https://doi.org/10.33472/AFJBS.6.6.2024.5484-5495

African Journal of Biological Sciences

Journal homepage: http://www.afjbs.com

Research Paper Open Access

Meckel's Diverticulum: An Unusual Dislocation in Associated Pathology, Rare Complications in Children

Ergashev N. Sh.[1], Markaev A. Y.[2], Rakhmatullaev A. A.[3], Samatov O. S.[4]

[1,2,3,4]Tashkent Pediatric Medical Institute, Uzbekistan, Tashkent.

Article Info

Volume 6, Issue 6, June 2024

Received: 13 April 2024

Accepted: 19 May 2024

Published: 14 June 2024

doi: 10.33472/AFJBS.6.6.2024.5484-5495

ABSTRACT:

The paper presents literature data and the results of our own observations on the diagnosis and surgical treatment of 47 children with Meckel's diverticulum in the clinical bases of the Department of Hospital Pediatric Surgery of the Tashkent Pediatric Medical Institute in 2010-2022. The frequency, nature of complications, features of pathological conditions in DM and methods of surgical interventions were studied. DM without pathological changes was detected during surgery in 7 cases as an accidental finding, in 40 cases it was accompanied by various complications: intussusception, strangulating intestinal obstruction, diverticulitis and bleeding. Rare forms of localization in combination with other anomalies and complications were analyzed.

Keywords: Meckel's diverticulum, clinical manifestations, associated anomalies, complications, diagnosis, treatment, children.

1. Introduction

Meckel's diverticulum is a congenital anomaly of the ileum that occurs as a result of impaired obliteration of the proximal part of the vitelline duct. It is one of the most common congenital anomalies of the gastrointestinal tract and the cause of a number of serious conditions. DM is a protrusion of a section of the ileum of various lengths and shapes, resembling a vermiform appendix at a distance of 20–100 cm from the ileocecal angle. Usually hangs freely into the abdominal cavity, sometimes the apex is attached to the umbilical ring, intestinal mesentery or other abdominal organs, which can lead to intestinal obstruction. Histologically, its wall is similar to that of the small intestine, with a less pronounced muscle layer. In the mucous membrane there are areas of heterotopic gastric mucosa or pancreatic tissue [1,3-5,7,14]. The

length of the diverticulum can be from 1-2 cm to 15-20 cm [1], the diameter can reach the width of the ileum. The literature describes gigantic sizes of DM up to 35 cm, with a diameter of 15 cm [1,3,4-6,12,14]. The frequency of DM is 2–3%, clinical manifestations and complications of the disease are observed in 25% of cases [9]. If DM is considered a variant of ileal duplication, then the description of thoracoabdominal duplications penetrating through the diaphragm into the abdominal cavity or vice versa is extremely rare (8,9). Histological examination of diverticular duplication corresponds to the abdominal organs: stomach, duodenum, small or large intestine. With DM, as with other developmental anomalies, there is a combination of various malformations of the cardiovascular system, genitourinary system, spine and spinal cord, or an association in the form of a triad of diaphragmatic hernia, intestinal malrotation, heterotopia of pancreatic tissue in parts of the gastrointestinal tract or in the Meckel's diverticulum itself [11 ,12]. In the clinical picture of DM, most researchers identify a triad of symptoms: abdominal pain, gastrointestinal bleeding (GI) and intestinal obstruction. The predominance and severity of each of them depends on the anatomical features of the DM, the presence of ectopic tissues in the DM wall that have different morphofunctional characteristics, the age of the patient and his physiological characteristics. The most common forms of DM are inflammation and ulceration with transformation into perforation; they are observed in 40% of cases. Diverticula can cause navel pathology: cysts, fistulas, fibrous cords between the diverticulum and the navel - 12%. Intestinal obstruction can be a complication of DM in 25% of cases. In 3% of cases, a complication of diverticulum can be benign or malignant neoplasms of the ileum [10].

Purpose of the Study: to highlight the features of the clinical course, the difficulty of diagnosing rare complications and atypical localization of Meckel's diverticulum in combined pathology in children based on clinical material.

2. Material and Research Methods

In 2010-2022, in the clinical bases of the Department of Hospital Pediatric Surgery of the Tashkent Pediatric Medical Institute, 47 children with DM were observed, which caused complications and diseases that required surgical intervention. In 7 (15.2%) patients, DM without pathological changes was detected during operations performed on the abdominal organs for appendicitis; 4 patients had malformations of the anterior abdominal wall; 2 had inguinal-scrotal hernia; in 1 thoracoabdominal form of DM, associated with diaphragmatic hernia. Among the patients there were 32 (68%) boys and 15 (32%) girls. Pathology was detected in 6 (12.8%) children under 3 months, from 3 months. up to 1 year – in 4 (8.5%), from 1 to 3 years – in 8 (17%), from 3 to 7 years – in 8 (17%), from 7 to 12 years – in 12 (25.5 %) and from 12 to 18 years – in 9 (19.2%). At the stages of treatment, laboratory, instrumental, ultrasound, radiation diagnostic methods, endoscopic and histomorphological studies were used. This report analyzes diagnostic and operational-tactical errors, complications that arose in patients with atypical thoracic dislocation and rare complications.

