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Modern Approaches To Surgical Treatment Of Congenital Malformations Of The Gastrointestinal Tract In Newborns

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ABSTRACT

The presented scientific work presents the results of a comprehensive study of modern methods of surgical treatment of congenital malformations of the gastrointestinal tract in newborns.

The study was retrospective and prospective in nature and covered 124 patients with various forms of congenital anomalies of the oesophagus, stomach, duodenum, small and large intestine. Special attention was paid to the comparative analysis of minimally invasive technologies and traditional cavity surgeries.

Survival rates, recovery time, nature of complications and long-term results of surgical intervention were studied. Preoperative preparation was carried out in compliance with the principles of neonatal resuscitation and with the use of modern diagnostic techniques.

It was shown that the use of laparoscopic and thoracoscopic techniques under certain conditions contributes to a significant reduction in mortality and the incidence of infectious complications. It has been established that the reduction of the duration of stay of a newborn baby in the intensive care unit is directly related to less traumatic minimally invasive interventions. The importance of multidisciplinary approach including surgeons, neonatologists, anaesthesiologists-resuscitators and other specialists was emphasized, which allows to increase the effectiveness of treatment.

Generalization of the results obtained gives grounds to assert that further introduction and improvement of minimally invasive methods can significantly increase the effectiveness of treatment.

Generalization of the obtained results gives grounds to assert that further introduction and improvement of minimally invasive methods can significantly increase the efficiency of surgical treatment of congenital malformations of the gastrointestinal tract in newborns.

Keywords: *congenital malformations of the gastrointestinal tract, newborns, surgical treatment, minimally invasive technologies, rehabilitation, postoperative complications, survival rate, prognosis.*

1. INTRODUCTION

Modern neonatology and paediatric surgery have made significant progress in the diagnosis and treatment of congenital malformations of the gastrointestinal tract, which often pose a threat to the life of the newborn from the first hours or days after birth. The prevalence of such pathological conditions varies depending on the specific malformation and the region of observation, but the total number of such patients remains quite high, which determines the relevance of this problem for practitioners. Developmental anomalies of the oesophagus, stomach, small and large intestine can lead to severe nutritional disorders, progressive intoxication, severe electrolyte shifts and the development of multi-organ failure, which ultimately significantly increases the risk of mortality.

The key task in congenital malformations of the gastrointestinal tract is the timely recognition and surgical correction of the detected defects [1]. Early initiation of treatment, including not only surgery itself but also intensive care, is crucial for survival and quality of life. Most critical malformations require surgical treatment, often on an emergency basis, even before complications develop and decompensation of the child's condition.

The technical equipment of modern clinics and the development of anaesthetic techniques allow the use of a wide range of surgical interventions, ranging from traditional open operations to minimally invasive techniques [9]. The use of laparoscopic and thoracoscopic techniques in recent years has aroused stable interest among doctors of various specialties. Reduced surgical trauma, lower risk of infectious complications and shorter postoperative period represent significant advantages of minimally invasive interventions. However, there are still situations when traditional surgery is the only possible option to save a child's life, especially in critical condition or severe combined anomalies.

The organization of specialized care for newborns also plays an important role. The use of high-tech techniques is possible only if there are qualified personnel and adequate material and technical base. A modern perinatal centre staffed by a team of paediatric surgeons, neonatologists, anaesthesiologists and resuscitators, as well as specialists in related fields (cardiologists, neurologists, urologists) provides a multidisciplinary approach to the treatment of complex malformations. This model of medical care allows us to effectively address the issues of complex diagnostics and the choice of the optimal surgical option.

2. MATERIALS AND METHODS OF THE STUDY.

The work was conducted in a multidisciplinary perinatal centre for three years with the participation of a team of paediatric surgeons, neonatologists, anaesthesiologists-resuscitators and related specialists. The study had a retrospective and prospective design, including the analysis of medical records of children with congenital malformations of the gastrointestinal tract and systematic observation of newborns operated on during this period.

