

Comparative Evaluation of the Results of Traditional and Endoscopic Correction of Congenital Pyloric Stenosis in Newborns and Infants

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Abstract Congenital hypertrophic pyloric stenosis (CHP) is a malformation of the gastrointestinal tract (GIT), characterized by organic narrowing of the pyloric part of the stomach adjacent to the duodenum. The pathogenesis is based on an acute violation of patency in the pyloric region of the stomach due to hypertrophy of the circular fibers of the pyloric muscle, the development of connective tissue, and thickening of the mucosa in the pyloric region.

Keywords Congenital hypertrophic pyloric stenosis, High intestinal obstruction, Pyloric stomach, Endoscopy, Endoscopic pyloromyotomy, Hypertrophy

1. Introduction

CHP is the most common surgical pathology of the neonatal period, requiring immediate surgical treatment. CHP is of great interest to surgeons and pediatricians. In the last decade, a decrease in incidence has been noted in many developed countries, such as the USA, Denmark, Great Britain, Scotland, Germany, and Sweden. In addition, the incidence of births of children with pyloric stenosis may be influenced by racial and ethnic differences. The disease most often occurs in people of the white race, especially of Northern European origin, somewhat less frequently in people of the Negroid race, and very rarely in eastern peoples [3,5].

Morphologically, pyloric stenosis is manifested by a thickening of the wall of the pyloric canal up to 3-7 mm (normal 1-2 mm). In healthy children in the first weeks of life, the pylorus has a pink color and a rounded shape, resembling an onion; with this disease, it lengthens and acquires an olive-shaped shape, cartilaginous density and a white color. These changes develop over time. Histologically, hypertrophy of muscle fibers (mainly the circular layer), thickening of connective tissue septa, edema, and subsequently sclerosis of the mucous and submucosal layers with impaired differentiation of connective tissue structures are revealed [1,5].

Nursing of the patient after the operation directly depends on his condition before the operation. Immediately after the operation, the child is considered healthy, but concomitant lesions of the mucous membrane of the digestive tract

are often not taken into account. The multifactorial model of inheritance of congenital pyloric stenosis suggests a pronounced clinical polymorphism.

Prolonged regurgitation and vomiting with functional disorders can also lead to metabolic disorders and the development of malnutrition, therefore the problems of diagnosis and differential diagnosis of congenital hypertrophic pyloric stenosis and pylorospasm are relevant for pediatricians. Vomiting can also be a symptom of a number of other diseases: infectious, inflammatory and metabolic (adrenogenital syndrome, etc.), which requires a careful approach to differential diagnosis. Carrying out an endoscopic examination and comparing data from the compared groups will allow us to identify features and choose the right approach to therapy [2,7].

Extensive experience in the surgical treatment of CHP allows us to achieve good long-term results and complete recovery of patients. Over the past decades, significant advances in pediatric surgery have been noted, which have made it possible to perform endoscopic (laparoscopic) operations in pediatric patients whose age exceeds 3 months of age. The extraordinary progress of endosurgery has led to the fact that almost all interventions in childhood have been transformed into minimally invasive procedures, practically no different from those used in the adult patient population [4,6].

2. Objective

Improvement of treatment outcomes by comparative evaluation and methods of correction of congenital pyloric stenosis in newborns and infants.

3. Materials and Methods

In the period from 2014 to 2022, 206 patients with congenital pyloric stenosis, aged from 2 weeks to 3 months, were diagnosed and treated at the Republican Educational-Treatment-Methodological Center of Neonatal Surgery at the Russian Orthodox Church, 170 (82.5%) boys, 36 (girls) 17.4%.

All patients underwent the following instrumental studies: ultrasound of the abdominal organs - 206 (100%), EchoCG-90 (44%), NSG-206 (100%), X-ray of the abdominal organs - 109 (53%).

After instrumental studies, congenital comorbidities were detected in 9(4.3%) patients. Such as heart defects - 4(33.3%): of them ASD-2 (50%), VSD -2(50%); pathology of the kidneys - 3(33.3%) of which hydronephrosis - 2(66.6%), hydrocephalic syndrome 1(11%), as well as Ladd's syndrome (11%).

Depending on the severity of exicosis and malnutrition upon admission, we performed infusion therapy.

Depending on the method of surgical correction, the patients were divided into 2 groups.

The first group of patients was operated on by the traditional method until 2017 - 98 (47.5%) patients. The second group included 108 (52.5%) children who underwent endoscopic pyloromyotomy from 2017 to the present day.

Table 1

Indicators:		score
Cry	No	0
	Silent crying	1
	Loud crying	2
Facial expression	Calm or smile	0
	Grimace of lips	1
	Grimace of lips and eyes	2
Body position	Calm	0
	Forced	1
	Tense	2
The position of the lower limbs	Neutral	0
	Knocks legs	1
	Tense	2
Physical activity	Plain	0
	Moderate anxiety	1
	Expressed anxiety	2

Pain assessment by the sum of points: 0 - no pain; 3-5 points moderate pain; 6-10 points intense pain.

