“ ЗАТВЕРДЖЕНО”

на методичній нараді кафедри

дитячої хірургії протокол № 1

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Зав. кафедрою дитячої хірургії

професор\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_А.Ф. Левицький

**THEME No2**

**Intestinal obstruction. Intussusception.**

**Compiler:**

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**Overview**: Major causes of intestinal obstruction are: intussusception, adhesions, hernia, inflammation, volvulus, neoplasm, fecal impaction, Hirschprung’s desease, meconium ileus, trauma, dynamic ileus. There are prominent symptoms and signs of intestinal obstruction: pain, vomiting, abdominal distention and absence of stool.

Classification of intestinal obstruction . By origin-congenital and acquire. On mechanism of occurrence –mechanical and dynamic. On presence or absence of blood circulatory disturbance in intestine –obturation, strangulation and combined form (intussusception). On clinical tendency- complete and partial. On a level of obstacle- high and low. Border between a high and low intestinal obstruction is the initial part of a jejunum.

**Educational aims**:

1) To learn the most frequent forms of acquired intestinal obstruction in children.

2) To learn about intussusceptions as the most frequent type of acquired intestinal obstruction.

3) To master principles of diagnosis and treatment of acquired intestinal obstruction.

4) To know modern methods of treatment paretic intestinal obstruction.

5) To know modern methods of treatment adhesive intestinal obstruction.

**A student must know**:

1. Types of acquired intestinal obstruction.

2. X-ray picture of intestinal obstruction ( proximal and distal).

3. Clinical manifestation of acute intestinal obstruction.

4. Surgical treatment of acute adhesive intestinal obstruction.

5. Intussusception. Pathogenesis and the structure of the intussusceptum.

6. Clinical manifestation of intussusception.

7. Diagnosis and differential diagnosis of intussusception.

8. The pneumocolography as diagnostic and curative method.

9. Pressure at diagnostic and at curative pneumocolography .

10. Roentgenological and sonographic findings of intussusception.

11. Signs of successful desinvagination after curative pneumocolography.

12. Pneumatic reduction. Indication and contraindication.

13. Indications for surgical treatment of intussusception.

14. Operative treatment. Open and laparoscopic approaches .

15. Main symptoms of acute adhesive intestinal obstruction.

16. Complications of acute adhesive obstruction.

17. Types of dynamic intestinal obstruction.

18. Conservative treatment of paretic intestinal obstruction.

19. Criteria of viability of intestine.

20. Types of intestinal anastomoses .

21. Aim of preoperative treatment in intestinal obstruction.

**A student must be able to :**

1. To collect the complaints, anamnesis of disease and life at the pediatric patient and his (her) parents at the patient with acquired intestinal obstruction.

2. To demonstrate the examination , percussion and palpation of the abdominal wall and make a plan of following examination of the patient with acquired intestinal obstruction.

3. To perform differential diagnosis of acquired intestinal obstruction with other acute diseases of abdominal cavity.

4. To interprete X- ray films in acquired intestinal obstruction.

5. To make conclusion about severity of the condition of the patient with acquired intestinal obstruction and determine main principles of preoperative treatment .

6. To know indications for the operative treatment of acquired intestinal obstruction.

7. To demonstrate the technique of pneumocolography at the intussusception.

8. To determine main methods of treatment of acquired paretic intestinal obstruction.

9. To introduce decompressive nasogastral tube in patient with acquired intestinal obstruction.

10. To master different types of enemas at acquired intestinal obstruction.

**Terminology**

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| **Term** | **Definition** |
| 1.Intussusception | Full –thickness invagination of the proximal bowel into the distal contiguous intestine |
| 2.Abdominal plain film | Diagnosis of intussusceptions can be suspected on upright posteroanterior and lateral position. |
| 3.Pneumocolography | A method of roentgenological examination when the contrast substance is air. |
| 4.X-ray signs of intestinal obstruction | Abdominal films will show dilated loops of small bowel with multiple air fluid levels ( Kloiber’s cups). |
| 5.Sign of Dance. | The right lower quadrant may feel empty and the cecum may not be palpable in the right fossa. |
| 6.”Sausage-shaped “ mass. | ”Sausage-shaped “ mass may be palpable to the right of the umbilicus. |
| 7.”Red currant jelly” stools. | The combination of intraluminal fluid, blood, and mucosal tissue fragments results in stools with appearance, color, and consistency of red currantjelly. |
| 8.”Doughnut”,”target” and “pseudokidney” signs. | Two ultrasonographic signs of intussusceptions are: 1) the ”doughnut” or ”target” sign on transverse views , and 2) the “pseudokidney” sign on longitudinal views. |
| 9.Disinvagination. | Hydrostatic barium enema or pneumatic enema is used to confirm the diagnosis and to reduce the intussusception. |
| 10.” Squeezing out” method. | Surgical exploration for intussusception. Retrograde pressure is applied by squeezing the intussusceptum within the intussuscipiens in a proximal direction. |
| 11**.**Viability of intestine. | After reduction the questionable ischemic bowel can be warmed with saline- soaked laparotomy pads and reevaluated by coloration,peristalsis, presence of Doppler signals. |
| 12.Adhesions. | Adhesions are fibrous bands of tissue that form between loops of bowel or between the bowel and the abdominal wall after intraabdominal inflammation. |
| 13.Intestinal intubation. | Introduction of a special probe into the gastrointestinal tract. |
| 14. Intestinal anastomoses. | If bowel necrosis is found , it is resected together with adjoining healthy parts and anastomosis is established. |
| 15**.**Mikulicz’s operation. | Establishment of enterostomy if peritonitis develops in neglected cases. |

**Content.**

Intestinal obstruction is a syndrome that appears at different diseases of gastro-intestinal tract and it is expressed by disordered peristalsis and evacuative function with morphologic changes of the affected intestinal area. Among acute surgical diseases of organs of abdominal cavity the acquired abdominal obstruction takes the second place after appendicitis. At the same time the number of lethal outcomes at it is more, than at other acute surgical diseases of organs of the abdominal cavity which have been taken together. Mortality of intussusception with treatment is 1-2%, if left untreated, this condition is unfortunately fatal in 2-5 days.Adhesive intestinal obstruction is followed with high lethality of 5-7%.

There three prominent symptoms of intestinal obstruction are : pain, vomiting , and abdominal distention.

Description of the pain of intestinal obstruction. An obstruction in the proximal intestine produces a dull, constantly painful sense of epigastric fullness. More distal obstruction in the small bowel causes recurring , intermittent episodes of cramping pain or colic, located periumbilically. Typically the cramping begins abruptly with crescendo intensity , lasting for 1-3 minutes, and then subsides in decrescendo fashion.There may be a pain-free interval for a varying period, but colic recurs. Initially the waves of cramping occur at short intervals, but as the obstruction progresses , the bowel fatigues , and cramping becomes more like a steady dull pain. The patient finds some relief by drowing the legs up and assuming a fetal position.

Description of the character of vomiting. Initially vomiting may be a reflex response , and the emesis consist only of gastric contents. The intestine responds to obstruction with increased peristaltic activity. In addition , the mucosa no longer absorbs luminal fluids, and fluid secretion into the lumen increases. As the volume of fluid backs up to the stomach, the emesis becomes greenish-brown and develops a fecalent odor. The fecalent odor does not imply a colonic obstruction; it is due to the overgrowth of enteric organisms in the luminal fluid. Bilious vomiting must be considered a sign of intestinal obstruction until proved otherwise. A distal ileal obstruction may not produce bilious vomiting for a prolonged period after the onset of obstruction because of the distance that enteric contents must travel back to the stomach.

The physical examination is helpful to a limited degree. Vital signs of pulse/ respiratory rate, blood pressure , and temperature usually are normal initially. As the patient loses fluid into the bowel and with vomiting, diminished plasma volume is reflected in tachycardia, narrowing of pulse pressure , and low grade fever. At the onset of the obstruction the patient appears relatively normal between bouts of colic. Over time , however, the patient develops an anxious expression with sunken eyes, dry skin and mucous membranes, and prolonged capillary refilling time.

The presence of an abdominal scar from a pelvious laparotomy almost ensures that the bowel obstruction is due to adhesions. Distended bowel loops may be visible and palpable through the abdominal wall. The presence of a mass may indicate an inflammatory process ( such as an appendicle abscess), infracted bowel, or matted intestinal loops due to Crohn’s disease. If peritonitis has developed , the abdomen is rigid and diffusely tender with signs or rebound tenderness.