3. Results and Discussion

No specific clinical manifestations were observed in uncomplicated DM. The remains of the rudimentary vitelline duct in the form of a fixed cord of Meckel's diverticulum with the umbilicus or mesentery caused intestinal volvulus and intestinal compression with the manifestation of symptoms of intestinal obstruction (Table 1).

Table 1Forms of DM pathology identified during surgery intervention (n=47)

DM without changes or pathology	**Number of patients**	
	Abc.	**%**
Diverticulum without change	7	14,9%
Diverticulitis without peritonitis	13	27.7%
Diverticulitis with perforation	9	19,1%
Intussusception	6	12,8%
Strangulating intestinal obstruction	8	17,1%
Evagination of a patent vitelline duct	1	2,1%
Foreign body in the DM	1	2,1%
Ulcerations DM	1	2,1%
Thoracoabdominal form of DM	1	2,1%
Total:	47	100%

Of particular clinical interest was a child with multiple malformations in the form of a diaphragmatic hernia, Meckel's diverticulum and intestinal malrotation, referred to in the literature as a triad of these anomalies, and a second patient with massive intestinal bleeding due to DM ulceration. Here is a clinical example.

Patient T.M., 1 year 4 months. East Bol. No. 9894-386. He was admitted to the Department of Thoracic Surgery 2 - State Clinical Hospital on April 7, 2023 with a referral diagnosis: MVPR. Cystic adenomatous malformation of the upper lobe of the right lung. Condition after surgery for intestinal malrotation (Ledd syndrome). Severe protein-energy malnutrition.

From the anamnesis it was found that the child was from the first pregnancy and first birth, which occurred with symptoms of toxicosis. He was born at 40 weeks gestation with a body weight of 2400 g and a length of 46 cm. An antenatal examination was not performed. Apgar scores after birth at 1 and 5 minutes were 8 and 9. On the 2nd day of life, vomiting with bile appeared. He was hospitalized in the surgical department, where, based on X-ray data, a diagnosis was made: high partial intestinal obstruction. On the 5th day of life he was transferred to the neonatal surgery department of the Republican Perinatal Center (RPC).

Upon admission, the child's condition was serious, due to endotoxicosis, and the skin was subicteric. Respiratory rate -58 beats per minute, pulse -166 beats per minute. Heart sounds are muffled. Breathing is free, the chest is of correct shape, without visible deformations. On auscultation, moist rales are heard against the background of hard breathing. The abdomen is soft, moderately distended, and stagnant discharge is detected by gastric tube. Blood tests: hemoglobin - 155.0 g/l, er. $5{,}18\times10^{12}$, SP 0,92, thrombus. 274×10^{9}/l, leukocytes - $9{,}1\times10^{9}$, seg. core - 46%, lymphocytes - 40%. Total protein - 58.0 g/l. Total bilirubin - 155.8 mmol/l, direct - 87.6 mmol/l, indirect -68.2 mmol/l. Stool and urine tests without pathology. Neurosonography shows signs of hypoxic damage to the central nervous system. Ultrasound of the gastrointestinal tract - dilation of the stomach and duodenum. A chest x-ray reveals an air cyst in the projection of the upper lobe of the right lung (Fig. 1).

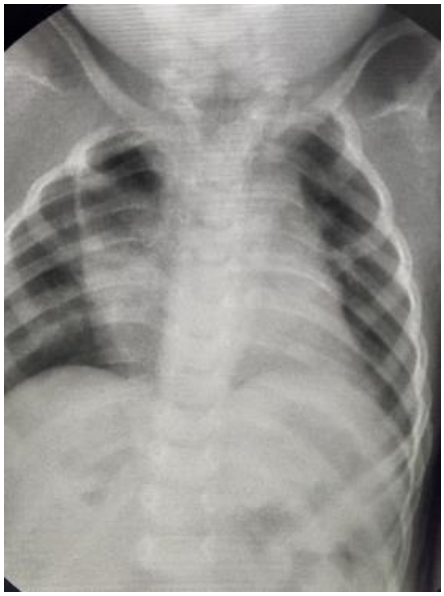

Fig. 1 Plain chest x-ray. Cystic formation in the projection of the right lung.

