

Ministry of Health of Ukraine  
Zaporozhye State Medical University  
Chair of Pediatric Surgery and Anesthesiology

**Methods of examinations children  
with surgical pathology**

Clinical methodical guidance  
For English-speaking fifth-year students of medical faculty  
For clinical case report writing

Zaporozhye 2015

The guidelines on teaching and methodology are designed as a manual for independently conducted treatment of children with surgical pathology and writing a training case history for the 5<sup>th</sup> year students of treatment and pediatric faculty during their training course in the clinic of pediatric surgery. The guidelines include aims of treatment, the plan of medical examination of a patient child, the plan of writing a case history. The appendix contains plans of medical investigation in various diseases and standard physiological and laboratory indicators, which are necessary to shape clinical thinking.

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## **INTRODUCTION**

THE AIM OF CARE to teach students of medical faculty how to:

- a) communicate with patient children and their parents;
- b) get objective evidence from examination of a child, interpret the evidence with regard to anatomic-physiological peculiarities and age standards;
- c) diagnose most frequent surgical diseases of a child's age;
- d) make a plan of treatment, define indications for a surgery, define intraoperational tactics, conduct postoperative treatment of children with surgical and urological pathology.

## **TREATMENT CONDUCTING METHODS**

On the first day of the course on pediatric surgery every student gets one patient for treatment and methodology guidelines on treatment. The treatment is conducted independently under a teacher's supervision. Time for treatment is assigned every day during the course. At the end of treatment a student hands in a training case history for checking. The teacher of case history gives a mark.

Methodology guidelines comprise of two sections:

I – case history plan;

II - appendix: clinical, physiological and laboratory indicators of a healthy child.

## Case history plan

ZAPORIZHYA STATE MEDICAL UNIVERSITY

CHAIR OF PEDIATRIC SURGERY

### CASE HISTORY

\_\_\_\_\_  
/surname, name, age of a child/

Diagnosis:

Basic \_\_\_\_\_  
\_\_\_\_\_

Complication \_\_\_\_\_  
\_\_\_\_\_

Concomitant \_\_\_\_\_  
\_\_\_\_\_

Tutor: \_\_\_\_\_

Supervisor: \_\_\_\_\_ Student \_\_\_\_\_

course \_\_\_\_\_ , group \_\_\_\_\_

Beginning of treatment: \_\_\_\_\_

End of treatment: \_\_\_\_\_

## I. GENERAL INFORMATION

1. Surname, name, patronymic

\_\_\_\_\_

2. Age \_\_\_\_\_

3. Date of birth \_\_\_\_\_

4. Sex \_\_\_\_\_

5. Address \_\_\_\_\_

6. Job title of parents and their place of work \_\_\_\_\_

7. Directional diagnosis: \_\_\_\_\_

8. Admission diagnosis: \_\_\_\_\_

9. Clinical diagnosis: \_\_\_\_\_

a) primary disease \_\_\_\_\_

complication of the primary disease) \_\_\_\_\_

b) concomitant disease \_\_\_\_\_

10. Operation \_\_\_\_\_

11. Anesthesia \_\_\_\_\_

12. Operation date \_\_\_\_\_

13. Postoperative complications \_\_\_\_\_

## **COMPLAINTS**

The patient's complaints as well as those of their parents or people around them concerning the primary disease of the child at the moment of admission should be registered briefly and logically. Special attention should be paid to the starting time, duration and location of pain, its clinical features (intensiveness, irradiation and relation to other factors).

If the patient has several complaints, they are evaluated consecutively and recorded according to organs and systems.

## **CASE HISTORY**

### **(Anamnesis morbi)**

Beginning and development of the primary disease has to be established and described in a strict chronological order – from its first signs to the moment of the patient's examination by the supervisor. Attention should be focused on the effect of the course of illness on general condition, psychological and physical development of the child.

It is very important to find out the circumstances, which preceded and accompanied the illness.

The effect of treatment on the course of illness has to be described.

If the child has been examined before in other medical institutions, examination results have to be listed with reference to the source of information: the patient's words, their parents, people around them or medical papers.

## **PATIENT'S LIFE HISTORY**

### **(Anamnesis vitae)**

The most appropriate beginning of a patient's life history is giving information about the parents' age, their jobs, working conditions, household and

health, burdening diseases (hereditary diseases, tuberculosis, syphilis, metabolic diseases, etc.) and bad habits (alcohol and drug addiction, smoking, etc.).

The younger the child, the more important it is to ascertain the illnesses endured by the mother, which preceded the pregnancy or lasted during the intrauterine development of the fetus, as well as the number of undergone pregnancies and their outcomes. If there were premature terminations of them, the reasons for it should be established as well as the health condition of other children.

After that it is advisable to describe the circumstances in which the child was born, his number in succession, whether he was born in due time or prematurely, his weight at birth, the course of pregnancy and labour, when the child started to walk, talk and study, his physical and mental development. Conditions and quality of upbringing from the birth to the present moment should be described here. If the patient is newborn it is necessary to note whether he/she is on natural or artificial feeding, its amount, quality and frequency. The following aspects also need to be recorded: undergone illnesses, their severity, duration, treatment applied, its effectiveness; contact with contagious patients at home, in the day nursery, at school, etc.; dates of vaccinations, their aim, the child's reaction on them.

## **OBJECTIVE STUDY DATA**

Present state –Status praesens objectivus)

Overall assessment of the child's condition: satisfactory, moderately critical, critical, extremely critical, agonal. Consciousness: clear consciousness, mental confusion, absence of consciousness. Face and eyes expression: calm, suffering, depressed, excited. Position in bed: active, passive, forced. Gait. Build: regular, deviations are present: slouch, scoliosis, deformations. Nutrition: excessively good, satisfactory, reduced, exhaustion. Height. Weight. Body temperature. Skin: turgor,



colour (usual, pale, cyanotic, note cyanosis site, icteric, sallow), pigmentation, miliaria, intertrigo, rash, scars, scratches, desquamation, decubital ulcers, appearance of rash, skin elasticity, sweating, dryness, moisture, hyperesthesia. Hair and nails, their condition.

Visible mucous tunics: moisture, colour - usual, pale, icteric, pigmental, ulceration, rash, oedemas. Lymphatic system: whether lymph nodes are palpated or not. Their size in millimetres, consistency, tenderness, adhesion with each other and surrounding tissues.

#### MUSCULOSKELETAL SYSTEM.

Limbs, deformations, oedema, atrophy, periosteum condition. Joints: regular configuration, deformations, contractures and anchyloses, range of active and passive motions (bending, extension, abduction and adduction angles). Muscles: general development - good, moderate, weak, atrophy. Tenderness. Tonus: usual, increased, decreased. Local hypertrophies and atrophies, tumours.

THORACIC CAGE AND ITS ORGANS. Shape of the chest: usual, conical, barrel, cylinder, rickets, keeled, funnelform, other types of deformations, asymmetries.

Scapula position: firm adherence to the thoracic wall, not sticking firmly. Mammary glands. Examination: shape, symmetry of nipples, their size, pigmentation. Palpation data: consistency, tenderness, discharge from nipples, displaceability of mammal glands, presence of inflammatory infiltrates, tumours.

#### RESPIRATORY ORGANS.

Type of breathing: mainly thoracic, abdominal, mixed. Movements of nose wings at breathing. The rhythm of breathing: regular, Kussmaul's, Cheyne-Stokes's, Biot's respiration, number of respiratory movements per minute.

The way the child weeps, cries, description of his voice and cough. Measurements of chest circumference on the level of nipples during inhalation and exhalation.

Lungs percussion - percussion sound (bandbox, tympanic, dulling, dull). Lungs borders. Lungs excursion. Comparative assessment of vocal tremor - permanent, diminished, intensified. Comparative lungs auscultation:

Character of respiration: vesicular, hard, bronchial, amphoric, puerile, diminished, absent. Rales: crackling, dry, moist (fine (small), coarse (large)), etc. Rales character changing after expectoration.

#### CARDIOVASCULAR SYSTEM.

Pulsation of vessels of the neck, in the region of heart, presence of cardiac hump, apical thrust, its properties. Palpation of the heart region, large arteries: coiled, hard, knotty. Pulse: frequency per minute, symmetry, properties (full, high, small, low), tension - tense, not tense, soft; rhythm: rhythmic pulse, arrhythmic pulse, extrasystolia. Arterial pressure: systolic, diastolic. Examination and palpation of veins. Presence of dilatation of veins in the neck, thoracic cage, limbs, abdominal wall and spermatic cord. Induration and tenderness of veins. Percussion of heart: right, left, upper border of relative and absolute dullness of the heart. Auscultation of heart and large vessels: clear, muffled, strong, split or bifurcated, weakened. Rhythm: regular, arrhythmic – note the type of arrhythmia.

Murmurs: systolic, diastolic, pericardiac, etc. Strength of the murmur and change of its character at changing the body's position. Pericardial murmur, where it is detected. Functional tests: Stange-Gench, Sabrazés, Waldvogel tests. The data of X-ray, electrocardiographic examination of heart. Blood group, rhesus-factor.

#### DIGESTIVE ORGANS.

Appetite, stool character and frequency, presence of nausea, regurgitation, vomiting, amount and character of vomit masses.

Mouth, lips, their colour (usual, crimson, cyanotic). Dryness, fissures. Gums: pale, loose, bleeding, ulcerated. Teeth: quantity, condition (not the formula). Tongue: wet, dry, non-furred, furred (slightly, moderately, heavily), character of fur and its colour, presence of crust, fissures, ulcerations, oedemas. Mucous membrane of the pharynx: usual colour, red, oedematous, presence of fur, rash. Tonsils: usual size, hyperemic, intumescence of the mucous membrane fur, purulent plugs, ulcerations.

Abdomen: shape – usual configuration, oval, piriform, protruding, growing obese. The size of epigastric angle (acute, right, blunt). Abdomen: swollen, not swollen,

drawn-in, asymmetrical, presence of visible peristalsis, takes part or doesn't take part in breathing. Navel: inflamed or not, drawn-in, protruded, presence of hernia in the region.