Mechanical and dynamic forms of acquired intestinal obstruction are distinguished.

The mechanical obstruction is divided into congenital and acquired, by the mechanism of appearance – into the occlusive, strangulation and mixed (intussusception) , and also volvulus, by the level of appearance – into high ( the level of the first third of the jejunum) and low. High obstruction develops more abruptly, it leads to water electrolytic and hemodynamic dysfunction. Low obstruction develops more slowly, the key symptom is intoxication development.

**Acquired intestinal obstruction** (**AIO**)can occur at any age. The most characteristic for children is intestinal intussusceptions, adhesive obstruction and dynamic obstruction.

AIO is distinquished : by the clinical development : acute and chronic; by the causative factor : mechanical and dynamical.

A simple intestinal obstruction occurs when one end of the bowel lumen is obstructed. A simple obstruction may be complete or incomplete.

The mechanic acute intestinal obstruction includes:

-stangulation ileus ( disorded blood supply, venostasis) : strangulation, volvulus:

-occlusive ileus ( a tumor, foreign body, helmintes, bowell compression):

-mixed AIO ( intussusception, adhesive ileus).

**Dynamic ileuses** is one of the most often happening forms of intestinal ileus among the common forms of intestinal obstruction in childhood. Paretic ( intestinal paresis) and spastic forms are distinguished. Dynamic ileus results from functional deficiency of the digestive system in craniocerebral birth trauma, pneumonia, intestinal diseases , sepsis and in postoperative period on the abdominal and thoracic cavities. Dynamic ileus is characterized by repeated vomiting with an admixture of green matter, increasing abdominal distention, absence of stool and gases and signs of toxicosis. High position of the diaphragm disturbes breathing. The abdomen is soft to palpation and no peristalsis is heard. Plain radiographs of the abdomen, supine and upright are necessary , which demonstrates multiple Kloiber’s cups of small diameter and uniform distention.

**Paretic** ileus (in peritonitis, spinal cord impairments, poisoning) is maintained by hypocaliemia. The repeated vomiting , which develops at an intestinal obstruction , results to exicosis and hypoelectrolytemias. Clinical manifestation of it consist of attacks of pain, vomiting with an admixture of green matter, flatulence absence of stool and gases. The abdomen is evenly swollen, anterior abdominal tenderness usually occurs. Peristalsis weakened, there is the “deathly silence” symptom, Loteisem symptom. At the plain X-ray films at upright posteroanterior position are equal swelling of all intestinal areas or multiple small arches and fluid levels (Kloiber’s cups). Treatment consist of eliminating of the cause, decompression with nasogastric tube, water –saline balance correction, peristalsis stimulation ( Proserin, Cerucal, Bisacodil, 10% sol. Na Cl, hypertonic enemas), electrostimulation, peridural anestesia, hyperbaric oxygenation.

**Spastic** intestinal obstruction appeared due to poisoning with mushrooms, salts of some heavy metals (lead, oxides of zinc, arsenic, nicotine) or some remedies; neurogenic, hysterical. Clinical manifestation of it consist of attacks of pain without distinct location, absence of flatulence and fecal retention, general condition is satisfactory, abdomen is ordinary or indrawn, sometimes is muscular strain, on X-ray- small arches and fluid levels (Kloiber’s cups). Treatment is commonly conservative: 1) elimination of the cause, 2) spasmolytics medications, 3) siphon enemas. Operative treatment is rare to be used, it is decompression ( intestinal intubation) or putting the intestinal fistula.

**Adhesive Intestinal Obstruction** .Adhesions are fibrous or collagenous bands of scar tissue that form between loops of bowel or between the bowel and the abdominal wall after intraabdominal inflammation (most commonly follow the trauma of a laparotomy). The incidence of postoperative adhesive obstruction after laparotomy is about 2%. The risk of intestinal obstruction after laparotomy may be as high as 10% over lifetime of the patient. The risk of obstruction is higher after pelvic operations than after upper abdominal procedures. Obstruction occurs when the bowel is “caught” within one of these fibrous bands in a kinked or twisted position, twists around an adhesive band, or herniates between a band and another fixed structure within the abdomen. The procedures which have highest risk for adhesive formation in pediatric patients are: subtotal colectomy, resection of symptomatic Meckel’s diverticulum, Ladd’s procedure, and nephrectomy. Adhesions may obstruct the intestine in several ways. The seromuscular layer of one loop of bowel may become densely adherent to another loop and in the process kink the intestine, much like bending a garden hose. Another form of adhesion may have the configuration of a single violin string or involve multiple bands of scar ( similar to crabgrass) that entrap the intestine and block the bowel’s lumen.

**Clinical presentations.** Children present with cramping abdominal pain, distention, and vomiting. Later the vomitus becomes bilious event feculent. Inspection of the abdomen may reveal obvious dilated loops of bowel and distention. If observed early in the clinical course, the patient’s vital signs are within the normal range and the abdomen is not tender. In contrast, children with compromised bowel or prolonged obstruction, present with abdominal pain, vomiting, fever, tachycardia, decreased blood pressure, abdominal tenderness and leucocytosis ,signs of peritoneal irritation, white blood cell count elevation or left shift, or elevated levels of inflammatory mediators (e.g., erythrocytes sedimentation rate, C-reactive protein), decreased blood pressure and abdominal tenderness. In a child with complete bowel obstruction , abdominal films will show dilated loops of a small bowel with multiple air fluid levels and little or no air in the rectum and/or distal to the obstructing lesion.

Typically early postoperative adhesive small bowel obstruction is less likely to result in ischemic change; however, late ( weeks to months to years) adhesive obstruction always present with that risk. Because of the great difficulty in identifying strangulation obstruction, an old surgical doctrine advises, “Never let the sun rise or set on small bowel obstruction” would most often avoid ischemic injury.

The differential diagnosis is ileus versus mechanical obstruction. Nonsurgical inflammatory and metabolic conditions that may result in ileus must be considered. Blood in drawn and sent for Hbg, WBC and differential, amylase ( pancreatitis),liver function tests (hepatitis) and bilirubin ( biliary tract disease). Urinanalysis ( urinary tract infection, nephritis, stones), blood cultures ( systemic infection), and stool cultures ( colitis, rotavirus) may also be indicated. Upright posteroanterior and lateral chest x-rays are obtained to exclude pneumonia or the presence of free intraperitoneal air. Flat and upright abdominal films are also obtained. In a child with a complete bowel obstruction, abdominal films will show dilated loops of small bowel with multiple air fluid levels and little or no air in the rectum and / or distal to the obstructing lesion. Ultrasound is occasionallu useful to rule out a postoperative intussusception.

Treatment. Nonoperative management includes resuscitation with isotonic saline solutions, nasogastric decompression ,correction of electrolyte abnormalities, intravenously antibiotics, and serial examinations. Within 24 hours , children with ileus and simple mechanical obstruction will improve as indicated by a return of bowel function, a normalization of vital signs and normal WBC. Indications for operation include obstipation for 24 hours, continued abdominal pain with fever and tachycardia, decreased blood pressure , increasing abdominal tenderness , and leukocytosis despite adequate resuscitation and medical treatment.

Surgical treatment. The abdomen is opened through a previous incision, if present, and midline, if not. The cecum is identified and the collapsed ileum is followed proximally until dilated bowel and the point of obstruction is identified. The offending adhesive bands are disrupted and the abdomen is closed. Laparoscopic lysis of adhesions is another option and may allow a shorter postoperative recovery and hospital stay.

Postoperatively, nasogastric decompression and intravenous fluids are continued until return of bowel function and the volume of gastric aspirate decreases.

A **strangulation** obstruction occurs when the circulation to a segment of intestine is impaired. The ischemia progresses to gangrene without prompt operative repair. Volvulus , in wich the mesenteric blood supply to the bowel becomes twisted , is the obvious example of strangulating obstruction. The other example is closed loop obstruction . In the usual sequence, the first step is venous compression; because arterial pressure is not yet compromised, the bowel wall and lumen become suffused (hemorrhagic) with blood. Subsequent cessation of all blood flow produces infarction. The unique combination of bacteria and their toxins, blood, and necrotic tissue is particulary lethal. As these products are absorbed from the lymphatics and peritoneum, the result is septic shock with a high mortality rate. In patients with a strangulating obstruction , blood and bacteria eventually ooze into the peritoneal cavity, resulting in parietal peritoneal irritation. The patient tends to be highly agitated and moves about , attempting to find a position of comfort. There is no period of pain relief between bouts of colic. The pain becomes constant, with tenderness and guarding localized to the area of infarction. Subsequently , a generalized peritonitis develops. Collapse often occurs. In the early stages of the disease no distention of the abdomen is seen, it is soft to palpation and intensified gurgling peristalsis is heard. Borborygmi are the loud rumbling and gurgling sounds due to the movement of air and fluid that has puddled in the widely dilated bowel lumen. They are said to coincide with the waves of colic, but in reality the coincidence of colicky pain and the borborygmi is unusual.

