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Clinical and Radiological Manifestations of Partial Intestinal Obstruction in Newborns and Infants

Sattarov Zh. B., Ibragimov A. V.

Tashkent Pediatric Medical Institute, Republican Training, Treatment and Methodological Center for Neonatal Surgery at the Republican Perinatal Center, Uzbekistan

Abstract The article presents data on examination of 123 patients with congenital intestinal obstruction out of 463 children with various forms of congenital intestinal obstruction. Their clinical presentation in upper and lower partial intestinal obstruction is presented. The results of radiological methods, indications and the sequence of application of simple radiography, irrigography and passing through the gastrointestinal tract are presented.

Keywords Congenital partial intestinal obstruction, Clinical presentation, Anatomical forms, Diagnosis, Newborns, Children of weaning age

1. Relevance

Despite the increasing incidence of intestinal obstruction in children [5], there are only a few publications in the literature devoted to this problem. Some authors mention the membranous form of atresia, although in most of the described cases there was a complete membrane of the colon, identified intraoperatively during the neonatal period [2,5].

The incidence of congenital intestinal obstruction (CIO) is 1:1500-1:2000 newborns. Various forms of CIO in most cases occur in the neonatal period and up to 3 months of age [1,4,9,12]. There are known examples of manifestations of intestinal obstruction in children of older age groups, adolescents and even adults. There is no detailed analysis in the literature of the frequency, forms and results of treatment of older children and adults with this pathology. A few works highlight methods of diagnosis and surgical treatment in individual cases [3,4,6,11].

There are subacute, chronic and recurrent forms of CIO. With obstructions that cause partial obstruction of patency from the inside of the intestine (stenosis, membranes with lumen, doubling of the gastrointestinal tract) or compression of the intestine from the outside, caused by malformations and tumors of other organs, abnormal arrangement of the vessels of the abdominal cavity, unusual structure and fixation of ligaments and other formations of the peritoneum, gradual progression of clinical signs of gastrointestinal obstruction in the form of chronic intestinal obstruction [4,7,12].

The clinical picture, characteristic of almost all types of intestinal obstruction, consists mainly of such symptoms as: abdominal pain, nausea, vomiting, lack of stool, and the passage of gas. With the development of complications, peritoneal symptoms of systemic disorders appear. The course of the disease depends on the etiological factor and characteristics of pathogenesis. Among the methods of radiation diagnostics, the most informative are ultrasound and x-ray examination. Especially ultrasound of the abdominal cavity, the reliability of which reaches 96%. X-ray examination, as a traditional method of examining intestinal obstruction, is available in all medical institutions [1,4,7,8].

There are many controversial issues in the diagnosis and treatment of children with CIO that require a unanimous decision.

The purpose of this study is to study the features of the clinical course and radiological manifestations of partial intestinal obstruction in newborns and infants.

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2. Materials and Methods

In the Republican Training, Treatment and Methodology Center for Neonatal Surgery at the Russian Orthodox Church, at the clinical base of the Department of Hospital Pediatric Surgery of the Tashkent Pediatric Medical Institute, in 2015-2022, 463 children with various surgical diseases of the abdominal organs, manifested by congenital intestinal obstruction, were treated. Of 123 (26.6%) newborns and infants with various forms of CIO, 99 (80.5%) newborns were aged from 1 day to 1 year; up to 3 months – 19 (15.5%); up to 7 months – 3 (2.4%); up to 1 year – 2 (1.6%). In 105 (85.4%) patients, high partial intestinal obstruction was established, in 18 (14.6%) – low. of 64 (52.0%) children with defects of intestinal rotation and fixation, intestinal obstruction was: high - in 31 (93.75%), low - in 24 (6.25%). Among the patients, boys predominated - 51 (41.5%), girls were 72 (58.5%).

The patients underwent complex clinical, laboratory and radiation diagnostic methods (ultrasound, radiological - plain radiography of the abdominal organs, contrast study of the gastrointestinal tract, irrigography and CT), aimed at an objective assessment of the somatic status, the course of transient conditions and determining the form of CIO, the nature of the accompanying developmental anomalies and somatic diseases affecting the course and outcome of the disease.

3. Research Results

Based on the results of treatment of 123 children with CIO of various forms, localization and causes of obstruction in accordance with the generally accepted classification, we determined the frequency of individual nosological forms, systematized their clinical manifestations, features of the course, summarized the results of auxiliary research methods, and identified the nature of associated anomalies. These data are of fundamental importance due to the fact that, with individual differences in clinical and radiological manifestations and complications characteristic only of high or low intestinal obstruction, the same clinical and radiological picture is observed, regardless of the cause of obstruction in the corresponding localization.

With high intestinal obstruction, partial obstruction was caused by duodenal stenosis - in 6 (3.9%) patients; compression of the duodenum by the annular pancreas – in 10 (3.9%); external compression of the organ by periduodenal adhesions - in 11 (2.3%); the presence of a membrane with a lumen – in 18 (14.7%). In 60 (48.1%) cases, duodenal obstruction was caused by various forms of intestinal malrotation.

