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DIAGNOSIS OF ATRESIA IN THE ILEUM OF NEWBORNS

Abstract. *The most pronounced degenerative changes of the structure of the wall can be observed in the area of the ileal atresia and in the preatresic segment; they are less pronounced in the postatresic segment. In the area of atresia there were multiple foci of necrosis and fibrosis, separation of ileal membranes, desquamation of epithelium, disorders in angiogenesis.*

Key words: *atresia, preatresic segment, postatresic segment, ileum.*

Introduction. Ileal atresia incidence is 1: 1600 newborns. This malformation is equally common in males and females. The proportion of ileal atresia and that of the jejunum is approximately equal, the proximal part of the small intestine and distal portion of the ileum are mainly affected (31 and 36% of cases respectively). In approximately half of the cases the intestinal atresia occurs in the form of free diverticula; atresia with taenia occurs in less than 40% of cases; membrane form of atresia in this place as opposed to the duodenum can be observed only in 13-20% of cases. Intestinal stenoses occur by almost 20 times less frequently than atresia. In 6% of cases atresia is characterized by its multiple nature [1-5]. Ileum atresia is a topical issue of Gastroenterology, requiring surgery in infants and young children.

Objective: to establish morphological changes in the wall of the ileum in newborns with atresia.

Materials and methods. The study was conducted on 14 fragments of the ileum in newborns with atresia using morphometry, microscopy of histological sections and statistical analysis.

Results and discussion. To systematize the results of the study we examined changes in the area of atresia, in preatresic and postatresic segments of the ileum. In atresia the muscular membrane of the ileum underwent a complete fibrous transformation (Fig. 1). There are a lot of fibroblasts in the circular muscular layer as well as lymphocytic infiltration. The nuclei of smooth myosites are enlightened, eosinophilia of the cytoplasm is reduced. The blood vessels of the

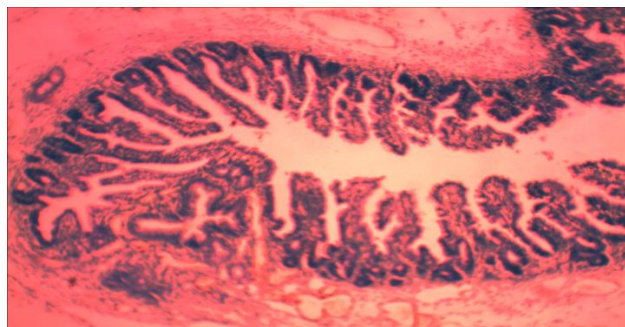


Fig. 1. A transition from the preatresic segment to atresia area of the terminal part of the ileum. Staining with hematoxylin-eosin. Mount. r. 8, Magn.7

ileum dramatically dilated, erythrocyte adhesion to the vessel walls can be observed. In atresia areas fibrosis and necrosis occur alternately, so the intestinal parameters are not possible to determine. Dilation in the ileum atresia can be explained by a larger amount of intestinal contents than in the colon. The wall of the colon is thinner, the diameter is larger, and the colon dilates less with the same volume of the content.

According to the literature and the results obtained, researchers are practically unanimous on the question of etiology and pathogenesis of the membrane form of atresia (type I according to the classification). At the dissection of the ileum the membrane looks like a thin filmy foramen that resembles a fold in the intestinal mucosa. The membrane of the ileum reaches 0.6 mm thick.

As to the multiple bowel atresia (type IV), developing as a result of apple peel syndrome there is no unanimous opinion regarding the occurrence of atresia. However, researchers

assume a significant disorder in the development of mesenteric arteries, which is associated with genetic disorders – "vascular" theory and the emergence of atresia due to disturbances in rotation of the intestinal tube. The areas of the intestine look like segmented multiple mesenteric taeniae, the unaffected segments are compensatory dilated and thickened, some areas are narrowed, indicating their functional unloadedness.

In atresia with fibrous taeniae the preatresic area of the ileum ends with diverticula, in certain areas there are some intestinal segments on both sides. The closed intestinal segments are connected with a mesentery and its fibrous taeniae (type II), which are thin stringlike formations, going from one enclosed segment of intestine to another. These taeniae form a free edge of the mesentery and is actually a thickened free edge of the visceral peritoneum duplication. In complete atresia (type III) the segments of the bowel are completely apart, not only along the intestinal tube, but also along the mesentery. In this case we can observe some disorders in both the intestinal angiogenesis and in the dorsal mesentery.

In the preatresic segment of the ileum on the side of its mucosa, shortening of villi and crypts enlargement are observed. In some areas of the mucous membrane there is no epithelium. The cells become cubic, the epithelial cells get shorter. There is a significant hypertrophy of the muscular layer in the muscular membrane of preatresic segment of the ileum.

