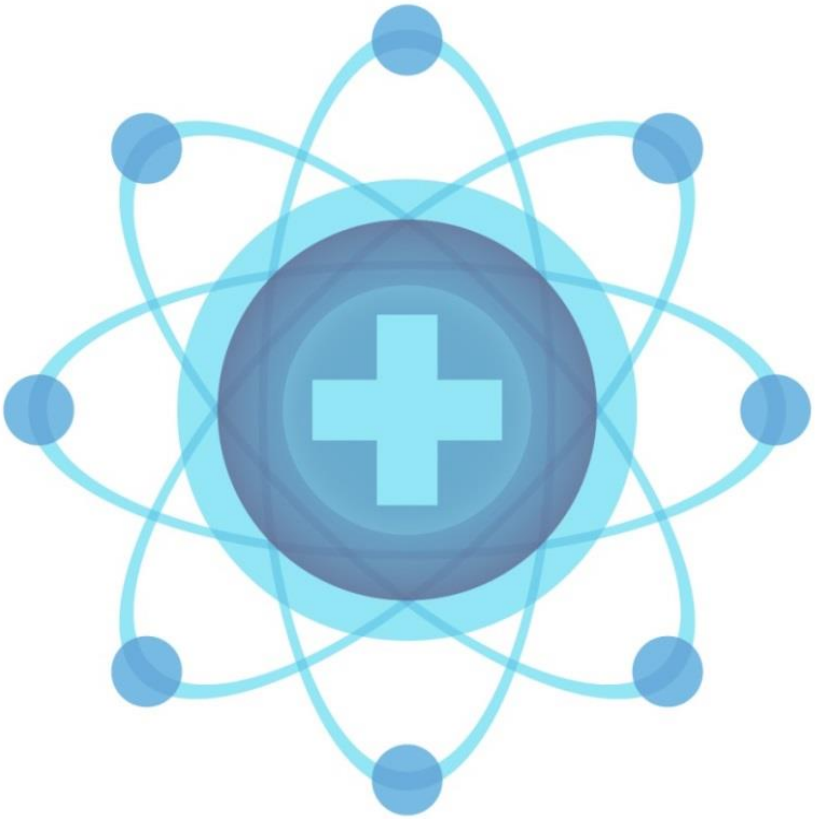

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STUDY OF THE DYNAMICS OF THE DEVELOPMENT OF COMPONENTS OF THE STOMACH WALL OF RATS DURING ONTOGENESIS

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Abstract. Continuity of smooth muscle bundles of the stomach and esophagus, absent in rats. The continuity of the smooth muscle bundles of the stomach and esophagus is absent in rats. Circular muscle bundles run around the circumference of the stomach, forming a cap of parallel muscle bundles at the bottom.Small muscle bundles connect circular muscle bundles. The oblique muscle fused and became continuous with the orbicularis muscle near the gastroesophageal junction at the base of the fundus and in the body lateral to the lesser curvature. Structural and functional changes in the gastric mucosa are clearly seen in different age periods.

Keywords: rat, stomach, ontogenesis, mucous membrane, submucosa, muscular membrane, glandular stomach, non-glandular stomach, late postnatal.

In the conditions of modern life, the human body is exposed to the influence of a huge number of exogenous factors (4). Organs and systems that have direct contact with environmental factors are especially susceptible to the impact of the latter. Among these organ systems is the digestive system (3). A decrease in the gastric mucosa and smoothing of the gastric pits may indicate atrophic processes as a reflection of age-related changes during aging (1,5,9).

According to Madeleine RDi (2022), the rat stomach muscle in the area of the gastroesophageal junction consists of three components of the muscular coat: longitudinal, circular, and internal oblique. In rats, the proventriculus is separated from the glandular stomach by a mucosal fold that forms a limiting ridge on the inner surface of the organ, which borders proximally on the proventriculus and distally on the glandular stomach Ilyasov A.S., SharifovaSh.K. (2022). According to Kamoldinov R.A. (2020), the formation of the mucous membrane of the fundus of the stomach, its glands occurs during the period of breastfeeding and is completed by the time of the transition to definitive nutrition. According to scientists, the structural and functional formation of the mucous membrane of the glandular part of the stomach is basically completed by the time of transition to definitive nutrition.

Despite the need for practical medicine in detailed information about the features of the structure of the stomach in different age periods of postnatal ontogenesis, until recently, the data characterizing age-related changes in the membranes of this organ are incomplete, brief, fragmentary and contradictory.

