Annals of R.S.C.B., ISSN:1583-6258, Vol. 25, Issue 1, 2021, Pages. 356 - 366
Received 15 December 2020; Accepted 05 January 2021.

Morphistological Changes in the Wall of the Color Column with Elongation and Impairment of Its Fixation in Children

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Abstract. This article presents a morphological study of resected colon preparations with sub- and decompensated forms of chronic colostasis. Intestinal morphological examination was carried out in 26 sick children operated on in the period 2018-2019. the subcompensated form of the disease in 7 (27.0%) and decompensated in 19 (73.0%) patients.

It was revealed that the leading pathological changes are structural changes in the vascular bed, especially microcirculation. An important change in microvessels is the appearance in them of a large number of microthrombi. The revealed changes determine the ineffectiveness of conservative therapy for decompensated forms of chronic constipation and can serve as one of the arguments in favor of choosing a surgical method of treatment.

Key words: children; lengthening of the colon; violations of its fixation; chronic decompensated colostasis; histopathological examination; specificity of morphohistological changes.

Introduction

According to American scientists, constipation affects from 30 to 50% of the working-age population of developed countries and 5–20% of children in the general population [5,7,10,14]. According to Borowitz SM et al. (2005), complaints of constipation account for 3-5% of the reasons for visits to a children's clinic and about 35% of the reasons for visits to children's gastroenterologists. At the same time, 35% of girls and 55% of boys with constipation have encopresis [1-2,5,10].

Relevance

There is no consensus in the literature on the indications for surgical treatment of chronic constipation (CL) with lengthening of the colon in children, and the unsatisfactory results of conservative treatment of chronic constipation with lengthening of the colon reach 60% [3,7].

Colorectal abnormalities occupy an important place in pediatric coloproctology. This determines the need for the development and implementation of comprehensive examination programs and assessment of treatment results for this group of children. An important role among the approaches, examination and diagnosis and evaluation of treatment is given to morphological studies [4,6,9,12].

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The views on the histological features of the colon are rather contradictory. Knowledge of the morphological features of various parts of the colon with its anomalies will allow choosing the most adequate method of surgical treatment [1,6,8,11].

In the colon, four membranes are distinguished: the mucous membrane, the submucosa, its own muscle layer (muscular membrane), and the serous membrane [13-16]. In the mucosa, which determines the functional specificity of this part of the gastrointestinal tract, three components are distinguished: the epithelium, its own connective tissue layer (lamina propria) and the muscular layer of the mucous membrane (muscularis mucosa). The surface of the mucous membrane is lined with a single layer of prismatic epithelium with the formation of Lieberkühn crypts. This epithelium is composed of brush-bordered suction prismatic cells and goblet cells that synthesize, store and secrete mucus granules. Among the epithelial cells, so-called intraepithelial lymphocytes and, less often, eosinophils can be found. Epithelial cells are located on a thin basement membrane. The crypts have a tubular, slightly convoluted shape and are parallel to each other. Branching, expansion and other changes in the shape of crypts occur in inflammatory processes. Goblet cells dominate in crypts. At the bottom of the crypts, there are precursor cells of all types of cells (stem cells), endocrine cells and Paneth cells [5-6,8-9,13].

Lamina propria contains lymphocytes (both B and T), plasma cells, macrophages, mast cells, eosinophils, histiocytes and evenly distributed collagen fibers that form a kind of network, blood and lymphatic vessels and nerve elements.

The submucosa is composed of connective tissue identical to the lamina propria. A distinctive feature of this layer is the presence of submucosal nerve plexuses (Meissner). The muscular layer consists of an inner circular and an outer longitudinal layer. The muscle layer contains Auerbach's nerve plexuses [13-16].

The serous membrane (T .Adventitia) consists of loose connective tissue covered with one layer of flattened mesothelial cells [13-16]. The morphological features of various parts of the colon in children with its anomalies have not been sufficiently studied. This determined the carrying out of morphological studies described in this section of the work [5-6,8-9,13-16].

We have studied the features of morphological changes in the wall of the colon, resected in sick children with a diagnosis of lengthening of the colon and a violation of its fixation. The dynamics in the development of morphological changes in the intestinal wall, depending on the degree of compensation of these diseases and the presence of complications such as colostasis, encopresis and pain syndrome.

Purpose of the study – morphohistological examination of resected preparations of the large intestine with sub- and decompensated forms of lengthening of the colon and impaired fixation in children.