Taking into account the phenomena of partial intestinal obstruction, a contrast study of the gastrointestinal tract was performed, the results of which were assessed as a moderate delay of contrast in the stomach and duodenum. Echocardiography revealed a patent foramen ovale with a diameter of 4 mm and a patent ductus arteriosus with a diameter of 22.0 mm. Based on research data and the results of corrective measures for identified disorders, on January 10, 2022, the child was operated on with a presumptive diagnosis of partial high intestinal obstruction. An upper supraumbilical transverse laparotomy was performed. During the inspection, the pathology found was considered to be malrotation of the Ledd syndrome type, and a Ledd operation and appendectomy were performed. The midgut is left in its original position of incomplete rotation. The postoperative course was without complications; on March 16, 2022, he was discharged from the hospital in satisfactory condition, weighing 2500 g. Blood values: hem. 115 g/l, эр. 4,17 $\times 10^{12}$, SP 0,8, platelets – 274 $\times 10^{9}$/l, leukocytes 8,8 ×10*9, segm. core 46%, lymphocytes 40%, total protein 44.4 g/l, total bilirubin 14.4 mmol/l, direct absent. Regarding “congenital lung cyst”, a wait-and-see approach and dynamic monitoring are recommended. After discharge from the hospital, the child gained little weight and was sharply behind in physical development. For auxiliary nutritional therapy, on June 18, 2022, the child was hospitalized in the gastroenterology department of the Scientific and Practical Center for Pediatrics with a body weight of 4250 g. and a height of 58 cm with a diagnosis of severe protein-energy deficiency. Condition after Ledd's operation. The child received complex treatment for 10 days aimed at correcting the identified disorders. In the hospital, I gained 200 grams in body weight. On June 27, 2022, he was discharged from the hospital with a body weight of 4450 g. in a state of moderate severity with recommendations regarding feeding and examination by a surgeon regarding lung pathology.

Upon admission to the thoracic department at the age of 1 year 4 months, the condition was of moderate severity, low nutrition, body weight 7500 g. (deficit - 25%). On the anterior abdominal wall there is a scar from a transverse supramidal laparotomy. On examination, the liver protrudes 2-2.5 cm from under the edge of the costal arch; wheezing is heard in the lungs against the background of hard breathing. Blood tests: hemoglobin - 99 g/l, er. - 3.87 $\times 10^{12}$, CP - 0.82, platelets - 234 $\times 10^{9}$/l, leukemia. - 9.2 $\times 10^{9}$, seg. nucleus - 56%, lymphocytes - 32%. Against the background of correction of protein-energy deficiency, hematological and

electrolyte disturbances due to temperature reaction, antibiotic therapy with Ceftriaxone was started.

On April 11, 2023, MSCT pulmonary angiography was performed. The walls of the pulmonary arteries are smooth and clear. The lumen to the subsegmental arteries is preserved. The walls of the thoracic aorta are moderately thickened due to small mixed plaques, its lumen is preserved. The mediastinal organs are not displaced. No fresh foci or infiltrative changes were detected in the lung fields on the right and left. The vascular pattern is normal. The bronchial tree is not deformed. The roots of the lungs are expanded, signs of infiltration of the hilar tissue and reactions of the hilar lymph nodes were not detected. A defect of the right dome of the diaphragm with a diameter of 2.7 cm at the level of the posterior triangle with the exit of the hernial sac into the chest cavity with dimensions of 3.4 x 5.1 x 7.6 cm was determined; the contents of the sac are fatty tissue and intestinal loops compressing the medial sections of the right lung (Fig. 2).

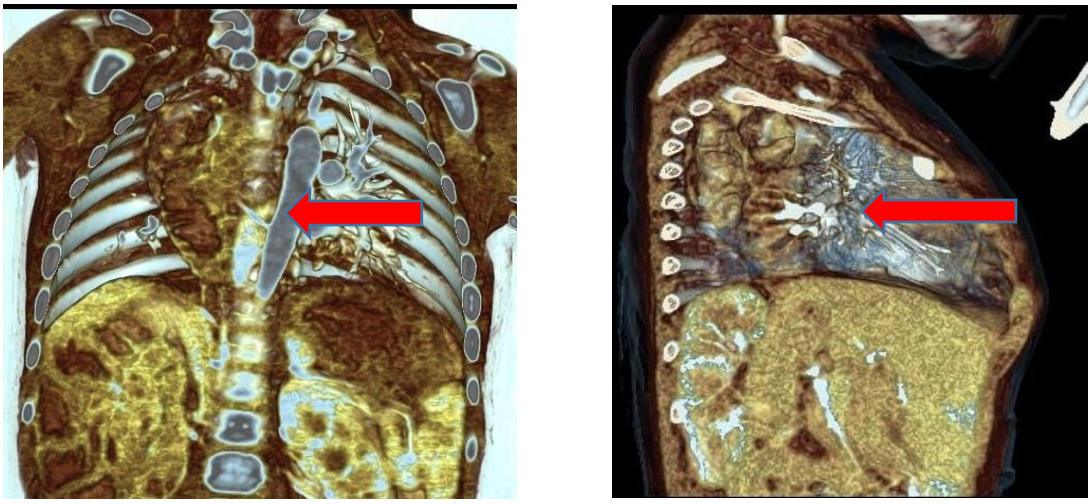

Fig. 2 a.b. MSCT angiography. A defect in the projection of the posterior triangle of the right dome of the diaphragm and movement of intestinal loops into the chest cavity are determined.