The main methods of the study were clinical and diagnostic, instrumental and laboratory, as well as statistical in the processing of the obtained data. Anamnesis, physical status, X-ray and ultrasound data were assessed, which allowed us to classify malformations and determine the severity of the newborns' condition. Computed tomography and consultations of specialized specialists (cardiologist, neurosurgeon, and urologist) could be used to clarify anatomical defects in case of a complex clinical picture [11].

When forming the sample, children with confirmed congenital malformations of the oesophagus, stomach, duodenum, small and large intestine were taken into account. Patients with fatal combined anomalies incompatible with life, when the decision on surgical intervention was not taken due to the extreme severity of the condition or hopeless prognosis, were excluded. The neonates included in the study required urgent or emergent surgical correction and were hospitalized in the neonatal pathology department.

Preoperative preparation was carried out according to the protocol adopted in the clinic. Correction of water-electrolyte disorders, stabilisation of respiration and haemodynamics, and antibacterial therapy in the presence of signs of infection were performed. Surgical interventions were performed under general anaesthesia, usually with inhalation or combined type of anaesthesia, and controlled artificial ventilation of the lungs. The choice of the method of surgical correction (minimally invasive or traditional) depended on the anatomical features of the malformation, the equipment of the operating theatre, the experience of specialists, and the patient's condition at the time of intervention.

The technical equipment of operating theatres included a standard laparoscopic set (5-mm optics, additional trocars, and laparoscopic instruments) or equipment for open surgery (laparotomy and thoracotomy sets). In minimally invasive interventions, low-flow anaesthesia was used and insufflations were controlled to maintain adequate pressure in the abdominal or pleural cavity [2]. During surgery, vital functions including heart rate, blood pressure, oxygen saturation, and capnometry and body temperature were monitored.

Postoperative management included intensive therapy in the intensive care unit. Pain control, antibiotic prophylaxis, and parenteral nutrition were performed if enteral feeding could not be started early. In case of stable condition and absence of complications, patients were transferred to a specialized department for further rehabilitation. To collect statistical

information, mortality rates, duration of artificial ventilation, length of hospital stay and frequency of postoperative infectious complications were recorded. Then the obtained data were analyzed using descriptive statistics methods, calculation of mean values, standard deviations and tests of statistical significance of differences using a number of criteria (Student's t-criterion, $\chi 2$, etc.) [7].

Thus, the study materials included a combination of anamnesis data, clinical and diagnostic examinations, and protocols of surgical interventions and indicators of the dynamics of the newborns' condition in the early and remote postoperative period. The described methods made it possible to comprehensively evaluate the efficacy and safety of various surgical approaches, as well as to determine the range of factors affecting treatment outcomes.

Justification of the results obtained.

The analysis of medical records and examination data made it possible to establish that the study included 124 newborns with confirmed congenital malformations of the gastrointestinal tract. Diagnostic procedures performed as an emergency included general and biochemical blood tests, chest and abdominal radiography, and ultrasound examinations. In case of atypical or severe course of pathologies, computed tomography was additionally performed. Consultations with allied specialists allowed timely exclusion or consideration of concomitant congenital anomalies of other organs and systems.

47 patients had oesophageal atresia or tracheo-oesophageal fistula, 29 had congenital duodenal obstruction, 23 had intestinal malrotation with volvulus, 15 had Hirschprung's disease, and 10 had combined anomalies including various defects of the stomach and intestine. The distribution of newborns by type of major malformation is shown in Table 1.

Table 1. Distribution of newborns by main types of congenital malformations

Congenital defect	Number of patients (n=124)	Percentage of total number, %
Oesophageal atresia / tracheo-oesophageal fistula	47	37,9
Congenital duodenal obstruction	29	23,4
Intestinal malrotation with volvulus	23	18,5
Hirschprung's disease	15	12,1
Combined anomalies	10	8,1

The patients included in the study included children who received both minimally invasive and conventional surgical treatment. The minimally invasive surgery group included 68 newborns operated on laparoscopically or thoracoscopically, and the traditional surgery group included 56 children who underwent classic laparotomy or thoracotomy.