Materials and research methods In 2014-2019, 731 children admitted with suspected intestinal obstruction, recurrent abdominal pain, vomiting syndrome and chronic colostasis were examined and treated in the clinical bases of the Department of Hospital Pediatric Surgery of TashPMI. Of these, 648 (88.6%) - with lengthening of the colon; 83 (11.4%) - with anomalies of colon fixation. The age of the patients ranged from 3 months. under 18 years old. Among the patients, boys prevailed - 440 (60.1%), girls accounted for 291 (39.9%).

Along with careful collection of anamnesis, methods of objective and laboratory studies, the following methods of instrumental diagnostics were used: irrigography, passage of barium suspension along the gastrointestinal tract, sigmoidoscopy, colonoscopy and MSCT.

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Intestine morphological examination was carried out in 26 sick children operated on in the period 2018-2019. the subcompensated form of the disease in 7 (27.0%) and decompensated in 19 (73.0%) patients. With clinical manifestations of colostasis in 26 (100%), in combination with colostasis with encopresis in 4 (15.4%) and in combination with colostasis with pain in 9 (34.6%) sick children.

The indications for surgery were: the ineffectiveness of the courses of complex conservative therapy, the persistence of abdominal pain syndrome and chronic disease against this background. Fragments of the colon and sigmoid colon, removed during operations, served as material for the morphological study of the intestine.

The intestinal wall measuring 0.5x0.5 cm was fixed for 24 hours in a 10 -12% formalin solution (pH 7.2-7.4) in Lilly's phosphate buffer. Paraffin sections 5-6 μm thick were stained with hematoxylin - eosin.

The study and photography of light-optical preparations was carried out using a microscope "AXIOSKOP-40" (Carl Zeiss, Germany), with a digital camera Prog Ress, Caputer Pro 2.6, interfaced with a Pentium IV computer.

Results and its discussion. As our light-optical studies have shown, the structure of the colon mucosa is represented by tubular crypts lined with a single-layer prismatic epithelium. The luminal surface is dominated by prismatic rimmed suction cells; in crypts, goblet cells are the predominant type of cells (Fig. 1). Own connective tissue plate (lamina propria) with a moderate number of connective tissue cells. The muscle layer of the mucous membrane (muscularis mucosa) is thin, formed by 3-4 layers of smooth muscle cells.

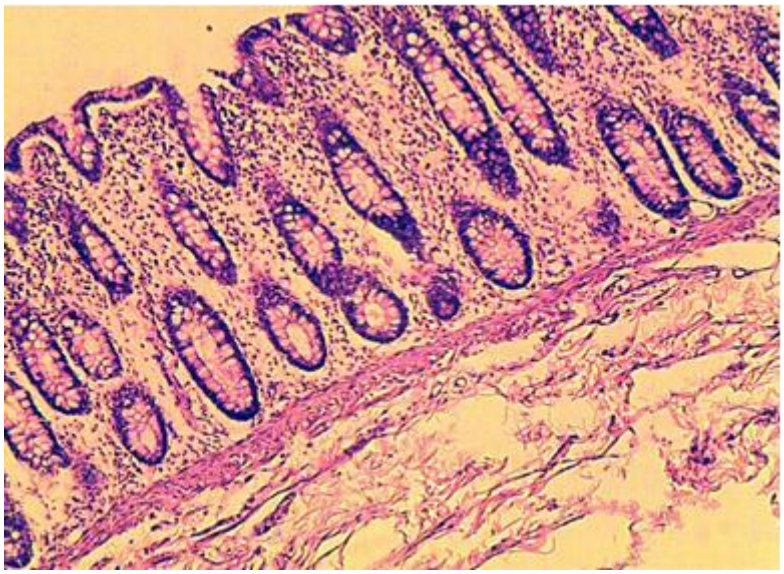

Figure № 1. *Connective tissue base formed by collagen and other types of connective tissue fibers intertwining with each other and forming a felt-like structure. G-E. 10x10.*

The submucosa is formed by connective tissue identical to the lamina propria, which is dominated by blood and lymphatic capillaries and connective tissue fibers. The cellular elements of connective tissue are few in number (see Fig. 1). At the border of the submucosa and muscular membrane, the dominance of chaotically located connective tissue fibers is noted. A layer of circularly located smooth muscles of the muscular membrane is adjacent to the submucosa.

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A distinctive feature of this membrane is the presence of submucosal nerve plexuses (Meissner).