Local lordosis is determined in the lower cervical region. The spinal canal at the level of the lower cervical region is expanded to 1.8 cm. The spinal column in the cervicothoracic region C is figuratively curved. The cervical vertebrae (C5-6-7) are formed and consist of many individual hemivertebrae. The TH1 vertebra is presented as a hemivertebra, the right half of the body and 1 rib on the right are not identified, the arches of the TH1 and TH2 vertebrae are fused (Fig. 3).

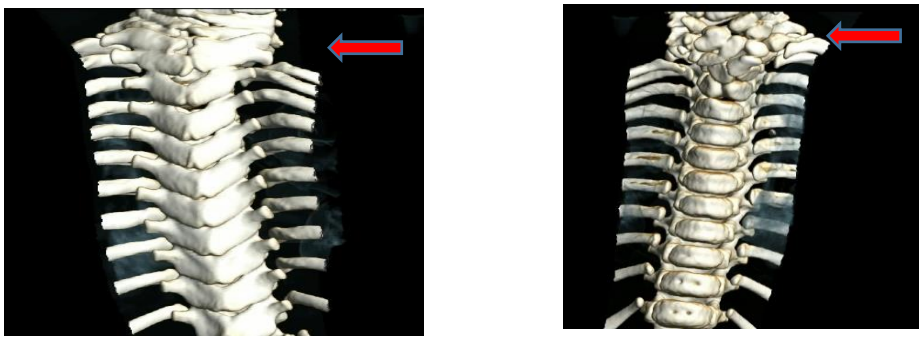

Fig. 3 a, b. MSCT of the cervicothoracic spine.

Due to the atypical location of the diaphragm defect with the formation of a hernia on the right, contrast irrigography and passage of contrast through the gastrointestinal tract were performed to clarify the diagnosis. On the irrigogram, most of the contrasted colon is located in the left half of the abdominal cavity; the transition of the contrast in the form of reflux into the lumen of the small intestine, localized in the abdominal cavity, is clearly visible. Movement into the chest is not determined (Fig. 4).

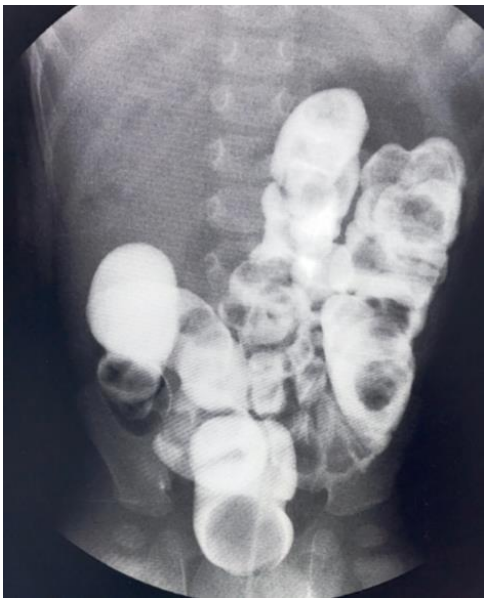

Fig. 4 Contrast irrigography. Left-sided location of the colon

When passing through the gastrointestinal tract, the contrast passes freely through the esophagus; there is no evidence of hiatal hernia or paraesophageal hernia. Evacuation from the stomach is timely. Subsequent images show a disruption of the normal configuration of the duodenum without its typical branches and fixation in the area of the Treitz ligament. The initial sections of the jejunum are somewhat dilated. In the images, at 1 hour 30 minutes and 3 hours, the passage of contrast into the chest cavity, further movement through the small intestine, a gradually increasing volume of contrast and noticeable peristalsis in the thoracic segment of the intestine are determined (Figure 5).