A distinct loop of gas- containing, dilated bowel that is bent on itself and looks like a coffee bean suggest a closed-loop , gangrenous obstruction. Sometimes a gangrenous obstruction is assotiated with an absolutely gasless abdomen and no dilated intestine is discernible.

How to distinguish a simple small bowel obstruction from strangulating obstruction? The short answer : there is no sure way with current diagnostic measures. Every patient with a complete intestinal obstruction should be considered to have a gangrenous obstruction. Eventually gangrenous bowel provokes signs of peritonitis with fever, localized abdominal rigidity , rebound tenderness, and elevated white blood count. However it takes time for strangulated intestine to exude the toxic products of necrosis that irritate the parietal peritoneum. Thus patient must be reevaluated carefully at frequent intervals. Cleary concern should be greater when this signs are present and when symptoms have changed from episodic cramping to constant and intense pain with radiation to the back and increasing abdominal tenderness. Nevertheless, experience has shown that such features may not be present when frank gangrene has occurred, and not infrequently , they may be present with simple obstruction. Because of the great difficulty in identifying strangulating obstruction, an old surgical doctrine advises “ Never let the sun rise or set on a bowel obstruction”. A laparotomy is indicated as soon as possible. This principle applies for complete intestinal obstruction. Operation consisting in laparotomy and excision of the strangulation band or adhesion is indicated.

**Intussuseption** is the most frequent causes of bowel obstruction in infants and toddlers. The most common cause for a small bowell obstruction in an infant without an abdominal scar is an intussusception.

Intussusception means by definition that one portion of the gut is telescoping in another distal part with further motion of the intussusceptions into the intusscepiens by ongoing peristalsis. Intussusception occurs most frequently between the ages of 3 months and3 years. Peak incidence is 4-12 months. The most common form is ileo-colic in 80-90% of cases, less often ileo-ileal occurs in up 15% and rarely caeco-colic, jejuno-jejunal or even ileo-ileo-colic occur in a double or three- fold manner. **Most ileocolic intussusceptions involve the distal ileum, cecum and part of the colon** and may rarely prolapsed out the rectum.

Intussusception is related to the mixed or combined type of mechanical obstruction since it is a combination of strangulation (strangulation of the mesentery of the invaginated intestine) and occlusion ( closure of the intestinal lumen by the invaginated segment of the intestine).The proximal invaginating intestine is termed the intussusceptum, the distal receiving bowel ( outer part) is the intussuscipiens. The cause of intussuseption is most often unknown (idiopatic,nonpathogenic lead point) and is best though to be viral in origin. Several viral gastrointestinal pathogens ( rotavirus, reovirus, echovirus) may cause hypertrophy of the Peyer’s patches of the terminal ileum which may potentiate bowel intussusception. Although only proven to be causative factor in 20% of cases, the intussusceptions often follows a viral illness (upper respiratory, gastrointestinal) which produces an enlargement of the distal ileal lymphoid tissues.

A small percentage of intussusceptions are caused by PLPs (Pathologic Lead Point), the most common of which are a Meckel’s diverticulum .Other anatomic leads points include polyps, ectopic pancreatic or gastric rests, lymphoma, lymphosarcoma, enterogenic cyst, hamartomas (i.e., Peutz-Jeghers syndrome), submucosal hematomas ( i.e., Henoch- Schonlein purpura),inverted appendiceal stumps , foreign bodies, and anastomotic suture lines. These anatomic lead points tend to increase in proportion to age, especially after 2 years of age. PLPs occur in 4 % to 8% of intussusceptions and more commonly found in intussusceptions that are not ileocolic. Ileocolic intussusceptions most often ( 95%) occur in children from 6 months to 12 months of age.

Ileocolic intussusceptions usually present with complete small bowel obstruction. The mesentery of the invaginated intussusceptum is compressed between the layers of the intussusceptum. There is almost immediate venous compression and stasis. This sets up a vicious cycle of more swelling and venous obstruction, which produce an outpouring of mucus and blood from the engorged intussusceptum causing the classic “currant jelly” stools. The arterial inflow continues until the tissue congestion and pressure finally exceed the arterial pressure producing gangrenous changes leading to necrosis.

Clinical presentation. The classic presentation of intussusception is a toddler with intermittent, crampy abdominal pain associated with “currant jelly” stools and palpable mass on physical examination. The principle signs are:

1 - vomiting (85%),

2- abdominal pain (83%),

3 - passage of blood or bloody mucous per rectum (53%),

4 - a palpable abdominal mass ,

5 - lethargy.

The classic triad of pain, vomiting , and bloody mucous stools (“red currant jelly” or“raspberry jelly “) is present in only one third of infants with intussusception. Suspect the diagnosis in any infant or child with a history of episodic paroxysmal abdominal pain with straining, crying, drawing up of knees and inconsolability. The abdominal pain is frequently acute in onset, severe, and intermittent. The pain is sudden in onset in a child who was previously comfortable. During episodes of pain the infant will often draw his/her knees up to the abdomen, scream inconsolably , and become pale and diaphoretic. Between pain episodes , which may last only briefly, the child may be quiet , appear well and may fall asleep .With time, the child may become more ill and appear lethargic with increasing abdominal distention, vomiting and progression to shock with cardio vascular collapse.

Examining the child, the right lower quadrant seems empty but a tender mass ( “sausage – shaped “) – mostly in the right upper quadrant – can be felt in about 85% of cases. The sign of Dance is the absence of cecum in the right iliac fossa during palpation.

The longer the duration of symptoms and signs before the diagnosis is made, the lower reduction rate.

If the diagnosis is suspected by history and physical examination, several radiographic studies can confirm the diagnosis. Early in the course of illness, abdominal plain x-ray may show a normal or nonspecific bowel gas pattern. Later, abdominal films will show a more obvious pattern of small bowel obstruction with a relative absence of gas in colon. However, plain films have limited value in confirming the diagnosis and cannot be used as the sole diagnostic test.

Ultrasonography of the abdomen is reliable means to identify intussusception. Two ultrasonographic signs of intussusception are:

1. the “doughnut” or “target” sign on transverse views, and

2. the “ pseudokidney” sign on longitudinal views.

Absence of colour flow in colour Doppler suggests compromise of the mesenteric vasculature, indicating a difficult reduction and a lower reduction rate.

Barium or air contrast enema is the “gold-standard” diagnostic study for infants with suspected intussusceptions. It is both diagnostic and therapeutic in identifying and reducing intussusception. In comparison to barium enema, air reduction is reported to be quicker , less messy, decreases time of irradiation and shows a higher reduction rate (75 vs.90%).

Treatment options.

Once a presumptive diagnosis of intussusceptions is made , the child should have

1. an intravenous line placed for rehydration (20 cc/kg),

2. a nasogastric tube placed for decompression , and

3. intravenous antibiotics started. A complete blood count, chemistry panel , and type and screen are obtained.

The treatment options for a pediatric patient with an intussusceptions are quite simple : radiologic reduction ( hydrostatic = fluid, pneumatic =air) , or laparotomy with operative reduction or resection.

Pneumatic (air) enema is quicker and safer than hydrostatic reduction with a barium enema, less messy , easier to perform , delivers less radiation< has an equally high reduction rate, and is more comphortable for the pediatric patient. In air reduction there no risk of barium peritonitis. Non-surgical treatment should not be undertaken in patient with clinical signs of shock, peritonitis , heavy obstruction and after 24 hours from beginning of clinical manifestation.

The technique of pneumatic reduction (Fig 2.1 ) . The infant lies prone and should be on sedation. A Foley catheter as big as possible is inserted into the ampulla of the rectum. The buttocks are squeezed together and taped to prevent leakage. Under fluoroscopic guidance, pressure within the distal bowel pushes the intussuscipiens proximally. Pressure used for reduction should **not exceed 80-130 mm Hg using air** ( Fig 2.2 ). Complete reduction is confirmed only when air freely fills more proximal loops of bowel with reflux into the terminal ileum. The clinical criteria of its effectiveness are disappearance of Dance’s symptom, phenomenon of “ bang”, decreasing of pressure on tonometer till zero, passage of gases into small bowel, belching with air or air coming out of the nasogastric tube. A maximum of three attempts should be made.

