POLTAVA STATE MEDICAL UNIVERSITY

AGE-RELATED ANATOMICAL AND PHYSIOLOGICAL FEATURES OF THE DIGESTIVE SYSTEM IN CHILDREN. METHODS OF EXAMINATION OF THE DIGESTIVE SYSTEM IN CHILDREN.

Assoc. Professor Soloviova Halyna

Plan of the lecture

- 1. Functions of Digestive System.
- 2. Human deciduous and permanent teeth.
- 3. Peculiarities of the esophagus in children of different age.
- 4. Peculiarities of the small intestine in children.
- 5. Peculiarities of the large intestine in children.
- 6. Peculiarities of the liver in infant.
- 7. Inspection of Digestive System.
- 8. Palpation of the Digestive System (General rules).
- 9. Deep palpation according to Obrazcov-Stragesko's.
- 10. Additional methods of investigation of Digestive System.
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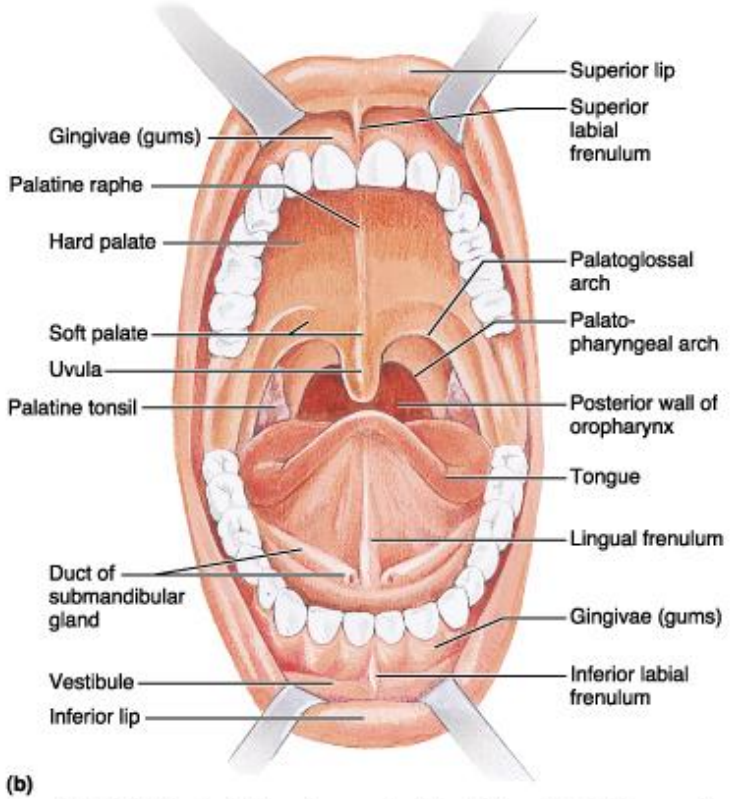
Functions of Digestive System:

1. **Ingestion**
2. **Propulsion**
3. **Mechanical processing**: chewing, churning, mixing, compacting
4. **Chemical digestion**: enzymatic breakdown of large molecules into building blocks
5. **Secretion**: enzymes, acids, mucus, water, cell wastes
6. **Absorption**: move organic molecules, electrolytes, vitamins, water from gut to interstitial fluid, lymph, blood
7. **Excretion**: cell waste, secretions, indigestible foodstuffs ejected from body

Oral Cavity

- *Functions:*

- Analyze food (taste buds)
- Mechanically process food (chew)
- Lubricate food (saliva)
- Digest starches (amylase)



HUMAN DECIDUOUS TEETH

The milk teeth erupts during

- **1st year of life:**

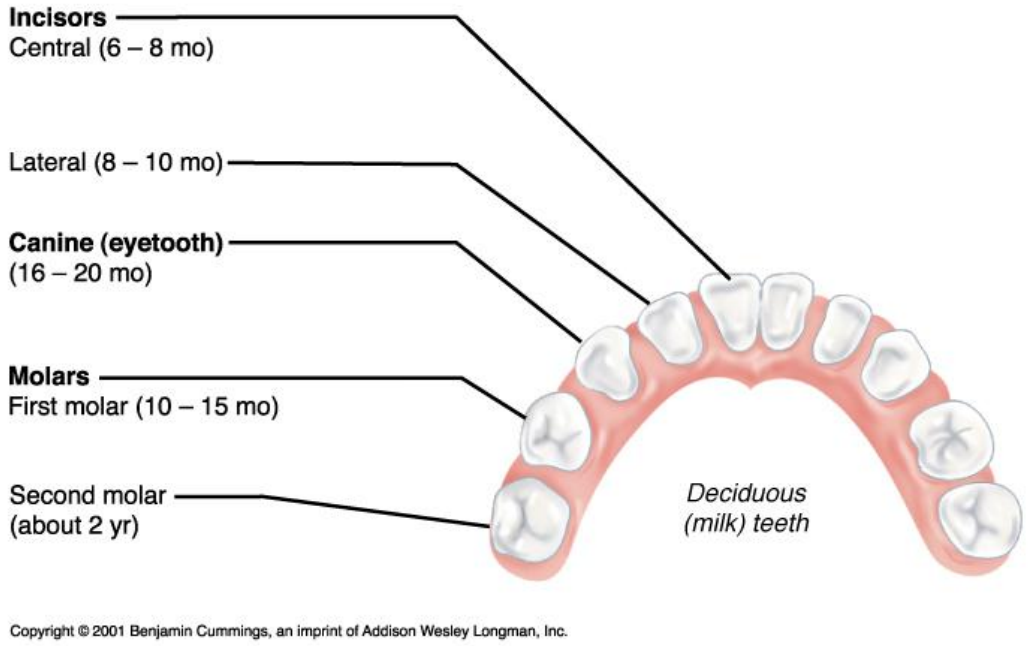
6-7 month – 2 lower middle incisor teeth
8-9 month – 2 upper middle incisor teeth
9-10 month - 2 upper lateral incisor teeth
11-12 month – 2 lower lateral incisor teeth

- **2nd year of life:**

12-14 month – first 4 molars
14-20 month – 4 canine teeth
20-24 month – second 4 molars
A child 2 years should have **20** milk teeth

$$X = n - 4,$$

x – number of teeth
n - age in years



HUMAN PERMANENT TEETH

The permanent teeth erupts:

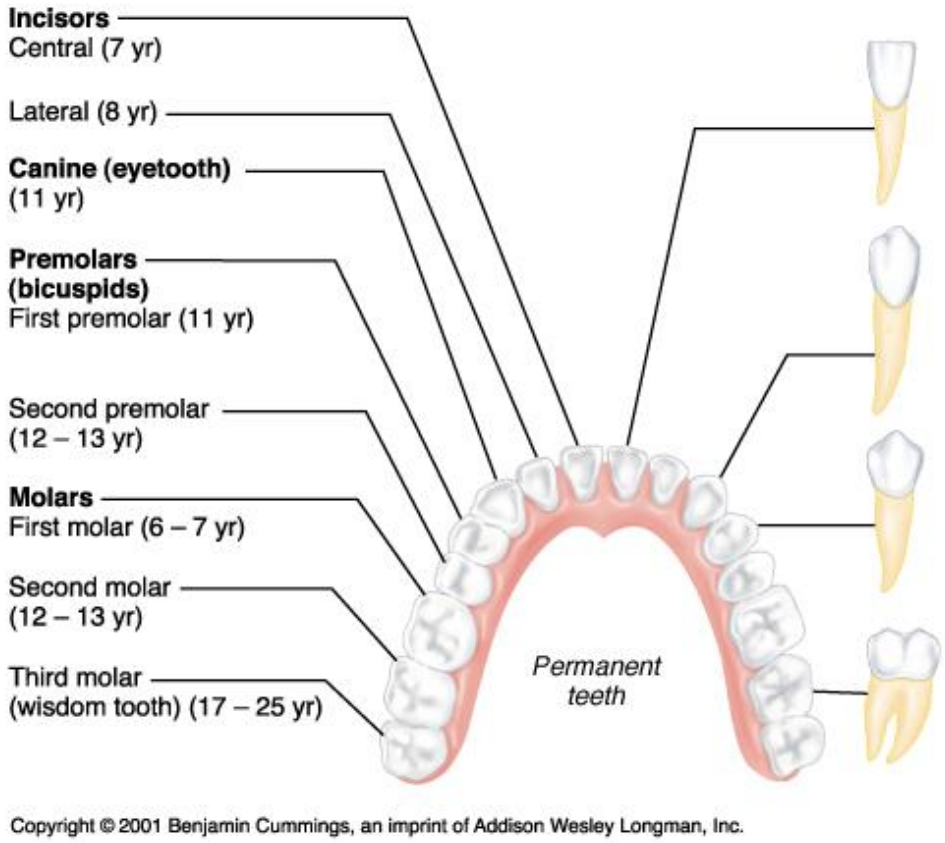
- 6-7 years – first molars
- 7-8 years – incisors
- 10-11 years – canine teeth
- 11 years – first premolars
- 12-13 years – second premolars, second mo
- 17-25 years - third molar

An adult person should have **32** permanent te

$$X = 4n - 20,$$

x – number of teeth

n - age in years



SALIVARY GLANDS

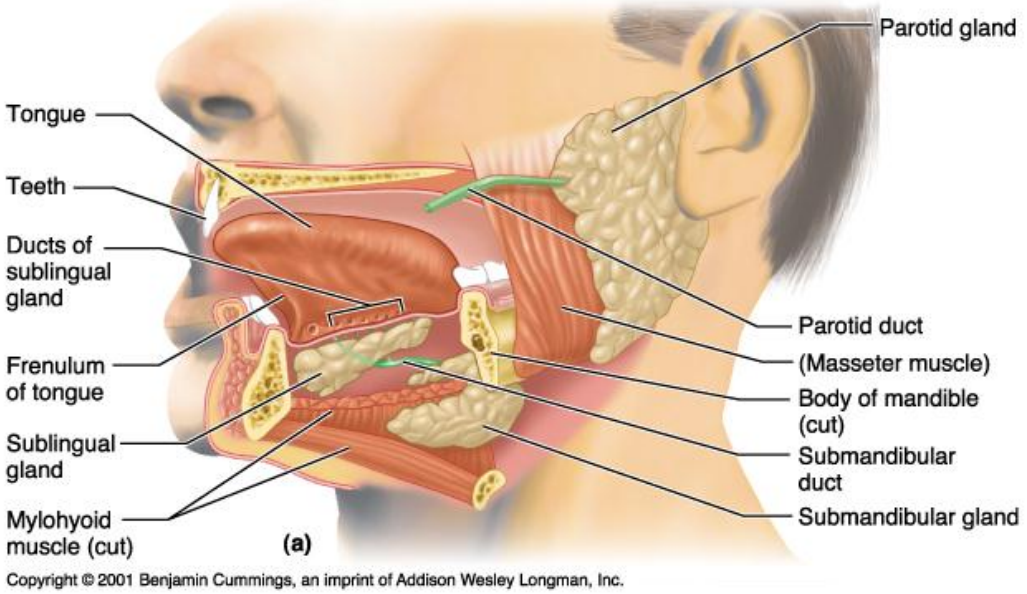
Produce 1-2 L saliva/day

Saliva = 99% water plus:

- enzymes (amylase for starch digestion),
- electrolyte buffers
- mucin (lubrication)
- antibodies
- antimicrobials (lysozyme and defensins)

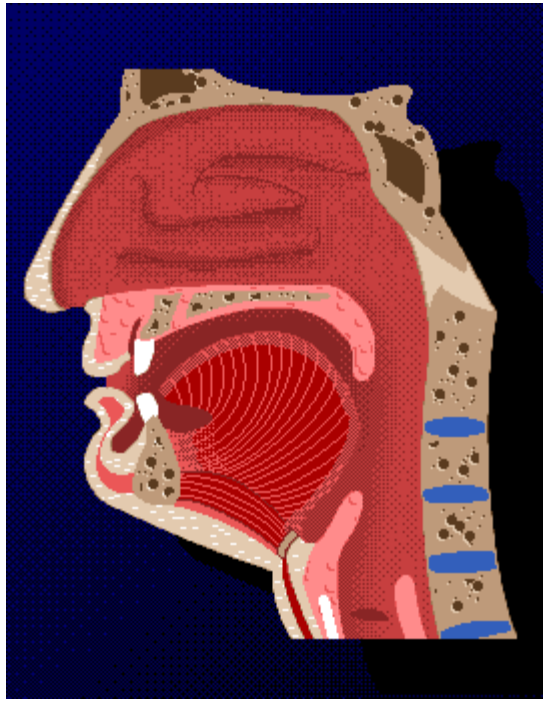
Functions of saliva:

1. Cleanse mouth, control oral bacteria
2. Dissolve food chemicals for taste
3. Moisten food for bolus formation
4. Begin chemical digestion of carbohydrates
5. Buffer oral pH



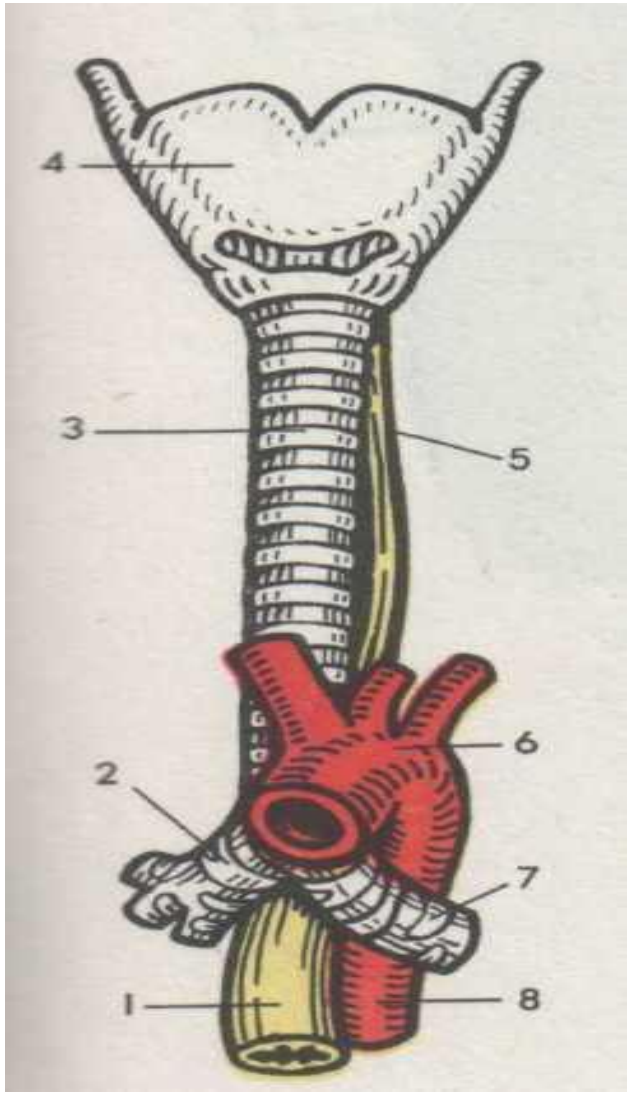
Deglutition (swallowing)