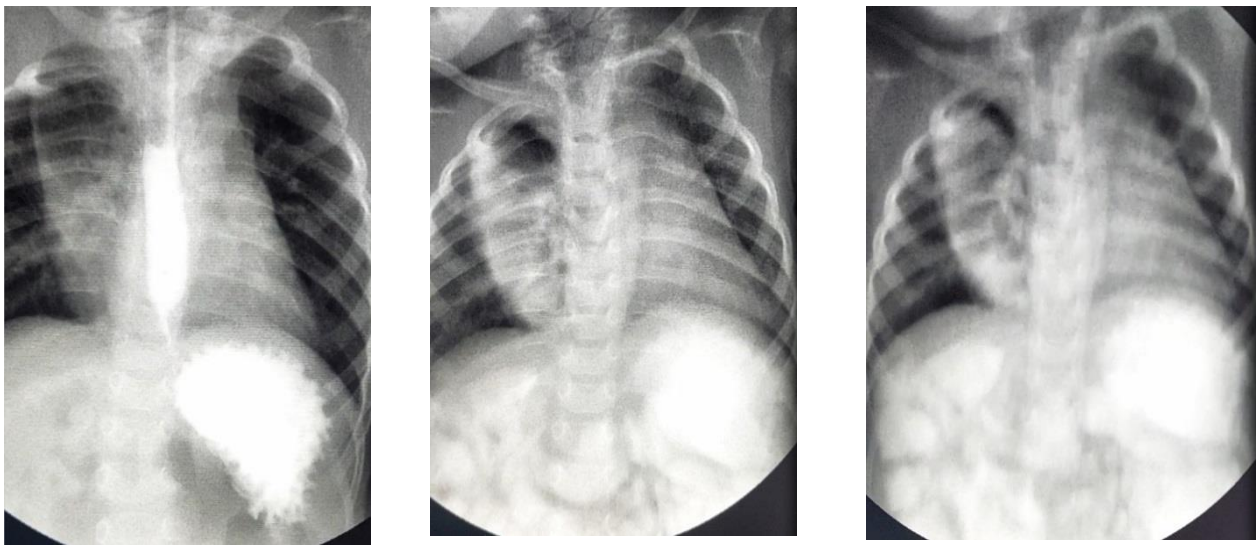

Fig. 5a, b, c. Passage through the gastrointestinal tract

Data from contrast irrigography and passage through the gastrointestinal tract correspond to the state after surgery for intestinal malrotation. Characteristic data for a diaphragmatic hernia on the right are determined. Based on the results of comprehensive studies, a diagnosis was made: MPR. Diaphragmatic hernia on the right, PDA, anomaly of the spine and spinal cord. Severe protein-energy malnutrition. Condition after surgery - intestinal malrotation. It was decided to perform surgical intervention to eliminate the diaphragmatic hernia using a laparotomic approach.

On April 26, 2023, the operation began with excision of the old supramidal postoperative transverse scar. The audit revealed massive interintestinal adhesions and adhesion of intestinal loops to the peritoneum and on the surface of the liver. With technical difficulties, the intestine was mobilized from adhesions. During mobilization and revision, it was established that the duodenum does not have a typical anatomical structure in the form of a horseshoe and syntopy - there is no fixation and duodeno-jejunal bending. The moderately dilated duodenum passes into the dilated jejunum. These sections are fixed with cords that form non-sharp bends. The large intestine is mostly located in the left flank of the abdominal cavity, the ileocecal angle is located in the midline at the level of the umbilicus, the appendix was removed during the first operation. As the loops of the small intestine were freed from interintestinal adhesions, the gallbladder and surrounding formations in the right hypochondrium, the immersion of the small intestine into the chest cavity was established through a defect in the diaphragm in the middle part of the costophrenic angle, freely allowing the index finger to pass through. When separating the adjacent sections of the intestine, it was found that at a distance of 40 cm from the ileocecal angle, the outgrowth of the intestine plunges into the chest cavity through the indicated defect. The proximal and distal sections of the intestine have a normal lumen with preserved patency. The pathology was assessed as Meckel's diverticulum with dislocation into the chest cavity in the form of a diaphragmatic hernia (Fig. 6).

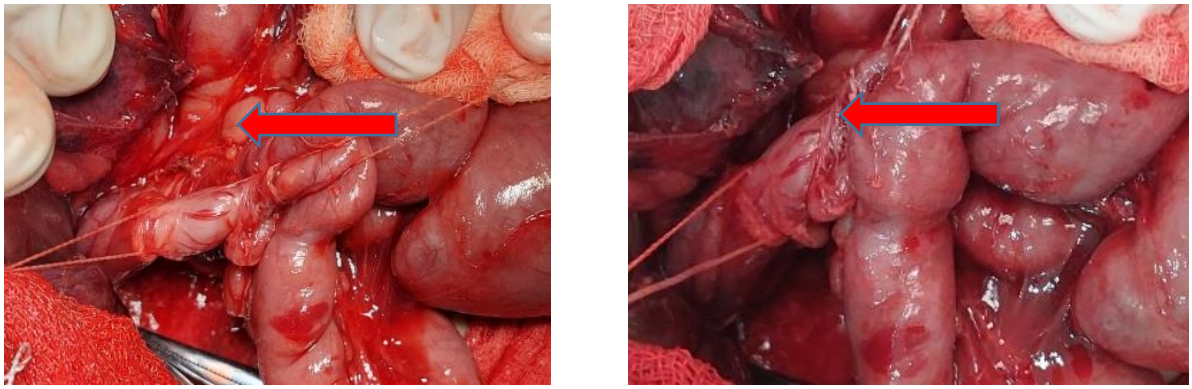

Fig. 6 a, b Meckel's diverticulum

After moderate expansion of the diaphragm defect, this formation was gradually mobilized by pulling into the wound and gradual coagulation of bleeding vessels to a depth of 10-12 cm. In this case, the mobilized DM up to 25 cm in length was brought into the abdominal cavity. There were no signs of damage to the lung parenchyma or blood vessels. A drainage tube with side holes is left in the bed; the diaphragm defect is sutured with interrupted sutures. After making sure that the formation is a dislocated Meckel's diverticulum with a wide base, a segmental resection of the section of the intestine bearing the diverticulum was performed with an end-to-end anastomosis (Fig. 7).