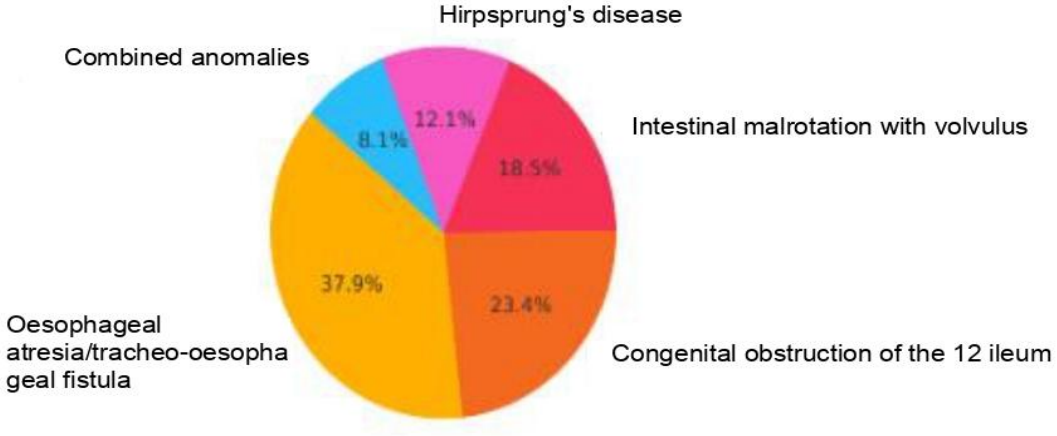

Figure 1 - Distribution of newborns by main types of congenital malformations

The results of surgical treatment revealed significant differences in the postoperative period and survival rates. The main advantage of minimally invasive techniques was a reduction in the duration of artificial ventilation, which is associated with less surgical trauma, reduced pain and early activation of patients. Reduced duration of ventilator support, in turn, reduced the risk of respiratory complications including pneumonia and respiratory distress syndrome [5].

Comparative analysis also indicated a lower incidence of septic complications in the minimally invasive group, which can be attributed to the smaller surgical wound area and reduced risk of contamination. It is noteworthy that overall mortality was also reduced in this group. Most of the unfavorable outcomes in children with severe comorbidities were in the traditional intervention group, which confirms the potentially higher surgical risk with a large volume of surgical trauma [11].

Summary data on the average duration of surgery, ventilator time, ICU stay, and frequency of septic complications, overall mortality, and length of hospitalization are shown in Table 2.

Table 2. Main indices of the postoperative period

Indicator	Minor invasive group (n=68)	Traditional group (n=56)
Average duration of surgery, min	90,6 ± 14,3	80,2 ± 12,9
Average duration of ventilation, hours	34,2 ± 5,8	56,4 ± 7,2
Average ORIT stay, days	5,2 ± 1,1	7,3 ± 1,4
Total mortality, %	5,9	14,3
Frequency of septic complications, %	7,4	17,8
Average length of hospitalisation, days	15,1 ± 2,4	19,7 ± 3,1

A closer look at the causes of mortality revealed that most of the deaths in the traditional group were due to combined malformations, severe cardiovascular malformations and late diagnosis of the underlying disease. Even in such cases, the use of minimally invasive techniques, when technically feasible, is associated with better results, as less surgical trauma gives the child a better chance of a favourable course in the early postoperative period.

Reduced length of hospitalization in the minimally invasive group also correlates with rapid initiation of enteral nutrition and faster recovery of digestive function [4]. Traditional surgeries have been associated with more intense pain requiring prolonged analgesia, which sometimes slows down the process of introducing the child to full enteral feeding [8].

