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The influence of herbicides on the development of small bowel abnormalities and their surgical correction*

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Summary

* Illustrations to the article are on the colored inset of the Journal (p. IV–V).

The birth of children with congenital malformations of the small intestine has a correlation with the degree of use of chemical plant protection products and water supply problems in some regions. Surgical treatment of this pathology in this group of surgical patients — in newborns who are extremely difficult to tolerate any diagnostic and treatment interventions, have limited prospects and opportunities. The problem associated with these malformations of the digestive tube in newborns must be addressed with preventive measures.

Keywords: newborn, digestive tube, morphology, malformations, pesticide, surgical intervention

EDN: LWSNMP

Conflict of interest. Authors declare no conflict of interest.





Влияние гербицидов на развитие аномалий тонкой кишки и их хирургическая коррекция*

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Резюме

Рождение детей с врожденными аномалиями развития тонкой кишки имеет корреляционную связь со степенью применения в некоторых регионах химических средств защиты растений и с проблемами водоснабжения. Новорожденные крайне тяжело переносят любые лечебно-диагностические интервенции и вмешательства, и к сожалению, в нашем регионе пока имеют ограниченные перспективы и возможности лечения. В силу ряда региональных социально-экономических причин, решение проблем, связанных с пороками развития тонкой кишки у новорожденных, необходимо активнее переводить в плоскость профилактических мер.

Ключевые слова: новорожденные, пищеварительная трубка, морфология, пороки развития, пестициды, хирургическое вмешательство

Конфликт интересов. Авторы заявляют об отсутствии конфликта интересов.

* Иллюстрации

к статье –
на цветной
вклейке в журнал
(стр. IV–V).

Introduction

The small intestine in mammals and humans, in particular, participates in ensuring homeostasis, harmonious activity of the functional systems of the body due to the perfect integration of the regulatory systems of the body, and the inverse relationship of the central and peripheral links [2, 3]. The immune-neuroendocrine system of the small intestine is a developed structural and functional formation, and provides mutual communication between the organs of the digestive and other systems during digestion and absorption of organic and inorganic substances, regulation of the level of nutrients and ions in the blood, penetration of antigens of both food and microbial origin [1, 8, 9, 10]. But, despite the establishment of general regularities of the functioning of regulatory systems in internal organs, the formation and integration of various levels of its organization has not been studied enough, the mechanisms of spatial-temporal relationship in the dynamics of age, before and after birth, during the regulation of homeostasis of the internal environment of the body have not been clarified [2, 3, 4, 7].

To date, the issues of the sequence of their morpho-functional formation and the features of their integrative activity, as well as the influence of pesticides

through the mother's body and the reactive reaction of regulatory structures remain insufficiently studied. Separate studies on the effects of various pesticides and pesticides coming from the milk of nursing females do not allow us to reveal these mechanisms [5, 11].

Elucidation and establishment of patterns of development and formation of internal organs in physiological conditions and under the influence of adverse environmental factors is of great theoretical and applied importance.

According to the literature, one of the main factors polluting the environment (biosphere) at present are pesticides. The effect of unfavorable environmental factors in the formation of organs and systems in ontogenesis is often the cause of various congenital malformations [2, 3, 4]. The development of surgery for congenital malformations of internal organs, the improvement of neonatology, timely prenatal diagnosis of malformations, in recent years, the improvement in the survival rates of newborns with congenital intestinal obstruction is noticeable [1, 6, 8, 9, 10]. However, there is still an unresolved problem related to the variety of clinical and anatomical variants of developmental anomalies, the choice of tactics and timing of surgical treatment of partial intestinal obstruction, including

in isolated duodenal malrotation [1, 8, 9]. The most severe group of patients are newborns with combined and multiple malformations, complicated by inversion and necrosis of the intestine, intrauterine perforation, meconium peritonitis [14, 15].

The purpose of the research. Study of morphological and clinical features of congenital anomalies of the small intestine in newborns in regions with varying degrees of use of chemical plant protection products and the results of their surgical treatment.

Materials and methods of the research

The study material was the small intestine of operated newborn patients with congenital malformations of the small intestine in the Department of neonatal surgery of the 2nd clinic of the Samarkand State Medical

University for the period from 2009 to 2017. The subject of the study was a comprehensive study of the clinic, treatment and morphology of congenital small bowel obstruction in newborns.

Research results and their discussion

The effect of pesticides on the body of pregnant rabbits and the intrauterine effect of these chemicals on the developing fetus and internal organs can cause the development of congenital malformations, in particular, the intestinal tube [2,3,4]. When studying the incidence of congenital small bowel obstruction in newborns in various regions of the Samarkand region, we found that higher rates are observed in areas with a high risk of negative effects of pesticides (peritroid class), irrigated farmland with fairly intensive use of plant protection products from insects and pests, but with a relatively low level of provision of the population with tap drinking water. At the same time, it is obvious that the degree of entry of pesticides into the human body occurs through drinking water.

