SELECTION OF TACTIC AND OF METHODS SURGICAL TREATMENT IN NEWBORNS WITH CONGENITAL ACUTE DUODENAL OBSTRUCTION

B.B. Ergashev[1], U.A. Hamroev[2]

[1]Tashkent State Medical University, Tashkent, Uzbekistan
[2]Republic of center perenotologest, Tashkent, Uzbekistan

Objective. To improve the results of treatment of congenital duodenal obstruction (CDO) in newborns by optimizing the tactics and methods of surgical correction.

Methods. We conducted a retrospective review of 169 patients with CDO who underwent surgical treatment between 2017 and 2025 at the Neonatal Surgery Training and Methodological Center under the Republican Perinatal Center of the Republic of Uzbekistan. All patients diagnosed with CDO, regardless of the cause of obstruction, were included in the study.

Results. In our study, laparoscopic access in the correction of CDO demonstrated clear advantages over traditional open intervention with a reduction in postoperative early and late complications. Despite the fact that the average duration of the operation at laparoscopy was longer than at laparotomy, patients recovered noticeably faster in the early postoperative period. In particular, the use of laparoscopy made it possible to reduce the length of hospital stay by approximately 1.6 days, limit the use of narcotic analgesics on the first day, and ensure a better cosmetic result for the wound.

Conclusion. Laparoscopic access is recommended as a minimally invasive choice method in neonatal surgery for the correction of VDN in newborns, taking into account the experience of surgeons and the high qualifications of anesthesiologists and resuscitators.

Key words: *duodenal obstruction; newborns; anastomoses; laparoscopic method.*

For citation: Bahtiyor B. Ergashev, Ulugbek A. Hamroev. Selection of tactic and of methods surgical treatment in newborns with congenital acute duodenal obstruction.

Relevance. Congenital duodenal obstruction (CDO) in children is the result of various defects in embryonic development, disturbances in the intestinal recanalization process, formation of internal organs, as well as abnormalities in the relationships during embryogenesis between the duodenum (DU) and other structures (for example, the pancreas (PG) or portal vein), which can also lead to CDO [1, 2, 3, 4, 5]. According to the world literature, the incidence of CDO in newborns is 1:5000–10000 [3, 6, 7, 8]. Moreover, 25–30% of CDO cases are combined with Down syndrome [9, 10, 11, 12, 13]. Despite certain successes in the surgical correction of VDN, to date, issues of antenatal and early postnatal diagnosis, the choice of surgical treatment method and postoperative management of children remain a subject of debate and remain relevant in neonatal surgery [1, 6, 7, 14].

Purpose of the study. Improving the results of treatment of VDN in newborns by optimizing tactics and methods of surgical correction.

Materials and methods. We conducted a retrospective review of 169 patients with VDN who underwent surgical treatment between 2017 and 2025 at the Neonatal Surgery Training, Treatment, and Methodological Center of the Republican Perinatal Center of the Republic of Uzbekistan. The study included all patients diagnosed with VDN, regardless of the cause of obstruction. Data were collected from medical records, including gestational age, birth weight, weight at surgery, perioperative stability, clinical presentation, diagnostic tests, surgical details, and outcomes. Follow-up data were obtained during outpatient visits and telephone interviews with families.

A total of 169 patients met the inclusion criteria. Of all the identified cases, 22 (14,9%) were premature infants with partial duodenal obstruction who were admitted to a specialized department late and required prolonged intensive care until their condition was stabilized. Therefore, they were not operated on in the neonatal period and were excluded from this study. Also excluded from the study were 5 (2,9%) premature infants whose condition was critical upon admission, all stabilization measures were unsuccessful, and the patients died during the preoperative preparation stage. Thus, the study included 147 (100%) newborns, of which 79 (53,7%) were boys and 68 (46,3%) were girls.

All patients underwent a comprehensive preoperative examination, including a physical examination, laboratory tests, abdominal ultrasound, and plain and contrast abdominal radiography. Preoperative stability was assessed by anesthesiologists, and indications for surgical intervention were established for all patients. X-ray contrast examination of the upper gastrointestinal tract was performed in the supine position with the head end elevated by 30°. The volume of water-soluble contrast agent was calculated as the volume of a single feeding (weight × coefficient for newborns 1/5) × number of feedings per day (for newborns 7) = m × 1/5 ÷ 7) in a 1:1–1:10 dilution with saline solution due to

the high osmolarity of the contrast agent to avoid unwanted damage to the gastrointestinal mucosa upon contact with it. In case of low gastric motility, delayed radiographic images were taken at 1, 3, 6, 9, and 12 hours after the administration of the contrast agent, which made it possible to assess the motility and patency of the intestinal tract.

All patients underwent preoperative preparation aimed at stabilizing the biochemical composition of the blood (correction of electrolyte disturbances, bilirubin, glucose, and total protein levels), restoring the acid-base balance, and eliminating the symptoms of exsiccosis.

