

Morphological Signs of Inflammatory Process in the Pancreas in Young Children with Acute Respiratory Viral Infection

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Abstract

Immunomorphological changes of the pancreas with acute respiratory virus infection, which led to a lethal outcome, with which patients entered the department of children's intensive care and the regional perinatal center №3 are discussed in the article. The history of the disease and the protocols of the pathologic anatomical autopsy were subjected to analysis - 21 lethal cases for the period from 2013 to 2017. It is shown that immunomorphological changes in the pancreas are diverse in terms of severity and manifestations, which are more noticeable in ARVI.

Keywords: Acute Respiratory Viral Infection; Pancreas; Immunohistochemistry

Reducing perinatal mortality and morbidity, complications of pregnancy and childbirth, creating conditions for the normal development of newborns, timely identification of risk factors that affect the health of the future generation - all this is an indispensable condition for ensuring demographic status [1,2,3,6].

The morphogenesis of the pancreas during the physiological course of pregnancy and the minimal risk of perinatal pathology has been studied in enough detail [5,7,9]. At the same time, the contribution of stressing environmental factors to the growth and differentiation rates of the pancreatic parenchyma has not been adequately studied. Timely diagnosis and treatment of pancreatic diseases in children is one of the most difficult problems of clinical and morphological aspects.

The process of development of the fetal organs and tissues is largely conditioned by the complex effect of environmental factors. According to N.P. Shabalov et.al.[6,7], positive factors affecting the maternal organism, factors are also favorable for the fetus, such factors are attributed to various social, economic and environmental conditions.

On the other hand, if the specific biological and psychosocial needs of the fetus are not satisfied, with the progression of pregnancy, a variety of non-infectious fetopathies and congenital developmental anomalies are formed. Uncomfortable for the fetus, the ecological environment in a single fetoplacental system significantly increases the risk of miscarriage and perinatal losses.

The pathology of the pancreas in children continues to be one of the most difficult sections of pediatric pathology, since its symptoms may be similar to other diseases, and accurate verification is difficult due to limited diagnostic capabilities. Extremely difficult is the diagnosis of pancreatic disease.

Over the past 25 years, there has been a worldwide trend towards an increase in the incidence of acute and chronic pancreatitis [15].

Timely diagnosis and treatment of pancreatic diseases in children is one of the most difficult problems of clinical and morphological aspects. There is a definite tendency to increase the frequency of these diseases and at the same time, their recognition presents considerable difficulties and is often accompanied by diagnostic errors.

The introduction of immunomorphological methods opened a new era in the practice of histologists and pathologists. The value of their use has increased especially since 1974, when Taylor demonstrated the possibility of using paraffin sections for immunomorphological studies. At present, there are many markers that allow to determine not only the tissue belonging of the cell with the help of immunohistochemistry, but also to reveal its specific features, nature and composition of the intracellular environment [4,8,9,10].

The use of immunomorphological methods makes it possible to make more profound morphological studies and helps to objectify the conclusion [6,8].

Immunomorphological studies of the pancreas in cases of acute respiratory viral infections have not previously been carried out, and this was the starting mechanism for our studies. The data on the incidence of acute and chronic pancreatitis in children in the structure of diseases of the digestive organs in literature are 5-25% of the number of patients with gastroenterological diseases [12,13,15].

The Purpose of the Study

To give an immunohistochemical characteristic of the pancreas in young children with ARVI.

Material and Methods

We conducted a morphological study of the pancreas of deceased young children with respiratory viral infection. Morphological characteristics of this body we carried out both qualitatively and quantitatively. We investigated the morphological state of the pancreatic acinous tissue, fibrosis, lipomatosis, plethora, hemorrhages, the presence of cellular infiltration. In parallel, we conducted an immunohistochemical study of the pancreas on the severity of the functional activity of such basic cells as those producing insulin, glucagon, somatostatin, serotonin. And, we investigated the phenomena of apoptosis in the pancreas in ARVI. Immunomorphological studies were performed on pancreatic tissue (in total, 21 cases), taken from the deceased from a viral infection. The pancreas materials of children of the same age, who died of other diseases (cardiovascular pathology, developmental defects), and not associated with ARVI served as a control.

Results and Their Discussion

The results of morphological study of the pancreas in acute respiratory viral infection was established stromal edema, interlobular and intralobular sclerosis, lipomatosis with foci of fat necrosis, perifocal hemorrhages. The morphological picture of these cases coincides with the results of similar studies by domestic and foreign scientists [6,8,9,11]. In some cases, bladder organ, flabbiness or sclerotic gland thickening was noted, as well as lymphohistiocytic infiltration, atrophy and dysplasia of endocrine parenchyma cells. In the lumen of most ducts, there is an accumulation of a pinkish, amorphous type of secretion. Inside the islet apparatus, numerous cellular elements are seen disposed noncompactly, voids are defined between the elements. The diameter of the cell element is various, distinct, rounded in shape by nuclei. In individual cells, fine-grained granularity is revealed (Fig. 1.a, b). Interstitium between lobes moderately unevenly expanded due to edema and small-focal inflammatory infiltration by leukocytes. The vessels are dilated, they look empty or full-blooded with erythrocyte sludge, moderate intravascular leukocytosis, and the endothelium partially falls. Small focal proliferation of fibers of the connective tissue around the vessels, in the walls of the ducts and around them is noted. Around the excretory ducts tissue is autolysis, tends to homogenize.