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The aim of the work is to study the dynamics of growth and development of the components of the stomach wall of rats in the period of late postnatal ontogenesis.

Materials and research methods. The study was carried out on 66 rats, 1-month-old, 3-month-old, 6-month-old, 9-month-old and 12-month-old. Animals were slaughtered under ether anesthesia. After opening the abdominal cavity, the length of the lesser and greater curvature of the stomach was measured. The obtained material was fixed in 12% solution of neutral formalin and Bouin's liquid. The material was passed through alcohols of increasing concentration and embedded in paraffin. Sections with a thickness of 8-12 μm were stained with hematoxylin - eosin, according to van Gieson. Micropreparations were studied and described using a Biolam microscope. Morphometric measurements were made using an eyepiece ruler using an eyepiece micrometer.

The measurement and description of the structure of the stomach membranes was carried out in the area of the glandular and non-glandular sections. The structure and thickness of bundles of collagen fibers of the connective tissue in the stomach membranes, their relationship with each other and the components of the organ wall were studied. The thickness of the mucous membrane, submucosa and muscular-outer membranes of the stomach was measured. In the muscular membrane, the thickness of the layers of muscles and their relationship with each other were studied depending on the part of the stomach. The location of the intraorganic vessels of the stomach of the rat in the age aspect was studied. The relationship between vessels and lymphoid formations in the wall of the organ was studied.

Statistical processing of the results was carried out on a Pentium IV personal computer using the Microsoft Office Excel - 2012 software package, including the use of built-in statistical processing functions.

Results of the study and their discussion. In rats, in the non-glandular section of the gastric mucosa, a stratified keratinizing epithelium is detected, in which there are three rows of cells. In the drawing. 1 shows the transition point of the keratinized stratified squamous epithelium to the single-layer columnar epithelium of the stomach. In the basal row are oval-shaped cells. Larger oval cells predominate in the middle and upper rows. In contrast to the cells of the basal row, the nuclei in them are displaced to the periphery and there are secretory granules in their apical part. The cells of the upper row are covered with a cuticle.

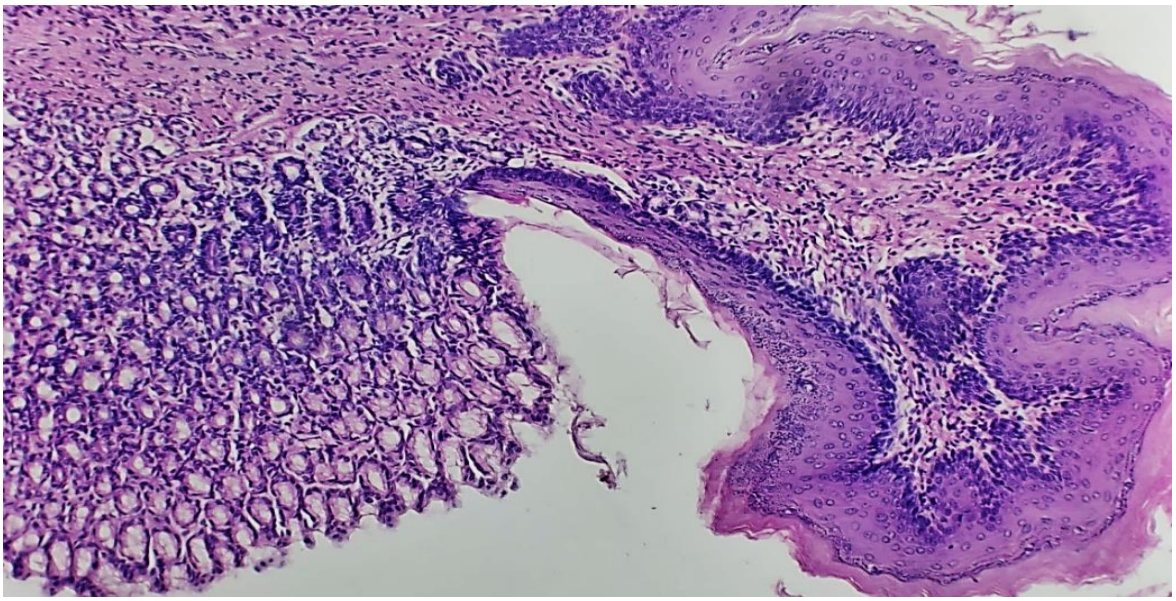

Fig.1. The place of transition of the stratified squamous keratinizing epithelium to the single-layer cylindrical epithelium of the stomach of a 3-month-old rat. 1. Stratified squamous keratinizing epithelium. 2. Single-layer cylindrical epithelium. 3. The glandular part. 4. Non-glandular part. 5. Own plate of the mucous membrane. Hematoxylin-eosin staining. Ob.7xOK.20.