Based on the surgical approach used for VDN, patients were divided into two groups: laparoscopic and laparotomy. All surgeries were performed under general anesthesia with tracheal intubation. Intraoperative vital signs and exhaled carbon dioxide levels were continuously monitored to ensure surgical safety and to promptly decide on conversion in the event of uncontrolled metabolic disturbances developing during laparoscopy. Laparoscopic intervention was performed using a three-port approach. The first (umbilical) trocar was inserted using an open laparoscopic technique without a Veress needle, and CO_2 insufflation was maintained at a pressure of 6–8 mmHg. Two additional 3-mm diameter working ports were inserted in the right and left hemiabdomen under laparoscopic control. Laparoscopic reconstructive procedures included laparoscopic duodenoduodenostomy, membrane excision with transverse duodenal suturing, longitudinal duodenotomy with subsequent transverse duodenal suturing, and band excision with duodenal mobilization. Open procedures included Kocher duodenoduodenostomy, Kimura anastomosis, duodenotomy with membrane excision and transverse suturing, and longitudinal duodenotomy with transverse duodenal suturing.

Pre-established criteria for conversion were intraoperative major vessel bleeding, unclear anatomy, or anesthetic instability.

Postoperatively, patients were treated in the neonatal intensive care unit. Enteral feeding (via nasogastric tube or orally) was gradually initiated as bowel function recovered. Patients were closely monitored for potential complications, such as anastomotic leakage, peritonitis, or recurrent obstruction. Follow-up examinations were performed regularly for 1–5 years after surgery.

Results. Of the 147 patients included in the study, 109 (74.1%) were full-term infants, while 38 (25,8%) were premature infants.

The detection of polyhydramnios and the visualization of two dilated fetal abdominal fluid formations (the "double bubble" symptom) during antenatal ultrasound screening suggested duodenal obstruction in 87 (59,1%) cases, and the fetal malformation was detected in the second trimester in all pregnant women. All women were referred for further examination to the RPP of the Republic of Uzbekistan. Based on the examination results, a postnatal prognosis was determined during a perinatal consultation, and the couple was thoroughly informed of all the risks associated with the congenital malformation. No indications for termination of pregnancy were identified. The pregnant women were recommended to deliver in a multidisciplinary hospital with a neonatal intensive care unit and neonatal surgery. This antenatal care algorithm and the continuity of care between obstetric and neonatal services helped to avoid the risk of late diagnosis and the development of a critical condition due to severe intestinal obstruction (IO).

The clinical course of VDN in the early neonatal period depended on the degree of duodenal obstruction. With complete obstruction, the disease manifested itself as severe vomiting syndrome and rapid development of exicosis ; with partial obstruction, a subacute course was observed. Most newborns were hospitalized within the first day after birth – 87 (59,1%) children, on the 2nd-3rd days – 33 (22,4%), on the 4th-10th days – 18 (12,2%). We classified hospitalization on the 11th-19th days – 9 newborns (6,1%) as late admission. The reasons were often an atypical course of VDN, masked by the symptoms of concomitant diseases and conditions. Almost all late-admitted premature infants showed signs of aspiration bronchopneumonia and exsiccosis against the background of a septic state. In premature infants, the acute course of VDN was often accompanied by severe exsicosis, which developed at an earlier stage than in full-term infants, which is associated with the immaturity of adaptive mechanisms and requires a more careful assessment of the causes of impaired tolerance to enteral loading.

If intestinal obstruction was suspected in the postnatal period, the examination of newborns began with an abdominal ultrasound. Acute high intestinal obstruction was characterized by the presence of the "double bubble" sign, while partial high intestinal obstruction was characterized by an increase in duodenal diameter compared to normal values. In all cases of suspected intestinal obstruction, a plain chest and abdominal radiograph was performed in the upright position (in two projections). The presence of two gas bubbles with horizontal fluid levels on the plain abdominal radiograph, corresponding to a dilated stomach and duodenum, indicated obstruction of the distal duodenum. Thus, detection of the characteristic "double bubble" sign on ultrasound and radiography served as

grounds for terminating further examination of the patient. If plain chest radiography and ultrasound were insufficiently informative (which was rare), a contrast study of the stomach with a water-soluble contrast agent was performed. In this case, moderate dilation of the stomach and duodenum was detected, as well as delayed evacuation of gastric contents into the small intestine.

A comprehensive examination allowed us to identify concomitant somatic pathology, congenital malformations and genetic syndromes. In particular, 39 (26,5%) had intrauterine growth retardation; 37 (25,1%) had respiratory distress syndrome; 34 (23,7%) had hypoxic-ischemic CNS damage; 9 (6,1%) had edema syndrome. In 28 (19%) newborns, VDN was combined with other multiple developmental anomalies (of which, in 8 (28,5%) cases, it was Down syndrome). It should also be noted that the risk of developing neonatal maladjustment was extremely high in the presence of concomitant malformations. The combination of several congenital anomalies significantly complicated the course of VDN in newborns and was one of the leading factors of an unfavorable prognosis before and after surgery.