If there is a perforation during the air contrast enema, the child may go into extremis due to the high pressure in the peritoneal cavity. If this is the case the abdomen should be rapidly decompressed with a large angiocath placed into the RLQ (right lower quadrant). This may need to be done quickly as the rapid and high pressure pneumoperitoneum can cause rapid respiratory embarrassment and abdominal compartment syndrome.

Clinically the infant must show an overall complete improvement and lethargy should disappear in the following routine observation for 24-48 h. Oral diet is resumed on the next morning. If the intussusceptions cannot be completely reduced, operative intervention is indicated.

Surgery is indicated in children with:

1. clinical evidence of dead bowel,
2. peritonitis,
3. septicemia,
4. evidence of an anatomic/pathologic lead point,
5. failed enema reduction,
6. hemodynamic instability,
7. perforation,
8. shock.
9. age >5 years,
10. duration of symptoms >24 hours.

Preoperative preparation includes administration of broad-spectrum antibiotics, intravenous fluid resuscitation, monitoring of body temperature and oxygen and placement of a nasogastric tube for decompression.

Surgical exploration for intussusceptions is performed through a right lower quadrant transverse incision. Cloudy or sanguineous fluid raises the suspition that a perforation or necrosis is going to be found. Annual reduction has to be performed very carefully and slowly. Retrograde pressure is applied by squeezing the intussusceptum within the intussuscipiens in a proximal direction. No “pulling”attempts should be made at the ileal end. Following successful reduction, it is important to assess bowel viability and search for anatomic lead points. Appendectomy is usually performed. Local or segment resection is indicated if:

1. the intussception cannot be reduced ,

2. the segment of bowel appears infracted or nonviable, or

3. a lead point is identified.

The reduced bowel wall is always oedematous with a non-shiny serosa, but may be discoloured or even blue or black. As a test of viability, administering moist and warm wraps may serve in order to check whether there is a regular color coming back after 20 minutes of waiting. Appendectomy is usually performed.

Indications for resection include irreducible intussusceptions, gangrenous bowel or perforation of the bowel. Primary end-to-end intestinal anastomosis can usually be performed with minimal morbidity. No drainage is used.

Success with air insufflation for reduction is 95%. The recurrence rate of intussusception after successful reduction (whether hydrostatic or surgical) is about 5-7%. Recurrence may be slightly lower with reduction using air insufflations. The mortality rate of intussusceptions is less than 1%. Mortality increases with delay in diagnosis, inadequate fluid resuscitation, perforation, and surgical complications.

Laparoscopic approach.

Initially, laparoscopy was only used to confirm either a successful radiologic reduction or the correct diagnosis of intussusception before reduction per laparotomy. Recent studies have reported successful laparoscopic reduction of intussusception in more than 60% of patients.

Most described laparoscopic techniques use three ports (one on the umbilicus and two on the left side of the abdomen). Using atraumatic graspers, gentle pressure is applied distal to the intussusceptum.

In difference to the open method, traction must often be applied proximal to the intussuscipiens to succeed with reduction. After reduction, the bowel must be carefully inspected for injury, necrosis, or perforation. Particular attention must be paid to search for a pathologic lead point because most tactile cues are lost.

Recurrent intusssusception has been described in 2% to 20% of cases (average about 5%), with about one third occurring within 24 hours and the majority within 6 months of the initial episode. Recurrences usually have no defined lead point, and they are less likely to occur after surgical reduction or resection. Multiple recurrences can occur in the same patient. Success rates with enema reduction after one recurrence are comparable to those with the first episode and are better if the child did not previously require operative reduction. An overriding concern in recurrent intussusceptions is occult malignancy, although multiple recurrences are not a contraindication to attempted radiologic reduction. Unfortunately the clinical findings or pattern of recurrence do not predict the presence of a pathologic lead point. A careful imaging search is mandatory , and ultrasonography has been recommended as the imaging study of choice. Indications for operation include :

1. irreductible recurrence;

2. clinical evidence to suggest a pathologic lead point;

3. documentation of a pathologic lead point by an imaging procedure;

4. persistence of clinical symptoms after the completion of the enema.

**Tests for initial level of knowledge, keys for tests:**

**1**.A boy of 12 years, was admitted with complaints about repeated vomiting, colicky pains in the abdomen, flatulence. Anamnesis: appendectomy three months ago. Objectively: the skin is pale, the pulse is 90 beats per minute, AP -110/80 mm Hg, body temperature is 37,2C.The abdomen is moderately swollen, asymmetric, a little resistant in lower parts. The intestinal sounds are extremely intensified.Peritoneals signs are negative. The digital rectal examination showed extended rectal ampoule that is empty and weak tone of the sphincter. Whatdiagnosis is the most probable ?

A.Renal colic.

B.Food poisoning.

C.Acute adhesion intestinal obstruction.

D.Hepatic colic.

E. Acute pancreatitis.

**2**. A girl of 11 years, 6 hours ago there appeared colicky abdominal pains, nausea, multiple vomiting with eaten food and than bilious. Flatulence and absence of stool. Two months ago appendectomy was performed to the patient. On the anterior abdominal wall on the right from the navel a reveal obvious dilated loops of bowel with high tympanitis over it. What diagnosis is the most possible?

A. Adhesion intestinal obstruction.

B. Inflammatory infiltrate of the abdominal cavity.

C. Intussusception.

D. Abdominal tumor.

E. Acute purulent right –sided paranephritis.

**3**. A child of 11 months of age , was reffered to the surgical department for the third time with the diagnosis of acute intestinal intussusceptions. In the previous cases conservative disinvagination was performed. Which of the causes is the most probable to lead to the recurrent intestinal intussusception?

A. Irregular introduction of natural feeding.

B. Disbalanced age nutrition diet.

C. Gastroenterocolitis.

D. Disbalansed nutritional regimen.

E. The anatomic lead point.

**4.** A child of 6 months of age, in 12 hours after the disease onset there was clinically and roentgenologically diagnosed intussusception. What is the most probable treatment tactics?

A. Conservative treatment of intussusception.

B. Planned operation.

C. Urgent operation.

D. Pneumoirrigography pneumatic reduction.

E. Syphon enema, surveillance.

**5**. A child of 7 months of age was reffered to a surgical unit 16 hours after disease onset which was sudden. The child became restless, drawed up his knees , refused feeding. An attack of agitation was short, then the boy calmed and fell asleep. He woke up in 20-25 minutes, there appeared vomiting and repeated expressed agitation. The child is pale, adynamic. The diapers are covered with dark-red discharge. What is the tentative diagnosis?

A. Helminth intestinal obstruction.

B. Enterocolitis.

C. Meckel’s diverticulum.

D. Intussusception.

E. Tumor of the abdominal cavity.

**6.** A child of 6 months of age was refered to a hospital in 6 hours after the disease onset, pale, has attacks of agitation with repeated vomiting. The last defecation occurred 4 hours ago. The child was first in his life fed with “ Semolina”. At examination : the child is pale, agitated, tachycardia; the forehead is covered with cold sweat. The abdomen isn’t swollen, soft, it isn’t possible to find the caecum in its usual position, at rectal examination : “raspberry-jelly” stools. What is the diagnosis?

A. Intussusception.

B. Dysentery.

C. Gastric ulcer.

D. Anal fissure.

E. Rectal bleeding polyp.

**7.** A child of 5 months of age first had attacks of abdominal pains, multiple vomiting, flatulence and delayed defecation. At examination : the abdomen is soft; there is a little tender and movable malformation in the right subcostal area. At rectal examination : “red currant jelly” stools on doctor’s finger. What diagnosis is the most probable?

A. Intussception.

B. Abdominal tumor.

C. Polyposis.

D. Peritonitis.

E. Intestinal tumors.

**8**. The factors which contribute for intussusceptions development aren’t:

A. Meckel’s diverticulum;

B. Disordered nutritional regimen;

C. Insuffitiency of ileocaecal valve;

D. Intestinal polyp;

E. Disordered electrolyte metabolism.

**9**. The term of appearance of early adhesive obstruction is:

A. Before 1 months;

B. 2 months;

C. 3 months ;

D. 6 months ;

E. Before 1 year.

**10.** A child of 9 years of age complaints about attacks of colicky pains. Vomiting with gastric contens, sometime later the emesis became greenish-brown and develops fecalent odor. The child is restless, tries to suit himself cozy in the bed. The abdomen is swollen, evently painful. The symptom of dosen percussion is doubtful. The peristalsis is loud , with separate waves. Rectally : the ampoule is empty. What is the diagnosis?