Superficial palpation of the abdomen: the abdomen is soft or tensed, painless or painful; note the character of tenderness: local or disseminated. Symptoms of peritoneum irritation (Shchetkin-Blumberg, Rousing, Voskresensky, Razdolsky, etc). Deep sequential palpation according to Obraztsov, palpation of liver, characteristics of the lower edge (upper bound is defined with percussion). Palpation of spleen. Dosing systematic percussion according to Shurink. Percussion of abdomen, character and steadiness of the percussion sound, presence of dulling, site, its changing at changing of the body position. Abdomen auscultation: Intestinal murmurs, splashing sound, lower bound of stomach. Examination of the anus and rectum: inspection, digital investigation – state of sphincter, rectum walls, presence of overhangings, infiltrates, tenderness. Characteristics of discharge of the glove.

UROGENITAL SYSTEM. Complaints. Characteristics of day and night urination, frequency, presence of tenderness and its demonstration. Daily amount of urine, its ratio to the amount of the liquid drunk.

Examination of urination system: inspection of lumbar region, palpation of kidneys at supine position, lateral recumbent position, upright position. Pasternatsky symptom detection. Palpation of ureter and urinary bladder region. Laboratory tests of urine. Data of special urological tests (micturating cystography, i.v. urography, cystoscopy, pyelography, etc).

Examination of genital organs. Inspection: functional and anatomic deviations (malformations, in girls – state of virginal membrane, characteristics of discharge from genital tracts, state of vulva membrane (hyperemia, erosions, ulcerations). Palpation of testicles: position, size, consistency, tenderness. Data of transrectal examination of small pelvis organs, state of internal genital organs. (In boys presence of phimosis).

NERVOUS SYSTEM AND SENSE ORGANS. Complaints. Mental development,

intellect. Sleep, mood and its stability, reaction to people around. Presence of headaches, dizziness, faints. Speech: usual, scanning (staccato, syllable), stammer and other kinds of dysarthria. convulsions, paralyses, pareses. Sensitivity disorder: note the site. Dermographism: white, red, unstable. Reflexes: skin, tendinous, mucous. Meningeal symptoms. Pathological reflexes (if present, note the kind). In children under 12 months give characteristics of reflexes physiological for them (state of sucking, swallowing reflexes, reflexes of position, crawling, Kerning, Babinsky, Brudzinsky symptoms, etc). Coordination of movements. Symptoms of lesions of craniocerebral nerves.

Sense organs: sight, hearing, smell, taste (with / without deviations). With indications further examinations may be carried out: encephalography, electrodiagnostics, data of neuropathist's consultation, neurosurgeon, psychiatrist.

**ENDOCRINE SYSTEM.** Presence or absence of endocrine disorders (obesity, characteristics of the state of secondary sexual characters and others). Note the types of disorders, if present. Thyroid gland: size, shape, consistency, displaceability. Graphe, Mebius, Koher, Stelvag symptoms. In newborn children thymus gland needs checking. If any symptoms are present, data of endocrinologist's consultation is provided.

#### **LOCAL STATUS AND EXAMINATION TECHNIQUES**

Preliminary location of an illness is based on analysis of the main complaints of the child patient or their relatives concerning the illness, analysis of pathological process development, as well as an objectively conducted examination. Description of illness site is made according to the common outline, provided for a certain system, to which the involved organ belongs. This description together with the description of the system is entered into this section. At the end of it specially conducted tests and investigations are cited (laboratory, endoscopic, X-ray, cytological, US, etc).

#### **PROVISIONAL DIAGNOSIS**

Provisional diagnosis is built upon analysis of anamnesis, objective

examination and conducted clinical and laboratory tests with regard to the site and course of illness.

## DIFFERENTIAL DIAGNOSIS

Differential diagnostics should be started with providing reasons for the choice of disease, which have a similar clinical presentation with the pathological process developing in the patient under examination. Main complaints or one of the leading symptoms (such as pain, presence of swelling, bleeding, etc) are the basis for this explanation.

When comparing clinical presentation of the disease in the patient under supervision with diseases having similarities or even analogous symptoms one should always describe their patient's symptoms in the first place.

Differential diagnostics should be conducted by means of comparing and analysis of certain signs rather than simply denying them. At this stage the results of special and additional examination methods should be widely used. While conducting differential diagnostics it is required not only to diagnose a disease but also to solve the problem of personal peculiarities of the disease taking into consideration age, reactivity and general development of a child\*

## FINAL DIAGNOSIS

Final diagnosis is based on the analysis of all conducted subjective, objective and special investigations with regard to the results of conducted differential diagnostics. Opinion on peculiarities of the course of illness, its form and severity. Functional disorders and concomitant diseases.

## AETIOLOGY, PATHOGENY, CLINICAL PRESENTATION

(in classical form)

It is conducted in accordance with up-to-date techniques, briefly, with regard to individual peculiarities of illness development.

## TREATMENT PLAN

A specific plan of treatment for the patient is provided. The specific plan is supported by peculiarities of illness development in this particular case, analysis of effectiveness of treatment measures applied earlier, general condition of the patient, his/her reactivity, age.

When there are indications for operation they are grounded with regard to necessary preoperative preparation and choice of anaesthetization method. The most efficient method of surgical treatment for the patient is chosen among existing. A short plan of operation and postoperative management including preventive measures for possible complications is provided.

## CASE HISTORY JOURNAL

(Clinical course)

Case history journal is filled every day. It registers all changes happening in the patient's organism during the day, fluctuation of temperature, pulse, arterial pressure, respiratory rate, physiological functions, etc. All conducted manipulations, dressings with detailed description of the wound condition are registered. If the patient undergoes a surgery within the period of treatment, operative notes are given. Doctor's prescriptions are written down into the journal every day.

## PROGNOSIS AND PREVENTION

Prediction on clinical outcome includes the following: prognosis for life (prognosis quoad vitam) and for functional recovery (prognosis quoad function). Considerations on possible relapses of illness, their prevention, possible disability are provided in the conclusion.

Notes:

1. All abbreviations in the text of case history are allowed only in accordance with

generally accepted regulations.

2. Data on size, weight and volume are cited in centimetres, kilograms or grams and millimetres respectively.

## EPICRISIS

Final (discharge, transfer, postmortem) epicrisis is issued in the same cases as the final clinical diagnosis. It involves a brief description of the whole case history and consists of the following sections:

1. Surname, name, patronymic of the patient, admission and discharge (or death) dates (time, if necessary). Final clinical diagnosis.
2. The main complaints at admission (briefly).
3. The main anamnestic data (briefly) providing insight into the duration, characteristics and peculiarities of course of illness and its complications as well as data on other endured illnesses.
4. The main pathological data on organs.
5. Results of laboratory and instrumental methods of examination (on admission and discharge or death): clinical examination of blood, urine, faeces, sputum, ECG, X-ray results, biochemical blood analysis, other examinations data as well as professional consultants statement.
6. Treatment conducted at the in-patient department: regimen, diet, medicines (dosage and period of intake), physical treatment methods, surgeries etc.
7. Evaluation of in-patient treatment results based on dynamics of the main manifestations of illness. Patient's state on discharge.
8. In-patient report: the patient is discharged to work (work regimen, limitations), into a clinic, transferred to another in-patient hospital, turned to a health centre for aftercare, turned to MSEC (Medical Social Expert Commission).
9. Recommendations concerning, diet, work conditions and lifestyle, postexposure prevention, drug therapy (medicine name, dosing, types of intake, length of treatment) or other type of treatment. Treatment at a health resort.

## Supplement

### HEIGHT

Body length of a full-term newborn ranges from 46 to 56 cm, on average in boys it equals 50,7 cm, and in girls –50,2 cm. If a newborn baby's body length is 45 cm and less it is considered to be prematurely born.

In the first 3 months of life the height increases by approximately 3 cm monthly or 9 cm every quarter of a year. In the second quarter – by 2,5 cm a month, i.e. by 7,5 cm a quarter, in the third quarter – by 1,5-2,0 cm, in the fourth quarter – by 1 cm a month, i.e. by 3 cm.

General body length gain for the first year is 25 cm. The following scheme can be applied as well: a baby aged 6 months has a body length of 66 cm, for every month under 6 months, 2.5 cm are deducted, for every month after 6 months, 1.5 cm are added. Body length of a baby at present is doubled till the age of 4, and triples till the age of 12. After the age of 12 months the speed of growth slows down. From the second and third year gains in height comprise 12-13 cm and 7-8 cm respectively. Then they become relatively even.

At the age of 4 the child is 100 cm high. If the child is younger than 3, its height equals  $100 \text{ cm} - (4-n)$ , where n- the number of years. If the child is older than 4, its height equals  $100 + 6/n - 4$ , where n – the number of years.

The height of the child aged between 2 and 15 is defined on the basis of the height of an 8-year-old child, which is 130 cm. For every previous year 7 cm are deducted from 130 cm, for every following year 5 cm are added to 130 cm.

### WEIGHT

On average body weight of a full-term newborn baby comprises for boys 3494 g, for girls – 3348 g. Permissible range of body weight at birth is considered to be 2700-4000 g. A newborn baby with a weight of less than 2500 g is considered to be prematurely born or born with intrauterine growth retardation (hypotrophy). A newborn baby with a weight of more than 4000 kg is considered to be big. Body weight can be defined as a sum: body weight at birth + 800 g x N, where N is the number of months in the first half-year, and 800 g is an average monthly weight



gain during the first half-year. For the second half-year of life body weight equals: body weight at birth + body weight gain for the first half-year.

$(800 \times 6) + (400 \times N)$ , where N is the age in months, and 400 g is an average weight gain for the second half-year.

#### HEAD CIRCUMFERENCE CHANGE

On average head circumference at birth is 34-36 cm. Later on it grows quite fast in the first months and years of life and slows down its growth after the age of 5.

For children under 5: head circumference of a 6-months old child comprises 43 cm, for every previous month 1.5 cm are deducted from 43 cm, for every following months 0.5 cm are added.

For children aged 2-15: head circumference of a 5-year old child is 50 cm, for every previous year 1 cm is deducted from 50 cm, for every following year 0.6 cm are added.

#### CHEST CIRCUMFERENCE

For children under 1 year old: chest circumference of a 6-months old child is 45 cm, for every previous month 2 cm are deducted from 45 cm, for every following months 0,6 cm are added.

#### TOUR'S INDEX

Chest circumference in children under the age of 7 is smaller than their head circumference by the number of centimetres equal to the child's age (i.e. in a child aged 5 chest circumference is 5 cm smaller than head circumference).

#### CHULITSKAYA'S INDEX

(3 arm circumference + thigh circumference + shin circumference) minus height equals:

in 1 year-old children 20-25 cm, 2-3 -year old children - 20 cm, 6-7-year old children - 10-15 cm.