In morphological studies of the preatresic segment of the ileum on the side of mucous membrane the villi become shorter and the crypts get larger. In the preatresic segment of the ileum in the muscular membrane, there is a significant hypertrophy of the circular muscular layer compared to longitudinal one, hyperplasia of smooth myosites, areas of fibrosis, areas of polymorphonuclear leukocyte infiltration along the blood vessels. (Fig. 2). There is a dissection of muscular membranes, its swelling, disintegration of muscular layers into individual muscular cells. Compared with the structure of the intestine of a newborn in a normal muscular membrane of the preatresic segment of the

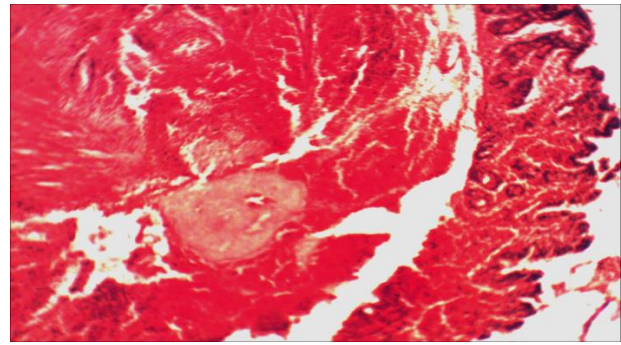


Fig. 2. Atrophy of the mucous and muscular membranes of the preatresic segment of the ileum. Staining with hematoxylin-eosin. Mount. r. 10^x, magn. 10^x

ileum a dilation of small vessels of muscular type with hypertrophy of the wall and the dilation of capillaries can be observed. In the intervals between the circular and longitudinal muscular layers a significant amount of cellular elements of connective tissue was found. The changes in the ileum muscular membrane are confirmed by morphometry findings.

In preatresic segments of the ileum there are significant changes in the nerve cells and their processes. There is an increase and change in shape of neurocytes, thickening of their processes, significant thickening at the ends of dendrites was found too. Nerve fibers that have not undergone decay, have rare residual effects of dyschromia and local edema. Around the middle third of the ileum segment the vascular glomeruli of ganglia are formed with a dense grid.

The areas with atresia undergo the most destructive changes both in the nervous system and in hemocirculatory stream. In the segments of the ileum that has undergone them, significant changes in hemomicrocirculatory stream and its intramural nerve plexuses were found. Intramural arteriolar diameters in most cases are narrowed to 16.70 mm. Their contours are winding. The capillaries that surround nerve cells near the atresia segment are dilated and tortuous. Compared with the norm, diameter of the venules in the preatresic and postatresic segments increased by almost twice. The number of arteriovenular anastomoses increases. The ileum atresia areas with multiple foci of necrosis and fibrosis indicate directly the possible primacy of blood vessels disorders due

to ischemia in this area with the development of fibrosis (Fig. 3).

In the postatresic segment of the ileum morphological changes occur, such as: mucous membrane with submucosa base is in a state of edema, it is peeled off in some areas. There are some multiple areas of epithelial desquamation. The muscular membrane is thinned, there is a decrease in myositis sizes when their number increased, which is indicative of muscular layer hyperplasia (Fig. 4).

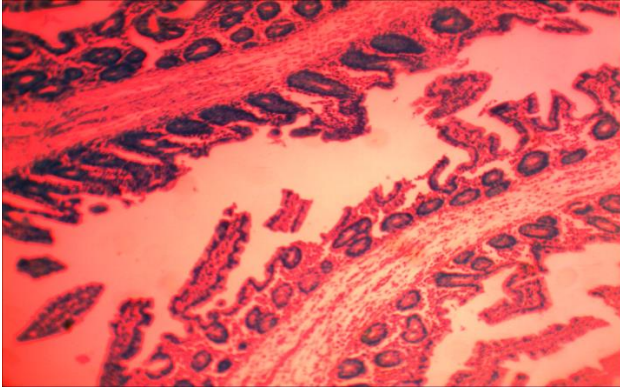


Fig. 3. Partial atresia of the ileal wall. Staining with hematoxylin-eosin. Mount. r. 10x, magn. 10x

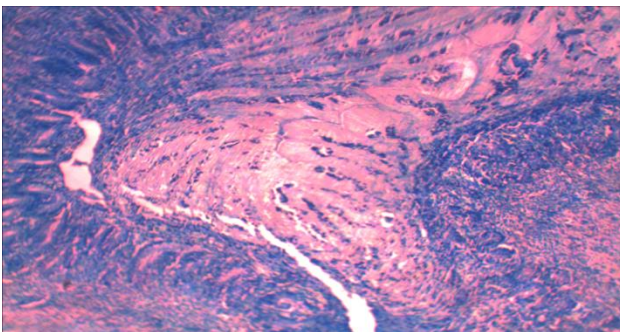


Fig. 4. Blood vessels in atresia of the terminal portion of the ileum. Staining with hematoxylin-eosin. Mount. r. 10x, magn. 10x

Morphological findings in the postatresic segment indicate its functional unloadedness, for myocyte hyperplasia is not accompanied by increasing their size; they are only divided.