A. Acute appendicitis.

B. Acute intestinal obstruction.

C. Perforated ulcer.

D. Acute pancreatitis.

E. Pelvioperitonitis.

**Keys: 1-C;2-A;3-E;4-D;5-D;6-A;7-A;8-E;9- A;10-B.**

**Tests for final level of knowledge :**

**1**. A child of 6 months of age, was brought to the surgical department in 16 hours since the disease onset. The disease developed suddenly. The child became restless, started pulling the legs, refused feeding. An attack of restlessness was short. The boy calmed and fell asleep. He woke up in 20-25 minutes, there appeared vomiting and repeated expressed agitation. The child is pale and adynamic. The diapers are covered with dark-red discharge. What is the tentative diagnosis?

A. Intestinal intussusception.

B. Enterocolitis.

C. Meckel’s diverticulum.

D. Helminthic intestinal obstruction.

E. Abdominal tumor.

**2**. A child of 5 months of age, was brought to a hospital in 6 hours since the disease onset, pale, attacks of agitation, repeated vomiting . Last defecation was 4 hours ago. The child first in his life ate “Semolina”. At examination: the child is pale, agitated, tachycardia, the forehead is covered with cold sweat. The abdomen isn’t swollen, soft, it isn’t possible to find the caecum in right hypogastrium, at rectal examination revealed “ raspberry jelly “ blood on the surgeon’s glove. What is the diagnosis?

A. Intussusception.

B. Dysentery.

C. Gastric ulcer.

D. Anal fissure.

E. Rectal bleeding polyp.

**3**. A child of 4 months of age, was admitted to a hospital in 10 hours since the disease onset: pale, agitated, repeated vomiting . The child first in her life drank apple juice. At a examination : shock condition of the child , the forehead is covered with cold sweat. The abdomen isn’t swollen, it isn’t possible to find the caecum, at rectal examination 0 blood of the “ raspberry jelly” type. What is the diagnosis?

A. Dysentery.

B. Intussusception.

C. Gastric ulcer.

D. Anal fissure.

E. Rectal bleeding polyp.

**4.** A boy, 12 years of age was hospitalized with complaints of vomiting, attakcs of abdominal pain, flatulence. Case history: appendectomy was performed two months ago. Objectively: the skin is pale, pulse is 90 beats per minute, AP- 110/80 mm Hg, body temperature is 37,2oC. The abdomen is moderately inflated, asymmetric, a little resistant in the lower department. The intestinal sounds are extremely intence. Peritoneal signs are negative. At digital examination: the rectal ampoule is extended, empty, sphincter tonus is weak. What diagnosis is the most probable?

A. Hepatic colic.

B. Acute adhesive intestinal obstruction.

C. Renal colic.

D. Food poisoning.

E. Acute pancreatitis.

**5**. A child, 11 months, was brought to the surgical department for the third time with the diagnosis of intussusceptions. There was performed conservative disinvagination in the previous times. Which of the recalled causes is the most probable to lead to recurrent intestinal inussusception?

A. Mechanic factors.

B. Disordered introducing of new food.

C. Disordered age nutrition regimen.

D. Gastroenerocolitis.

E. Disordered nutritional regimen.

**6**. A child, 7 months, was brought to the surgical department in 8 hours since the disease onset with complaints about attacks of agitation, abdominal pains, single case of vomiting. At examination – there is malformation in the right part of the abdomen. At rectal examination – “raspberry jelly “stools. What is the diagnosis?

A. Helminthic invasion.

B. Intestinal duplication.

C. Abdominal tumor.

D. Intussusception.

E. Enterocystoma.

**7**. A child, 6 months, in 12 hours after the disease onset. The intussusceptions was diagnosed. What is the most correct treatment tactics?

A. Conservative reduction.

B. Planned operation.

C. Urgent operation.

D. Pneumoirrigography.

E. Syphon enema, survelliance.

**8.** A 6 months- old child after first in her life feeding with mashed vegetables became restless, cries, repeated vomiting. Her condition is moderate severity. The abdomen is soft , painful in the right iliac region. Rectal examination : “raspberry –jelly “ stools. What is the tentative diagnosis?

A. Inestinal infection.

B. Intussception.

C. Dyspepsia.

D. Gastrointestinal bleeding.

E. Bleeding polyp.

**9**. A boy, 7 years, was brought to a surgical department with abdominal pains and disordered defecation. The established diagnosis is : late adhesive intestinal obstruction. The central venous pressure is 0. Your tactics.

A. Conservative treatment.

B. Urgent operation.

C. Operation, if conservative treatment is noneffective.

D. Operation after the preoperative management.

E. Barium enema and conservative treatment.

**10**. An 5 year old boy complaints about colicky pains in the abdomen. The child is restless, tries to suit himself cozy in the bed . The abdomen is swollen, evently painful. The symptom of dosen percussion is doubtful. The peristalsis is loud, with separate waves. Rectally- the ampoule is empty. What is the tentative diagnosis?

A. Acute appendicitis.

B. Acute intestinal obstruction.

C. Perforated ulcer.

D. Acute pancreatitis.

E. Pelvioperitonitis.

**Keys: 1-A;2-A;3-B;4-B;5-A;6-B;7-A;8-B;9-D;10-B.**

**Tasks for final level of knowledge**

**1.** A family doctor examines at home a 6-months –old , who 8 hours ago became agitated. Cries, exerts herself, and tosses her legs. At first there were “periods of rest” in the disorder and then there appeared repeated vomiting and dark blood on the diapers after defecating. From the anamnesis : mother gave the child mashed vegetables for the first time. At examination: palpation of the right inguinal region – emptiness.

1. Make the tentative diagnosis.

2. Determine doctor’s tactics.

**2.** A child of 10 years was hospitalized with complaints about colicky pain in abdomen, flatulence and stool absence, single vomiting . The anamnesis shows that the child underwent operative treatment of appendicitis 2 months ago. Objectively: the child tries to assume fetal position, moans , the tongue is coated. The abdomen is asymmetric due to contouring of enlarged intestinal loop. At palpation – there are no symptoms peritoneal irritation , the enlarged intestinal loop is palpated. At auscultation – increased peristalsis, no pathological sounds. Stool and gases are absent. The child is ill for 10 hours.

1. Put the diagnosis.

2. Give the first aid to the child.

**3**. A patient of 3years 4 months, stayed in the infectious department for 3 days with acute intestinal infection diagnosed. The anamnesis show s that a child had a diarrhea, changed into constipation. Hypertonic enema was made , after it the child became restless, there was single case of vomiting. In spite of antibacterial therapy the patient’s condition was continuously worsening, on the 3rd day there appeared blood in feces.

1. Put the tentative diagnosis and name the disease form.

2. What diseases should differential diagnostics be performed with?

3. Is it necessary to perform the instrumental examination in this case?

4. Management tactics.

**Materials for the self –study of the students**

|  |  |
| --- | --- |
| Main tasks | Notes |
| Repeat   1. Topography of abdominal cavity and gastrointestinal tract. 2. Histologocal structure of bowel. 3. Anatomical structure of different parts of gastro-intestinal tract. 4. Physiology of gastrointestinal tract. 5. Peritineal covering of different parts of gastrointestinal tract. 6. Topography , blood supply and innervation of the small and large intestine. 7. Rotation and malrotation of bowel. 8. Correct anatomical location after the midgut rotation. 9. Short bowel syndrome. | 1.Represent methods of diagnostics of organs abdominal cavity.  2.Upright posteroanterior and lateral abdominal xrays.  3. Irrigography and irrigoscopy.  2. Draw a block diagram of pathogenesis of intestinal obstruction.  3.Describe a pathogenesis of intussusception.  4.Chose and write methods of conservative and surgical therapy of intussuception. |
| Study:  1.Surgical accesses to different parts of gastrointestinal tract in children.  2.Resection of the bowel and end-to end enteroenterostomy.  3.Laparoscopic lysis of adhesions.  4.Conservative treatment of intussusception. | 1**.**To make a differential diagnostics of another diseases of gastrointestinal tract in children.  2. To make a block scheme of intussusceptions, |

**Input tests.**

**1**. A child of 6 months entered the surgical clinic 16 hours after вeggining of the disease, which began suddenly. He became restless, began to pinch his legs, refused to feed. Attacks of anxiety were short-lived. The boy calmed down and fell asleep. Woke up in 20 - 25 minutes, there was vomiting and repeated expressed anxiety. The child is pale, adynamic. The diaper is smeared with a “red currant jelly”stools. What is the preliminary diagnosis?