#### TROPHISM INDEX

Existing weight / proper weight x 100 = /in percents%/ Normal indicator is - 100

%.

### ERISMANN's INDEX

If chest circumference equals half a height it indicates plumpness of a child and size of thoracic cage.

The index has to be positive until the age of 3.

Under 1 year old – 10.0-13.5; 2-3 years old – 6.0-9.0; 6-7 years old – 2.0-4.0;

7-3 years old – 0.

### AVERAGE PERIODS OF MOTOR DEVELOPMENT IN CHILDREN DURING THE FIRST YEAR OF LIFE

Movement	Average age of mastering	Possible diapason
Smile	5 weeks	3-8 weeks
Cooing	7 weeks	4-11 weeks
Head control	2 months	11 weeks/ 2-3 mo
Hands movements control	4 mo	2 1/5 - 5 1/2 mo
Turning-over	5 mo	3.5 – 6.5 mo
Sitting	6 mo	5.5 - 3 mo
Crawling	7 mo	2 - 9 mo
Unconditioned snatching	8 mo	5.75 – 10.25 mo 6 - 11 mo
Rising	9 mo	6.5 – 12.5 mo
Steps with backup	9.5 mo	
Standing without assistance	10.5 mo	8-13 mo 9-14 mo
Walking without assistance	11.25 mo	

### PULSE AND BREATHING RATE ACCORDING TO AGE

Age	Pulse rate per minute	Breathing rate per minute
Newborn	120 -140	60 - 40
1 year	120	40- 35
3 years	105	30 - 25
5 years	100	25

#### PULSE / BREATHING RATIO IN CHILDREN ACCORDING TO AGE

Newborn	1:2
Infants	1:2, 5-3
Preschool children	1:3, 5-4
Schoolchildren	1:4,5

#### PCV SIZE ACCORDING TO AGE

Age	PCV, %	Age	PCV, %
1 <sup>st</sup> day	64.8	14-16 <sup>th</sup> day	42+-7
3 <sup>rd</sup> day	63.3	3 <sup>rd</sup> month	35.0
5 <sup>th</sup> day	60.0	4-10 <sup>th</sup> year	37
7 <sup>th</sup> day	59.6	10-14 <sup>th</sup> year	39/33-50/
10-14 <sup>th</sup> day	58.1	adults	41 /36-48/

#### WATER REQUIREMENTS OF CHILDREN

Age	Body weight, kg;	Daily food and water requirements	
		ml	ml/kg
3 days	3	250-300	80-100
10 days	3,2	400-500	130-150
6 mo	8,0	950-1000	130-150
1 year	10,5	1150-1300	120-140
2 years	14.0	1400-1500	115-125
5 years	20.0	1800-2000	90-100

10 years	30,5	2000-2500	70-85
14 years	46.0	2200-2700	50-60
18 years	54.0	2200-2700	40-50

### BLOOD PICTURE OF A CHILD

Leukogram, %

Age	Erythrocytes $10^{12}/l$	Hemoglobin g/l	Leucocytes $10^9/l$	Neutrophils	Lymphocytes	Monocytes	Eosinophils	Basophils	ESR mm/hr
2-4 wk.	5,31	170	10,25	26,0	53,0	12,0	3,0	0,5	6
1-2 mo.	4,49	142,8	12,1	25,25	61,25	10,3	2,5	0,5	6
5-6 mo.	4,55	132,6	10,9	27,0	53,5	10,5	3,0	0,5	7
1-2 yr.	4,82	127,5	10,8	34,5	50,0	11,5	2,5	0,5	8-7
4-6 yr.	4,6^	136,0	10,2	45,5	44,5	9,0	1,0	0,5	8
9-10 yr.	4,9	136,0	3,6	51,5	33,5	8,0	2,0	0,25	10

### BLOOD COAGULATION FACTORS LEVELS IN NEWBORN AND TERMS OF THEIR INCREASE TO THE ADULT LEVEL

Factor	Level of factors		
	At birth	In children after 1 year /or in adults/	Terms of their stabilization
I fibrinogen/, г/л	1,5-2,0	2,5-3.0	in 2-4 days

II /prothrombin/, %	24 - 65	100	in 10 days
V /proaccelerin/%	70-170	75-100	Before birth
VII /proconvertin/,%	20-50	75-100	in 2-12 mo.
VIII /antihemophylic globulin A/,%	70-150	50-150	
IX antihemophylic globulin B/,%	15-60	50-150	in 3-9 mo.
X /Stuart-Prower factor/,%	20-55	100	in 2-12 mo.
XI /Rosenthal factor/,%	15-70	100	In 2 mo. mec.
XII /Hageman's factor/, %	25-55	100	in 9-14 mo.
XIII /fibrinstabilizing/,	100	100	Before birth
Antithrombin I, %	60-80	75-125	in 10 days
Antithrombin II, %	55-75	70-125	-/- 3-6 mo.
Heparin, c	7	4-5	-/- 10-30 days
Plasminogen, %	20-45	100	-/- 3-6 mo.
Fibrinolysin %	20^45	85-115	-/- 2-3 mo.

The rest of indicators in children are practically similar to those in adults (time of blood coagulation, duration of bleeding, time of plasma recalcification, heparin tolerance of plasma). Only prothrombin index and time and thrombin time are transitly decreased and slowed down in newborns.

## MOST IMPORTANT BIOCHEMICAL INDICATORS OF BLOOD IN CHILDREN

Substance	Age	Content of substance	
		%	Units, IS
Total Protein	1 <sup>st</sup> mo.	4.1-5.5	41-55 g/l

Protein fractions: albumin $\alpha_1$ -globulin $\alpha_2$ -globulin $\beta$ -globulin $\gamma$ -globulin albumin $\alpha_1$ -globulin $\alpha_2$ -globulin $\beta$ -globulin $\gamma$ -globulin	1 mo.     1 yr. and older 0,1-0,4     	2,05-3,85 0,12-0,33 0,25-0,66 0,16-0,77 0,41-1,21 3,7-5,2  1,0-4,0 0,5-1,0 0,6-1,2 0,6-1,6	20,5-38,5 1,2-3,3 2,5-6,6 1,6-7,7 4,1-12,1 37,0-52,0  1,0-4,0 5,0-10,0 6,0-12,0 6,0-16,0
Glucose (in serum)	0-7 days  1 mo.  2 mo.-14 yr.	30-75mg%  45-85mg% 60-100 mg%	1,7-4,2 mmol/l 2,5-4,7 mmol/l 3,33-5,55 mmol/l
Total lipids	0-7 days  1 mo.  2 mo.-14 yr.	170- 450mg% 240-700 mg/% 450-700 mg%	1,7-4,5 g/l  2,4-7,0 g/l  4,5-7,0 g/l
Total cholesterol	0.1mo. 2 mo. -1 yr. 2 r.-14 yr.	60-115 mg% 70-190 mg% 144-250 mg%	1,56-2,99 mmol/l 1,82-4,94 mmol/l 3,74-6,50 mmol/l
Total bilirubin	4-e days 9-days 1 mo.-14 yr.	4-6 mg% 2-4 mg% 0,2-0,8 mg%	68,4-102,6 mmol/l 34,2-68,4 mmol/l 3,4-13,7 mmol/l
Unconjugated bilirubin (indirect)	4- days 9-days 1 mo.- 14 yr.	3,8-5,4 mg% 1,75-3,25 mg% 0,15-0,6 mg%	65,0-92,3 mmol/l 29,9-55,6 mmol/l 2,56-10,3 mmol/l
Direct bilirubin	4- days 9-days 1 mo.-14 yr.	0,2-0,6 mg% 0,25-0,75 mg% 0,05-0,2 mg%	3,4-10,3 mmol/l 4,3-12,8 mmol/l 0,85-3,4 mmol/l

Urea nitrogen/ in serum/	newborn 1 mo.-1yr.  2yr.-14 yr.	7-12 mg%  9,4-15,7 mg%  12,1- 20,6mg%	5-9 mmol/l  6,7-11,2 mmol/l 3,6-14,7 mmol/l
Rest nitrogen /in serum/	newborn 1 mo.-1yr.  2г-14 yr.	20:5-32 mg%  24-39 mg%  27-41мг%	14,6-22,35 mmol/l 17,1-27,85 ммоль/л 19,3-29,3 ммоль/л
Creatinine	0-14 yr.	0,4-1,2mg%	0,035-0.11
Urea	newborn 1mo.-1 yr. 2 yr. -14 yr.	15-27 mg%  20-33,6 mg% 26-44,1 mg%	2,5-4,5 mmol/l 3,3-5,6 mmol/l 4,3-7,3 mmol/l
Potassium	newborn 1 mo.-5yr. лет	18,2-26.0 mg%	4,66-6,66  2 15-5 76
Calcium	0-5 days 6 days-14 yr.	0,0-9,8 mg% 10-11,5 mg%	2,25-2,45 2,5-2,37
Sodium	newborn 1 mo.-14 yr.	310-355 mg%  305-325 mg%	135-155 mmol/l 133-147 mmol/l
Phosphorus	0-14 yr.	2,0-7,0 мг%	1,78-2,26
Chlorine	0-14 yr.	340-330 mg%	96-107 mmol/l
Immunoglobulin A	newborn 1-7 yr.	0  30-175 mg%	0  0,3-1,75 g/l
G	newborn 1-7 yr.	400-1100 mg% 460-1750 mg%	4,0-11,0 g/l 4,5-17,5 g/l
M	newborn 1-7 yr.	60-120 mg% 33-200 mg%	0,6-1,2 g/l  0,33-2,0 g/l

Aldolase	newborn 1-12 mo. 14 yr.		0,6-12,2 IE/l 2,7-7,9 IE/l 0,6-66 IE/l
LDH	newborn 1 mo.-1yr. 1yr.-3 yr.		300-500 IE/l 200-400 IE/l 150-230 IE/l
AST (aspartate aminotransferase)	newborn nurseling over a year	5-120 EB 5-70 EB 5-40 EB	2-60 IU 2-34 IU 2-20 IU
ALT	newborn nurseling over a year	5-90 EB 5-40 EB 5-35 EB	2-43 IU 2-19 IU 2-17 IU
Alkaline phosphatase activity	newborn 1-12 mo. 1 yr.-14 yr.		59 IU/l 40-156 IU/l 28-138 IU/l



# **METHODOLOGY OF A CHILD SURVEY WITH SURGICAL DISEASES**

## **1. A CHILD SURVEY WITH ACUTE ABDOMINAL DISEASES**

### **Acute appendicitis**

Among the surgical diseases of children, the frequency of acute appendicitis takes the first place: the ratio of appendectomy to other types of surgery is on average 39%.