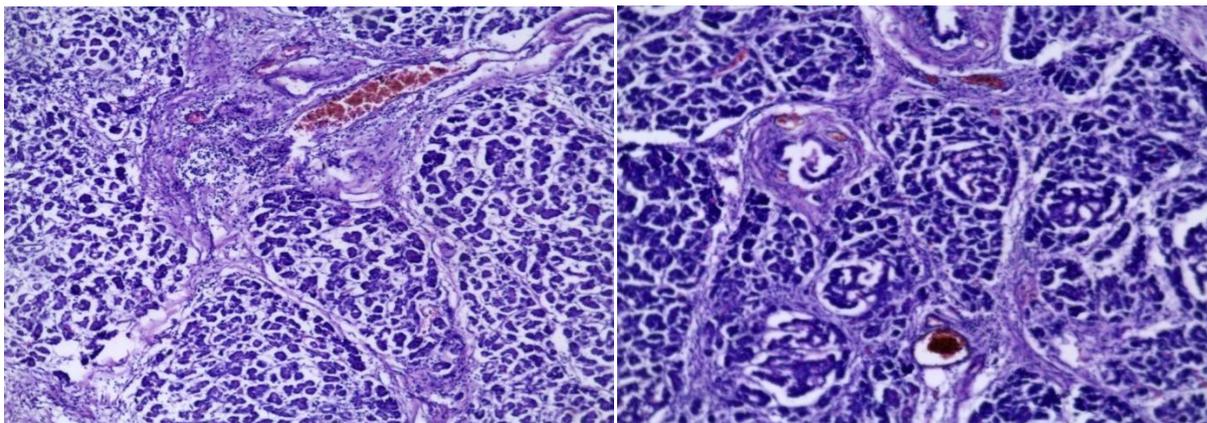


Figure 1: Uneven blood filling and fullness of blood vessels with rheology of blood, finefocal pancreasclerosis. Coloring of hematoxylin-eosin. Uv x 150.

In generalized intrauterine infections, in combination with developmental anomalies, formed lobules of the exocrine part of the gland were formed, consisting of densely located acinus. Periductal and perivascular clusters of many dense courses fibrous connective tissue have been identified, which indicates the phenomenon of mesenchyme.

For children of the first days of life up to one year, an abundance of coarsely fibrous connective tissue remains, the division into fuzzy segments is characteristic. In the stroma, the amount of elastic fibers decreases, and the mass of collagen fibers increases.

According to the literature data, the connective tissue system has several critical periods of functioning and development, among which the prenatal period and the first 2 years of life of the child are singled out. Pathogenic effects at this time often cause developmental disorders that contribute to the formation of functional inadequacy of the body systems in the postnatal period of life, and the digestive system in particular [3,5,12].

The figure shows that in the islet of Langerhans pancreas at death from acute respiratory viral infection, there is a pronounced programmed cell death, an increase in the number of cells producing glucagon, a decrease in cells synthesizing insulin, and the absence of serotonin. Several studies prove the relationship between the localization of serotonin and insulin in B cells of the islets of Langerhans and the role of serotonin in the secretion of insulin [5,14,15].

The most striking observation was that almost all morphology data were related either to pancreatic insufficiency or to the pancreas, and not to both.

According to their data, the use of histochemical methods or electron microscopy provides more detailed information on the localization of serotonin within islet cells.

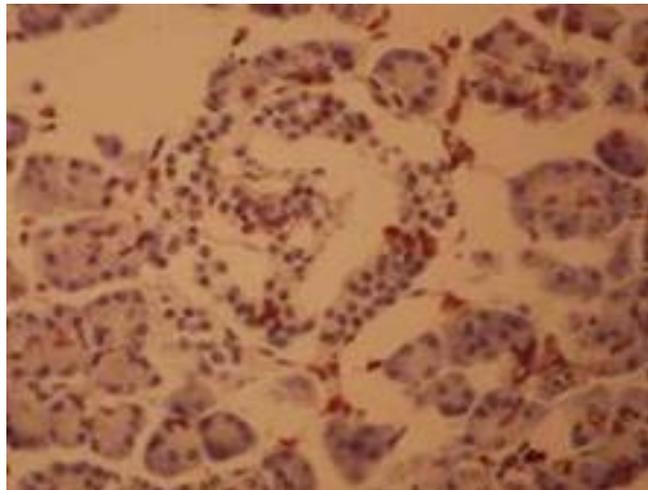


Figure 2: Apoptotic cells in the islet and the acinous tissue. Uv. x 140. Immunohistochemical coloring.