The muscular layer consists of an inner circular and an outer longitudinal layer. The muscular sheath contains Auerbach's nerve plexuses. They are larger than the Meissner plexuses, their number is greater and are more often located between the circular and longitudinal layers of the muscular membrane.

At the bottom of the crypts, cells with pronounced basophilic cytoplasm dominate. The prismatic cells themselves are reduced in size (see Fig. 1). The lumen surface is somewhat raised. In the own connective tissue layer of the mucous membrane, there are accumulations of lymphoid cells with the formation of structures such as follicles.

The fibers of the muscular membrane are not divided into a circular and longitudinal layer, but have a chaotic arrangement.

The connective tissue base is formed mainly due to collagen and other types of connective tissue fibers of various calibers intertwining with each other and forming a felt-like structure, connective tissue cells are single (Fig. 2).

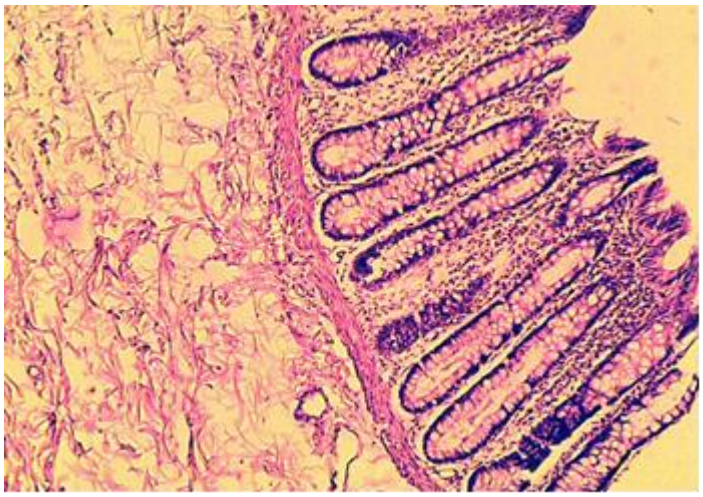

Figure № 2. *The fibers of the muscle layer are located chaotically and are not divided into circular and longitudinal layers. G-E. 10x10.*

The lumens of most microvessels are injected. In some blood vessels, microthrombi are determined. Lymphatic capillaries with thin walls and dilated lumens. In some of them, a homogeneous eosinophilic substance is determined, which, apparently, is a lymph (see Fig. 2).

With anomalies of the large intestine, its mucous membrane undergoes significant changes. In the subcopene stage, the crypts are shortened, twisted, the ratio of goblet and prismatic cells is disturbed. Severe damage to the epithelial lining is noted. This is especially pronounced on the transmissive surface (Fig. 3). There is a pronounced inflammatory infiltration of the epithelial lining, manifested both in the surface layers and in the depth of the epithelium (see Fig. 3). At the same time, in the area of the bottom of the crypts, rather large accumulations of lymphoid cells are noted, forming formations like Peyer's patches.

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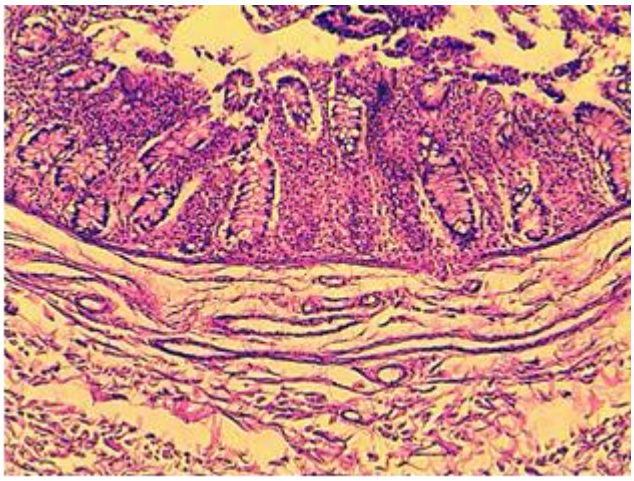

Figure № 3. *Violation of the integrity of the surface layers of the epithelium of the large intestine with its anomaly. Compensated stage. G-E. 10x10.*

The muscular layer itself and, in part, the muscular layer of the mucous membrane thicken (Fig. 4).