### **ANAMNESIS**

The anamnesis of acute appendicitis should be treated critically. Sometimes you need to take the history from the sick children (of older age), because they can provide more reliable information about their disease.

The disease begins gradually with the appearance of nagging or tensive pain in the abdomen. In the beginning the pain is not sharp and a child may not pay attention to it for some time. Subsequently the pain increases gradually and the highest intensity is observed at the onset of disease.

In the beginning, localization of pain may be indeterminate, but it often irradiates in the navel and epigastric region. In a few hours the pain is localized in the right iliac region and they gradually decrease (the loss of nerve apparatus of the appendix), but do not stop completely.

Therefore, children with acute appendicitis sleep poorly at night. When the appendix perforation takes place the intensity of the pain increases again. This two-phase course of acute appendicitis can give rise to diagnostic errors, if children with acute appendicitis are examined at a later date.

Simultaneously or a little later with the appearance of the abdominal pain the child starts to vomit. Vomiting is frequently of a reflex nature. It can be once or at least a few times. Repeated vomiting is characterized only for children under 3 years old. Some children do not have vomiting at all. They can only have nausea.

The body temperature rises to 37-38 degrees, but for young children it can rise up to 39-40 degrees. Children with acute appendicitis usually have normal bowels

function. Children of younger age with pelvic location of the appendix are characterized with frequent liquid stool with admixtures of mucus and sometimes blood.

### **EXAMINATION**

The patient's condition may vary depending on the onset of disease and the time of hospital admission. The child usually lies on his right side with his legs raised to the abdomen. He tries to avoid any movements, while others can sit and bend their knees forward. Facial features show that a child is in pain. Skin is pale. Tongue is dry with white or grayish incrustation. The child often asks to drink. Pulse is frequent, sometimes arrhythmic, does not correspond to the temperature. A reliable sign of acute appendicitis is a discrepancy between the pulse rate and body temperature ("scissors") - pulse rate increases by 15-25 strikes per 1 degree rise of body temperature (the norm is with the increase of temperature by 1 degree pulse quickens by 10 strikes).

The abdomen has the usual configuration, and only with closer inspection one may notice some bloating, and the lag in the act of breathing of the right iliac region, or the right side of the abdomen.

### **PALPATION**

Palpation of a child's abdomen should be done very tenderly and with warm hands. At first tender superficial palpation and stroking is done starting from the left side in the lower abdomen, gradually passing to the upper section. Then the right hypochondrium is palpated and only then the right iliac region. With these actions, we can define a reliable and valuable symptom of acute appendicitis - abdominal muscle tension in the right iliac region, which is a protective reflex.

The area of tension extension usually corresponds to the extension of the inflammatory process in the abdominal cavity. The abdomen is palpated a couple of times and its left part is compared to the right one in unclear cases. Even the slightest muscle tension can be felt if one hand touches the right iliac region, and the other one - the left region pressing tenderly the sides in turns. Muscle tension may be absent if the appendix is wrapped with omentum.

When the location of the appendix is retrocecal muscle tension may be localized from the side of loin. At the same time muscle tension can be found in the right iliac region, but it is expressed to a lesser extent.

In the later stages of acute appendicitis while doing the abdominal palpation muscle tension of the anterior abdominal wall is determined, giving a picture of the wooden belly. The deeper palpation of the abdomen is followed later. Palpation technique is the same as that of a superficial palpation.

Deep palpation of the abdomen reveals another constant symptom of acute appendicitis – provoked pain.

Localization of pain is most often found in the right iliac region, but it may change depending on the location of the appendix: if the location of the appendix is retrocecal pain is defined in the lumbar region, with pelvic location - above the pubis.

There exist numerous pain symptoms to detect the pain of acute appendicitis, but they are of no great practical importance.

Of all the symptoms characteristic of acute appendicitis, the most important is Shetkin-Blumberg symptom. This symptom is examined in the following way: press slowly and deeply with two or three fingers on the anterior abdominal wall in the right iliac region, and then quickly take the hand away. In this case one feels sharp pain caused by the concussion of the inflamed appendix. The smaller the child the less important is the value of this symptom.

It is particularly difficult to detect this symptom with small children, and so there exist another trick: put the patient's hand with the fingers apart on his own abdomen and start tapping on these fingers from left to right. Pain appears in the right iliac region and the child removes his hand.

Typically, you may reveal pain of varying intensity in the right iliac region during palpation. This important sign - local tenderness – was pointed out by N.F. Filatov (Filatov symptom).

Other appendicular symptoms are the following:

- Voskresenskiy symptom - "a symptom of a shirt" – with the rapid sliding of a pressing hand through the shirt on the abdominal wall there is pain in the right iliac region and the child winces.
- Older children can have a Sitkovskiy symptom - the emergence of pain in the right iliac region when you turn the patient on his left side.

You must keep in mind that among the symptoms characteristic to acute appendicitis, there is no symptom specific, peculiar only to appendicitis. That's why during the child examination, you should try to find the symptoms that are the most constant. It is necessary to conduct finger study through the rectum when children have acute appendicitis. This study makes it possible to determine the presence of pain and infiltration of the anterior wall of the rectum, the presence of an abscess or infiltrate, which is located in the pelvis. In addition, you may reveal pathology of the internal reproductive organs of girls during this study.

### **LABORATORY RESEARCH**

Changes in the CBC (complete blood count) are not constant. The increase of the number of leukocytes with a shift of leukocytic formula to the left is most often observed. Leukocytosis varies considerably depending on the severity and the duration of the disease. Usually the leukocytosis is in the range 11000-15000. A considerable leukocytosis during acute appendicitis indicates the presence of severe intoxication. However, some children with acute appendicitis may have leukopenia. Thus, the CBC has only auxiliary importance.

In the urine study sometimes, there are no changes, and sometimes there are the following changes:

- a significant amount of protein,
- a moderate number of leukocytes,
- individual erythrocytes and cylinders (response to the renal parenchyma irritation).

Thus, a critical evaluation of the detailed medical history, careful clinical examination of the patient in combination with the laboratory data help to diagnose acute appendicitis correctly and in time.

### **Peritonitis of appendicular origin.**

Child's diffuse peritonitis often complicates the course of acute appendicitis, it is especially hard for children under 3 years.

#### **ANAMNESIS**

Abdominal pain is a major and permanent indication of peritonitis. The pain amplifies gradually during phlegmonous and gangrenous appendicitis complicated by peritonitis. Sharp pain in the abdomen appears during perforation of the appendix and extends to all its parts.

The pains are permanent, although they may vary depending on their intensity. In this regard, children with peritonitis have sleeping problems. The children become anxious, cry. With the progression of the process, the growth of intoxication, the abdominal pain reduction, children become flabby, sleepy, which is sometimes regarded as an improvement of the child's condition.

Repeated vomiting is characteristic for peritonitis. Children refuse to eat. You can distinguish admixture of bile or intestinal contents in vomit.

Body temperature rises to 30-40 degrees. If children arrive late - in the period of severe intoxication - the temperature reduces to subfebril or normal, but sometimes it is below normal.

Children with peritonitis usually have a delayed stool, children under 3 years of age and with pelvic location of the appendix may experience diarrhea.

#### **Physical examination**

**Examination.** The child's condition is severe; he lies on the right side, with the legs near the stomach. Skin dry, with an earthy tone. Pinched face, his eyes sink. Tongue dry, coated with a yellowish incrustation. Pulse frequent, sometimes arrhythmic, does not correspond to the body temperature, when having peritonitis differences in pulse rate and body temperature are expressed most clearly. Cardiac sounds are muffled, with a sharp intoxication systolic murmur at the apex of the heart is heard.

The abdomen is swollen, not involved in the act of breathing. The anterior abdominal wall, especially in small children, is pasty, venous network is enlarged.

Superficial palpation of the abdomen is sharply painful. The abdominal muscles tension in all parts of the abdomen is present, expressed more in the right iliac region.

Shetkin-Blumberg symptom is positive in all parts. When a child arrives late abdominal muscles tension and a symptom of peritoneum irritation cannot be identified.

Stomach percussion is sharply painful.

Rectal examination should be carried out in all cases: it serves as an additional method of diagnosis and detects the overhang of the anterior arch and a sharp pain on palpation.

### **Laboratory Methods of Examination.**

A high number of leukocytes is indicated in blood – up to 20-30 thousand. In neglected cases with severe intoxication, the number of white blood cells can decrease to normal or leukopenia starts. More valuable are the blood formula indicators: aneosinophilia occurs, sharp shift of the formula to the left before the appearance of young forms and myelocytes, toxic granulation of neutrophils, which indicates a severe peritonitis with intoxication.

As a result of intoxication protein, fresh and leached erythrocytes, leukocytes, cylinders are found in the urine.

Pathological impurities are sometimes found in the feces: erythrocytes, leukocytes, mucus.

**Biochemical studies** of the blood have great significance. During peritonitis acid-base balance is greatly disturbed in the direction of metabolic acidosis. In severe condition it is accompanied by frequent vomiting and diarrhea, kaliopenia develops (Up to 11-12 mg% or less) and hlorpenichesky metabolic alkalosis, which is a poor prognostic sign.

During peritonitis, there is a decrease in blood volume, haematocrit increases up to 50-60%. Despite the large losses of protein of patients with peritonitis, its total number remains within normal limits for quite a long time, only the albumin level changes (decreases) and globulin (increases), albumin ratio is always below

normal.

### **X-ray study**

On the plain film of the abdominal cavity organs, a large amount of gas and multiple horizontal layers of fluid in the loops of the bowels resulting from dynamic obstruction define.

During perforation of the appendix sometimes free gas can be found in the abdominal cavity as a thin crescent strip below the diaphragm. In rare cases, there is a homogeneous shadow due to inflammatory infiltration of tissues and the accumulation of pus.

### **Appendicular infiltration**

Appendicular infiltration is more common for children of older age. It can be detected on the 3-5 day of acute appendicitis.

### **HISTORY**

Abdominal pain becomes not as bad as that at the beginning of the disease, but may increase if the peristalsis of bowels increases. Vomiting becomes rare; feces come to normal or sometimes detain. The temperature is about 38-39 degrees.