- **Sequence**
  - Voluntary stage
    - Push food to back of mouth
  - **Pharyngeal stage**
    - Raise
      - Soft palate
      - Larynx + hyoid
      - Tongue to soft palate
  - **Esophageal stage**
    - Contract pharyngeal muscles
    - Open esophagus
    - Start peristalsis



ESOPHAGUS

- Surrounded by
  - SNS plexus
  - Blood vessels
- Functions
  - Secrete mucous
  - Transport food



PECULIARITIES OF THE ESOPHAGUS IN CHILDREN OF DIFFERENT AGE

1. Average length of the esophagus in newborn is 10-16 cm

   in 1.5-2 years - 22-24.5 cm

   in 15-17 years - 48-50 cm

2. It is relatively narrow

3. Ratio between the length of the esophagus and the length of the body is the same in children of different age groups (1:5)

THE CONSTRICTION OF THE ESOPHAGUS

- **Anatomical**

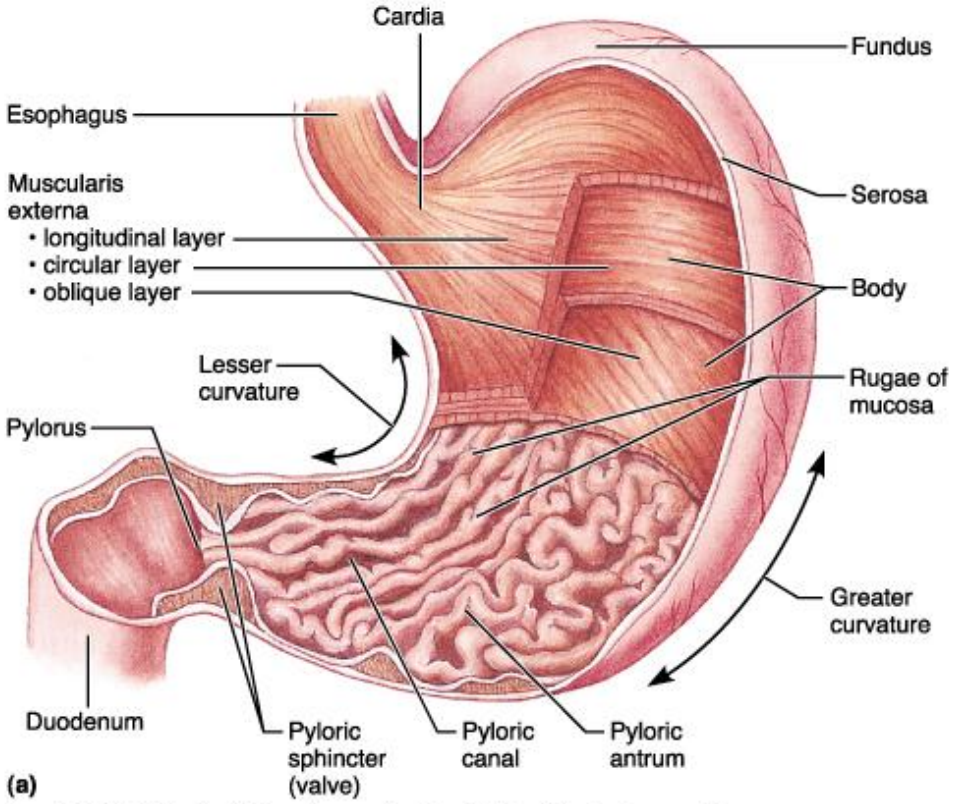
1. Upper constriction - in place of entrance into the esophagus
2. Middle constriction - in place of adjacent the trachea to esophagus
3. Lower constriction - in place of entrance through the diaphragm

- **Physiological**

1. Upper constriction - at the begining of the esophagus
2. Middle constriction - in place of adjacent the aorta to esophagus
3. Lower constriction - in place of entrance into the cardial part of the stomach.

Stomach

- **Mix food**
- **Reservoir**
- **Start digestion of**
  - Protein
  - Nucleic acids
  - Fats
- **Activates some enzymes**
- **Destroy some bacteria**
- **Absorbs**
  - Alcohol
  - Water
  - Lipophilic acid
  - B 12



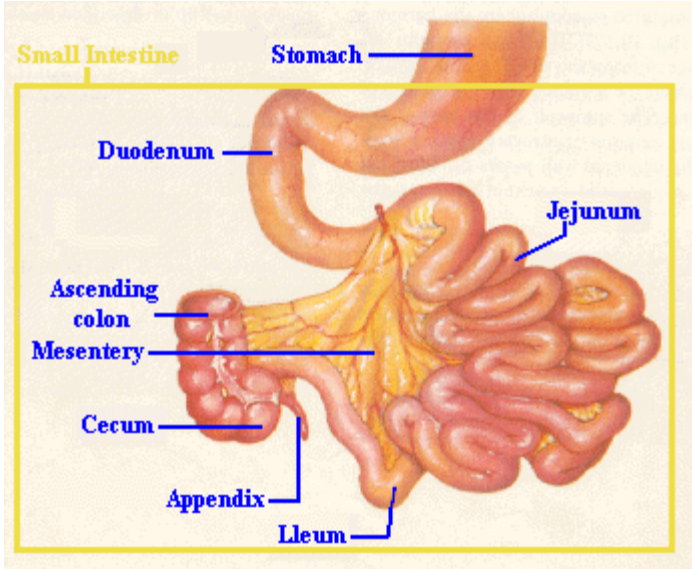
CAPACITIES OF THE STOMACH

- **Anatomical, cm3**
  - Newborn - 30-35
  - 4 days – 45
  - 14 days – 90
  - In next months increase for 25 cm 3
  - 2 years – 500
  - 4 years – 700
  - 8 years – 1000
  - An adult- 1200-1600

- **Physiological , cm3**
  - In newborn - 7
  - 1 year - 250-350
  - 3 years - 400-600
  - 10 years - 1300-1500

Small Intestine

- **Regions**
  - Duodenum
  - Jejenum
  - Ileum
- **Absorbs**
  - 80% ingested water
  - Electrolytes
  - Vitamins
  - Minerals
  - Carbonates
  - Proteins
  - Lipids
- **Movements**
  - Segmentation
  - Peristalsis



PECULIARITIES OF THE SMALL INTESTINE IN INFANT

1. The length is in two time less than in adult.
2. The length of small intestine mesentery is relatively longer.
3. The membrane is thin, is well vascularitied.
4. The intestinal glands are more bigger then in adult.
5. The lymph cells are in each little parts of small intestine.