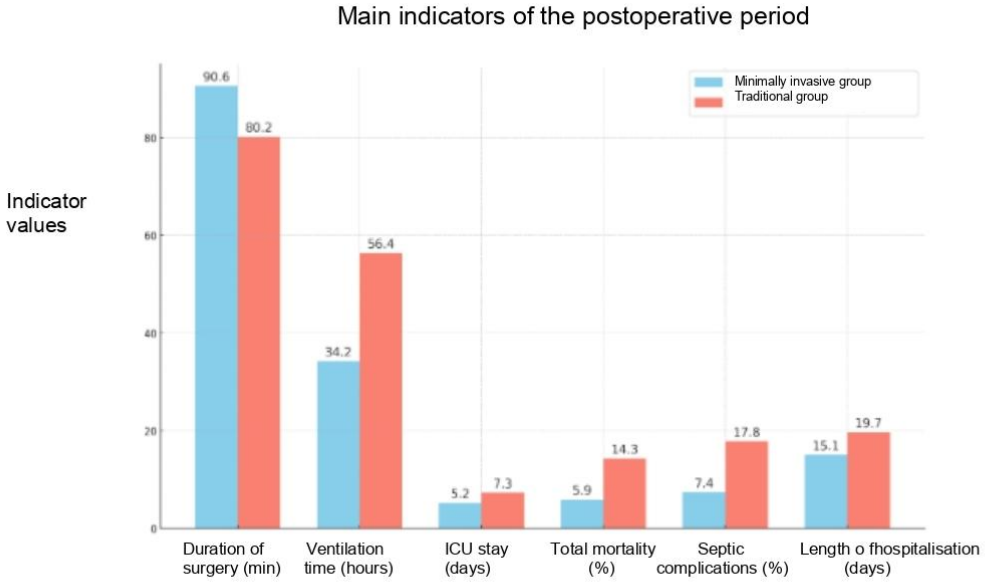

Figure 2 - Main indicators of the postoperative period

When evaluating the long-term results (6-12 months after discharge), there was a general improvement in the quality of life in both groups. The children who underwent minimally invasive surgery were less likely to have scarring and adhesions, which reduces the risk of recurrent intestinal obstruction in the future. The presence of functional disorders (episodes of

vomiting, stool instability) in some cases is explained by the initial severity of the malformation or concomitant neurological pathologies.

Timely surgical treatment performed in the first two days of life in critical malformations significantly improved the prognosis. Children whose diagnosis was delayed were more likely to experience complications, including severe septicaemia. The material and technical equipment of the clinic also had a significant impact: in modern perinatal centres equipped with devices for non-invasive methods of respiratory support, monitoring systems and extracorporeal methods of haemocorrection, survival rates were higher.

The results of the study confirm that minimally invasive technologies should be integrated into the routine practice of surgical care of newborns, if the anatomical features of the malformation and the general condition of the child allow. With proper organization of perinatal care and training of specialists, it is possible to significantly reduce surgical risk, improve survival rates and accelerate recovery after surgery.

3. CONCLUSIONS

Extensive analysis of data collected in a multidisciplinary perinatal centre has shown that in newborns with congenital malformations of the gastrointestinal tract, surgical correction is vital in the first hours or days of life, which directly affects the prognosis and survival rate. Minimally invasive methods of surgical treatment in most cases have advantages in terms of reduced postoperative traumatisation, shorter duration of artificial ventilation, reduced risk of respiratory and septic complications and faster restoration of enteral nutrition. Reduced stay in the intensive care unit, as well as reduced incidence of fatal outcomes indicates the high effectiveness of such interventions in the conditions of modern neonatal anaesthesiology and intensive care.

At the same time, traditional (open) interventions remain relevant in cases of extremely severe combined malformations, unstable haemodynamics and inability to create safe conditions for minimally invasive access. The decision on the choice of surgical treatment method should be made taking into account the individual characteristics of the malformation, concomitant diseases and the general condition of the child.

The results demonstrate the importance of a multidisciplinary approach involving close interaction between paediatric surgeons, neonatologists, anaesthesiologists and resuscitators, and specialists in related fields. Early diagnosis, competent preoperative preparation and subsequent rehabilitation with the involvement of high-tech methods of intensive care ensure better outcomes.

In the future, further improvement of endoscopic equipment, advanced training of medical personnel and widespread introduction of minimally invasive operations can significantly improve the results of treatment of congenital malformations of the gastrointestinal tract in newborns. Joint efforts of the scientific and clinical community aimed at optimizing surgical techniques and developing neonatal resuscitation will further improve the quality and life expectancy of these children.

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