### **Physical examination**

The condition of children - moderate, pulse rate becomes more rapid, tachycardia.

Abdomen during the examination is moderately swollen, sometimes asymmetrical due to bulging in the right iliac region. The right half of the abdomen does not keep up with the left one during breathing. While palpation in the first days of the disease moderate tension of the abdominal muscles is determined. In the right iliac region, you can palpate a tumor-like formation of a dense consistency, immobile, painful, with no clear boundaries of different sizes.

Percussion of the anterior abdominal wall over this formation is painful, gives a sound dullness.

During the rectal examination painfulness of the right side of the rectum is detected.

In a blood test, there is a moderate leukocytosis and a formula shift to the left,

accelerated ESR.

On the plain film of the abdominal cavity, there is shadowing in the right half of the abdomen.

When there is reverse development of appendicular infiltrate the child's condition improves, stomach pain decreases, vomiting stops, body temperature normalizes, the infiltrate size decreases, blood value normalizes as well.

When infiltrate suppurates, the body temperature becomes of hectic nature; abdominal pain increases, vomiting becomes frequent. During abdomen examination there is abdominal swelling and asymmetry due to its right half bulging. During palpation sharp pain in the area of infiltration detects, the symptoms of irritation of the peritoneum are positive.

Blood test shows the increase of the number of leukocytes and a sharp formula shift to the left, toxic granulosity of neutrophils appears. The most threatening complication of suppurated appendicular infiltrate is a breakthrough in its abdominal cavity with the development of diffuse purulent peritonitis.

### **Intussusception**

Intussusception - the kind of intestinal obstruction due to the introduction of distal area to the proximal part of bowels. Such a mechanism of obstruction is most common for children after 6 months or older. The mechanism of penetration is regarded as the result of intestinal dyskinesia, abnormality of its motor function, developed because of the transition to qualitatively new foods, or eating food of poor quality and poorly digestible foods. Polyps of the bowels, diverticulitis, tumors and tumor-like formations, worms favor intussusception.

There are enteric, colonic and ileocecal intussusception. The latter subdivides into the ileocolic (with the introduction of the ileum through the Bauhin's valve) and blindly colon (first cecum penetrates into the ascending intestine, that drags iliac intestine). Intussusception distinguishes an outer tube (vagina) and internal tube (intussusceptum). The initial section of the penetrated intestine is called the intussusceptum head.



## **HISTORY**

Examination of a hospitalized child in the surgical clinic with intestinal intussusception begins with the collection of family history. It must be remembered that the development of the clinical picture of intussusception and its complications, the usefulness of certain methods of examination are dictated by the stage of the process, in which the child has been hospitalized.

The first signs of the disease include an indication in a history of sudden sharp cramping abdominal pain with evident restlessness, pallor of a child at the time of the pain attack. The duration of pain attack - 5-7 min., after which the pain disappears and the child calms down.

Vomiting may not occur. Sometimes it can happen at the time of the attack but it is rare and of reflex nature. In the first 6-8 hours, there is no delay of gases and feces.

As the pathological process develops the intensity of pains grow, attacks interchange with light intervals of 10-15 min., restlessness is expressed. There is frequent vomiting with the impurities of bile, and delay in feces and gas. If peritonitis and necrosis of the intestinal wall begins, pain attacks and restlessness disappears, the child is flabby and apathetic, there is constant vomiting with intestinal contents, the total delay of feces and flatus.

### **Child examination and abdomen survey**

The general condition of a child, as a rule, is satisfactory, body temperature is normal; pulse rate is a bit rapid, and the tongue is moist and clean. Abdomen is available for palpation in all parts, pathological formations and peritoneal signs are not detected.

A crucial feature of the intussusception stage is a combination of opposite symptoms - restlessness and lack of peritoneal signs.

When the intussusceptum has formed, then the general condition of a child is moderate or heavy, skin is pale, he s flabby, temperature is about 38 degrees, pulse rate is rapid, and sometimes there is bradycardia, tongue is dry and coated with white incrustation.

During the abdomen palpation there is desolation of the right iliac region, the presence of sausage-like tumor in the abdominal cavity, tightly elastic consistency with clear boundaries of tenderness on palpation.

Muscle tension is not defined, peritoneal signs are not present. At the stage of developed complications (peritonitis, intestinal obstruction), the general condition is severe or very severe. The patient is dehydrated, severe weakness, paleness, the temperature is about 38-40 degrees, the pulse rate is frequent, the tongue is dry and coated with dirty-gray incrustations.

The abdomen is moderately bloated, muscle tension is detected in all parts, and intussusceptum is palpated. In neglected cases, there is intussusception of rectum with a permanent elimination of the masses from the lumen.

**Rectal examination.** Intussusception suspicion - a reason for mandatory finger rectal examination. It should be done carefully and gently with the preliminary lubrication of the tip of the finger with vaseline. To avoid the sphincter and rectal mucous injury this examination should be carried out with a little finger slowly the position of a child - on the left side with legs brought up to the abdomen.

At the initial stage of the disease intussusceptum may not be detected. Often, while intussusception the ampulla of the rectum is empty.

There are a couple of lumps of feces stained with blood on the finger. In some cases, with an unclear clinical picture in the hospital you can do a saline enema (100-150 ml). This manipulation allows to detect blood discharge from the bowels at an early stage (in the water there are streaks of blood).

If after the enema there is no discharge of feces and gas, this indicates complete intestinal obstruction.

When the intussusceptum is formed then on the nappies and during the examination you can see mucous and bloody discharge, which in most cases occur within 7-10 hours after the beginning of the disease.

During rectal examination, the head of the intussusceptum is palpated.

In some cases, when a child arrives late there is intussusception of rectum.

### **X-ray examination.**

During x-ray examination when the patient is in vertical position, there is accumulation of gas with a steady lower circuit (horizontal fluid levels are without additional shadows and filling defects). To detect intussusceptum localization, air introduction into large intestine is used (method of A.G. Pugachev and L.M. Roshal: the child lies on the table, a gas outlet pipe or a rubber catheter is injected into the rectum preconnected with a Richardson balloon. A surgeon by clicking on a balloon under 20-40 mm mercury column pressure slowly introduces into the rectum air, which gradually fills in all parts of the large intestine.

If there is intestine introduction the air advancement stops - intussusceptum head is found.

When a child is admitted to hospital in the first 14-18 hours of the onset of the disease, this method of examination and treatment is medical as well. The absence of pronounced edema and obstruction allow straighten the intussusceptum without resorting to laparotomy. If there a conservative intussusceptum straightening has been used, the child is subject to hospitalization and dynamic observation.

### **Additional methods of investigation.**

In the hospital, you can conduct palpation of the anterior abdominal wall under general anesthesia with relaxants of short action. Most often intussusceptum is palpated in the first 18 hours, then it "hides" under the liver or in the left side of the abdomen and it is difficult to detect it due to meteorism.

When a child comes to hospital on the stage of developed complications (peritonitis, obstruction) profound survey is conducted on the background of intensive preoperative preparation 2-5 hours.

### **Objectives**

1. What are the most permanent and reliable clinical signs of acute appendicitis of children?
2. What changes can be detected by X-ray examination of the abdominal cavity of children with peritonitis?

3. What can be detected by palpation of the abdomen of children with appendicular infiltrate?
4. A child of 6 months has been admitted to the hospital at the 20th hour of the disease: there is sudden cramping abdominal pain, with soothing intervals, has already vomited 6 times. The mother says there are blood discharges on the diapers from the rectum. What is your medical tactics?
5. A child of one year old has been brought to a hospital on the fourth day of the disease in critical condition. From his history we know that the disease began with the sudden anxiety of the patient, followed by "lucid space", vomiting started, which is on the third day has a sharp smell. During the examination, the abdomen is greatly bloated; there is a pronounced muscular tension in all the parts, shortening in sloping areas, hepatic dullness is absent. What additional research is needed and what is your further tactics?

## **2. EXAMINATION OF A NEWBORN WITH GASTROINTESTINAL TRACT DEFECTS.**

### **Atresia of the esophagus**

Children esophagus malformations occur on the early stages of intrauterine life. According to various authors, one in every 3500 newborns have atresia.

There are six major types of congenital obstruction of the esophagus. The most frequent (90-95%) is the esophageal atresia that occurs when the upper segment of the esophagus is blind, and the lower section links to the airways. Mucus and food do not fall into the stomach and accumulate in the upper segment of the esophagus that leads to regurgitation and aspiration. Aspiration pneumonia quickly develops, which amplifies by throwing the contents of the stomach through a tracheoesophageal fistula of the lower segment.

The favorable outcome for patients with esophageal atresia depends on the early diagnosis. This defect should be detected in the nursing home during the first 6-12 hours after birth.

**Anamnesis.** Note that the birth of children with esophageal atresia is often

(though not always) preceded by polyhydramnios.

**Examination.** During child examination, you can see abundant frothy discharges of saliva from the mouth and nose, sometimes of a yellow color (throwing of bile into the trachea through a tracheoesophageal fistula). If a child comes in at the end of the day after birth, then clear signs of respiratory failure are evident: cyanosis of nasolabial triangle, which amplifies at the child's anxiety and shortness of breath.

**Auscultation.** During lungs auscultation multiple mixed wet rales on both sides, more often on the right side are detected.

Indirect signs of esophagus atresia identified during the examination and auscultation are necessary to confirm with the simple methods available in any hospital - the esophagus sounding and the Elephant test.

For the esophagus sounding the rubber catheter № 8-10, lubricated with vaseline oil is placed into the esophagus of the child up to the obstacle. The obstruction usually occurs after catheter introduction at a depth of 8-12 cm from the edge of the gums. If the esophagus is not changed, then the catheter passes freely deeper. The Elephant test - a rubber catheter № 8-10 is introduced into the child's esophagus to a depth of 8-10 cm and inject air with a syringe. If there is esophagus atresia, then the air will come out through the mouth or nose of the child noisily, if there is no esophagus atresia, then the air goes into the stomach without the noise. But you must keep in mind that during this test if there is wide fistula between the upper segment of the esophagus and the airways, then the air passes into the airways of a child without the noise.

**That's why the crucial point in the diagnosis of esophagus atresia is x-ray examination.**

X-ray examination of esophagus atresia begins with an emergency radiography review of the chest and abdomen. During this examination, a particular attention is drawn to the lungs and the presence of air in the digestive tract. If there is a complete atresia of the esophagus and atresia with the presence of a fistula between the upper segment and the respiratory tract then there is a

homogeneous darkening of the entire abdominal cavity. If the lower segment of the esophagus has a link to the airways, then there is air in the digestive tract.