The causes of VDN in newborns in our study were: annular pancreas – in 62 (42,1%) patients; internal membrane of the duodenum – in 44 (29,9%); atresia of the duodenum – in 20 (13,6%); stenosis of the duodenum – in 15 (10,2%), aberrant vessels – in 3 (2%) and congenital cords – in 3 (2%).

The duration of preoperative preparation in the study group was 48–72 hours from the moment the child was admitted.

The laparoscopic method was used in 50 (34%) children. Among the laparoscopic surgeries, membrane excision with transverse suturing of the duodenum was performed in 16 (32%) cases, duodeno-duodenostomy was performed in 14 (28%) patients, longitudinal duodenotomy with subsequent transverse suturing of the duodenum in case of stenosis – in 5 (10%); excision of cords with duodenal mobilization – in 3 (6%). Conversion was required in 12 (24%) patients, the surgical intervention option was chosen from open surgeries. Thus, open anastomosis was performed in 109 (74,1%) children. With the laparoscopic method of VDN correction: duodeno-duodenostomy in 74 (67,8%) (traditional – in 39-35,7% and according to Kimura – in 35–32,1% of children); duodenotomy with excision of the membrane and transverse suturing – in 27 (24,7%) cases and longitudinal duodenotomy with transverse suturing of the duodenum in case of stenosis – in 8 (7,3%) cases.

In the immediate postoperative period, complications developed in 34 patients (23,1%). Anastomotic leakage was observed in 8 patients (5.4%); of these, repeat surgery with creation of gastrojejunal anastomosis was required in 5 cases (3.8%), and an abdominal wall fistula developed in 3 cases (2%), which subsequently closed spontaneously. Long-term functional duodenal obstruction was observed in 26 patients (17,6%), and necrotizing enterocolitis developed in 12 patients (9%); these complications were eliminated by conservative measures.

Postoperative mortality was 27 (19,7%) cases. The primary cause of death was multiple congenital malformations, which led to the development of severe pneumonia, disseminated intravascular coagulation (DIC), and multiple organ failure associated with sepsis.

Follow-up observation ranged from one month to one year after surgery in 70 surviving patients. Of these, 38 underwent laparoscopic surgery, with no recurrence of duodenal obstruction, normal nutritional status, and adequate weight gain. Physical examination and parental interviews confirmed satisfactory quality of life and growth. In newborns, the laparoscopic method was characterized by a longer operative time but ensured a more uneventful postoperative course compared to the traditional (open) method of duodenal obstruction correction. Laparoscopy reduced the hospital stay (by an average of 1.6 days), limited the use of narcotic analgesics to the first 24 hours, and improved cosmetic results.

Discussion. In our study, the laparoscopic approach to correcting VDN demonstrated clear advantages over traditional open surgery, with a reduction in postoperative early and late complications. Although the average surgical duration was longer with laparoscopy than with laparotomy, patients experienced significantly faster recovery in the early postoperative period. Specifically, laparoscopy reduced the hospital stay by approximately 1.6 days, limited the use of narcotic analgesics in the first 24 hours, and ensured a better cosmetic wound outcome. Furthermore, the overall incidence of postoperative complications in the laparoscopic group was lower than with the open approach. Our data are consistent with the findings of other authors [1, 14].

Comparing our results with current literature data, it can be noted that some centers previously encountered an increased incidence of anastomotic leaks when mastering the laparoscopic technique [5]. However, accumulated experience and technical modifications have made it possible to significantly reduce these risks. In agreement with this, recent publications report consistently good outcomes in laparoscopic duodenoduodenostomy formation in newborns [1, 6, 10, 14]. Our approach included a careful selection of the technique depending on the nature of the obstruction: for extrain-

testinal causes (annular pancreas), we preferred laparoscopic duodenoduodenostomy, whereas for local membranous obstruction, duodenotomy with excision of the obstructive membrane and subsequent transverse suturing of the intestine is optimal. This differentiated approach, in line with recommendations from Russian surgeons, has enabled us to achieve a high success rate in our work.

The development of neonatal resuscitation, parenteral nutrition, and the ability to manage comorbid conditions has reduced mortality to 5–10%, and in most cases, death occurs due to comorbidities, primarily congenital heart defects [1, 3, 6]. Similarly, in our series, the accumulation of surgeons' experience in performing laparoscopic procedures, improvements in anesthesiology, and postoperative care have led to a reduction in complications and mortality among children with congenital heart disease.