The ileum tends to develop a pathogenic type with primary disorders in mesenteric vessels corresponding to atresia with fibrous taenia and complete form of atresia with a vascular link in the pathogenesis. We revealed morphologically visually some intact areas of the intestine - before preatresic and after postatresic segments at the level of mesenteric vessels. In pathogenic type of ileal atresia with primary

disorders of vascular development, it is recommended to resect visually intact portion of the intestine above the preatresic and below the postatresic segments of the intestine near the closest ileal arteries.

We can observe a dilation of the ileum up to 13-14 mm: by twice compared to unaffected areas. In the ileum atresia with fibrous taenia the atresic section ends with a diverticulum. Enclosed segments of the intestine are connected to the mesentery and its fibrous taenia, and are thin stringlike taeniae. On the side of the ileal mucous membrane the villi become shorter, the crypts get wider and shorter and the number of goblet cells increases. The height of the epithelium reduces compared with normal areas, and in some places there is no membrane epithelium. There is a partial detachment of the epithelium from its own layer of the mucous membrane. There are numerous subepithelial swellings and inflammations in the mucosa and submucosal layers. Epithelial cells change their shape from cylindrical to cubical one and they sometimes become flat.

Morphological characteristics of the ileum mucosa: the mucous membrane is 490 ± 12 micrometers thick (normal), 310 ± 8 micrometers thick (atresia); the villi are 280 ± 14 high micrometers (normal) 317 ± 9 micrometers high (atresia); The villi are 46 ± 1 micrometers thick (normal) 46.9 ± 2 micrometers thick (atresia); the crypts are 217 ± 10 micrometers deep (normal) 216 ± 10 micrometers deep (atresia); the epitheliocytes are 28 ± 2 micrometers high (normal), 28.3 ± 3 micrometers high (atresia); diameter of the epitheliocyte nuclei is 3.3 ± 0.1 micrometers (normal) 2.9 ± 0.1 (atresia).

Morphological characteristics of the muscular layer of the ileal preatresic segment: the muscular layer is 37 ± 6 micrometers thick (normal) 160 ± 26 micrometers thick (atresia); the circular muscular layer is 22 ± 1 micrometers thick (normal) 102 ± 10 micrometers thick (atresia); longitudinal muscle layer is 16 ± 0.6 micrometers thick (normal) 47 ± 2 micrometers thick (atresia); diameter of smooth myositis is 8.6 ± 0.2 micrometers (normal) 7.2 ± 0.8

micrometers (atresia).

Areas of ileal atresia. In the areas of ileal atresia there were significant degenerative changes in the structure of the wall, separation of the mucous membrane, there are also multiple forms of degenerative neuroblasts, their number reduces, the hemocirculatory changes.

The changes in the hemomicrocirculatory stream are more pronounced in the ileal preatresic segment. Around the middle third of the segment the vascular glomeruli of ganglia are formed with a dense grid. The capillaries, that surround nerve cells, are dilated and winding near the atresic segment. The capacity of the ganglia blood vessels increases.

The postatresic segment of ileum is characterized by multiple degenerative changes in all membranes of the intestinal wall. In mucosa we observe a severe destruction of the villi and a desquamation of their apical epithelium.. In the lamina propria mucosa we can often observe oa polymorphonuclear leukocyte infiltration, more pronounced in the area of the villi. Crypta tunicae mucosae have irregular narrow space. There are multiple areas of epithelial desquamation. The muscular layer is thinned, its hyperplasia was found.

Conclusions. 1. The degenerative changes in the structure of the ileal walls are most pronounced in the area of atresia and preatresic segment whereas they are less seen in the postatresic segment. In the area of atresia there

are multiple foci of necrosis and fibrosis, separation of the ileal membranes, desquamation of the mucous membrane epithelium, disorders in angiogenesis. 2. In the postatresic segment we can observe the thinning of the mucous membrane, muscular layer atrophy, disintegration of the neurovascular plexuses, and reducing blood flow to the nerve nodes resulting from the functional unlodedness of this this segment.

References:

1. *Єршов В.Ю. Морфометрична характеристика кишки при атрезіях у новонароджених / В.Ю. Єршов, М.П. Ковальський // Науковий вісник Національного медичного університету імені О.О. Богомольця. – 2007. – № 4. – С. 40-47.*
2. *Дольницький О.В. Природжені вади розвитку. Основи діагностики та лікування: монографія / О.В. Дольницький, В.О. Галаган, О.В. Родамина. К.: 2009. – 1040 с.*
3. *Природжені вади розвитку людини. Загальні положення тератології / Т.М. Бойчук, І.Ю. Олійник, О.П. Антонюк, В.С. Пикалюк. – Чернівці: Медуніверситет, 2015. – 361 с.*
4. *Touloukian R.J. Diagnosis and treatment of jejunoileal atresia / R.J. Touloukian // World J. Surg. – 1993. – Vol. 17(3). – P. 310-317.*
5. *Tongsin A. Atresia of the jejunum and ileum: what is the difference? / A. Tongsin, M. Anuntkosol, R. Niramis // J. Med. Assoc. Thai. – 2008. – Vol. 91, Suppl 3. – P. 85-89. – 252 с.*