The height of the epithelial cover in 1-month-old rats is on average 84.6±1.2 μm, by the age of 12 months it is 65.6±1.3 μm. In the glandular section, by the age of 1 month in rats, the height of the epithelial cover is on average 19.4 ± 0.82 μm. By the age of 12 months - 21.0 ± 1.0 μm. The lamina propria is made up of fibrous connective tissue structures. In 1-month-old rats in the non-glandular section, the thickness of the lamina propria averages 115.2 ± 1.7 μm.

By the age of 12 months - 145.2 ± 1.6 μm. In the glandular section of 1-month-old rats, the lamina propria averages 211.2±3.3 μm. At 12 days of age in rats - 241.0±1.0 μm. Figure 2 shows the structure of the stomach wall component of a 1-month-old rat in the control group. Under its own plate of the mucous membrane lies its muscular plate. It is formed by 1-2 rows of smooth muscle cells. By the age of 1 month in the glandular section, the muscular plate averages 33.6 ± 0.8 μm. At 12 months of age - 25.5 ± 0.3 μm.

In the glandular section of 1-month-old rats, the muscular plate of the mucous membrane averages 22.36±1.23 μm. By the age of 12 months in rats, the muscular plate is on average 48.0 ± 1.0 μm. Figure 2 shows the muscular membrane of the stomach wall of a 6-month-old rat at the level of the esophageal-ventricular valve of the control group.

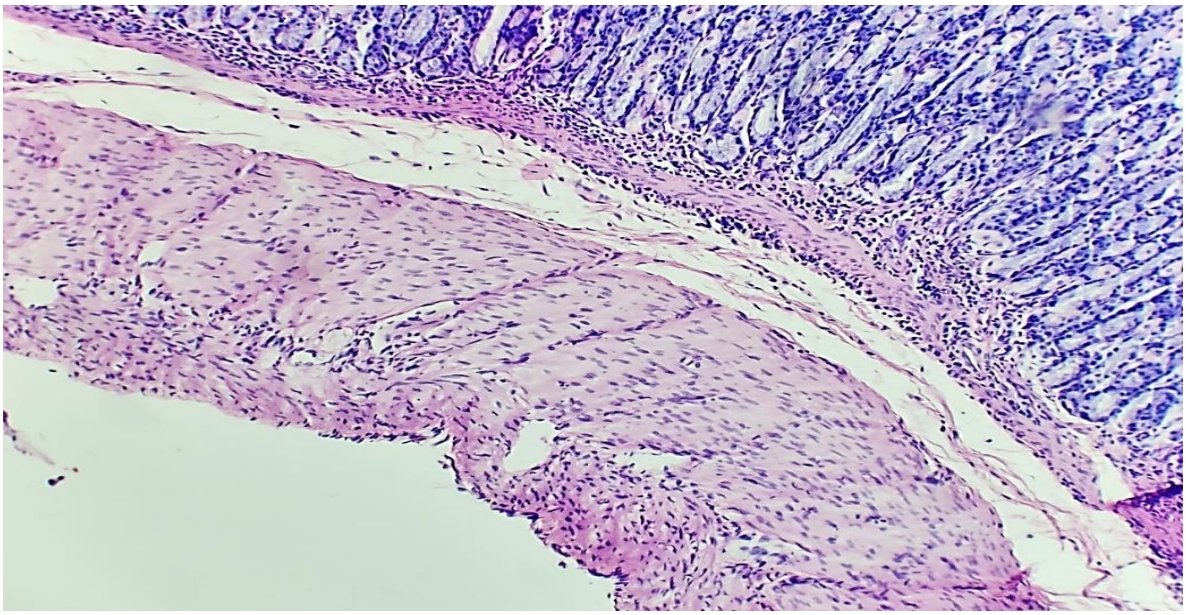

Fig.2. The structure of the stomach wall of 1-month-old rats of the control group. 1. Muscular outer shell. 2. Submucosa. 3. Muscular plate of the mucous membrane. 4. Own plate of the mucous membrane. Hematoxylin-eosin staining. Ob.10 x Ok.20.