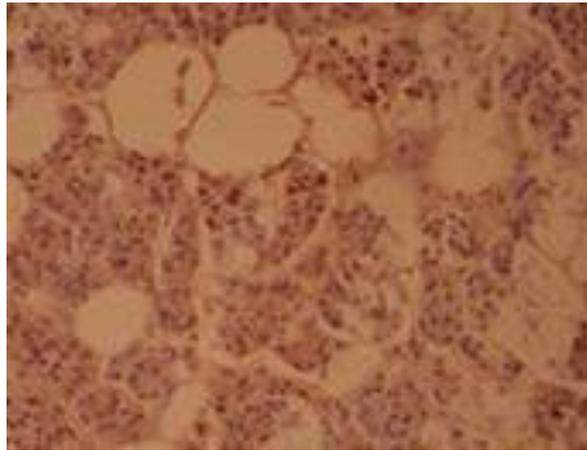


Figure 3: apoptotic cells with weak lipomatosis. Uv. x 140. Immunohistochemical coloring It was found that serotonin in B cells of the pancreas is contained in the same granules in which insulin is deposited. In our studies, the virus affected the pancreas in such a way that serotonin was observed in small numbers in the islets of Langerhans while reducing the number of B cells (Figure 2,3). In isolated cases of viral intoxication positive immunohistochemical reactions to serotonin in the exocrine part of the pancreas were observed, but the bulk of the observations had a negative reaction (Figure 4.a.b).

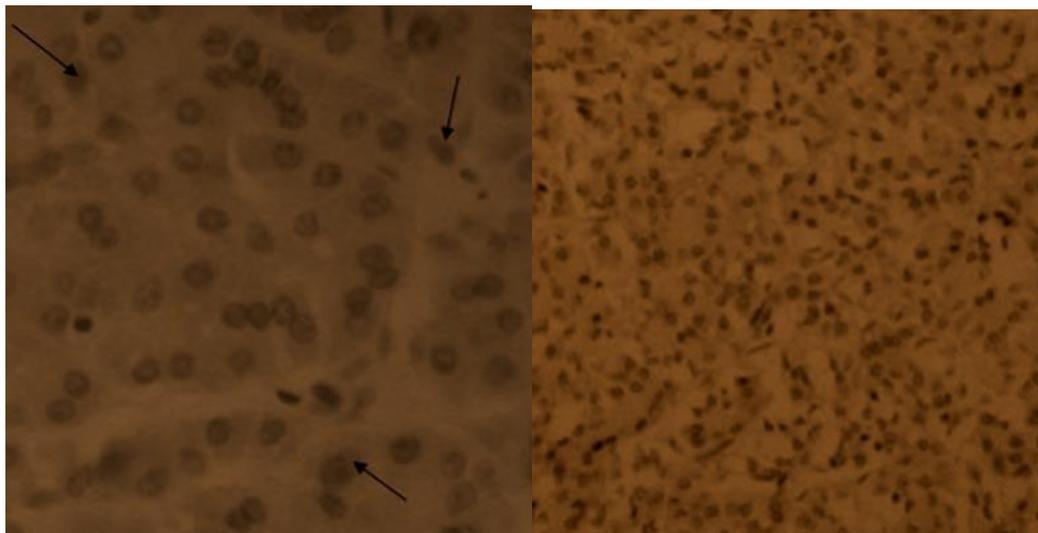


Figure 4.a.b: The state of acinar pancreatic tissue in viral infections during immunohistochemical methods for the detection of serotonin. a - serotonin in the exocrine part, SW. x 140.; b - the absence of serotonin in the exocrine part, SW. x 140., Immunohistochemical color.

Based on the foregoing, you can share the following: In all the investigated materials was established morpho functional state of the microcirculation. In this case, the endothelial cells are swollen, edematous, with a clearly pronounced irregular shape nucleus. Capillaries are sharply full-blooded, with increased gaps, imbibing erythrocytes. Thus, it can be concluded that in ARVI in the pancreas, you can note such changes:

- the degree of severity of morphological changes in pancreatic structures depends on the duration of exposure to viral infections;
- Against the background of acute respiratory viral infection, insulin deficiency develops, which is caused by the disappearance of serotonin from the endocrine pancreas, which is accompanied by a decrease in the number of cells that produce insulin and an increase in the number of cells that synthesize glucagon.
- Fertility, hemorrhages and inflammatory cell infiltrates are more common in acute viral infections;
- marked disintegration of the acinous tissue, severe fibrosis and mild lipomatosis are observed when the virus infection manifests itself on the organism during the period of the height of the disease for more than 5-7 days;
- **reliable dependence of some parameters of the fetal pancreas (perimeter, specific density of the flow and insular parts) on the influence of risk factors increases the likelihood of growth and developmental disorders in children, including those associated with pathologies of the cardiovascular system.**
- This is due to the lack of a unified classification of pancreatic diseases in childhood and a single methodological approach to the diagnosis of chronic pancreatic disease. In this regard, timely diagnosis of pancreatic diseases and timely adequate treatment will improve the prognosis of the disease and reduce the frequency of deaths.

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