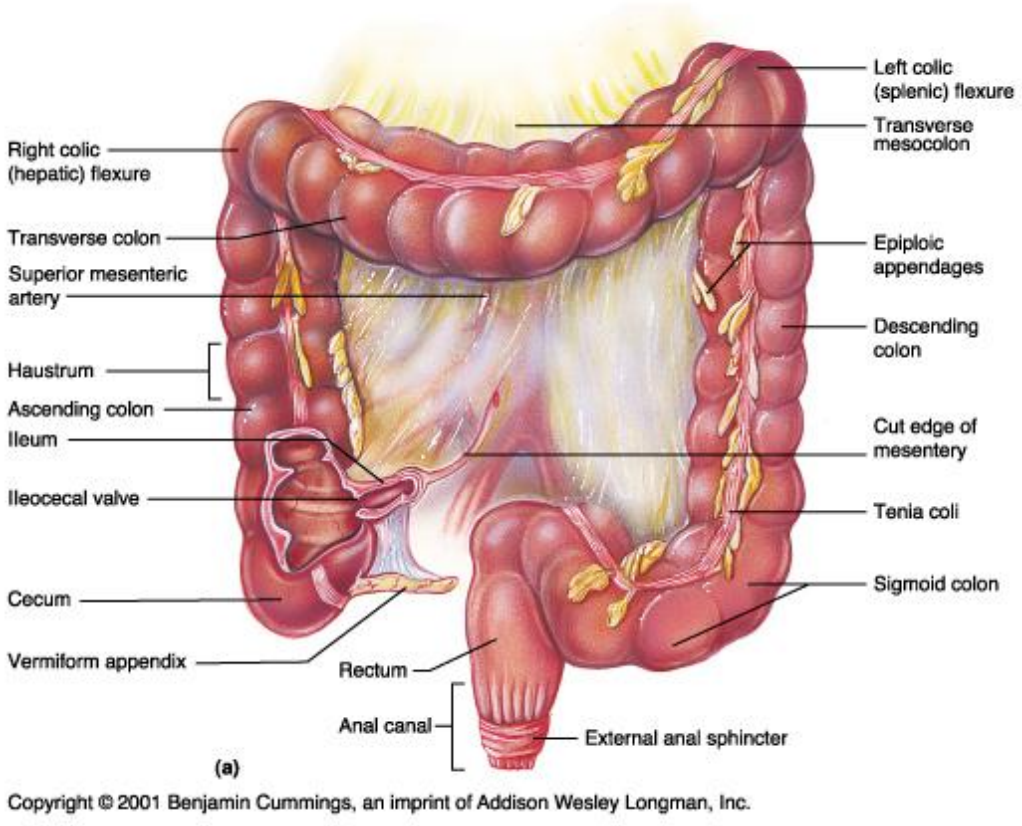
Large Intestine

Regions:

- Caecum – Appendix
- Colon
  - Ascending
  - Transverse
  - Descending
- Rectum
- Anal canal

Functions:

- Mechanical digestion
- Chemical digestion
- Bacterial digestion
- Absorption
- Concentrate/eliminate wastes



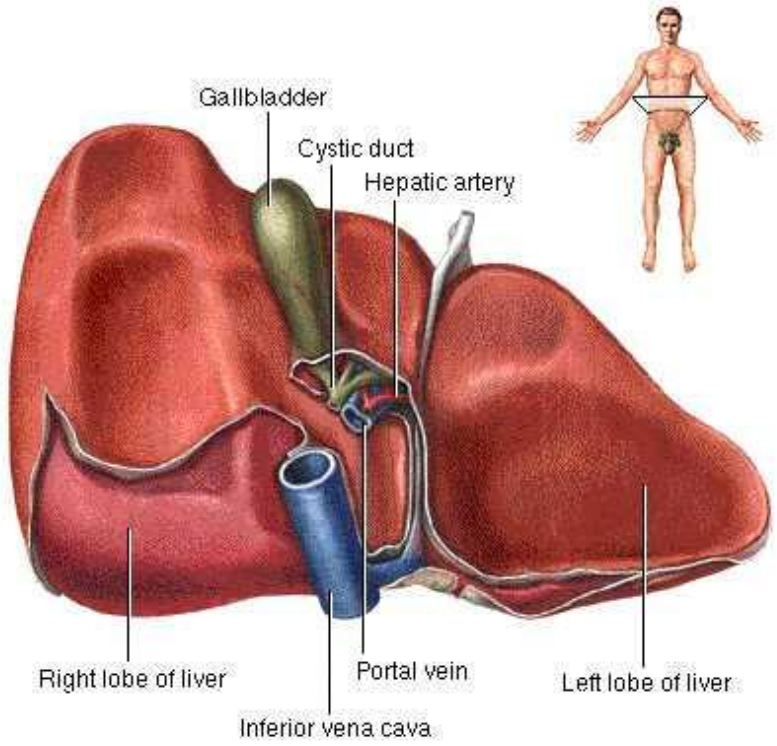
PECULIARITIES OF THE LARGE INTESTINE IN INFANT

1. The large intestine is not completely developed.
2. The length of the large intestine is the same as the body length (in any age of a child).
3. Haustrumes appear after 6 month of life.
4. In schoolchildren the rectum is in the small pelvis.
5. In newborn ampulla is absent.

LIVER

Functions:

1. Bile production
2. Detoxication
3. Stores
4. Activates vitamin D
5. Fetal RBC production
6. Phagocytosis
7. Metabolizes absorbed food mo



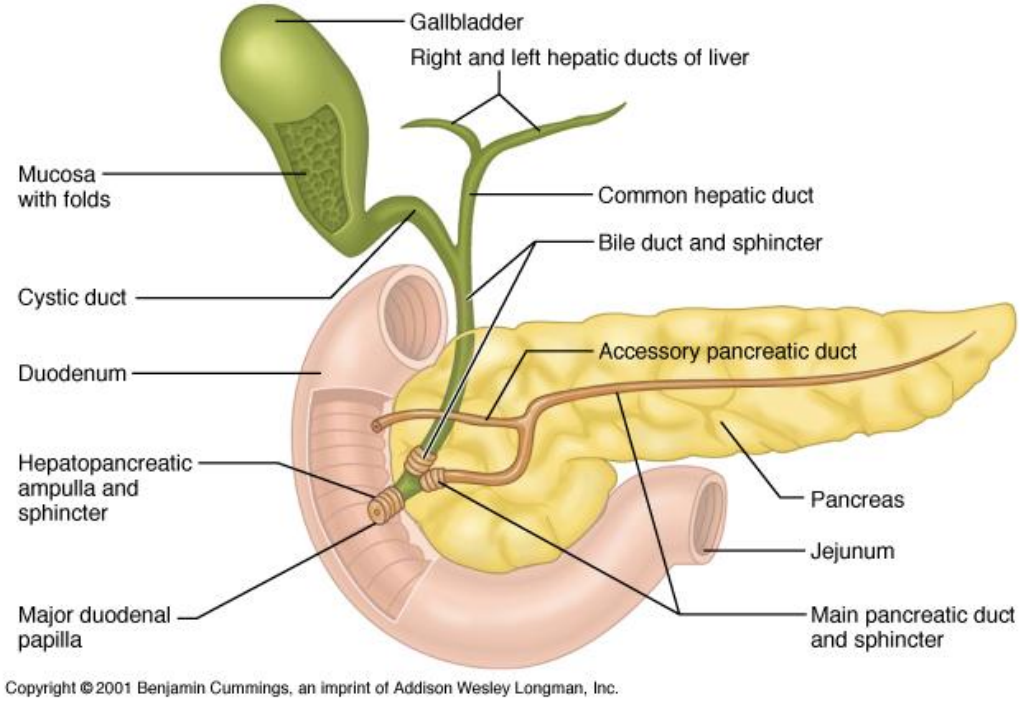
PECULIARITIES OF THE LIVER IN INFANT

- Before the birth the liver is the largest organ of the body
- The left lobes before the birth is very great
- In newborn is functionally undeveloped
- Normally the lower edge of the liver till 7 years is palpated below the edge of the right costal margin