In severe condition of the child to clarify esophagus atresia it is necessary to conduct this study after the introduction of a rubber catheter into the esophagus. If the catheter stopped or curled up in the upper segment of the esophagus then this indicates the level of atresia.

However, the most accurate method of research is a contrast study of the esophagus lumen. As contrast agents oil mist and water-soluble iodine-containing substances can be applied. For any form of esophageal atresia as a contrast agent barium sulfate is completely contra-indicated (possibility of aspiration into the airways).

The methodology of contrast study of the esophagus: through a rubber catheter inserted into the esophagus of a child, the content is evacuated and then 1 ml of yodlipol is injected into the esophagus, then images are done in two projections in the vertical position of a child. After that, the contrast is completely sucked out of the upper segment of the esophagus. If there is esophagus atresia then over the place of atresia there is an additional shadow, having the formula of a "pouch" with clear smooth contours. The bottom of the "pouch" can be located at different levels, but more often at the II-III thoracic vertebrae. The level of atresia is better defined on the lateral images.

Visible upper blind pouch, and absence of gas in the gastrointestinal tract indicates esophageal atresia without tracheoesophageal fistula. But you must keep in mind that if there is a narrow channel fistula or its occlusion with mucus radiographically fistula cannot be identified.

In all cases of tracheoesophageal fistula, there is usually motility disorders. Peristalsis is uncoordinated; there are anastaltic reductions - pendulum motions of contrast material in the affected segment.

The presence of such X-ray pictures in combination with the clinical manifestations allows to diagnose esophagus atresia.

## **High innate intestinal obstruction**

**Anamnesis.** The most typical and early sign of high intestinal obstruction is vomiting. Time of appearance and its character depends on the type and level of intestinal obstruction. When there is duodenum obstruction higher than p. Vater, vomiting appears immediately after the first feeding, its quantity is abundant and it is without admixture of bile.

If there is duodenum obstruction lower than p. Vater and the initial part of the jejunum, vomiting is preceded by regurgitation and only after feeding the child vomiting is of abundant nature and is densely colored with bile.

Almost all children with high intestinal obstruction have meconium discharge. If the obstruction is higher than p. Vater, the meconium is of a normal color and its quantity is normal too, i.e. meconium discharge is observed up to 3d-4th day, as well as healthy children have. If the obstruction is located below the p. Vater or in the jejunum, then the amount of meconium is scant and its consistency is viscous, and color - gray. When there is subtotal stenosis then single discharge of meconium or small portions several times during 1-2 days are usually observed.

A rapid decline in child's weight (200-250g) per day is characteristic.

**Examination.** During child examination with intestinal obstruction in the first day and later, exsiccosis and toxicosis attract our attention: skin and mucous membranes are dry, the skin folds, tissue turgor is reduced. The body temperature rises to 38 degrees, the eyes sunken. A child with high intestinal obstruction is a flabby, apathetic.

Abdomen in the epigastric region is swollen, in the lower parts sinks. Sometimes in the first day you can see the visible peristalsis. After vomiting, abdominal distension in the epigastric region decreases.

**Auscultation and palpation.** During chest auscultation, moist rales of different calibers are heard because of aspiration pneumonia.

The abdomen is soft and painless in all departments during palpation.

**Laboratory research.** In complete blood count, there are signs of blood clots: increased hematocrit and hemoglobin, an increase in the number of erythrocytes

and leukocytes. Changes in the biochemical blood tests are characteristic: these children have hypochloremia, the amount of potassium and sodium ions decrease and their ratio changes.

Farber's test allows us to differentiate partial and complete congenital bowel obstruction - detection in meconium the dead cells and hairs from the skin surface eliminates the complete intestinal obstruction.

For the diagnosis of high congenital intestinal obstruction, the most valuable is X-ray examination.

X-ray radiography begins with an overview of the abdominal cavity in the vertical position of a child. For high intestinal obstruction, two gas bubbles with horizontal levels corresponding to the stretched stomach and duodenum are characteristic. In other parts of the bowel gas is not observed. Sometimes you can see a picture of "silent belly," when throughout the gastrointestinal tract gas is absent. This happens more often with premature infants when the stomach and duodenum are overfilled with fluid. When you repeat x-ray, such children have 2 levels.

When there is subcompensated stenosis, in addition to the two levels there are single small levels in the lower parts of intestine.

The above-described X-ray picture in conjunction with the clinic picture points exactly to the high intestinal obstruction and this study can be completed.

Only in unclear cases with the aim of a differential diagnostics, it is good to hold a study using contrast agents. Barium sulfate as a contrast agent is absolutely forbidden (risk of aspiration!).

As a contrast agent for children, a water-soluble contrast is used. A catheter № 10-12 is introduced into the stomach of a child, and all the contents is aspirated. After that, the contrast is injected through a catheter in the amount of 3-5 ml and shots are produced in 15, 45 minutes, 2 hours after injection, in the vertical position of a child. X-rays show two horizontal levels of contrast material in the stomach and duodenum. The delay of contrast agent indicates the level of obstruction.



## **Low congenital intestinal obstruction**

Low intestinal obstruction includes congenital obstruction of the ileum, colon and rectum. Obstruction can be caused by a malformation of the intestinal tube itself (atresia and stenosis), or compression of intestinal lumen from the outside by spikes of various kinds.

A children survey admitted to the surgical hospital with low intestinal obstruction suspicion begins with his history.

One of the main indications of low intestinal obstruction, is the absence or a very small amount of meconium. Some children at the end of the day have the discharge of contents of the lower gastrointestinal tract in the form of a plug of solid consistency of the clay-gray or light brown color (the obstruction of the ileum and the initial parts of the colon). Sometimes the meconium and gases do not discharge at all, even after the enema there are only colorless lumps of mucus (obstruction of the lower parts of the colon and rectum).

Vomiting with low intestinal obstruction appears late, only to end of 2-3 days. At first, there is vomiting with the contents of the stomach, and subsequently it acquires the character of meconium.

**Examination.** The child's condition by the end of the day and later is serious. There is shortness of breath, cyanosis, pronounced effects of dehydration and intoxication. The child is restless, cries, and refuses to eat. Skin is of grayish color, facial features are pointed, eyes are sunken, body temperature is about 37-38 degrees.

The abdomen is increased in size, the skin shines, and extensive venous network is visible. It is also necessary to examine the child's natural openings. When there is anus atresia on the place of anus, you can see a small recess or skin cushion, when the child cries you can see an outpouching. Some children have only a thin membrane through which the dark meconium can be seen. Also, be sure to inspect the perineum and genitals for possible fistula openings.

**Percussion and auscultation.** During stomach percussion, tympanitis is detected in all departments; if there is gas in the abdominal cavity then there is no

hepatic dullness (perforated peritonitis). During abdomen auscultation on the first day, you can hear bowel sounds, but later when intestine paresis joins in they can not be heard.

**Palpation.** During abdomen palpation a child begins to worry, cry. The abdomen is moderately tense in all departments, sharply painful.

**Finger examination.** When meconium and gases do not come out, but anal opening is fine, then it is necessary to study the rectal with fingers. The tip of the little finger in a glove, lubricated with vaseline oil, is gently injected into the rectum, an obstacle at a depth of 1.5-3 cm usually indicates at the presence of rectum atresia. The same research can be carried out using a probe or a catheter.

**Laboratory research.** Complete blood count reveals signs of blood clots: increased hematocrit and hemoglobin, the number of erythrocytes and leukocytes is increased with a shift to the left.

However, a major survey of children with low intestinal obstruction is an X-ray study.

X-ray study begins with a radiography overview of the chest and abdomen in the vertical position of a child. The condition of the lungs is estimated and characteristic features of low intestinal obstruction are identified: a few large gas bubbles with horizontal levels, reaching across the abdomen - are characteristic of obstruction of the ileum, and meconium ileus.

Multiple sharply increased bowel loops with horizontal fluid levels are observed when there is the obstruction of the colon and rectum.

For the final decision on the nature of the disease in all cases of low intestinal obstruction the colon study with contrast material is required - irrigoscopy. As a contrast agent 20% solution of sergozin is used as barium sulfate can cause blockage of the lumen of the abnormally narrowed intestine.

Contrast agent, warmed up to body temperature, is slowly injected into the colon under the screen control. The contrast agent fills the intestine at some level, depending on the level of obstruction. Below the obstruction the intestine is represented as a thin cord.

This study is contraindicated in case of intestine perforation suspicion, because the penetration of meconium into the free abdominal cavity increases.

X-ray study of children with rectum and anus atresia has some special features, and we will consider them separately.

The study of children with anal atresia should start with Vangenstin x-ray study: an x-ray contrasting label is stuck to a place where anus ought to be (pellet, coin, etc.), then images in two projections in the position of the child upside down are done. The distance between the label and the air bubble, which fills the blind end of the rectum, characterizes the level of atresia. This study should be carried out to define how to treat the patient. But during this test you must remember that it is reliable only after 18-24 hours after birth, as the air should have time to reach the distal intestine.

### **Pyloric stenosis**

**Pyloric stenosis** - a malformation of the pyloric stomach, due to hyperplasia and hypertrophy of muscle tissue, which leads to varying degrees of stomach narrowing. It occurs in 2-3% of infants and ranks second among all kinds of intestinal diseases.

**Anamnesis.** In the end of the second and beginning of the third week after birth, the child begins regurgitation soon after feeding, which gradually becomes more frequent and vomiting starts. Vomiting becomes abundant and later it is "fountain-like vomiting" already. The quantity of vomit exceeds the quantity of eaten milk, and there are no admixture of bile. After vomiting, the child's condition improves, and the baby eagerly suckles breast.

A child loses much weight. Urination decreases up to 3-4 times a day. There is a delay in the feces.

**Examination.** It is necessary to examine a child in a well lit room. The child's condition will be different depending on the time of admission. When a child arrives late, there is obvious dehydration. Skin is dry, tissue turgor is reduced. Large fontanelle sinks down. A child doesn't eat well, the subcutaneous fat layer on the limbs and body is a little expressed or absent.

Belly sinks at the bottom and there is a slight bulge at the top.

**Palpation.** During palpation the abdomen is soft and painless in all the parts. Sometimes you can palpate the thickened pylorus that looks like a dense cylindrical roller to the right of the midline of the abdomen.