The total thickness of the mucous membrane at the age of 1 month in the non-glandular section averages 135.0 + 2.0 μm. At 12 months of life in rats, the total thickness of the gastric mucosa in the non-glandular section is on average 162.2 ± 1.6 μm.

The bundles of collagen fibers in the non-glandular section are located loosely and oriented in different directions. At the level of the pyloric sphincter, the muscular membrane, thickening, forms a muscle pulp. Where the lamina propria is low. Figure 3 shows bundles of collagen fibers in the pyloric sphincter of the stomach of a 1-month-old rat in the control group.

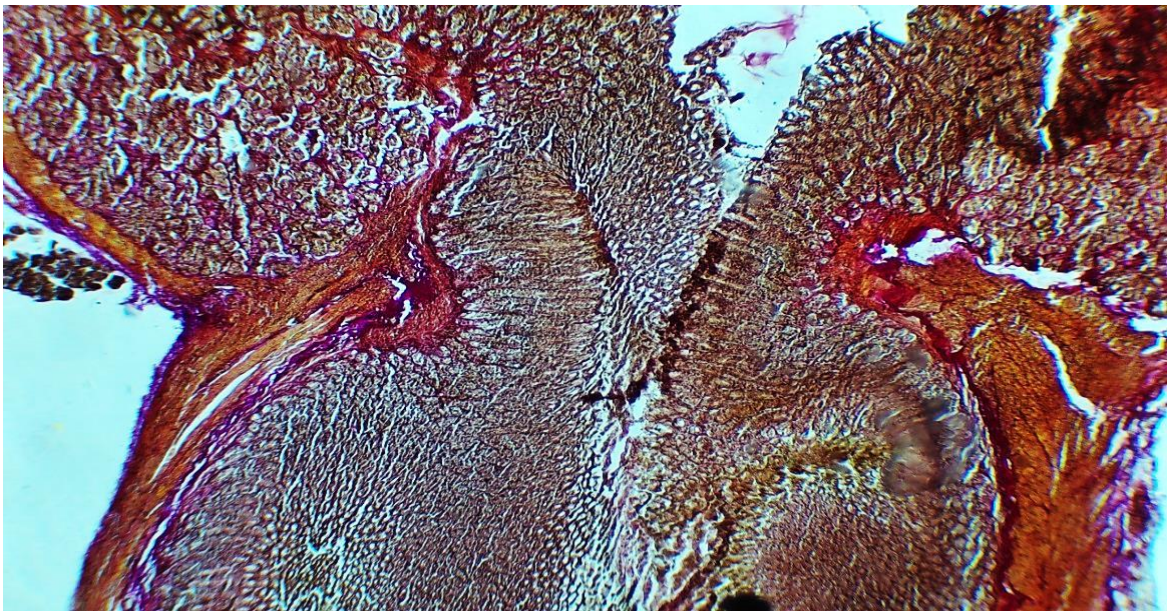

Fig.3. Bundles of collagen fibers in the pyloric sphincter of the stomach of a 1-month-old rat in the control group. 1. Muscular membrane. 2. Sphincter. 3. Mucous membrane. 4.Single-layer cylindrical epithelium. Van Gieson coloring. Ob.10 x Ok.7.

In the glandular section of 1-month-old rats, the total thickness of the mucous membrane is on average 22.36±1.23 μm. At 12-month-old rats, the total thickness of the mucous membrane is on average 48.0±1.0 μm. The submucosa of the gastric mucosa of rat pups is formed by loose connective tissue.

At the age of 1 month, the submucosa of the gastric mucosa of rats in the non-glandular section averages 99.0 ± 1.0 μm. In 12-month-old rat stomachs, the submucosa averaged 118.3±1.1 μm.

At 1-month-old rats in the glandular section, the thickness of the submucosal basis of the stomach is on average 72.60±1.98 μm. By the age of 12 days, it is equal to an average of 71.0 ± 1.0 μm.

In the submucosa, bundles of collagen fibers are unevenly distributed. In the non-glandular section of the stomach of animals, bundles of collagen fibers lying in the middle part of the submucosa are directed longitudinally. The bundles of collagen fibers adjacent to the muscular membrane form loops around the bundles of myocytes, changing their direction and passing into the inner longitudinal muscle layer, separating its bundles from each other.