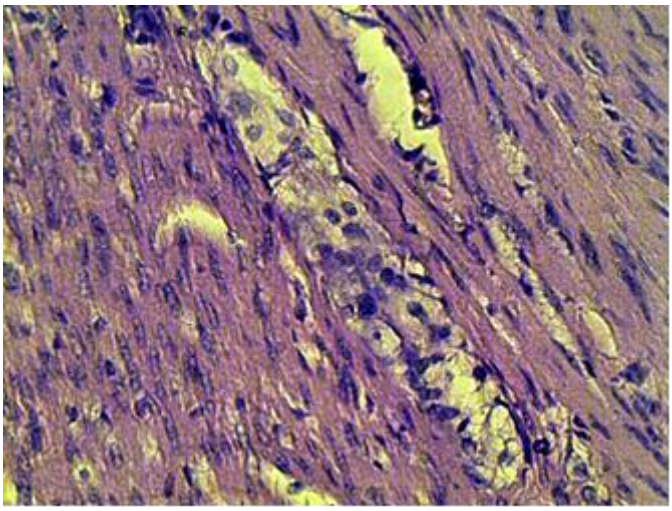

Figure № 4. *Hypertrophy of the nerve endings of the colon wall. Compensated stage. G-E. 10x40.*
In the muscular membrane, numerous nerve endings are determined - Auerbach's plexuses (Fig. 5).

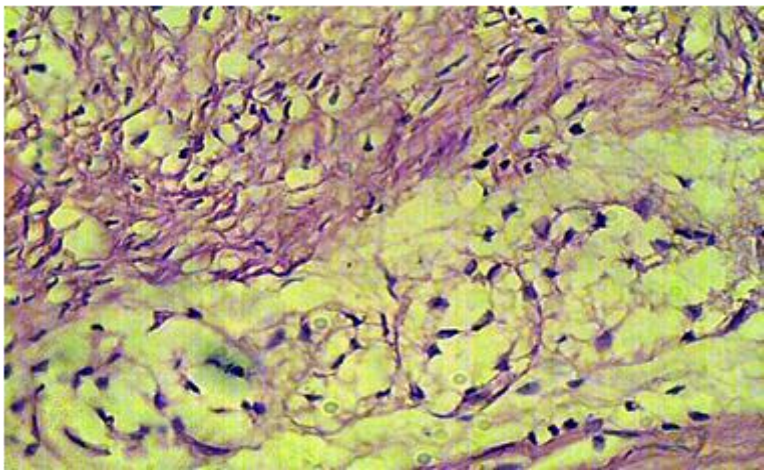

Figure 5. *Severe hypertrophy of the nerve endings of the colon wall. Compensated stage. G-E. 10x40.*

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Significant changes in colon anomalies are detected in microvessels of various sizes. These changes take place in all membranes of the large intestine, both the epithelial lining and the serous membrane (Fig. 6).

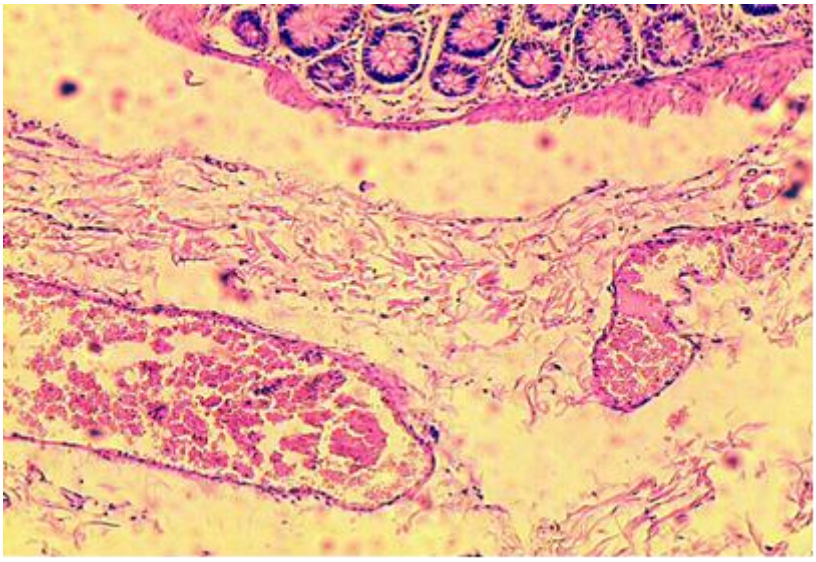

Figure № 6. *Blood filling of the vessels of the colon wall, edema of the submucosal layer. Compensated stage. G-E. 10x40.*

At the same time, the formation of microthrombi, both parietal and luminal, is noted. These changes in microvessels are accompanied by pronounced edema of the surrounding connective tissue (see Fig. 6).