1 of 23 patients with low intestinal obstruction, in 18 (69.2%) the phenomena of partial obstruction predominated. Membranes with lumen were noted in 4 (1.2%) patients; stenoses – in 3 (2.0%). Compression of the small intestine by adhesions and pathological formations in 7 (9.1%) patients caused partial intestinal obstruction. Various forms of intestinal malrotation in 4 (30.8%) children were accompanied by clinical and radiological signs of low intestinal obstruction.

With intestinal CIO, various combined anomalies of the gastrointestinal tract and other organs and systems are observed. In 76.4% of patients, CIO manifested as an isolated pathology; in 23.6% it was combined with other forms of CIO.

In acute intestinal obstruction, including CIO, an informative diagnostic method is x-ray examination. The feasibility of using this method separately or in combination is determined individually. The examination begins with a survey X-ray of the abdominal cavity (in newborns, covering the chest) with the child in an upright position.

The most common findings are two gas bubbles with a horizontal liquid level. This corresponds to a distended stomach and duodenum and indicates obstruction of the distal duodenum.

Multiple levels are characteristic of low intestinal obstruction. A distended stomach without intestinal pneumatization indicates volvulus (Fig. 1).

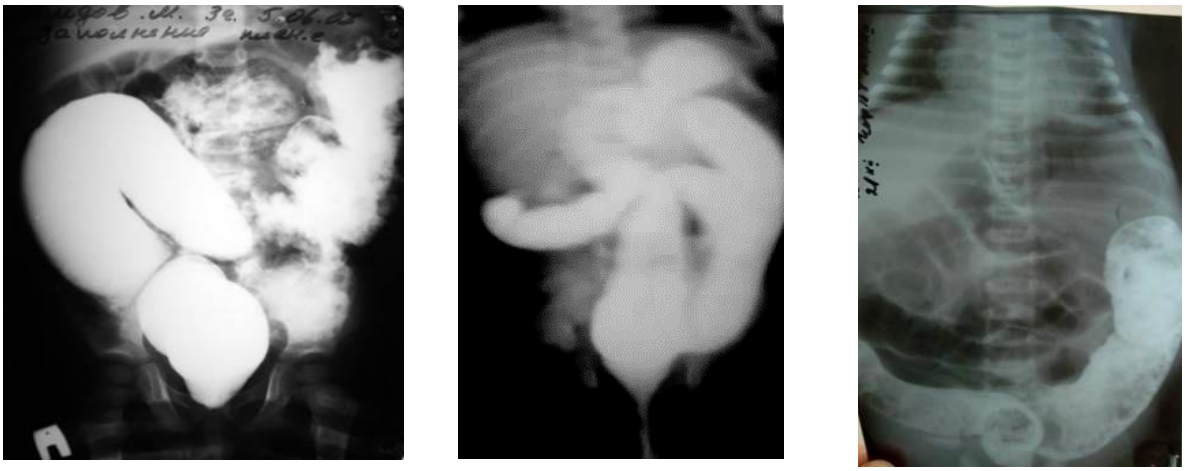
With partial obstruction of the duodenum and (or) within the midgut, multiple horizontal levels or a predominant accumulation of gas to the right of the spine in the mesogastric region are detected with decreased or no pneumatization in other areas, which may be an indirect sign of the right-sided position of the small intestine. Using plain radiography, before complications develop, it is difficult to identify pathologically ognomonic radiological signs characteristic of individual anatomical forms of intestinal malrotation.

If complications such as intestinal obstruction or peritonitis occur, x-rays may reveal a distended stomach, uneven distribution of gas in the intestines, fluid accumulation in the lower abdominal cavity, or gas under the domes of the diaphragm. With such an x-ray picture, you can refuse additional x-rays and determine the indications for surgical intervention.

Irrigography is performed in the presence of a distended stomach, uneven distribution of gas in the intestines (mainly to the right or left of the spine, in the mesogastric region), and accumulation of fluid in the lower abdominal cavity.