A. Intestinal obstruction caused by helminthic invasion.

B. Enterocolitis.

C. The diverticulitis of Meckel.

D. Intussusception.

E. Tumor of the abdominal cavity.

**Explaination:**

**A.** Clover infestation in children 6 months is not possible.

**B**. Enterocolitis runs with a clinic of bloating, diarrhea with an admixture of blood in the stool, there is no paroxysmal anxiety of the child.

**C**. Clinical manifestations of diverticulitis or bleeding from the diverticulum are typical for children 2 years and older. There is a “red currant jelly”stools . No paroxysmal pain in the abdomen at intervals of 20-25 minutes.

**D.** There is a clinic of intussusception of the intestine, consisting of crampy abdominal pain in the abdomen, a duration of 20-25 minutes with alternation of drowsiness, vomiting an admixture of blood in the stool like a “red currant jelly” . A typical age for intussusception is from 3 to 12 months.

**E**. The tumor of the abdominal cavity in young children grows asymptomatically, there is no paroxysmal nature of pain, there are no blood impurities in the stool like “red currant jelly” .

**2**. A child of 5 months was taken to the clinic 6 hours after the disease, pale, cramping pain in the abdomen, periodic exhilaration, with repeated vomiting. The last time the stools was 4 hours ago. From anamnesis it is known that the child first received oatmeal porridge as complementary foods. Upon examination, the child is pale, adynamic, tachycardia, the forehead is covered with cold sweat. The abdomen is not swollen, the soft, caecum in a typical place can not be found, with a rectal examination - stool like “red currant jelly” . What disease are you dealing with?

A. Intussusception.

B. Dysentery.

C. Gastric ulcer.

D. Fissure of the anal mucosa.

E. Rectum polyp.

**Explaination:**

**A.** A clinical findings of intussusception consisting of paroxysmal pains in the abdomen, with a duration of 20-25 minutes with alternating drowsiness, an admixture of blood in the stool like “red currant jelly” is represented. A typical age for intussusception is from 3 to 12 months. There is a provoking factor-introduction of complementary foods in the form of oatmeal porridge . The absence of the coecum in a typical place with the presence of abdominal mass in the right hypochondrium (Danset's symptom) indicates intussusception .

**B**. Dysentery is typical for older children, stools with dysentery frequent with a fresh admixture of blood, flow with hyperthermia, retinus of paroxysmal nature of pain.

**C.** Gastric ulcer in 5 months of children is not found.

**D.** The fissure of the anus can be ruled out with an external examination of the anus and rectal examination.

**E**. Polyp of the rectum appears in children of a more senior age (after 2 years), characterized by the presence of unchanged blood in the stool, symptoms of anemia.

**3.** A child of 11 months entered the third time in the surgical department with a diagnosis: acute intussusception of the intestine. Previous times, conservative reduction was conducted. Which of the following reasons is most likely for the onset of recurrent intussusception of the intestine?

A. Disturbance of complementary feeding.

B**.** Breach of age-feeding.

C**.** Gastroenterocolitis.

D. Breach of the feeding regime.

E. “Pathological lead point”.

**Explaination:**

**A**. Complementary feeding has already been introduced at 6 months old. There are no rules for violation of the feeding regimen.

**B**. There are no indications for age-related feeding disorders.

**C**. Gastroenterocolitis is typical for older children (5-17 years).

**D**. There are no indications of violations of the feeding regime, after previous conservative disinvagination, parents were instructed on the feeding regimen.

**E.** The pathological lead point is a recognizable intraperitoneal anomaly that tethers or obstructs the bowel, initiating the process of intussusceptions. Meckel’s diverticulum, intestinal polyps , intestinal duplications, B-cell lymphoma , and indvelling enteral feeding tubes are among the more frequent pathologic lead points.

**4.** The boy 12 years is hospitalized with complaints about repeated vomiting, paroxysmal pain in the abdomen, delay in leaving the stool and gases. In the anamnesis, a year ago, appendectomy was performed. Objectively: the skin is pale, pulse 90 beats per minute, AD -110/80 mmHg, body temperature 37,2 0 С. The abdomen is moderately inflated, asymmetric, somewhat resistant in the lower parts. Intestinal noises are intensified. Symptom Shchetkin-Blumberg negative. With a finger examination of the rectum, the ampoule is dilated, empty, the tone of the sphincter is weakened. What is the most reliable diagnosis?

A. Renal colic.

B. Food poisoning.

C. Acute adhesive intestinal obstruction.

D. Hepatic colic.

E. Acute pancreatitis.

**Explaination:**

**A**. For renal colic, strong paroxysmal pains are also characteristic, but there is no disturbance of stool and gas withdrawal, the abdomen is mild without peritoneal signs. The pain radiates into the lumbar region. Characteristic changes in the urine analysis , a positive symptom of Pasternatsky.

**B.** For food poisoning, multiple vomiting, frequent, loose stools, and colicky pains in the abdomen are common.

**С**.The clinical manifestation of late adhesive obstruction of the intestine is presented, in the anamnesis the operation is appendectomy.

**D.** For hepatic colic atypical lack of stools and gases, asymmetric bloating. The appendectomy a year ago makes us assume an adhesive intestinal obstruction.

**E.** For pancreatitis atypical lack of stool and gases, asymmetric bloating. The abdominal pain comes later because of the paresis of the intestine, there are peritoneal signs symptoms . The statement on appendectomy a year ago makes us assume an adhesive intestinal obstruction.

**5.** The child 7 months suddenly had paroxysmal pains in the abdomen, multiple vomiting, delayed departure of the stool and gases. On examination: the abdomen is soft, in the right hypochondrium is defined abdominal mass, inactive, slightly painful. At examination through a rectum: on a finger traces of a dark blood. What is the most reliable diagnosis?

A. Intussusception.

B. Tumor of the abdominal cavity.

C. Polyposis.

D. Peritonitis.

E. Intestinal tumors.

**Explaination:**

**A**. Intussusception is characterized by a typical age of 3-12 months. A clinic of intussusception consisting of paroxysmal pains in the abdomen, drowsiness, an admixture of blood in a stool like stool “red currant jelly” is presented. The absence of the cecum in a typical place with the presence of a tumor-like formation in the right hypochondrium, a sedentary and slightly painful (Danset’s symptom) indicates to intussusception .

**B**. The tumor of the abdominal cavity in young children for a long time grows asymptomatically, there is no paroxysmal nature of pain, there are no admixtures of blood in the stool like “red currant jelly”.

**C**. Polyp of the rectum occurs in children of a more senior age (after 2 years), characterized by the presence of unchanged blood in the stool, symptoms of anemia. The total polyposis (Peytz-Egers disease) is more severe than the solitary polyp.

**D**. Peritonitis. The clinical manifestations of peritonitis: bloating, board-like abdomen with palpation with positive symptoms of irritation of the peritoneum, symptoms of intoxication and dehydration.

**E**. The intestine tumor is rare in young children, it grows asymptomatically, there is no paroxysmal nature of pain, there are no stool like “red currant jelly” . Abdominal mass in the right hypochondrium should be regarded as a palpable intussuscipiens.The proximal invaginating intestine is termed the inussusceptum? The distal receiving bowel (outer part) is the intussuscipiens.

**6.** A 12-year-old girl became acutely ill 6 hours when there was a paroxysmal abdominal pain, nausea, repeated vomiting of previously taken food. The stool and the gases did not go away. Two months ago the patient was operated on appendectomy. On the anterior abdominal wall to the right of the navel is contoured a tumor-like formation with the sound of a high tympanite above it with percussion. What is the most reliable diagnosis?

**A**. Adhesive intestinal obstruction.

B. Infiltration of the abdominal cavity.

C. Intussusception of the intestine.

D. Tumor of the abdominal cavity.

E. Acute purulent right-sided paranephritis.

**Explaination:**

**A**. Vomiting, lack of stool and gas, stabbing abdominal pain, bloating (tumor-like formation with box percussion sound) and the presence of surgical treatment in anamnesis speak of adhesive intestinal obstruction.