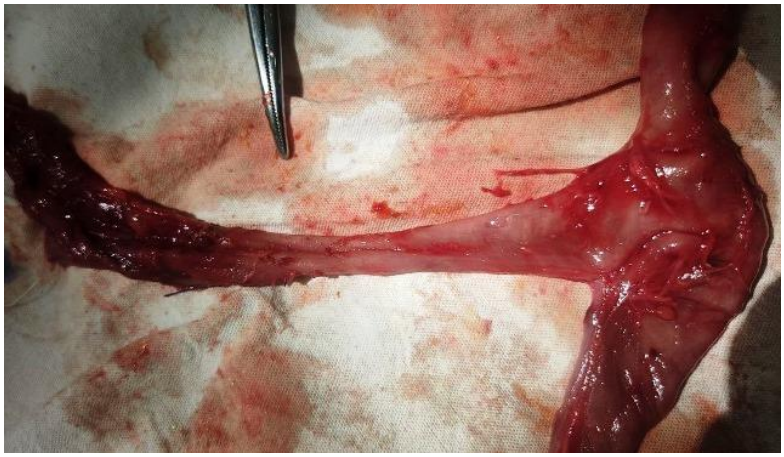

Fig. 7 Resected section of the small intestine bearing DM.

The operation was completed by layer-by-layer suturing of the surgical wound and leaving a drainage tube in the abdominal cavity. After the operation, with adequate hemodynamic and hematological parameters, the child was transferred to the ICU and connected to the monitoring system. Auxiliary ventilation was continued, a course of supportive and antibacterial therapy was prescribed, and planned pain relief with fentanyl. During dynamic observation, the child's symptoms of multiple organ failure progressed. Despite corrective therapy, cardiac arrest occurred 12 hours after surgery. Resuscitation measures were ineffective, biological death was declared. The autopsy revealed no complications associated with the operation. Pathological diagnosis: multiple malformations: intestinal malrotation, common mesentery, dislocation of DM into the chest in the form of a diaphragmatic hernia, polysplenia. Multiple interorgan adhesions in the abdominal cavity, polysegmental pneumonia, obstructive endobronchitis, pulmonary edema. Toxic hepatosplenomegaly, intestinal paresis, toxic nephroso-nephritis, myocarditis, hemorrhage into the adrenal glands. Hypotrophy.

In the presented observation, one can note a number of anatomical features of the pathology, the nature of the combination of concomitant anomalies and diagnostic and tactical errors made, and the causes of death in the early stages after surgery. Our case belongs to the category of rare concomitant multiple anomalies involving DM; they consisted of intestinal malrotation with characteristic data for Ledd syndrome, right-sided diaphragmatic hernia through a defect in the sternal and costal beginning of the diaphragm - the foramen of Morgagni, with movement of only DM without other parts of the gastrointestinal tract. Although the length of the DM was about 12 cm, its narrowness limited the increase in intrathoracic tension, and accordingly moderate respiratory disturbances were observed. However, the detected formation in the right hemithorax during X-ray examination led to an erroneous interpretation of the pathology as a cystadenomatous lesion of the right lung. Subsequent computed tomography studies using contrast agents clarified the diagnosis. During the primary operation for intestinal obstruction, the right-sided diaphragmatic hernia with displacement of the diaphragmatic hernia remained unrecognized due to incomplete exploration. During the operation, polysplenia was detected in the form of separate additional lobes of the spleen, confirmed at autopsy, which confirms the presence of polymalformations. The patient also had a patent foramen ovale and patent ductus arteriosus without significant hemodynamic disorders. A retrospective analysis of computed tomography data revealed abnormalities in the cervical spine without precise details of the nature of the osteoneural pathology. The final method of operation in this case was segmental resection of the intestine bearing the DM with end-to-end anastomosis and suturing of the diaphragm defect using a

translaparotomic approach. According to the majority of surgeons, when intraoperatively establishing a DM with pathological changes and in cases without changes, one should adhere to active surgical tactics - segmental resection of the intestine bearing the DM, or diverticulectomy with immersion of the stump, depending on the nature of the change and the diameter of its base. According to the literature, the immediate and long-term results of treatment are quite favorable. The causes of death in the early stages of the postoperative period in our case remain completely unclear. It can be assumed that the combination of identified anomalies and developed secondary changes in other organs against the background of malnutrition and protein-energy deficiency had a negative impact on the tonatogenesis of death.

Also worthy of attention is a child with massive intestinal bleeding from 9 patients with DM, with signs of intestinal bleeding with increasing symptoms of anemia. In 4 (8.5%) cases, melena manifested itself with painless spotting or tarry stools. Episodes of single or double hidden or moderate bleeding in history, which stopped on their own or after conservative treatment, were also noted in 4 (8.5%) children. As an illustration, here is an observation.
Boy Zh.M. 8 years old, medical history No. 292-127-9, delivered on an emergency basis on January 21, 2023. at 18:25 to the surgical department of the State Clinical Hospital No. 2 with a diagnosis of gastrointestinal bleeding of unknown etiology. The child has been experiencing general weakness and abdominal pain for 4 days. 2 hours before presentation there was heavy stool mixed with dark blood, dizziness was noted. From the anamnesis it was found that in June 2018 the patient was hospitalized at the Pediatrics Research Institute with gastrointestinal bleeding. The number of red blood cells was reduced to 1.7*1012/l, the hemoglobin level to 35 g/l. Complex hemostatic therapy, transfusion of FFP and er were carried out. masses. According to the data: FGDS, passage through the gastrointestinal tract, ultrasound of the abdominal organs, as well as hematological studies, the causes and source of bleeding have not been established. After the bleeding stopped, the child was discharged from the hospital. Subsequently, the patient with episodes of moderate intestinal bleeding was repeatedly examined and treated by a hematologist, gastroenterologist and surgeon.