The bundles of collagen fibers lying closer to the integumentary epithelium do not have a specific orientation, they are directed in different directions. At the base of large folds of the mucous membrane, part of the bundles of collagen fibers, intersecting with each other, form a network. Bundles of collagen fibers that lie at the base of large folds of the mucous membrane, bending, are directed to these folds, and

the distribution density of bundles of collagen fibers is greater at the base than at the top of the folds. Around the vessels of the submucosa, bundles of collagen fibers are oriented circularly, evenly surrounding the vessels from all sides.

The thickness of the bundles of collagen fibers gradually decreases throughout the submucosa from 36.9 μm in the non-glandular section to 20.5 μm in the glandular section.

In the glandular section, the bundles of collagen fibers lie more densely compared to the non-glandular section, especially near the lamina propria, here the bundles are directed longitudinally. Figure 25 shows bundles of collagen fibers in the walls of the stomach of 9-month-old rats in the control group. The muscular membrane of the stomach of rat pups is formed by two layers of muscles. The outer layer is represented by bundles of myocytes of the longitudinal direction. The inner layer consists of circularly directed muscle fibers. Figure 4 shows the muscular membrane of the stomach wall at the level of the esophago-ventricular valve of a 12-month-old rat in the control groups.

In 1-month-old rats, the circular muscular membrane of the stomach in the non-glandular section averages 52.8 ± 1.0 μm. By the age of 12 months of the stomach of rats, the circular muscular membrane is on average 61.8±1.6 μm.

In the glandular section at the age of 1 month, the circular muscular membrane of the stomach of rat pups averaged 51.6 ± 3.3 μm. On the 12th day of development, the circular muscular membrane is equal to an average of 79.0 ± 2.0 μm.

The outer circular muscle layer, regardless of the area of the organ wall, is represented by a continuous layer.

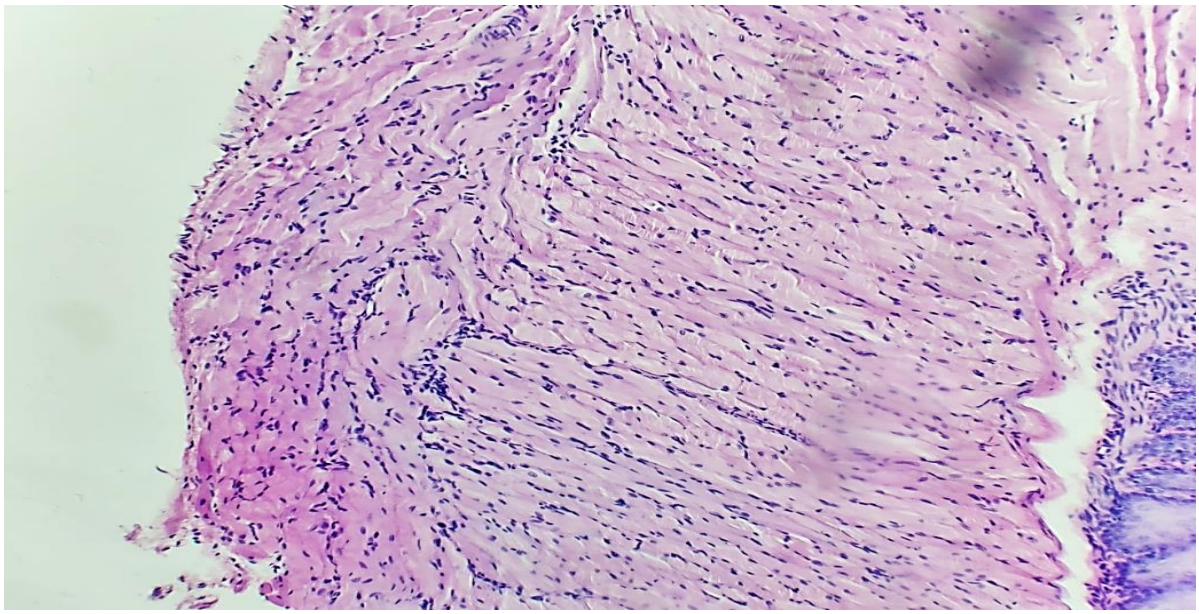

Fig.4. The muscular membrane of the stomach wall at the level of the esophageal-ventricular valve of a 12-month-old rat in the control group. 1.