**B**. For the infiltration of the abdominal cavity, duration of the disease should be a few days , for a postoperative infiltrate in this case, the timing is not typical.

C. Intussusception at the age of 12 years does not occur, appendectomy two months ago makes us think of adhesive obstruction.

D. For tumors of the abdominal cavity atypically turbulent beginning. Appendectomy two months ago makes us think of adhesive obstruction.

 E. Acute purulent right-sided paranephritis appeared as a septic condition with hyperthermia. In this case there is absence of symptoms of ileus. Appendectomy in anamnesis confirm diagnosis of adhesive intestinal obstruction.

**7.** A child of 4 years had seizures in the abdomen, vomiting, liquid bowel movements with traces of blood. The abdomen is not distended, soft painless and without rebound tenderness at palpation, the peristalsis is strengthened. In the right subcostal space, a tumor-shaped formation with distinct contours is palpated, moderately painful, moderately mobile. Suspicion of intussusception. Your tactics regarding the clarification of the diagnosis. What is the most likely answer?

A. Plain radiographs of the abdominal cavity in an upright position.

B. Pneumocolography.

C. Palpation of the abdomen under anesthesia.

D. Irrigography with barium suspension.

E. Irrigoscopy.

**Explaination:**

**A.** Plain radiographs with suspicion of intussusception is poorly informative in early period. Infrequently the intussuscipiens is visualized as opacity within a radiolucent, gas- filled distal bowel.

**B.** Pneumocolography gives a clear picture of the intussuscipiens in the form of a dentition or a claw of a cancer.

**C**. Palpation of the abdominal cavity under anesthesia allows the intussuscipiens to be palpated, but additional methods are needed (ultrasound, pneumocolography).

D. Irrigography with barium suspension is a highly informative method, but it can be replaced by a simpler and no less informative method-pneumocolography.

E. Irrigoscopy is indicated for studying the relief of the mucous membrane of the large intestine.In this case the irrigoscopy is a part of pneumocolography

**8**. A child of 7 months was taken to the surgical department 8 hours after the onset of the disease with complaints of anxiety, paroxysmal pains in the abdomen, a single vomiting. When examined in the right side of the abdomen, a tumor-like formation is palpated. When rectal examination we reveal blood in the stool like “red currant jelly” . What kind of disease can you think of?

A. Intussusception of the intestine.

B. Doubling the intestine.

C. Swelling of the abdominal cavity.

D. Cluster invasion.

E. Entererohistoma.

**Explaination:**

**A**. A clinic of intussusception of the intestine, consisting of paroxysmal pains in the abdomen, alternating drowsiness, a single vomiting, an admixture of blood in a stool like a raspberry jelly. A typical age for invagination is from 6 to 12 months.

**B**. For the doubling of the intestine, other clinical manifestations are characteristic -crovotency in the lumen of the intestine or the detection of a tumor-like formation in the abdominal cavity . Age, paroxysmal pains in the abdomen, the presence of a tumor-like formation in the right hypochondrium, and stools like “red currant jelly” indicate to the intussusception.

**C**. The tumor of the abdominal cavity in young children grows asymptomatically, there is no paroxysmal nature of pain, there are no admixtures of blood in the stool like raspberry jelly.

**D**. Gelmints invasion in children 6 months is not found.

**E**. Enterokrostoma manifests as a tumor or cyst of the abdominal cavity,clinical manifestation other than acute intestinal obstruction. The final diagnosis is put histologically.

**9**. In a child of 6 months of age 12 hours after the onset of the disease, intussusception of the intestine was clinically and radiological-diagnosed. What is the most reliable answer regarding treatment tactics?

A. Conservative reduction of the intussusception.

B. Operation in a planned manner.

C. Urgent operation.

D. Pneumoirrigography.

E. Siphon enema, observation.

**Explaination:**

**A.** With the established diagnosis of intussusception within 16 hours after the onset of clinical manifestations, conservative reduction of the intussusception is indicated.

**B**. Operation, if indicated carried out in an emergency order.

**C**. An urgent operation is possible if conservative spreading fails.

**D.** Pneumoirrigraphy a diagnostic method for diagnosis of intussusception

(creating a pressure of air 40 mm Hg).Usually suspected clinically, the diagnosis is confirmed by either ultrasonography( target or bullet sign) or contrast enema (fist or coiled-spring sign.

**E**. Siphon enema is indicated for colon cleansing, for preparation for surgical treatment or for irrigography and is not curative.

**10.** A newborn child after a while marked vomiting of a stagnant character with impurities of intestinal contents. Meconium is absent. Exercises in the form of thin mucous veins. What kind of diagnosis can you think of?

A. Pylorospasm.

B. Low intestinal obstruction.

C. Hirschsprung's disease.

D. Sepsis.

E. Meconium ileus.

**Explaination:**

**A**. With pilorospasm vomiting is noted with gastric contents.

**B**. In case of low intestinal obstruction vomiting is noted with intestinal contents, stool after enema in the form of thin mucous plugs.

**C.** Acute form of Girshprung disease (total aganglionosis of the large intestine) proceeds according to the type of acute congenital low intestinal obstruction.

**D**. With sepsis, severe intoxication, hyperthermia, multiple organ failure syndrome.

**E.** Meconium ileus is a bowel obstruction caused by inspissated meconium in the newborns with cystic fibrosis. In mekonium ileus, meconium does not depart, clinical manifestations of low intestinal obstruction occur earlier.

**Answers at the input tests: 1-D,2-A,3-E,4-C,5-A,6-A,7-B,8-A,9-A,10-B.**

**Final tests.**

**1**. Methods of examination that help in the diagnosis of intussusception, except:

A. The rectal examination of the rectum.

 B. Irrigography.

 C. Palpation of the abdomen under anesthesia.

D. Ultrasound examination of the abdominal cavity organs.

E. Thermography.

**Explaination:**

**A**. Finger examination of the rectum in case of intussusception will allow to detect in the rectum a stool like “red currant jelly” .

**B**. Irrigography, or better pneumocolography in combination with ultrasound can reliably establish a diagnosis of intussusception.

**C.** Palpation of the abdomen allows the intussuscipients to be palpated in the right hypochondrium, and later in time in other parts of the abdominal cavity.

**D.** Ultrasound examination of the abdominal cavity allows to determine the symptom of the "target or bullet", speaking of intussusception.

**E.** Thermography. In the first hours after the onset of intussusception, body temperature remains normal.

**2.** A child of 5 years complains of cramping pains in the abdomen. The vomiting, the delay of the stool and gases. The child is restless, looking for a comfortable place in the bed. The stomach is slightly distended, painful. The dosed percussion is doubtful. The peritoneal signs are doubtful .The peristalsis is loud, in separate waves. Rectal examination – ampoule of the rectum is empty. What disease is likely?

A. Acute appendicitis.

B. Acute intestinal obstruction.

S. Perforative gastric ulcer.

D. Acute pancreatitis.

E. Pelvioperitonitis.

**Explaination:**

**A.** In acute appendicitis, abdominal pain is constant, aching, wich is not decreasing. The appendicitis stool is ​​normal but in 30% of cases is liquid . The abdomen is not swollen during the first hours in appendicitis . When the abdomen is palpated there is local pain and a tenderness in the right iliac region and positive peritoneal symptoms.

**B**. For acute intestinal obstruction vomiting, stool and gas retention, bloating and paroxysmal pain in the abdomen is characteristic.

**C**. Perforative gastric ulcer usually occurs in adults or adolescents. Pain has a "dagger character." With percussion, the disappearance of hepatic dullness is determined, with palpation-the belly is a flaky, positive peritoneal signs.

**D**. Acute pancreatitis. The pain is extremely intense. Frequent pains of the entire epigastric region is often observed, often in the navel area, with irradiation of pain to the left shoulder, the heart area, behind the sternum. Vomiting dosen’t has pain reliving character. The main reference point of differential diagnosis is the gap between the severity of subjective complaints and a soft, painless or slightly painful abdomen.

**E**. For pelvioperitonitis is characterized by a discrepancy between the clinical picture of peritonitis and the duration of the disease, (a symptom of the first hours). .

**3**. In the surgical department entered a boy of 7 years with abdominal pain, vomiting didn’t give the relief, bloating and violation of the act of defecation. It was diagnosed with late adhesive intestinal obstruction. Central venous pressure (CVP)-0. Your tactic in this case.