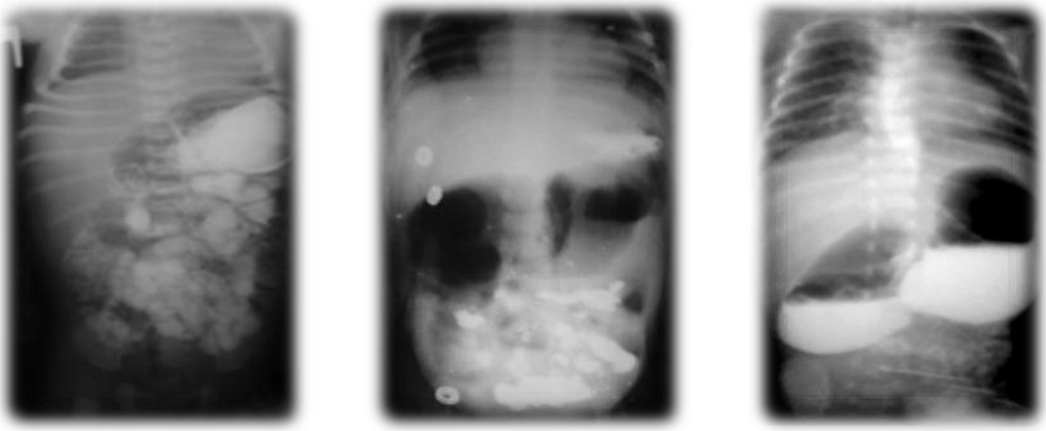
a b c

Figure 1. Plain radiography for intestinal obstruction: a) the presence of two fluid levels with high intestinal obstruction; b) accumulation of gas in the dilated colon with low intestinal obstruction; c) the "silent" zone and the initial parts of the small intestine filled with gas indicate malrotation of the midgut



a b c

Figure 2. Contrast irrigograms: a) tight filling of the distal colon, partial passage of contrast into the overlying sections at the membrane of the sigmoid colon; b) high location of the cecum with intestinal malrotation; c) delay of contrast in the sigmoid colon with stenosis of the colon



a b c

Figure 3. Passage of contrast through the gastrointestinal tract: a) partial high intestinal obstruction; b) partial low intestinal obstruction; c) changes in the size, shape and syntopy of the duodenum

Figure 4. Radiographs of a mesocolcoparietal hernia: a) plain radiography - uneven pneumatization of small intestinal loops with signs of low intestinal obstruction; b-c): passage of contrast through the gastrointestinal tract in right-sided localization (b); with left-sided localization (c) – contrasted parts of the small intestine are localized mainly on the right and left; d) irrigogram – identifies an incorrectly located colon in the form of microcolons

The method allows you to determine changes in position, length, diameter, and characteristic bends of the colon. With an atypical location of the colon, characteristic of intestinal malrotation (Fig. 2).

However, not in all cases it is possible to determine the type of malrotation, especially when predominantly part of the small intestine is involved in the pathological process. With incomplete and mixed rotation on irrigograms, the colon is on the left side. Some patients do not have additional bends.

Anomalies of fixation in the form of pathological fusion of the ascending colon and cecum with the transverse colon, localized in the upper abdominal cavity, can be considered excessive rotation.

In Ladd syndrome, the left half of the colon has a normal location on the irrigogram, and the cecum and ascending colon are atypically located in the right upper quadrant or along the midline of the abdomen. Sometimes a conglomerate is formed from loops of the small intestine, the right parts of the large and transverse colon.

Insufficient information content of plain radiography and irrigography in case of partial intestinal obstruction requires passage of a contrast mass through the gastrointestinal tract.

A common radiological finding during passage through the gastrointestinal tract in patients with CIO is the phenomenon of complete or partial duodenal obstruction. Changes in the anatomical shape of the duodenum may be observed in the form of absence of bends and its syntopy, deviation of the organ to the left and right in relation to the spine, atypical location of all or part of the colon, depending on the type of intestinal rotation disorder (Fig. 3).

More characteristic changes are observed in mesocolicoparietal hernias, when loops of the small intestine are localized in the hernial sac formed in the mesentery of the intestine to the right or left of the spine (Fig. 4). In doubtful cases, when diagnosing intestinal obstruction and CIO, there is a need to carry out a set of auxiliary methods in stages.

According to clinical and instrumental studies, it is difficult to determine the anatomical form of intestinal malrotation before surgery.

CIO was more severe in newborns due to complications of the main and concomitant diseases, combined anomalies. Analysis of clinical material showed the relationship between CIO and the severity of maladjustment in newborns, determined by the clinical status of the mother, the course of the birth process, and the condition of the newborn. In infants with CIO, symptoms of chronic or chronically recurrent intestinal obstruction, mainly caused by external compression of the intestine, predominated. Such children are characterized by underweight (15-20%) and retarded physical development due to chronic nutritional disorders and malabsorption. Analysis of clinical materials indicates unsatisfactory prenatal diagnostics of congenital malformations, including CIO in the republic, the need to more actively introduce antenatal diagnostics, optimize the diagnostic and treatment complex among newborns and infants.

4. Conclusions

The clinical picture of CIO in newborns and infants is dominated by signs of high or low partial intestinal obstruction, depending on the degree of obstruction, the nature of the complications encountered and concomitant pathology. Clinical signs of intestinal perforation, peritonitis with symptoms of intestinal obstruction and volvulus should be considered a risk of complications of intestinal malrotation.

Analysis of our material shows that the phenomena of recurrent intestinal obstruction, retardation of the child in physical development, paroxysmal abdominal pain, chronic constipation should cause doctors to be increasingly wary of CIO. Suspicion of such anomalies is justified in the following radiological signs: distended gas bubble of the stomach; phenomena of partial intestinal obstruction; atypical arrangement of loops of the small and large intestines; lengthening of the colon.

Data from preoperative X-ray studies are the most informative, but do not always allow us to identify the anatomical form of CIO. With an integrated approach to diagnosis, its accuracy increases. The final diagnosis is verified during surgery.

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