**Laboratory data.** Complete blood count reveals signs of blood clots - increased hematocrit and an increase in the number of erythrocytes and leukocytes.

Urine is concentrated and has a high specific weight. Hypochloremia and the increase of reserve blood alkalinity from frequent vomiting occurs. The determinant in the diagnosis of congenital pyloric stenosis is a clinical manifestation of disease! In 60-65% of cases the correct diagnosis can be established only on the basis of clinical manifestations.

However, all children with the pyloric stenosis suspicion need to be x-rayed.

Pyloric stenosis x-ray study begins with a radiography survey of the chest and abdomen in the vertical position of a child. The x-ray estimates the condition of the chest, and features characteristic of pyloric stenosis are detected from the abdomen side: an increase in the size of the stomach and the presence of fluid in the stomach of the child on an empty stomach, the gas content in the loops of the intestine is reduced or almost not detected.

After the review shot, the contrast study of the gastrointestinal tract begins. The contents of the stomach completely drain through a probe inserted into the stomach of a child and then enter slowly barium meal in the amount of 1-2 teaspoons into 40-50 mL of breast milk. In half an hour after the introduction of barium, direct and lateral images of the abdomen in the vertical position of the child are done. The following images are done in 1.5, 6 and 24 hours after giving barium.

These photographs reveal features characteristic of pyloric stenosis:

- a) increased size of the stomach. The longer the disease, the more pronounced is the increase in the size of the stomach;
- b) stomach peristalsis is enhanced, has the character of deep and "segmented", which gives the picture of the "hourglass". However, in neglected cases of the

disease peristalsis is weakened, or almost not detected, which can be attributed to gastric dilatation;

c) prolonged closure of the pylorus from 1 to 3-5 hours. Therefore, barium in the small intestine appears only in films taken after 6 hours;

d) the most reliable roentgenologic symptom of pyloric stenosis is narrowing of the pylorus. On the the film it can be in the form of a "beak", "wedge", evenly narrowed channel, etc. However, this symptom is very rarely seen on the film;

e) However, of all roentgenologic symptom of pyloric stenosis the most important is slow evacuation of contrast material from the stomach.

The films produced in 6 hours, most of the barium suspension remains in the stomach. Even in films taken in a day the contrast agent can be found in the stomach.

But you should keep in mind retrograde evacuation of barium from the stomach during vomiting.

Thus, the clinical picture and proper roentgenologic survey allow us to accurately diagnose pyloric stenosis.

### **Problems**

1. In the nursing home during the first feeding of the child a sharp attack of coughing, cyanosis and vomiting suddenly arose. A hypothetical diagnosis? Any additional research needed? What?
2. What information can provide radiography of the chest and abdomen if there is esophagus atresia?
3. The methodology and the diagnostic value of Faber test.
4. In the admission room of children surgical department a child has been enrolled on the 3 day after birth. The child's condition is grave. The skin is of an earthy tint, marked symptoms of intoxication. Repeated vomiting. The body temperature is 38 degrees. Abdomen is distended in all departments, very tense and painful during palpation. Stool is of grayish color. A hypothetical diagnosis? What research should be carried out to clarify the diagnosis?
5. What is the roentgenologic picture when there is meconium ileus?

### 3. CHILD EXAMINATION WITH A HERNIA.

#### **Inguinal and umbilical hernia.**

**Hernia** is extravasation of gastrointestinal tract through the opening or weak places in the muscle-fascial abdominal wall. In childhood the most frequent is inguinal hernia. It is congenital for children of young age. This hernia develops, going down the inguinal canal, entering it through the internal inguinal ring - they are always oblique. There are two types of congenital hernias - inguinal and inguinoscrotal. There are also funicle (90%) and testicular (10%).

In the hernial sac there are: the mouth (place of communication of the hernial sac with peritoneum cavity), body and bottom.

**Anamnesis.** Parents notice an outpouching in the groin area a few days or weeks after birth which is in 50% cases goes down into the scrotum. Most often this formation occurs during screaming, crying, child's anxiety. When child grows the formation can grow as well. Parents notice that a child has occasional pains in the stomach (usually around the navel), has a poor appetite, and sometimes unstable stool, poor dynamics of weight gain (especially small children).

**Examination.** The general condition of a child is satisfactory, there is probable underweight. Tissue turgor is reduced, flabby muscles. The muscles of the anterior abdominal wall are poorly developed.

Changes of chest organs are not specific.

During anterior abdominal wall palpation there may be mild pain in the umbilical region (due to the tension of the mesentery), especially for large hernias.

Attention is drawn to bulge in the groin or inguinoscrotal area.

Examination of a child with a hernia is best done in a horizontal and standing position.

When the child is examined in a horizontal position in the groin or inguinoscrotal region there is a painless formation of soft-elastic consistency. There is tympanitis percussion, intestinal peristalsis during auscultation . This formation with a little effort is set in the abdominal cavity with a characteristic

"rumbling."

The main sign of children inguinal hernia should be considered a reposition in the abdominal cavity.

After the reposition there is an increase in the corresponding half of the scrotum - the skin is flabby, wrinkled.

With the introduction of a finger in the external opening of the inguinal canal the expansion of its size is determined (normally you can introduce only the tip of the finger).

Re-examination in the upright position reveals that after a while the repositioned interiors re-emerge into the scrotum, and sometimes to identify this feature you need to ask the patient to cough or strain.

The most frequent and dangerous complication of inguinal hernia is an incarceration.

Hernia that used to reposition in the abdominal cavity suddenly stops doing that.

Most often the loops of the small intestine and omentum incarcerate in the inguinal ring.

### **Clinical picture.**

The main complaint of patients with a hernia incarceration is a pain in the area of herniation, which spreads throughout the abdomen.

When developed incarceration, there is often vomiting of reflex nature, which, as the disease progresses, increases (bowel obstruction, peritonitis).

Body temperature at the beginning of the disease is not changed. Pulse is frequent, rhythmic, heart and lung auscultation is normal.

Palpation of the abdomen is moderately painful in the umbilical region. The abdomen is soft, in the early stages of the disease symptoms of irritation of the peritoneum are not detected. With the development of obstruction bloating, muscle tension, symptoms of irritation of the peritoneum appear.

During inguinal canal and scrotum examination the formation of tightly-elastic consistency of various sizes, sharply painful during palpation reveals. During

percussion there is tympanitis. Formation does not reposition in the peritoneal cavity.

If there is strangulated hernia, then it is strictly forbidden to carry out force-reduction.

In the hospital, at the beginning of the illness (6-8 hours), you can use conservative measures, allowing to eliminate the incarceration of a hernia – let a child lie down with his head down, give subcutaneously atropine, promedol, papaverine doses according to the age. Put over the area of herniation a bag with warm water or make a warm bath.

The ineffectiveness of these measures require urgent surgery.

### **Diaphragmatic hernia**

Diaphragmatic hernia - the movement of abdominal organs into the chest cavity through a natural or abnormal opening in the diaphragm, and by the protrusion of thinned areas.

Diaphragmatic hernias are divided into true and false, congenital and acquired, simple and complicated.

There are three main groups of diaphragmatic hernias:

- 1) the diaphragm hernia proper (true and false).
- 2) esophageal opening hernia (true)
- 3) herniation of the anterior diaphragm (true and false).

**Anamnesis.** The symptoms of diaphragmatic hernia may occur at any age. Typical complaints on breathlessness are: during quiescent state there is shortness of breath, cyanosis, cough attack happens from time to time. These children often suffer from bronchitis and pneumonia.

Often, there are complaints on the digestive tract disorder: regurgitation, vomiting, attacks of abdominal pain and the chest. Periodically, there are signs of partial or complete intestinal obstruction - repeated vomiting, severe abdominal pain, cramping, delayed stool and gas. Sometimes, there are indications on vomiting with blood streaks.

**Examination.** The children lag behind their peers in physical development.



Skin and mucous membranes are pale with cyanotic hue. At quiescent state, there is shortness of breath and cyanosis of the nasolabial triangle. Some children have the deformation of the chest. The stomach is reduced in size, sinks - "scaphoid abdomen" can be skewed because of the sticking out liver. Less commonly, examination reveals no abnormalities.

**Percussion and auscultation.** During chest percussion there is tympanitis on the affected side, sometimes with areas of blunting. The borders of the heart are abruptly shifted to the healthy side (usually the right).

During auscultation of the lungs, on the affected side, breathing is sharply weakened or altogether lacking. On the same side the bowel sounds and liquid splashes are heard sometimes.

The abdomen is soft and painless during palpation in all areas, sinks especially in the lower parts.

If there are complications of diaphragmatic hernia (incarceration), all these symptoms are very sharp and clinical presentations are violent, and require immediate hospitalization and care.

**X-ray examination** becomes the determinant in the child's examination.

X-ray examination should begin with a **plan** roentgenoscopy or radiography of the chest and abdomen. A characteristic feature of the diaphragmatic hernia is the presence in the pleural cavity of multiple non-uniform size areas of light of various intensity. In some cavities there can be detected horizontal fluid levels. Structural elements of the lung tissue on the affected side is practically difficult to detect, and on the opposite side – a lung is compensatory swollen at the apex, mediastinum is shifted to a healthy side.

There is some gas in the intestine, or it is completely absent in the right half and center.

Diaphragm at the moment of deep inspiration can make paradoxical movements or it is poorly contoured.

During the study in the lateral projection or on lateral radiographs you can see that these abnormal shadows can be located in the anterior or posterior

mediastinum.

As these shadows and cavities are located in the pleural cavity and are accompanied by respiratory malfunction, they are often mistaken for pathology of the respiratory system. Therefore, when diaphragmatic hernia it is mandatory to contrast gastrointestinal tract.

During contrast study there are two possible variants: if the cavities are small and numerous, then passage must be carried out. Newborns and infants - through a tube inserted into the stomach, 5-7 ml of yodlipol is inserted and a doctor monitors the movement of the contrast substance in the gastrointestinal tract. Older children are given a suspension of barium sulfate, 1-2 teaspoons in 50 ml of milk. Images are done in 15 minutes, then in 2.8 and 24 hours after giving the contrast material.

If in the pleural cavity there are large cavitory formations, which can happen during the large intestine introduction, it is necessary to resort a contrast study through the rectum - irrigoscopy. It allows you to specify the nature of the hernia contents, the size and location of the hernial orifice. We emphasize that this study is dangerous to the newborns, as a sharp increase in the size of the colon due to its filling with contrast material can lead to rapid displacement of the mediastinum to the opposite side and thus cause acute respiratory failure.