Conclusions:

1. When choosing a surgical approach, it is important to consider the nature of the obstruction and the child's overall condition. With adequate preoperative stabilization and the absence of severe comorbidities, preference should be given to laparoscopic duodenoduodenostomy to correct extraintestinal causes of obstruction. This minimizes surgical trauma and speeds recovery. However, for intracavitary obstructions, a laparotomy approach with membrane removal and transverse intestinal suturing is more effective.

2. The laparoscopic method of correcting VDN in newborns has proven its relative effectiveness, which was associated with faster postoperative recovery, fewer complications and a shorter hospital stay.

3. It is recommended to use laparoscopic access as a minimally invasive method of choice in neonatal surgery for the correction of VDN in newborns, taking into account the experience of surgeons and the high qualifications of anesthesiologists and resuscitators.

Literature

1. Kozlov Yu.A., Rasputin A.A., Baradieva P.A., Cheremnov V.S., Ochirov Ch.B., Zvonkov D.A., Kovalkov K.A., Poloyan S.S., Chubko D.M., Kapuller V.M., Vinogradov K.A. Multicenter study of laparoscopic and open treatment of duodenal atresia // Surgery. Journal named after N.I. Pirogov. 2021; 5: 5–13. https://doi.org/10.17116/hirurgia20210515

2. Tikhon N.M., Volkova M.P., Khmelenko A.V. Chronic duodenal obstruction: a clinical case in pediatric practice // Hepatology and gastroenterology. 2017. Vol. 1, No. 2. P. 203–204.

3. Bax N.M., Ure B.M., van der Zee D.C., van Tuijl I. Laparoscopic duodeno-duodenostomy for duodenal atresia // Surg Endosc. 2001; 15(2): 217. doi: 10.1007/BF03036283

4. Bethell G.S., Long A.M., Knight M., Hall N.J.; BAPS-CASS. Congenital duodenal obstruction in the UK: a population-based study // Arch Dis Child Fetal Neonatal Ed. 2020; 105(2): 178–183. doi: 10.1136/archdischild-2019-317085

5. Hill S., Koontz C.S., Langness S.M., Wulkan M.L. Laparoscopic versus open repair of congenital duodenal obstruction in infants // J Laparoendosc Adv Surg Tech A. 2011; 21(10): 961–963. doi: 10.1089/lap.2011.0069

6. Mokrushina O.G., Razumovsky A.Yu., Shumikhin V.S., et al. Comparative evaluation of endosurgical and open intervention in newborns with duodenal obstruction // Russian Bulletin of Pediatric Surgery, Anesthesiology and Resuscitation. 2022. Vol. 12, No. 1. pp. 9–18. DOI: https://doi.org/10.17816/psaic1002

7. Chilibiisky Ya.I., Chepurnoy M.G. Modification of the Kimura operation in children with congenital duodenal obstruction // Modern problems of science and education. 2021. No. 6. P. 127.

8. Kay S., Yoder S., Rothenberg S. Laparoscopic duodenoduodenostomy in the neonate // J Pediatr Surg. 2009; 44(5): 906–908. doi: 10.1016/j.jpedsurg.2009.01.025

9. Razumovsky A.Yu., Kulikova N.V., Kholostova V.V., et al. Chilaiditi syndrome as a cause of chronic duodenal obstruction in children operated on for omphalocele // Experimental and Clinical Gastroenterology. 2021. No. 8 (192). P. 181–187.

10. Rostovtsev N.M., Baboshko P.G., Bazaliy V.N., Abushkin I.A., Kotlyarov A.N., Yadykin M.E., Mustakimov B.Kh., Lapin O.V. Results of treatment of duodenal obstruction in newborns // Pediatric Bulletin of the Southern Urals. 2016. No. 2. pp. 63–66.

11. Shchapov N.F., Keshishyan E.S., Ekimovskaya E.V., Melnik T.N., Pykhteev D.A. Organization of care for newborns with congenital malformations in the Moscow region // Russian Bulletin of Perinatology and Pediatrics. 2023. Vol. 68, No. 1. P. 123–127. https://doi.org/10.21508/1027-4065-2023-68-1-123-127

12. Ivanitskaya O., Odegova N., Shchapov N., Tsayuk Y. Band neutrophil sign: a strong first-trimester ultrasound marker of combined duodenal and esophageal atresia // Prenat Diagn. 2020. doi: 10.1002/pd.5848

13. van der Zee D.C. Laparoscopic repair of duodenal atresia: revisited // World J Surg. 2011; 35(8): 1781–1784. doi: 10.1007/s00268-011-1147-y

14. Shchapov N., Ekimovskaya E., Kulikov D., et al. Treatment of congenital duodenal obstruction: from open to laparoscopic approach for duodeno-duodenal anastomosis. Med. Res. Arch., 2023;11(7.2). doi:10.18103/mra.v11i7.2.4139