Upon admission, the child’s condition is moderate, he is conscious, the skin and visible mucous membranes are pale in color. Pulse 108 beats per minute. Blood pressure 80/50 mm Hg. Art. The tongue is dry and covered with a white coating. The abdomen is round, symmetrical, not swollen, and participates in the act of breathing. On palpation it is soft, painless in all parts. In the blood test: a decrease in red blood cells - 3.5×10^{12}/l, hemoglobin - 93 g/l, with platelet levels - 364×10^{9}/l and leukocyte levels - 14.4×10^{9}/l. A biochemical blood test revealed an increase in the level of alpha-amylase - 200 U/L. Ultrasound and radiography of the abdominal organs revealed no pathologies. According to FGDS, bleeding from the esophagus and upper gastrointestinal tract was not detected. Against the background of hemostatic therapy, the intensity of intestinal bleeding increased, and there was repeated profuse stool with dark, streaked blood. The child was transferred to the ICU for active observation and a complex of hemostatic therapy (ACC, etamsylate, vikasol, calcium chloride), 150 ml of fresh frozen plasma and 150 ml of erythrocyte suspension were transfused. Against the background of ongoing bleeding, hemoglobin dropped to 66 g/l, the number of red blood cells was 3.5 × 1012/l, with a hemotacrit indicator of 24%. To exclude bleeding from the lower parts of the gastrointestinal tract, the patient underwent fibrocolonoscopy. Considering the continued abundant secretion of dark blood and the lack of effect of complex hemostatic therapy, bleeding from Meckel's diverticulum is suspected. It was decided to perform a diagnostic laparotomy with an intraoperative decision on the extent of the operation. 01/23/2023, N-13.40, K-16.10. Under endotracheal anesthesia, the operation

began using a right-sided transrectal approach up to 8.0 cm long. There is a moderate amount of transparent serous effusion in the abdominal cavity. During inspection, the distal parts of the small intestine and large intestine are filled with bloody contents. At a distance of 60 cm from the Baugin valve, a broad-based Meckel's diverticulum was discovered. The latter is shrouded in adhesions and loops of adjacent areas of the small intestine, giving the impression of a retroperitoneal location of the DM; there were no signs of local inflammation. With technical difficulties, the intestine carrying the DM was mobilized from adhesions and brought into the abdominal cavity. The diverticulum, with a base up to 2.5 cm wide, 12.0 cm long, with thickened walls, is located along the antimesenteric edge of the ileum. Proximal and distal from the DM in the lumen of the small intestine, black intestinal contents are visible. When opening the DM, intestinal contents with blood clots, black in color, an ulcerative defect, with converging folds and craters around the ulcerative defect, from which passive bleeding occurs, were released. A segmental resection of the small intestine carrying DM was performed, moving away from it by 6-7 cm proximally and distally. An end-to-end anastomosis was created using continuous sutures. Histological examination showed no signs of catarrhal inflammation of the DM of ectopic tissues. A typical appendectomy was performed with the stump immersed in a purse-string suture. A drainage tube is inserted into the abdominal cavity through a counter-aperture. Layer-by-layer suturing of the surgical wound. Postoperative course without complications. On the 12th day the child was discharged from the hospital in satisfactory condition with normal blood counts. The patient is under dispensary observation.

The peculiarity of clinical observation is that Meckel's diverticulum is rarely complicated by bleeding, which complicates diagnosis and leads to a delay in surgical intervention. The presented case demonstrates the complexity of topical diagnosis, determining the cause of bleeding and the risk of severe complications in DM and other intestinal bleeding of unknown etiology. According to the literature, massive bleeding is observed with erosion of blood vessels in the area of changes in the intestine in the presence of heterotopic tissue of the pancreas or stomach. In our observation in the DM, no atypical tissue was identified during histological examination.

4. Conclusion

In conclusion, it is important to note that DM, as a congenital anomaly of the gastrointestinal tract, is a finding during surgical interventions. Its frequency is 2–3%, clinical manifestations and complications of the disease are observed in 25% of cases. In the clinical picture of the pathology, a triad of symptoms is observed: abdominal pain, gastrointestinal bleeding (GIB) and intestinal obstruction of varying severity. The absence of pathognomonic signs of DM presents significant difficulties in diagnosis. With DM, there is a frequent combination of malformations of individual organs or in the form of an association of various anomalies of other organs and systems, mutually aggravating their course. In recent publications, descriptions of the combination of various anomalies have increased. Mandatory resection of pathologically altered and intact DM is the main surgical tactic, since the risk of subsequent complications is incommensurate with simple diverticulectomy. The treatment of choice for DM is diverticulectomy. Options for its implementation and the type of simultaneous interventions depend on the severity and prevalence of the inflammatory process along the wall of the ileum and the diverticulum itself, the nature of the complication and secondary pathology of the peritoneum and abdominal organs.