### **Problems**

1. A 3-year-old patient has coughing attacks and pain in the abdomen and chest from time to time. Several times has been treated for pneumonia. On a plan roentgenogram, produced during the last illness, you can see dramatic mediastinal displacement to the right, on the left in the pleural cavity cavitory formations of varying size and intensity are detected. What is your hypothetical diagnosis? What are the additional methods of investigation to make the diagnosis precise?
2. Describe the roentgenologic picture during the diaphragm relaxation.

#### **4. CHILD EXAMINATION WITH GASTROINTESTINAL TRACT BLEEDING DURING PORTAL HYPERTENSION.**

Children gastrointestinal tract bleeding may occur due to various diseases. In this section we do not aim to describe all the possible causes of bleeding. We will focus only on the most frequent and severe complications arising from the portal hypertension syndrome.

In the clinical picture of children portal hypertension there distinguish intrahepatic form as a consequence of chronic hepatitis, cirrhosis, obliterating endophlebitis of hepatic veins (Hiari disease), various liver tumors, extrahepatic form due to congenital malformations development of portal vein and its branches, and compression of portal vein and its branches from outside (scars, tumors, infiltrates), mixed forms. Depending on the form clinical picture is slightly different too.

**Anamnesis.** Extrahepatic form of portal hypertension is found more often with children of preschool and early school age, the intrahepatic form is more common for children of secondary school age. Boys are susceptible to the illness twice more often than girls.

The first and only manifestation of the disease in the vast majority of patients can be a suddenly emerged massive gastrointestinal bleeding, though the child can look healthy.

When completing a history you need to find out: whether the parents and near relation have any family or acquired diseases. How the pregnancy went, whether there were various poisonings during this period, how they were treated, were there any toxic drugs used during the treatment. It is particularly important in the diagnosis to determine the characteristics of the neonatal period: the presence of umbilical sepsis and other purulent skin diseases, inflammatory diseases of the abdominal cavity, the timing of disappearance of jaundice, jaundice re-occurrence. If the patient in a history has jaundice, then you need to find out whether there was a hemorrhagic syndrome in the form of nasal or gastrointestinal bleeding.

It is equally important to identify signs of the previously erased form of

infectious hepatitis. When discolored feces, rich urine, yellow sclera, loss of appetite, dyspeptic symptoms were discovered (usually after turning 3 years old, dyspeptic symptoms pass, but loss of appetite and a moderate increase in the abdomen stay).

Before the beginning of the bleeding sick children often complain on the pain in the left shoulder, several hours or several days before the start of bleeding a temperature may rise up to 38-39 degrees. When a sudden massive bleeding starts children become sluggish, weak, they sweat, have pale skin, especially in the nasolabial triangle. Soon vomiting of blood with clots start, at the end of the first day of bleeding the dark tarry stool begins.

In the clinic picture of patients with intracranial form of portal hypertension the symptoms of liver damage come in the forefront. Patients complain on weakness, fatigue, emaciation, abdominal pain, feeling of heaviness in the epigastric region, dyspeptic symptoms, headaches, increased bleeding.

**External examination.** The patient feels relatively satisfactory. During external examination, the integument and visible mucous membranes of the patient are pale. Light skin icteritiousness can be detected. Vascular pattern of anterior abdominal wall is more or less pronounced. The abdomen of most children with extrahepatic form of portal hypertension is slightly increased in volume, due to the weakness of the abdominal wall muscles, flatulence, splenomegaly, increased deposition of fat in the omentum and mesentery of the intestine.

If there is intrahepatic form then dry skin, paleness and yellowness of the skin is noticed. It is characterized by the presence of vascular "spiders" and "stars" on the skin of the trunk and extremities. The abdomen is considerably increased in volume due to ascites.

**Palpation.** During palpation of the abdomen 50% of patients with extrahepatic form of portal hypertension in the right hypochondrium a soft, painful edge of the liver, projecting in 2-3 cm from the costal arch is determined. Enlargement of the liver is a permanent feature and is generally observed, with the hepatitis conjuncton. In very rare cases, there is pain in the projection of the

gallbladder. All patients have pronounced splenomegaly. Typically, the lower pole of the spleen reaches the navel, but can go down and to the pelvis. During the spleen palpation it is dense, sedentary, painless.

The magnitude and consistency of the liver with intrahepatic form depends on the stage of disease (cirrhosis). In the initial stages the liver is significantly increased in size, its lower edge reaches the level of the umbilicus, its surface is smooth. In the later stages of the disease the liver is not enlarged, dense, with a bumpy surface.

The spleen is enlarged, in one degree or another, dense, and its mobility depends on the severity of perisplenitis.

**Laboratory data.** During the study of peripheral blood, depending on the massiveness of bleeding anemia of varying degrees is detected.

Patients with portal hypertension can have a phenomenon of hypersplenism resulting from the inhibitory effect of the spleen on bone marrow hemopoiesis. White blood cell count decreases to 3-4 thousand - leukopenia, and platelet count decreases to 75-90 thousand - thrombocytopenia. ESR is usually accelerated. Occult blood feces analysis - positive.

The intrahepatic form (cirrhosis), there is an increase of bilirubin in the blood (with a predominance of the direct fraction); decrease in total serum protein with a decrease in the albumin-globulin ratio; decrease in the amount of sugar in the blood with a violation in a sugar load, decreases the amount of prothrombin and cholesterol. Phenomenon of oliguria is frequently observed in these patients with a reduction in urine specific gravity, a positive reaction on the bile pigments.

### **Special methods of investigation.**

**Esophagus and stomach radiography with barium meal.** The indication for the use of contrast studies of the esophagus are all cases of unexplained bleeding from the gastrointestinal tract, the presence of splenomegaly with portal hypertension syndrome suspicion.

For the esophagus radiography a thick suspension of barium in the usual proportions (800g of barium in 1 liter of water) is used. The patient is in the

Trendelenburg position. The optimal projection is the first oblique projection (right), in which the esophagus is located between the spine and heart shadow, on the background of a well-contoured transparent lung on radiographs. 3-4 target shots must be done. In some shots you can not identify varicose veins, swelling of which depends on the phase of respiration, the speed of spreading of peristaltic waves, altering blood filling.

If radiography is done before the passage of the bulk barium down the esophagus, the radiographs reveal its tight filling, and it is impossible to judge the condition of the veins.

If there is esophagus varix dilatation, then the folds of mucous membrane loses the longitudinal direction and become discontinuous and sinuous. On the x-ray picture you can see round or oval filling defects of various sizes, which are located along the folds.

Stomach x-ray is carried out on an empty stomach; liquid barium suspension is used for the study. Immediately after the esophagus x-ray, the patient is given 50 ml of barium suspension. Pictures are taken in the standing and lying positions after X-rays with a mandatory irising.

Children varix dilatation of the gastric cardia with portal hypertension define as a thickened and deformed folds of mucous membrane, which form curved, rounded shapes, separated by thin septa.

Bear in mind that the stomach varix dilatation diagnostics in children is difficult, since it is not always possible to distinguish between varix dilatation from the folds of mucous membrane thickening, in addition, cardiac palpation of the stomach is not available, which also makes it difficult to survey.

**Splenoportography and manometry.** The day before the study the sensitivity to contrast media is checked. The night before the day of the study and during the day of the study in the morning the patient is given enema. From the very morning the patient does not get drinks and food. The study is conducted in the X-ray room, the patient is put on the table on his back with his left hand thrown behind the head. The skin is treated with 70% alcohol (use of iodine infusion is not

good, since the gray background is created on the images because of the increased reflection and absorption of x-rays by iodine). Thin needles are used (0.5-0.7 mm). The most convenient place for the puncture is the ninth-tenth intercostal space on the back or middle axillary line. After the appearance of blood from the needle to the needle cannula is attached from the apparatus Waldman, "zero" the scale of which is set at a level of middle axillary line. The pressure in portal hypertension is usually increased, ranging 150-500 mm of water.

After measuring the pressure, a syringe with contrast material is attached to the needle; the contrast material for 4-7 seconds is gradually injected into the spleen tissue. At the end of the introduction, on the 6-8th second, an X-ray is done.

In marked liver cirrhosis contrast enhancement of vessels is much weaker. Splenic-portal trunk is more convoluted. Intrahepatic veins branching of only the right lobe of the liver are contrasted, which are also changed (smooth veins decrease from the main trunk to the periphery are broken, small vessels are straightened or broken, do not reach the edges of the liver). Size of vessels is greatly increased.

In extrahepatic form of portal hypertension, portal system vessels are contrasted more clearly. The main vessels of the portal vein are dramatically deformed. A wide variety of collaterals to the upper and lower hollow veins is found. Extrahepatic portal system vessels increase much less than in liver cirrhosis.

**Proctoscopy.** The study is conducted in patients with portal hypertension to determine the condition of submucosal veins of the rectum and the hemorrhoidal veins. The mucosa is inspected at a distance of 20-25 cm from the anus. Survey is conducted with the eyepiece of a fourfold increase.

Varicose veins of the submucosa of the rectum are found in up to 20% of cases, this research method can be regarded only as an aid in the diagnosis of portal hypertension.

**Liver needle biopsy.** The puncture is conducted with a Silverman needle in the ninth intercostal space on the right in the middle axillary line. The most complete data are obtained from patients with chronic hepatitis and severe liver

cirrhosis (diffuse distribution of the process). In severe liver cirrhosis misleading and inaccurate responses may be due to a sharp expansion of the connective tissue. Patients with extrahepatic form get fairly accurate answers in most cases. Secondary changes in the liver, consisting of the diffuse degeneration of liver cells, moderate infiltration of the periportal connective tissue and lymphoid cells of moderate fibrosis are revealed. Quite often there is a moderate hemosiderosis and lipid degeneration of liver cells.

Most of the special methods of investigation are carried out under general anesthesia, sometimes shutting down breathing (hepatic biopsy, etc.).

### **Conclusion**

Cure of children with surgical pathology is quite complicated. While writing case history it is necessary to be psychologically prepared for talking not so much with the child patient as with their parents. And only knowledge of anatomico-physiological peculiarities of childhood, correct interpretation of objective data which is supported by fundamental theoretical knowledge received in previous years of study, will help the student define the diagnosis correctly and choose a treatment tactics.



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