First of all, we assessed the duration of surgery, postoperative pain syndrome and noted the time of start of enteral feeding, the time of complete transition to enteral feeding, early postoperative complications and the duration of hospitalization. Postoperative pain was assessed using the CHIPPS (Children's and Infant's Postoperative Pain Scale) scale 4, 12, and 24 hours after pyloromyotomy. The scale is intended for use in newborns and children under 5 years of

age (Table 1).

The cosmeticity of postoperative scars was assessed in the long-term period after surgery using a modified BIQ questionnaire (Body Image Questionnaire), which is actively used to identify satisfaction with cosmetic results after surgical interventions.

4. Results and Discussions

During the study period, among all patients, the average age at the time of surgical treatment was 28 days (16–64 days).

The average duration of the pyloromyotomy operation with the traditional method was 48 ± 5.6 minutes. With the use of laparoscopy, the average duration of the operation was reduced to 18 ± 7.1 minutes. All operated patients began to feed on the first postoperative day. After undergoing laparoscopic surgery, gastrostasis phenomena were the least pronounced in children, which made it possible to start feeding with formula or breast milk 6.01 ± 0.24 hours after surgery. In open surgery, this indicator differed significantly and the start of enteral feeding became possible only after 10.4 ± 2.42 hours ($p < 0.05$) (Table 2).

Table 2. Comparison indicators in study groups

Groups		Main group n= 108	Comparison group n= 98
Indicators			
Operation time, min		18 ± 7.1	48 ± 5.6
Pain assessment on the CHIPPS scale, score	b/w 4 h	3.46 ± 0.17	$7.35 \pm 0.14^*$
	b/w 12 h	1.13 ± 0.31	$5.46 \pm 0.16^*$
	h/w 24h	0.28 ± 0.15	3.84 ± 0.12
Start of enteral feeding (hour)		6.01 ± 0.24	10.4 ± 2.42
Complete enteral nutrition (hour)		48.2 ± 0.71	67.4 ± 3.47
Intra- and postoperative complications		4 (3.7%)	3 (3)%
Average length of hospitalization (day)		7 ± 2.1	12 ± 2.3
Cosmetic effect of scars, according to the BIQ scale (point)		2.3 ± 0.15	8.6 ± 0.14

A similar trend was noted with the possibility of switching to full enteral nutrition. In the group with endoscopic pyloromyotomy, children did not require infusion support 48.2 ± 0.71 hours after surgery. In children operated on in the traditional way, full enteral feeding began only after 67.4 ± 3.47 ($p < 0.05$) hours.

When assessing the pain syndrome on the CHIPPS scale, the best indicators were observed in children after endoscopic pyloromyotomy. Most of the children operated on by this method did not need analgesics after 12 hours, and after a day, painkillers were canceled in all patients. Postoperative pain during open interventions was estimated at approximately the same level and amounted to 3.84 ± 0.12 points in a day, which did not allow stopping painkillers in most children.

Of the resulting intra - and postoperative complications,

with the traditional method, 2 (2%) cases of perforation of the gastric mucosa and divergence of the sutures of the surgical wound, the formation of a ventral hernia in one case (1%) were noted. Mucosal perforations were diagnosed in time and were sutured. During endoscopy, perforation of the gastric mucosa was observed in 2 (1.8%) cases. Incomplete myotomy occurred in 2 (1.8%) cases, in the main group, associated with insufficient dissection of the hypertrophied layer, which was successfully eliminated by repeated endoscopic method on the 3rd day after the first operation. All patients were discharged in a satisfactory condition.

The average duration of hospitalization was 4 ± 2.1 days in the main group, versus 10 ± 2.3 days in the comparison group.

Questioning parents with the BIQ questionnaire revealed satisfaction with cosmetic results after traditional access and laparoscopy: 2.3 ± 0.15 and 8.6 ± 0.14 points, respectively. Moreover, the difference in the groups was statistically significant ($p < 0.05$). The formation of a clearly visible scar after the traditional approach (8.6 ± 0.14 points) does not allow us to talk about the cosmeticity of this incision, when the indicator is at the level of 2.3 ± 0.15 points ($p < 0.05$) in the main group.

5. Conclusions

Our study showed a significant advantage of the laparoscopic method compared to the traditional one in terms of the duration of surgical intervention, restoration of gastrointestinal tract functions, severity of postoperative pain syndrome, as well as a decrease in bed days. The endoscopic method makes it possible to minimize the presence of postoperative complications due to the high detail of anatomical structures, magnification and resolution

of objects over which surgical manipulations are performed. In terms of cosmetics, the traditional method is inferior to the endoscopic method.

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