In 2009–2017, the number of newborns registered in the Samarkand region with an anomaly in the development of the small intestine amounted to 171 cases per 656289 newborns. The total incidence of congenital small bowel obstruction in the Samarkand region is 1 per 3838 births. In areas with the highest risk of pesticides, this indicator was 1 per 3519 live births, and in regions with centralized water supply and low level of agrochemicals use, this indicator was noticeably low – 1/5683.1 (Fig. 1).

In order to solve this problem, we studied the results of surgical treatment of 171 newborns with congenital small bowel obstruction hospitalized in the 2nd clinic of SamMI for the period from 2009 to 2017. There were 107 boys (62.6%), 64 girls (37.4%). Among the causes of obstruction, atresia of various types prevailed (Fig. 2), it occurred in 135 (78.9%) operated infants. There were 7 stenoses of the small intestine (4.1%). Malrotation was diagnosed a little more often than 26 (15.2%). Ileus on the basis of doubling of the intestine (Fig. 3) was noted in 3 (1.8%) newborns. 2/3 of the defects were attributed to abnormalities of the jejunum, the remaining 1/3 were due to lesions of the ileum.

newborns admitted to the specialized department of neonatal surgery, along with an assessment of the clinical picture of the disease, ultrasound was performed without fail, which showed signs of intestinal obstruction,

radiography of the abdominal cavity in the vertical position of the child. For this defect, a characteristic X-ray picture is the presence of multiple horizontal fluid levels in the stretched loops of the intestine. Irrigation was performed for limited indications (suspicion of dynamic intestinal obstruction, acute form of Hirschsprung’s disease and malrotation). Water-soluble radiopaque preparations were used for irrigation. A characteristic sign of congenital small bowel obstruction on irrigograms is the so-called “microcolon” symptom (Fig. 4).

During diagnostic procedures, preoperative preparation was carried out in parallel for 6–8 hours. Hemodynamics, respiration, body temperature, diuresis were monitored without fail, an oro- or nasogastric probe was installed for decompression of the stomach, infusion therapy was started aimed at correcting the acid-base state and electrolyte disorders and eliminating hypovolemia.

Right-sided transrectal laparotomy (140 (81.9%) cases) was used as operative access in most children, less often – upper (23 (13.5%) interventions) and mid-median laparotomy (8 (4.7%) patients).

When choosing the tactics of surgical treatment for infants with congenital intestinal obstruction, preference was given to simultaneous radical intervention – the primary formation of small-intestinal anastomoses and excision of the membrane, which was performed in 134 (78.4%) patients (Table 1). In the presence of cord-like atresia of the underlying small intestine (Fig.5), as well as in patients with diffuse peritonitis, it was necessary to perform the first stage of removal of ileo-eunostoma (37 (21.6%) cases).

In cases of inconsistency of the diameter of the stitched segments of the intestine less than a centimeter, they tried to perform an end-to-end anastomosis, and with a more pronounced discrepancy – “end to side”.

Among the complications of the postoperative period there were (Table 2): pneumonia, noted in 73 (42.7%) newborns, adhesive intestinal obstruction – in 37 (21.6%), wound complications – in 17 (9.9%), prolonged intestinal paresis – in 13 (7.6%), insufficiency

Table 1.
Types of surgical interventions for congenital small bowel obstruction, n=171

Type of intervention	n	%
Interstitial anastomosis	99	57,9
Stoma formation	37	21,6
Excision of the membrane	35	20,5

Table 2.
Complications after surgical interventions for congenital small bowel obstruction, n=171

Complication	n	%
Pneumonia	73	42,7
Adhesive intestinal obstruction	37	21,6
Suppuration of the wound	17	9,9
Prolonged intestinal paresis	13	7,6
Insufficiency of anastomosis sutures	10	5,8
Stoma prolapse	4	2,3

of interstitial anastomosis sutures – in 10 (5.8%) and stoma prolapse – in 4 (2.3%).

Postoperative mortality in newborns with congenital small bowel obstruction was 25.7% – 44 children died. The causes of death were more often pneumonia (25) and repeated interventions for adhesive intestinal obstruction (12) and peritonitis (7).

During morphological examination of the affected organ, hypoplasia of the small intestine and its wall

structures was observed, which is a consequence of the toxic effect of the pesticide on the processes of morpho- and organogenesis and differentiation of structures, the formation of functional systems, integration and adaptation processes. This indicates the effect of pesticides on the function and morphology of organs not only in direct contact with it, but also on the formation and formation of internal organs by acting through the mother's body.