PANCREAS

A. **Pancreatic islets** (endocrine) (1%) cells secrete **insulin** and **glucagon** to control blood sugar

B. **Pancreatic acini** (exocrine) produce digestive enzymes and buffers: pancreatic juice



GATHERING COMPLAINS (PAIN IN THE ABDOMEN)

It is necessary to distinguish the following signs:

1. Is it constant or colicky.
2. Location of pain.
3. Character of pain.
4. Intensity.
5. The connection with the time of eating.
6. The connection with the kind of intakes food.
7. The connection with the time of day.
8. The connection with the act of defecation.

INSPECTION

- **Common physical examination**:
  - Color of integuments
  - The condition of physical development
  - The position of the child
  - Expression of fair on the child's face
  - Moving by legs (children of early age)

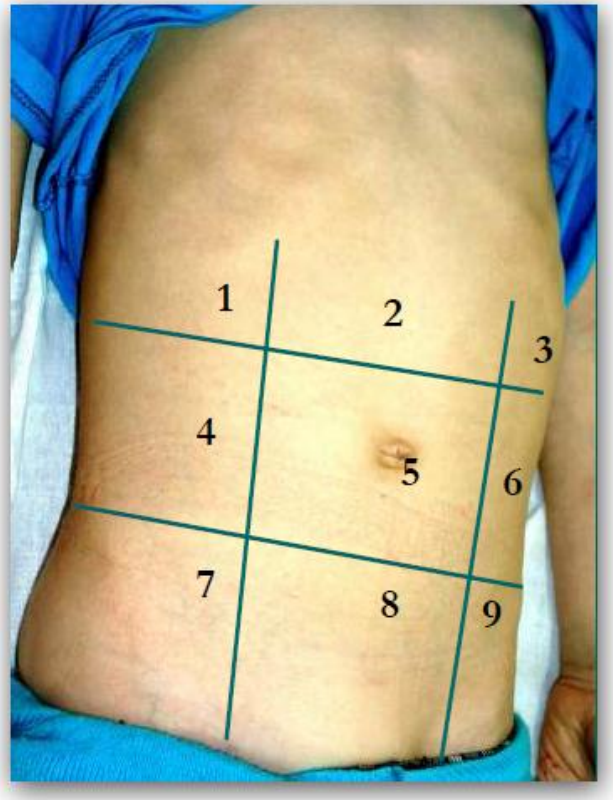
- **Physical examination of abdomen:**
  - The form, symmetry, size of abdomen
  - A degree of participation of the muscles of the abdominal cavity in active breathe process

Palpation (General rules)

- The doctor's hands should be dry, warm
- Well-lighted room
- The position during examination:
  - lying on the beg
  - on hard surface
  - child should band his legs at an angle 45*

PALPATION (GENERAL RULES)

The front abdominal wall is divided into 9 arias by lines:

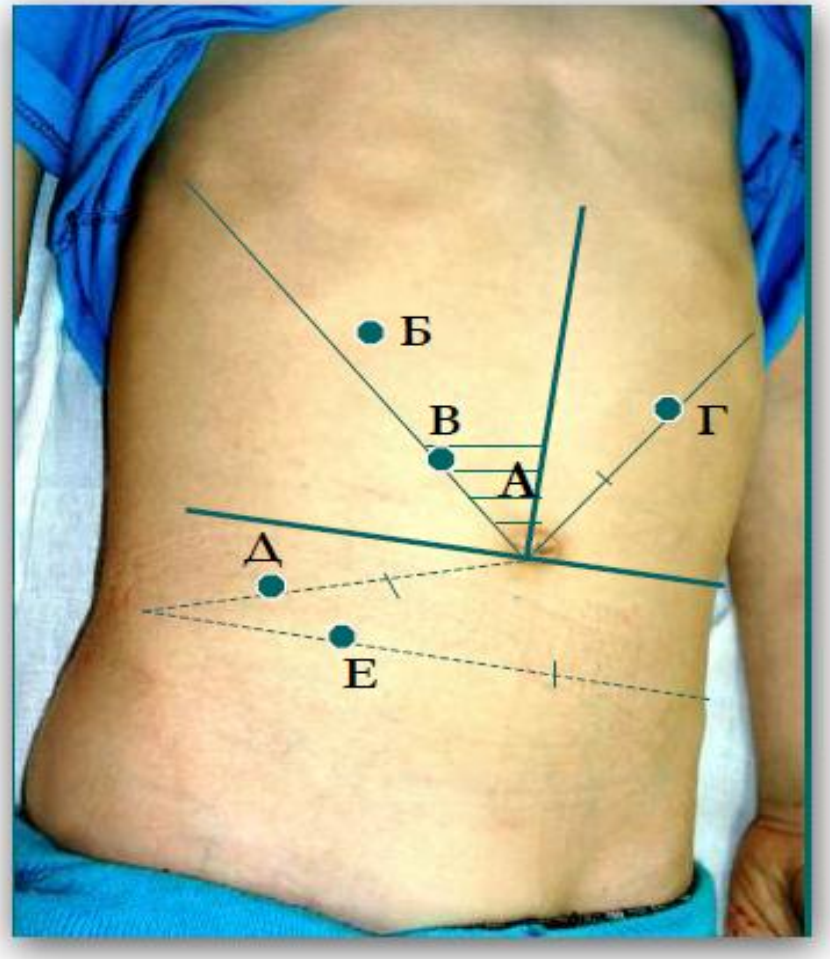


1-3 – epigastria arias

4-6 – mesogastria arias

7-9 – hypogastria arias

PALPATION



Points for palpation

А – Chauffard’s zone

Б – Kehr’s point

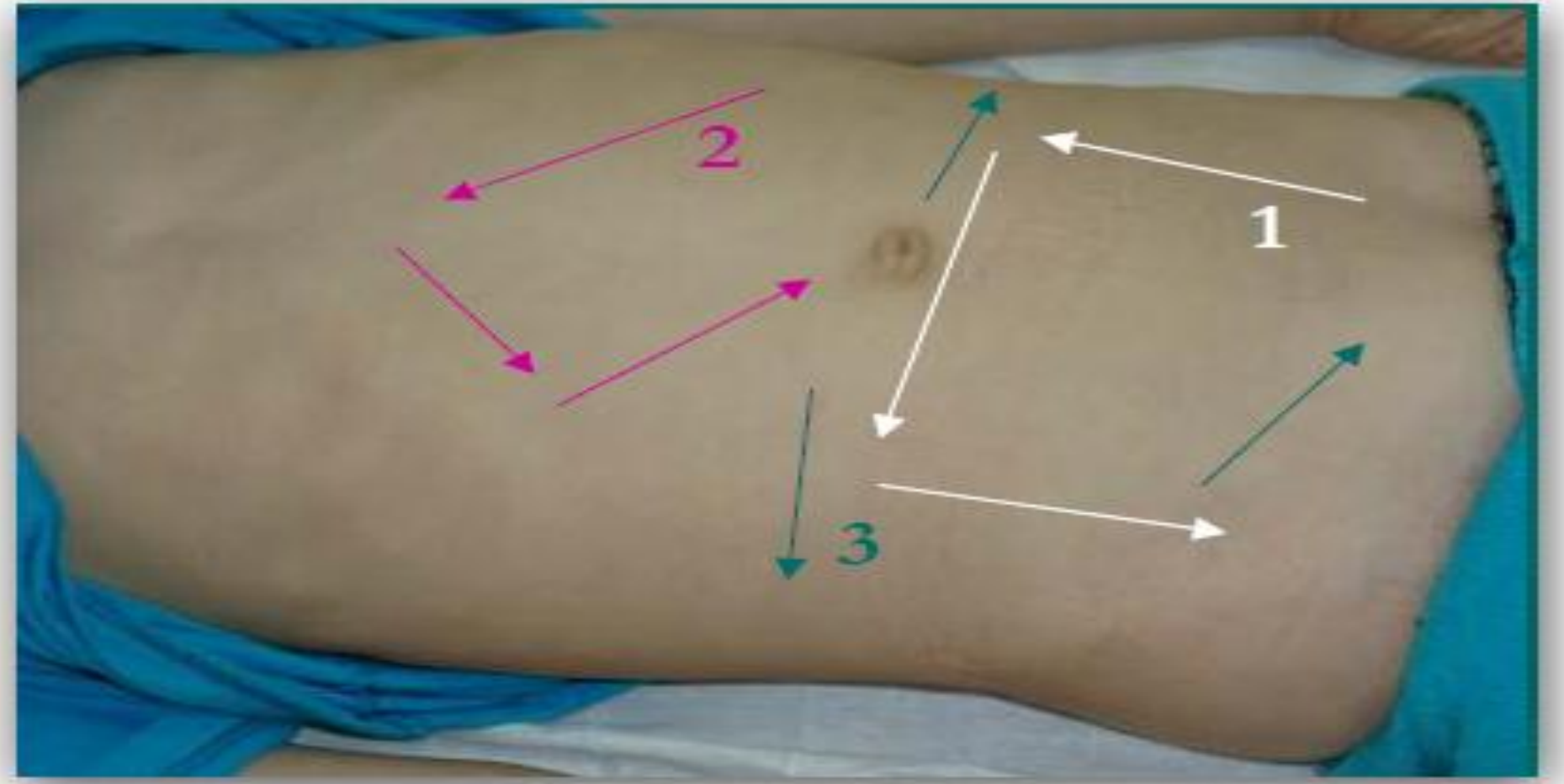
В – Desgandin’s point

Г – Mayo-Robson’s point

Д – Mc-Burney’s point

Е – Lants’s point

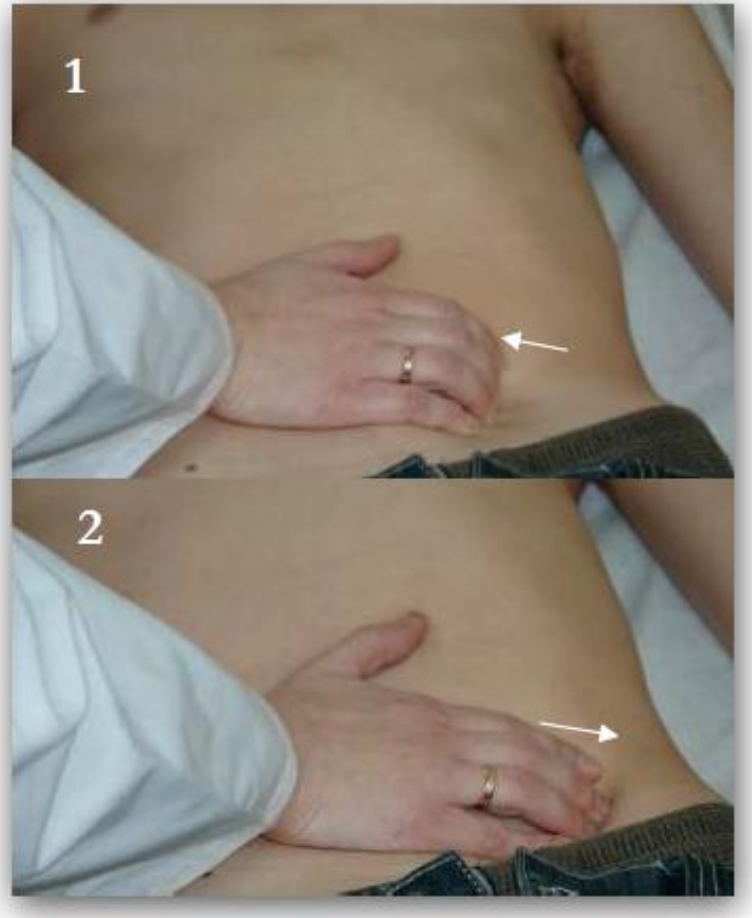
SUPERFICIAL PALPATION



SUPERFICIAL PALPATION

- **Signs determined during superficial palpation**:
  - Sensitivity
  - Painfulness
  - The tension of abdominal wall
  - Relaxation of abdominal wall
  - The sizes of the internal organs
  - At abdominal distension

Deep palpation according to Obrazcov-Stragesko's



Sigmoid colon in normal case it is:

- Painless
- With a smooth surface
- 1-2 cm
- Soft
- Mobile
- Grumbling is absent

Deep palpation according to Obrazcov-Stragesko's

The cecum in normal case it is:

- Painless
- With a smooth surface
- 3-3,5 cm
- Rather dense
- Mobile
- Grumbling can be heard

Deep palpation according to Obrazcov-Stragesko's

- **<u>Shchotkin-Blumberg's symptom</u>**

The pain is increased at fast taking away hand (peritonitis, acute apendicitis)

Deep palpation according to Obrazcov-Stragesko's

Mc-Burney's symptom

The pain is increased at pressing (peritonitis, acute apendicitis)

Deep palpation according to Obrazcov-Stragesko's

Lants's symptom

The pain is increased at pressing in point (peritonitis, acute apendicitis)

Deep palpation according to Obrazcov-Stragesko's

The ascending part of the large intestine

Is palpated according to the rules.