5. References

1. Barskaya M.A., Varlamov A.V., Zavyalkin V.A., Kuzmin A.I., Terekhina M.I. Diagnosis and treatment of complications of Meckel's diverticulum in children. Medical and pharmaceutical journal "Pulse" 2020 Vol. 22. N 12. 162-168.
2. Dzhenalaev B.K., Dosmagambetov S.P., Kotlobovsky V.I., Kenzhalina R.A. and others. Pathology of Meckel's diverticulum in children and issues of surgical treatment // West Kazakhstan Medical Journal. – 2017. – No. 1 (53). – P.50-55.
3. Noskov A.A., Lazarev S.M., Efimov A.L., Ershova N.B., Chepak D.A. A rare observation of a giant Meckel diverticulum. Bulletin of Surgery named after. I.I. Grekova. 2016;175(1):104-105.
4. Pimenov I.A. Meckel's diverticulum: a brief review of modern literature [Electronic resource] Electronic scientific publication Almanac Space and Time. 2018;16(3-4). DOI: 10.24411/2227-9490-2018-12032.
5. Podkamenev V.V. Pathology of Meckel's diverticulum in children Russian Bulletin of Pediatric Surgery, Anesthesiology and Reanimatology. 2012; II(4):28-33.
6. Timerbulatov M.V., Mekhdiev D.I., Timerbulatov Sh.V., Bykovsky I.S., Gabidullin I.R. Diagnosis and treatment of complicated forms of Meckel's diverticulum Klin. honey. 2017;95(11):1013-1017.
7. Cherevatenko A.A., Shapkina A.N., Sedykh I.S., Shevchuk A.S. A rare case of intussusception of Meckel's diverticulum in a child Pacific Medical Journal, 2018; 1:95-96.
8. Haddon M.J., Bowen A. Bronchopulmonary and neurenteric forms of foregut anomalies. Imaging for diagnosis and management // Radiol. Clin. North Am/ -1991/ v0ol.29. -P.241-254.
9. Stringer M.D., Spittz L., Abel R., Kiely E et al. Management of alimentary trakt duplication in children // Br J Surg/1995. Vol. 82.- P. 74-78.
10. Lin X.K., Haang X.Z., Bao X.Z. et al. Clinical characteristics of Meckel diverticulum in children // Medicine (Baltimore). 2017. Vol. 96, No. 32. P. 7760.
11. Parkash M., Amer A.S., Mansour J.A. A Triad of Congenital Diaphragmatic Hernia, Meckel's Diverticulum, and Heterotopic Pancreas. Hindawi Publishing Corporation Case Reports in Pediatrics Volume 2014, Article ID 725945, 3 pages http://dx.doi.org/10.1155/2014/725945
12. I. S. Kang, S. M. Ahn, A. Han et al., "Giant Meckel's diverticulum associated with a congenital diaphragmatic hernia," Yonsei Medical Journal, vol. 45, no. 1, pp. 177–179, 2004.
13. Laxman B., Roja A., Madhu B., Mohan R. Congenital diaphragmatic hernia, Meckel's diverticulum and malrotation in a 3-month-old infant. African Journal of Pediatric Surgery 2016
14. Mattei P. Fundamentais of pediatric surgery. - New York: Springer. - 2011:206-8
15. Babuci S., Negru I., Eremia V., Malanco S. Gigant Morgagni Congenital Hernia Associated with Intestinal Malrotation and Meckel Diverticulum in Child with Down Syndrome- Clinical Case Presentation and Literature Review JMSCR Vol.09.Issue11.Page 114- 119.November 2021.
16. Yuan Z., Chen J., Zheng Q., Huang X.Y., Yang Z., Tang J., "Heterotopic pancreas in the gastrointestinal tract," World Journal of Gastroenterology, vol. 15, no. 29, pp. 3701–3703, 2009.

17. Gupta M. K., Karlitz J. J., Raines D. L., Florman S. S., Lopez F. A., “Clinical case of the month. Heterotopic pancreas,” The Journal of the Louisiana State Medical Society, vol. 162, no. 6, pp. 310–313, 2010.
18. Schropp KP, Garey CL. Meckel's diverticulum. In: Holcombe GW 3rd, Murphy JP, editors. Ashcraft's Pediatric Surgery. 5th ed. Philadelphia, USA: Elsevier Saunders; 2010. p. 526-31.
19. Sehgal A, Chandra J, Singh V, Dutta AK, Bagga D. Congenital diaphragmatic hernia: Delayed presentation with asymptomatic splenic herniation. Indian J Chest Dis Allied Sci 2002; 44:57-60.