Conclusions

1. The frequency of birth of children with malformations of internal organs, in particular the small intestine, has a high degree of correlation with the problems of water supply of the population existing in some regions and the intensity of the use of chemical plant protection products.
2. Despite the development of modern therapeutic and diagnostic capabilities of neonatal surgery, neonatology, anesthesiology and resuscitation, the degree of postoperative complications and mortality in these defects remain high.
3. Surgical methods of treatment of this pathology in a group of the most unprotected surgical patients – in newborns, who are extremely difficult to tolerate any therapeutic and diagnostic interventions and interventions, have limited prospects and opportunities.
4. The solution of problems associated with malformations of the small intestine in newborns should be actively transferred to the plane of preventive measures.

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To article

The influence of herbicides on the development of small bowel abnormalities and their surgical correction (p. 112–116)

К статье

Влияние гербицидов на развитие аномалий тонкой кишки и их хирургическая коррекция (стр. 112–116)

Figure 1.
Map of the Samarkand region:
districts with
different levels
of water supply
and application of
agrochemicals

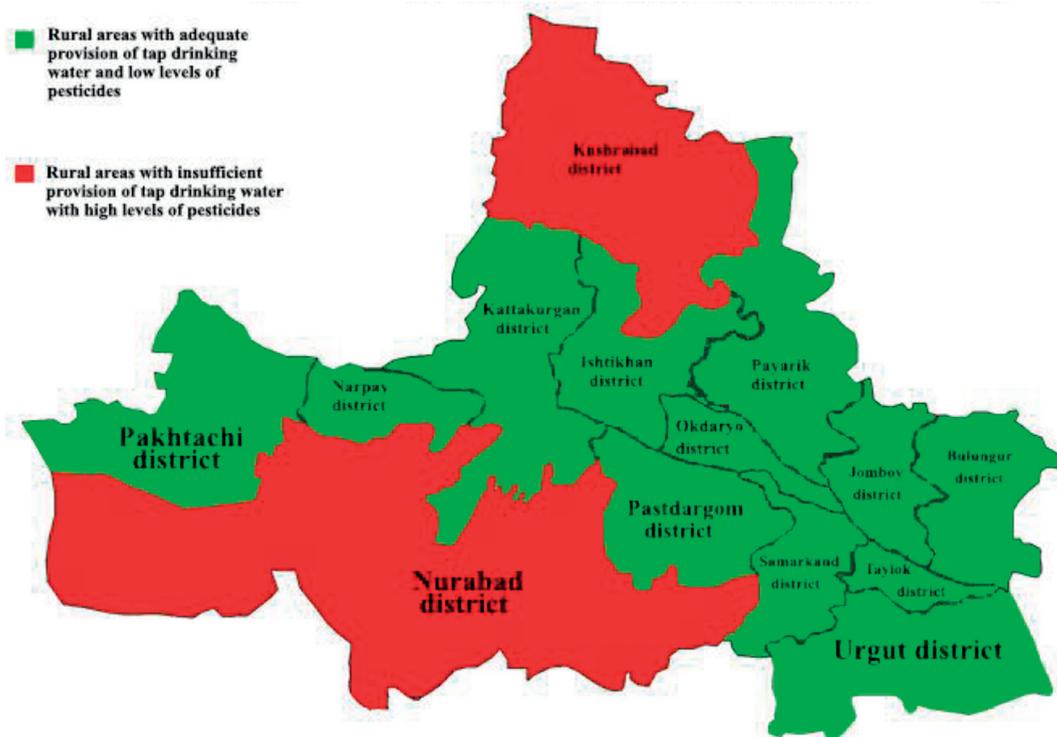


Figure 2.
Jejunum atresia.

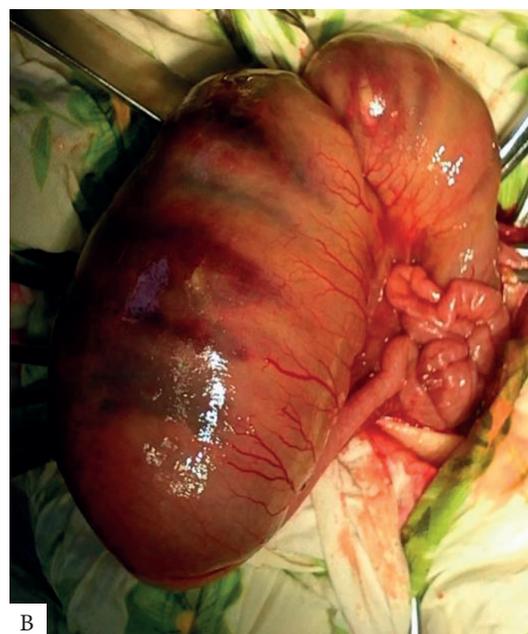


Figure 3.
Segmental doubling of the small intestine.



Figure 4.
Irrigation: a microcolon against the background of sharply swollen intestinal loops



Figure 5.
Cord-like atresia of the small intestine – ileostomy formation was performed