A. Conservative treatment.

V. An urgent operation.

C. Operation if inefficient conservative therapy.

D. Operation after preoperative preparation.

E. Barium swallow and conservative treatment **.**

**Explaination:**

**A.** Conservative treatment with late adhesive intestinal can lead to irreparable loss of time.

**B.** An urgent operation without preoperative preparation can also end fatal consequences.

**C.** Operation if ineffective conservative therapy. The patient will require urgent surgical intervention, but after preoperative preparation.

**D**. Operation after preoperative preparation, aimed at stabilization of the patient from shock. The availability criteria will be the increase in CVP, the appearance of diuresis.

**E**. Barium swallow and conservative treatment for the patients with the signs of complete intestinal obstruction is erroneous, which can worsen a patient's condition and lead to irreparable loss of time.

**4.** What fluid is used to perform the siphon enema?

A. Warm water (36, 00 С).

B.10% NaCl solution.

C.1% NaCl solution.

D. Vaseline oil.

E. Cold water.

**Explaination:**

**A**. When performing a siphon enema with warm water, the child may die from cerebral edema.

**B**. When performing a siphon enema 10% NaCl, the child may die from severe dehydration.

**C**. Siphon enema should be performed with 0.85% -1% NaCl solution at a rate of 1 liter of solution per year of life of the child.

**D**. Vaseline oil is introduced for a laxative effect in small quantities ..

**E**. Cold water. When performing a siphon enema with both cold and warm water, the child may die from cerebral edema.

**5**. Symptom, uncharacteristic for the late stage of intussusception:

A. Distention of belly.

B. Peritonitis.

C. Blood and mucus from the anus.

D. Vomiting of intestinal contents.

E**.** Pain in the abdomen.

**Explaination:**

**A**. Distention of belly will be in the late stage of intussusception, when peritonitis (paralytic intestinal obstruction) develops.

**B**. Peritonitis will develop in the late stage of intussusception due to necrosis of the invaginated gut.

**C**. The secretion of blood and mucus from the anus in the late stage of intussusception will continue.

**D**. Vomiting of intestinal contents in the late stage of intussusception will continue.

**E**. The pain in the abdomen of the late stage of intussusception will be absent.

**6**. Child 10 years complained of paroxysmal pain in the abdomen, vomiting at normal body temperature. From the anamnesis it is known that 3 years ago was operated about a simple appendicitis. When examined, the abdomen is moderately swollen, takes part in the act of breathing. At a palpation of stomach is soft, moderately morbid in the bottom areas, gases were excreted some hours back. About which what disease we can think?

A. Acute cholecystitis.

B. Dynamic obstruction.

C. Adhesions intestinal obstruction.

D. Stomach ulcer.

E. The Meckel's diverticulus .

**Explaination:**

**A.** In cholecystitis there is no paroxysmal nature of pain, body temperature is increased, pain is localized in the right hypochondrium. It reminds for surgical intervention makes one think of adhesive obstruction.

**B**. Dynamic obstruction is divided into spastic and paralytic. An indication of surgical intervention in the anamnesis makes one think of an adhesive obstruction.

**C**. Considering surgical intervention 3 years ago makes us think about late adhesive obstruction.

**D**. Gastric ulcer is observed in older children, with a prolonged "ulcerative anamnesis."

**E**. Diverticulum Meckel manifests itself in the form of diverticulitis (clinic of acute appendicitis), bleeding from the diverticulum or provokes intussusception. The indication of a surgical intervention makes one think of an adhesive obstruction.

**7**. Which of the following factors contribute to the development of intestinal intussusception, except:

A. Diverticulum of Meckel.

 B. Dietic violations.

C. Insufficiency of the bauginium Valvue.

D. Polyps of the intestines.

E. Violation of electrolyte metabolism.

**Explaination:**

**A**. Meckel's diverticulum can be the cause of intussusception.

**B.** The violation of dietary feeding may be the cause of intussusception.

**C**. The insufficiency of the bauginium Valvue may be the cause of intussusception.

**D**. Polyp of the intestine can be the cause of intussusception.

**E**. Violation of electrolyte metabolism does not affect the onset of intussusception.

**8**. The girl 6 years old was brought to hospital with complaints of abdominal pain that appeared 3 hours ago. Body temperature 38.5 ° C, vomited twice. The condition is of medium severity, the tongue is dry, coated. The abdomen is limited in breathing, palpation is painful in all departments, a positive peritoneal signs symptom of dosed percussion in the iliac regions, mucopurulent discharge from the genital tract. Preliminary diagnosis?

A. Intussusception of the intestine.

B. Acute appendicitis.

C. Acute mesoadenitis.

D. Parasitic invasion.

E. Primary peritonitis.

**Explaination:**

**A**. For intussusception, the age, strained abdomen, the absence of stools such as “red currant jelly” are atypical.

**B**. Clinic of peritonitis in a child does not correspond to the appendicitis clinic 3 hours after the onset of the disease.

**C**. Acute mesoadenitis is less pronounced, the abdomen with palpation will be painful, but without symptoms of irritation of the peritoneum.

**D**. For helminthic invasion, the pattern of the peritoneal abdomen is uncharacteristic.

**E**. The child of the clinic of primary peritonitis, which is indicated by a sharp beginning, rapid development of the peritonitis clinic, mucopurulent discharge from the genital tract, symptoms of dehydration.

**9**. A 7-year-old child reported with severe cramping pains in the abdomen, vomiting, no excretion of the stool. The abdomen is asymmetric due to the protruding swollen loops of the intestine. Peristalsis appears clearly when stroking the abdominal wall. One year ago, child was operated for non-inflamated appendicitis. The general condition quickly deteriorates due to dehydration. Is your presumptive diagnosis?

A. Early adhesive obstruction.

C. Late adhesive obstruction.

C. Food poisoning.

D. Pancreatitis.

E. Intussusception of the intestine.

**Explaination:**

**A**. Early adhesive obstruction is considered 4-5 weeks after the initial laparotomy.

**B**. Late adhesion obstruction develops several months or years after the laparotomy. Sometimes the obstruction is preceded by periodic painful attacks in the abdomen.

**C**. There were no signs of dietary violations In case of food poisoning, in addition to vomiting there will be a disorder of the stool. Surgery a year ago makes one think about late adhesive obstruction.

**D**. Pancreatitis. The pain is extremely intense. Frequent pains of the entire epigastric region is often observed, often in the navel area, with irradiation of pain to the left shoulder, the heart area, behind the sternum. Vomiting dosent has pain reliving character. The main reference point of differential diagnosis is the gap between the severity of subjective complaints and a soft, painless or slightly painful abdomen.

**E**. Intussusception of the intestine. For intussusception, early age, connection with the introduction of complementary foods, a stool like “red currant jelly” is characteristic.

**10**. Five days ago the child was operated on for gangrenous appendicitis. The child complains of periodically increasing permanent pains in the abdomen. Every day the pain becomes cramping, the daily gastric discharge of greenish color is increased through the nasogastric tube. Throughout the abdominal wall, a flaccid peristaltic can be traced. weak peristaltic sound. Diagnosed early adhesive ileus Your tactics of further treatment?

A. Urgent relaparotomy.

B. Conservative therapy.

С.Changing of antibiotic therapy.

D. Conservative therapy is not less than 10-12 hours, and in the absence of effect, surgical intervention.

E. Operative treatment in a planned manner.

**Explaination:**

**A**. In excessively active tactics, it is not uncommon during relaparotomy to question the appropriateness of the intervention, and it seems that Ileus can be cured by a conservative treatment.

**B**. Only conservative therapy with an increasing clinical symptoms will not give result.

**C**. Conservative measures include gastric emptying, drug stimulation for peristalsis, detoxification therapy and correction of homeostasis. The replacement of an antibiotic does not play important role.

**D**. In children with adhesive intestinal obstruction and severe intestinal paresis, conservative measures continue for at least 10-12 hours. If during this period the pain attacks increase or remain of the same intensity, then an operation is prescribed. In those cases, when the general condition improved, the pain and quantity of aspirated gastric contents decreased, or when the siphon enema went away, the treatment was continued for another 10-12 hours.

**E**. Operative treatment in a planned manner with acute early and late intestinal obstruction is not carried out.

**Keys at final tests.:1-E,2-B,3-D,4-C,5-E,6-C,7-E,8-E,9-B,10-D.**

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