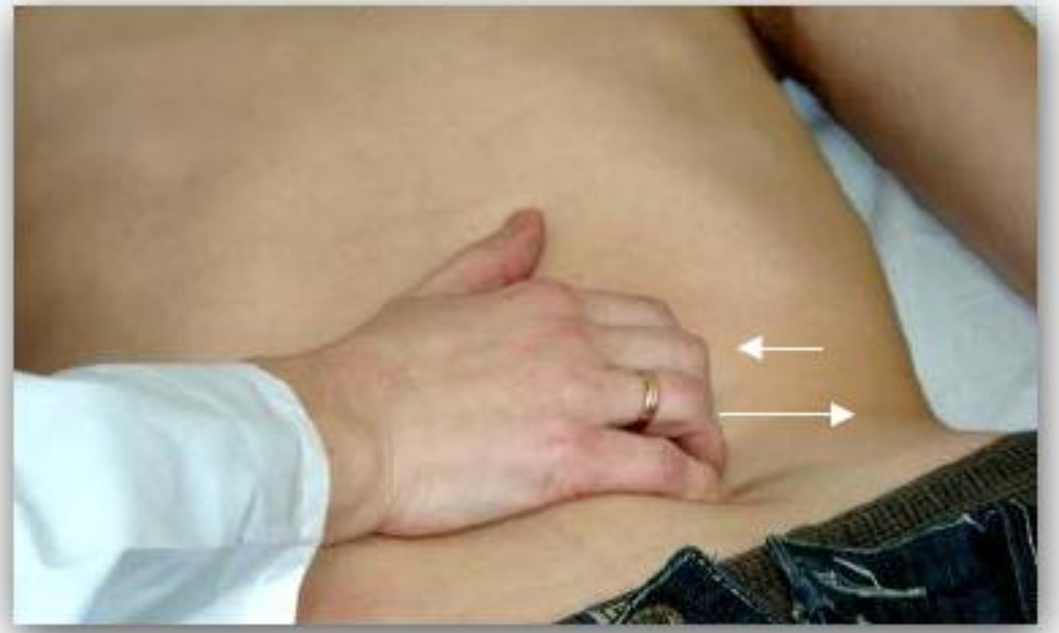
Often is not palpable.

Deep palpation according to Obrazcov-Stragesko's

Transverse colon in normal case it is:

- Painless
- With a smooth surface
- 2-4 cm
- Soft
- Mobile
- Grumbling is absent

Deep palpation according to Obrazcov-Stragesko's



The descending part of the large intestine

Is palpated according to the rules.

Often is not palpable.

GROTT'S METHOD OF PALPATION (PANCREAS)

The fist of the left hand is placed under the join. Palpation is carried out the right hand when child exhales.

PALPATION OF PANCREAS

Desgandin's point

Painfulness in this point arises at diseases of the head of pancreas.

PALPATION OF PANCREAS

Mayo-Robson's point

Painfulness in this point arises in children with the pathology of the pancreatic tail.

Palpation of the liver (bimanual)

In normal case the inferior margin of the liver is:

- 0.5-3 cm lower than inferior margin of the costal rib
- Painless
- The margin is sharpened
- Soft
- Smooth

PALPATION OF THE GALL BLADDER

Kehr's point

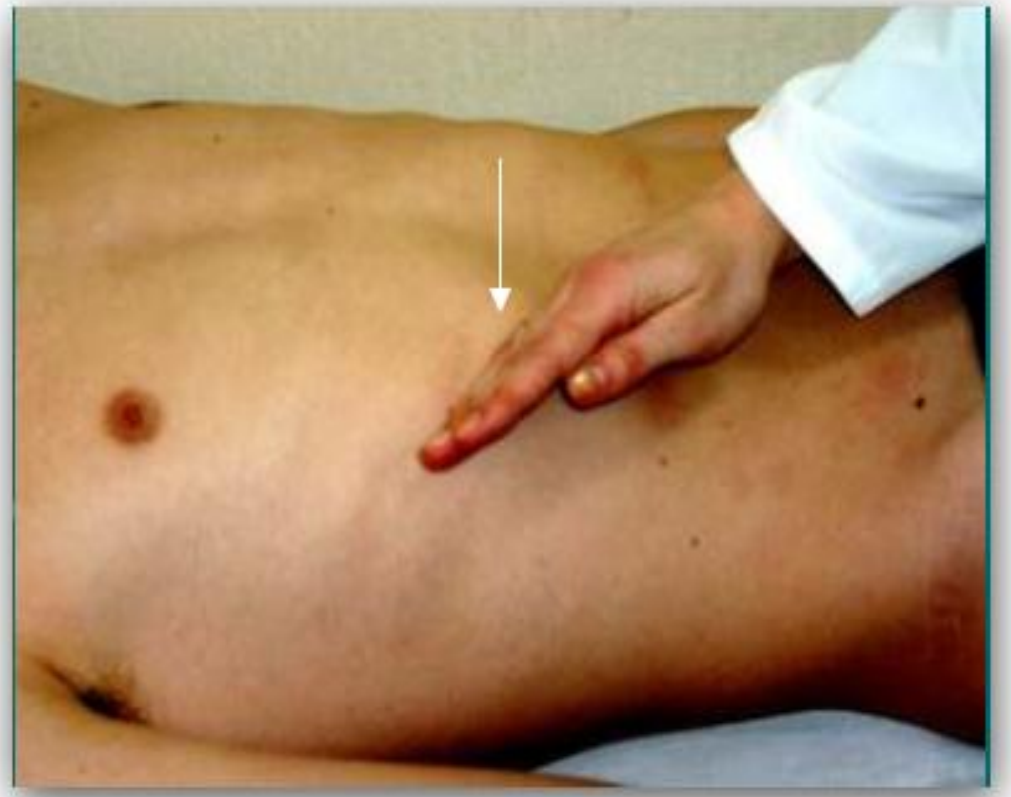
The pain is increased at pressing in point (diseases of gall bladder).

PALPATION OF THE GALL BLADDER

- **Lepine's symptom**

The pain is increased by percussion with the 3rd finger (diseases of gall bladder)

PALPATION OF THE GALL BLADDER



- **Ortner's symptom**

The pain is increased by percussion with the hand

PALPATION OF THE GALL BLADDER

- **Murphy's symptom**

The pain is increased at pressing in Kehr's point while child inhales (diseases of gall bladder)

PALPATION

- **<u>Mussy symptom (phrenicus-symptom)</u>**

Pain appears at pressing with a finger between the crus of the right sterno-cleido-mastoideus muscle.

PALPATION

- **Acromealic point**

Pain appears at pressing with a finger an acromeon of the left scapula.

PALPATION

- **Boas's symptoms**

Pain appears at pressing on the processus transversus of the X-XII thoracic vertebras (diseases of gall bladder and stomach)