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Submucosa. 2. Outer longitudinal muscle layer. 3. Inner circular muscle layer. 3. Stratified squamous keratinized epithelium. Hematoxylin-eosin staining. About.10xOk.40.

The muscle fibers that form it fit snugly together in all parts of the stomach. The inner longitudinal layer, depending on the section of the wall, has features in the structural organization. At the age of 1 month, the thickness of the longitudinal muscular layer of the stomach of rat pups in the non-glandular section averages 34.8 ± 1.0 μm. By the age of 12 months of the stomach of rats, the longitudinal muscular layer averaged 40.1±1.1 μm.

In the glandular section of 1-month-old rats, the thickness of the longitudinal muscle layer of the stomach of rat pups is on average 28.2 + 1.98 μm. At the age of 12 months in rats, the thickness of the longitudinal muscle layer is on average - 41.0 ± 1.0 μm

At the confluence of the esophagus into the stomach, myocyte bundles of the longitudinal layer are spindle-shaped, and they are located in a semicircle on the sides of the esophagus and transversely relative to the wall of the organ. Figure 5 shows bundles of collagen fibers in the muscular membrane of the stomach wall of 6-month-old rats in the control group. In the glandular section of the stomach of animals, the shape of the bundles of myocytes is oval, but they lie in the longitudinal direction relative to the wall of the organ. The bundles of myocytes of the longitudinal layer are separated from each other by bundles of connective tissue. The thickness of the bundles of collagen fibers lying in the intermuscular layers is from 6.2 microns to 14.3 microns. The circular muscle layer is separated from the longitudinal layer by bundles of connective tissue.

The outer shell of the organ is serous, it consists of a thin layer of connective tissue covered with mesothelium. The thickness of the bundles of collagen fibers that make up the outer shell varies slightly along the organ wall and ranges from 4.1 to 8.2 microns. Mesothelial cells are flat cells with a nucleus located in the center.

The total thickness of the stomach wall changes slightly, in 1-month-old rats the non-glandular section averages 332.4+4.6 μm. By the age of 12 months, the total thickness of the stomach wall of rats is on average 402.1 ± 4.9 μm.

In the glandular section of 1-month-old rats, the total thickness of the stomach wall is on average 404.4±9.2 μm. At the 12th month of development, the total thickness of the stomach wall is equal to an average of 485.0 ± 6.0 μm

Arterioles, capillaries, and venules are found in the non-glandular mucosa. The wall of an arteriole consists of three layers. The inner shell is formed by rounded endothelial cells located at a slight distance from each other. The middle muscular

layer is represented by one row of smooth muscle cells with a circular direction. Between the shells lies an internal elastic membrane. The outer shell is formed by loose fibrous connective tissue, adventitial cells are distinguished in it. The capillary wall is represented by one endothelial membrane. Endothelial cells in the wall of capillaries are rounded and lie at a slight distance from each other. The wall of the venules is formed by the endothelial membrane, which, unlike the endothelial membrane of the capillaries, is larger. Arterioles in the submucosa lie at the inner longitudinal muscle layer.

In the submucosa of the glandular part of the organ, most of the venules are directed longitudinally. In large mucosal folds, some venules branch out in several directions. In the mucous membrane of the glandular section, arterioles, capillaries and venules are detected. Most of the venules and capillaries of the department lie closer to the muscular membrane.

In the connective tissue layers between the circular muscle layer and the outer shell, the vessels of these shells are revealed. They are represented by arterioles, capillaries and venules. The structure of the walls of arterioles, capillaries and venules coincides with the structure of the walls of the vessels of the mucous membrane.

Conclusions:

1. In the non-glandular part of the stomach in the period of postnatal ontogenesis, the highest rate of increase in the total wall thickness and thickness of the muscularis mucosa increases by 0.8%, and the height of the epithelial cover increases by 10.0% by 12 months of age. The highest growth rate of the gastric mucosa is detected by the age of 3 months - 10.0%. The growth rate of thickness under the mucous bases is observed by 1 month of age by 14.0%.

2. In the glandular section, the highest growth rates of the total wall thickness, the height of the submucosa and the muscular outer shell are detected by the age of 3 months from 7.0% to 20.0%. We believe that the structural and functional formation of the components of the stomach wall of rats continues with the transition to rough and solid nutrition.

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