Studies have shown more pronounced changes in all membranes of the colon wall in children with decompensated forms. The greatest changes take place in the epithelial lining. They are manifested in significant destructive changes, especially pronounced in the luminal zones. They are manifested in a violation of the integrity of the epithelial lining, inflammatory infiltration of the mucosa and edema of all layers of the colon wall (Fig. 7-8).

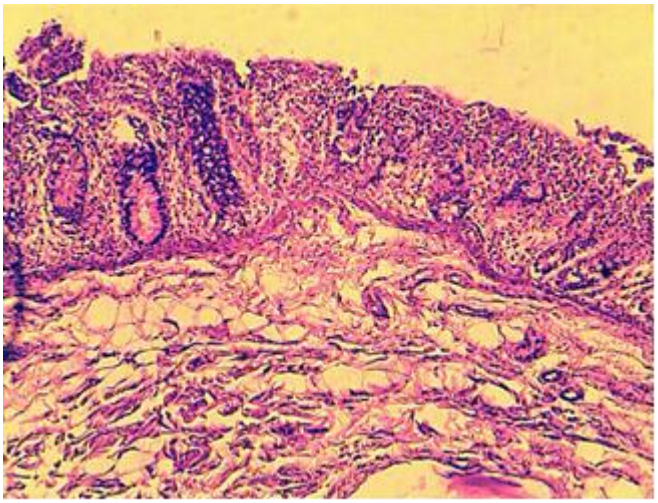

Figure 7. *Violation of the integrity of the surface layers. Inflammatory infiltration of the epithelium of the colon with its anomaly. Decompensated stage. G-E. 10x40***.**

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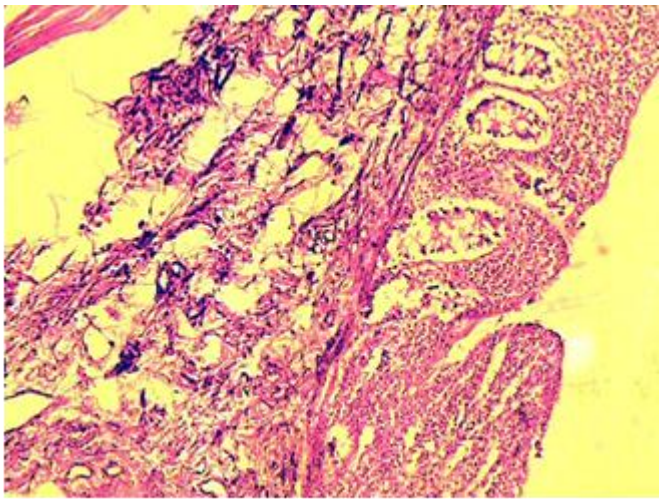

Figure № 8. *Violation of the integrity of the surface layers, inflammatory infiltration of the epithelium of the colon with its anomaly. Decompensated stage. G-E. 10x10.*

This is accompanied by a thickening of the muscular layer of the mucosa and muscle membrane (Fig. 9).

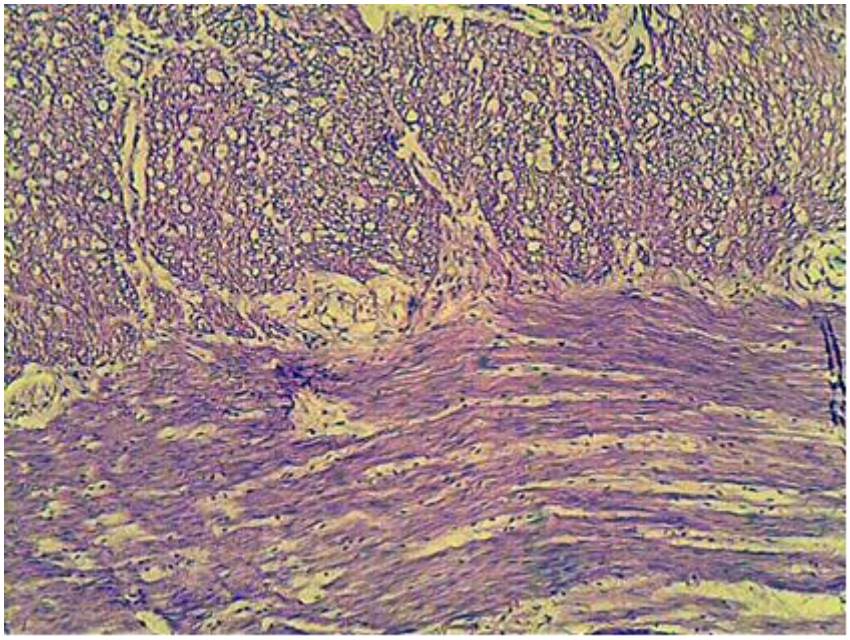

Figure №9. *Thickening of the muscular layer of the mucous membrane and the muscular membrane of the colon wall. Decompensated stage. G-E. 10x10. DS.*