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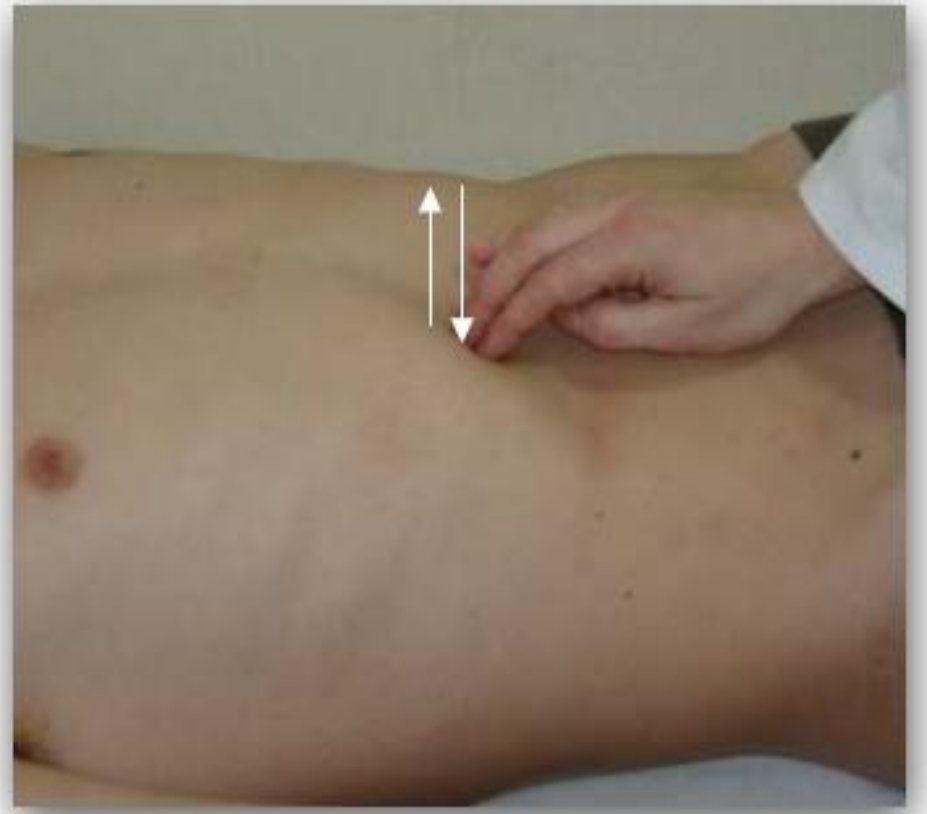
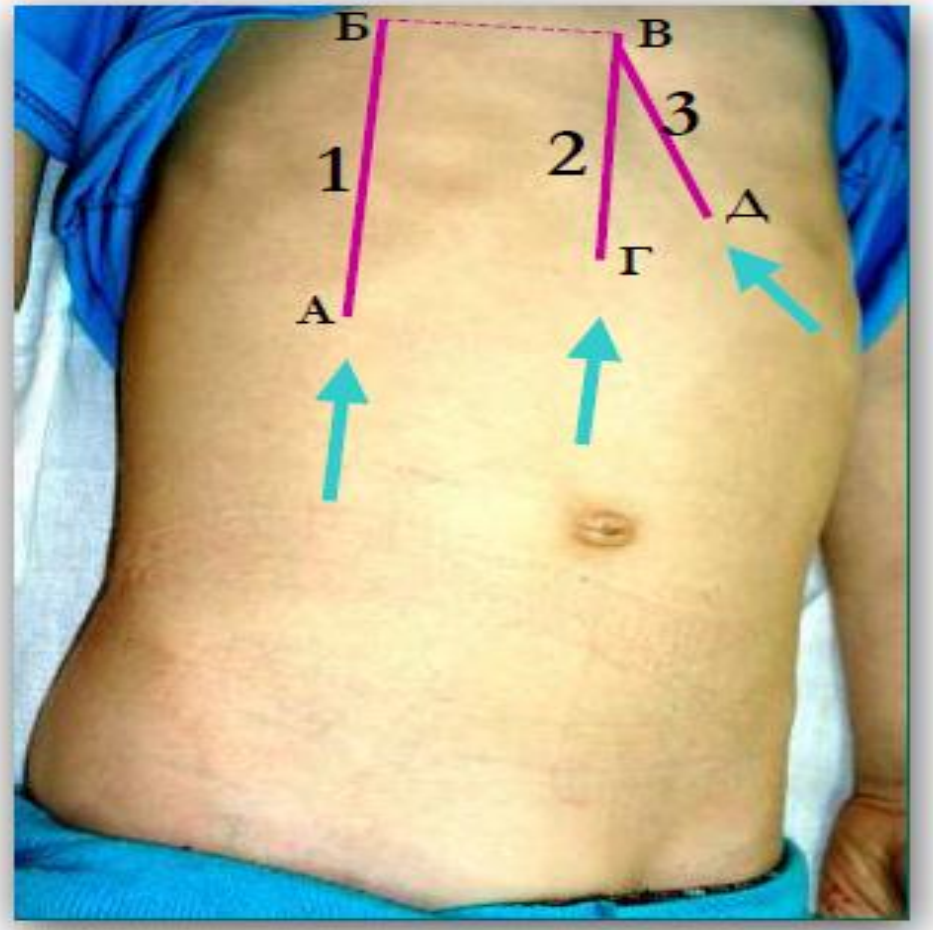
PERCUSSION



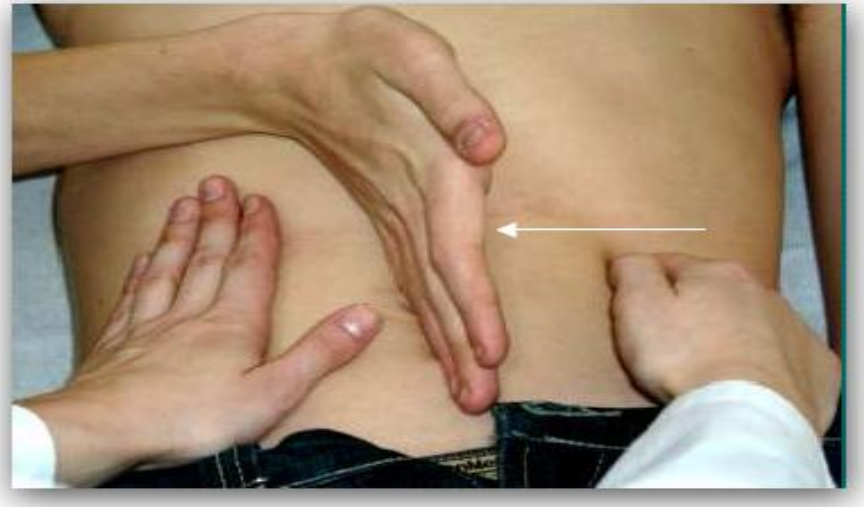
- **Mendel's symptom**

It is positive when pain arises at percussion in Chauffard's zone (duodenitis, duodenal ulcer).

PERCUSSION OF LIVER BY KURLOV



PERCUSSION



<u>Accumulation of the liquid in the abdominal cavity (ascites)</u>

Dull sound at percussion

AUSCULTATION

It is possible to determine:

- Grambling
- Lower margin of the stomach

ADDITIONAL METHODS OF INVESTIGATION

Instrumental diagnostic:

- Computed tomography scan (CT or CAT scan)
- Lower GI (gastrointestinal) series (also called barium enema)
- Magnetic resonance imaging (MRI)
- Magnetic resonance cholangiopancreatography (MRCP)
- Oropharyngeal motility (swallowing) study
- Ultrasound
- Upper GI (gastrointestinal) series
- Endoscopic procedures:
  - Colonoscopy
  - Endoscopic retrograde cholangiopancreatography (ERCP)
  - Esophagogastroduodenoscopy (EGD)


Thank you for attention

Literature, was used in the lecture

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- Інтернет – ресурси: Сайти МОЗ України: https://moz.gov.ua/protokoli Онлайн-платформа з протоколами на засадах доказової медицини Джерела клінічних настанов Інформаційні ресурси http://www.booksmed.com/pediatriya http://pediatriya.info http://health-ua.com/parts/pediatrics http://medkniga.ucoz.net/publ/pediatrija/40 http://www.medport.info/index.php?option=com_content&view=section&id=48&Itemid=73