
3. The all glands and glands with general ductus with S-shaped curvature in the wall of the human urinary bladder are characterized by their regionally features. Our studies have shown that the quantity of these glands is less in the upper third of the bladder wall than in the middle and lower third of all age groups in postnatal ontogenesis. In this regard, urinary bladder sphincters have a similar structure plan (triple muscle and

compressed nerves, veins), such as sphincters of tubular and cavitation organs and prevent urine backflow - urine from escaping to the ureters and kidneys. This concerns the location and functional-morphological proximity of the ureter sphincters and the inner urethra sphincter in the lower third of the bladder.

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