The microvasculature also undergoes significant changes. They are expressed in stasis, expansion of the lumen and the formation of microthrombi. The indicated changes, apparently. are the structural basis of microcirculation disorders, leading to pronounced edema of the connective tissue of all membranes (Fig. 10).

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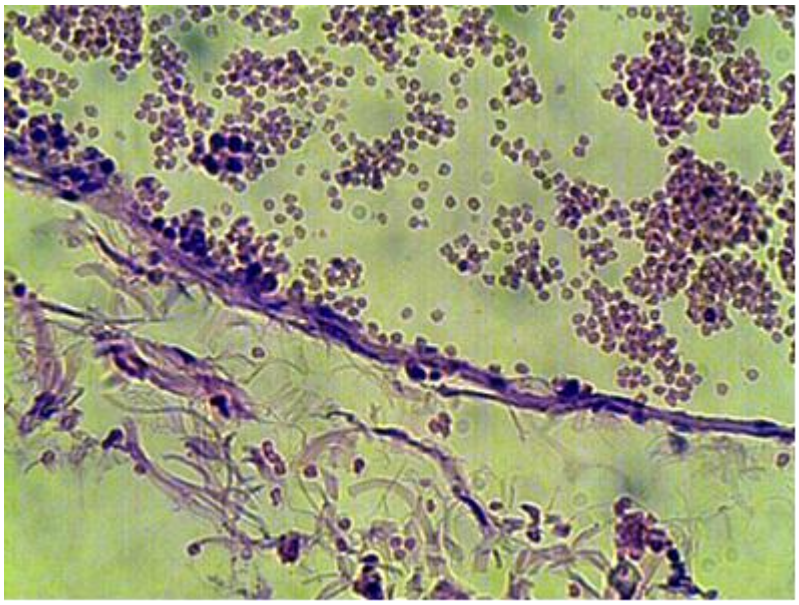

Figure 10. *Blood filling of the vessels of the colon wall, the formation of blood clots. Decompensated stage. G-E. 10x40. DS.*

Conducted morphological studies of the colon with its pathology showed different structural changes in all membranes of the colon wall. The mucous membrane undergoes the greatest changes.

It was revealed that at the decompensated stage of the disease, changes in all layers of the colon are more pronounced.

It should be noted that the leading pathological changes are structural changes in the vascular bed, especially microcirculation. Important changes in microvessels are the appearance in them of a large number of microthrombi.

Conclusions. According to the data of histomorphological examination of the colon wall with lengthening and anomalies of fixation in children, significant pathological changes are noted in all its layers.

Changes in the mucous membrane of the large intestine with this pathology are determined in the form of shortening and tortuosity of crypts, a violation of the ratio of goblet and prismatic cells in favor of a compensatory increase in the number of goblet cells, thickening of the own muscle layer of the mucous membrane. Severe damage to the epithelial lining and inflammatory infiltration, manifested both in the surface layers and in the depth of the epithelium, are determined.

The muscular layer and from part, the own muscular layer of the mucous membrane thicken and harden. In the intercellular space of smooth muscle structures, connective tissue fibers and renal infiltration are formed. The nerve endings of the Aurbach plexus in the muscle layer are hypertrophied.

The above are more pronounced in the decompensated stages of the disease. These morphological changes in the pathological department are clinically manifested by a violation of the dynamics and sequence of intestinal motility, which leads to chronic colostasis and encopresis in sick children.

The microvascular bed of the mucous and serous membranes undergoes significant changes in colon anomalies. These changes are manifested in the form of stasis, an increase in the diameter of capillary vessels and the formation of microthrombi in their lumen, which leads to ischemia of all layers

of the intestinal wall. Clinically, these pathological changes in sick children are manifested by pain syndrome.

According to the revealed histomorphological picture in the intestinal wall at sub- and decompensated stages of the disease, one can judge the ineffectiveness of conservative treatment of this pathology, which serves as one of the arguments in favor of choosing a surgical method of treatment.

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