# *Tumors. Introduction*

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# Definition of tumor

- Despite the long history of studying the problem of tumor growth, there is still no common understanding what a malignant tumor is.
- R.A. Willis (1967) defined a malignant tumor as "a pathological mass of tissue with excessive, uncoordinated growth that persists even after the cessation of the factors causing it."
- J.A. Ewing (1940) and H.C. Pilot (1986) in the definition of a malignant tumor emphasized that its main distinguishing feature is "hereditary determined autonomic growth."
- **A.I. Strukov and V.V. Serov (1985) defined the malignant tumor as "a pathological process characterized by unrestrained uncontrolled cell growth“ being not a result of regeneration and disembryogenesis**

# Epidemiology of tumors

- In recent years, in the epidemiological situation of morbidity and mortality from tumors, a number of trends have been revealed:
  - First, there is an increased incidence and mortality from cancer in all countries of the world. For many years oncology occupies the second place in the structure of causes of death after cardiovascular pathology. Since there is now a tendency to reduce mortality from the latter, the tumors have a chance to become a leader among the causes of death in the 21st century.
  - Secondly, increased incidence of tumors is recorded in all age groups, but the greatest number of patients suffering with cancer are people over 50 years old. So, the tumors become a gerontological problem.

# Epidemiology of tumors

- Thirdly, in the incidence and structure of the malignant tumors between men and women sex differences have been established. The average incidence of neoplasia among men is 1.5 times higher than among women, and in older age groups - more than 2 times.
- Fourth, the structure of morbidity and mortality from cancer is constantly changing due to increasing in some tumors and decreased incidence of other tumors. In some cases, such decrease in the incidence related to effectiveness of preventive control.

# Epidemiology of tumors

- In the structure of the incidence among males in Europe and in the United States lung cancer, stomach and colon cancer occupy the leading positions since 1981. There is some stabilization of the incidence of lung cancer and a significantly increased incidence of colon cancer.
- In the structure of the incidence among females the first three places share the cancer of the breast, uterus and large intestine.
- In Russia, the situation is somewhat different. In males, the most common are lung, stomach and skin cancer; in females - breast cancer, skin tumors and stomach cancer.

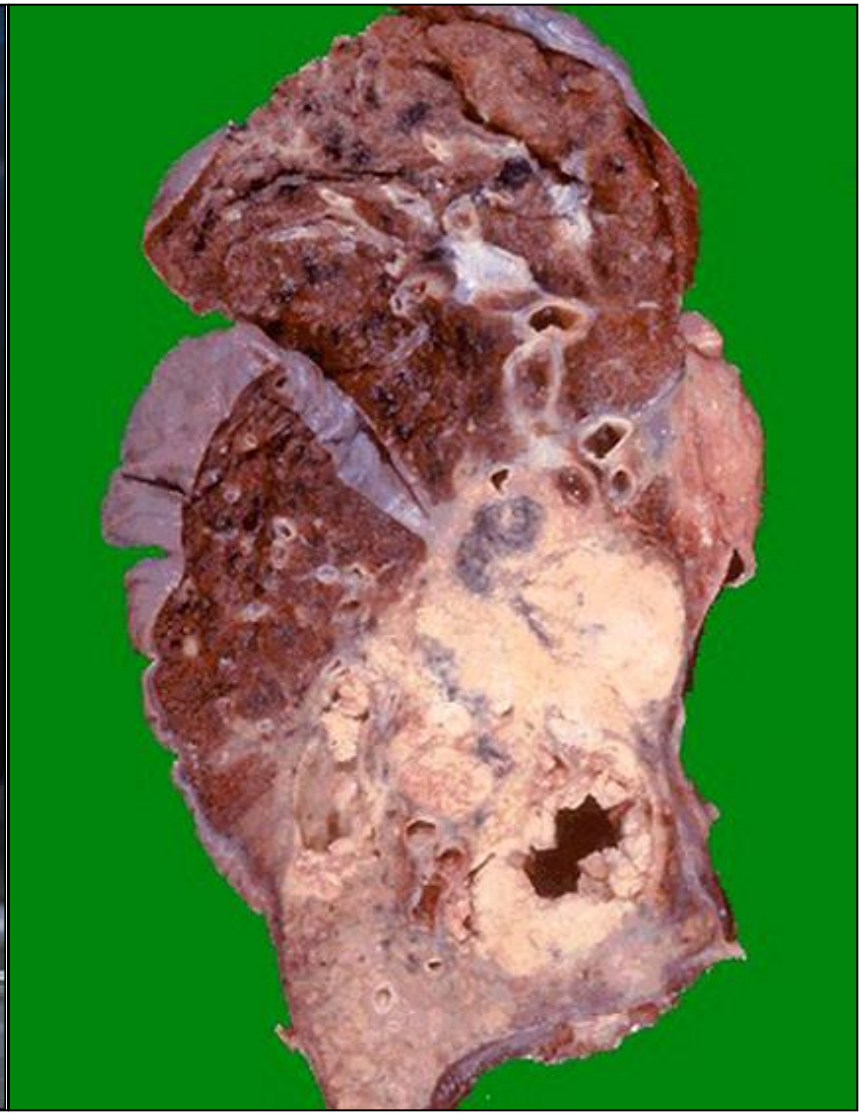
# Epidemiology of tumors

- **Etiological factors, which may be associated with the appearance of tumors:**
  - Chemical carcinogens,
  - Physical carcinogens,
  - Viral carcinogens,
  - Genetic disorders.

# Chemical carcinogens

- Chemical carcinogenesis in human was firstly described by J. Hill, who observed the development of polyposis of the nasal mucosa in people who inhaled excessive amounts of drugs, and Sir Percival Patt (1775), who described scrotal cancer in the chimney sweep.
- Clearly established the relationship between various chemicals and the emergence of tumors:
  - Smoking - lung cancer
  - Asbestos - mesothelioma, lung cancer
  - Nitrosamines (in food) - stomach cancer
  - Aniline dyes - bladder cancer
  - Aflatoxin B (Aspergillus flavus) - liver cancer
  - Benzene - acute leukemia
  - Polyvinyl chloride - angiosarcoma of the liver

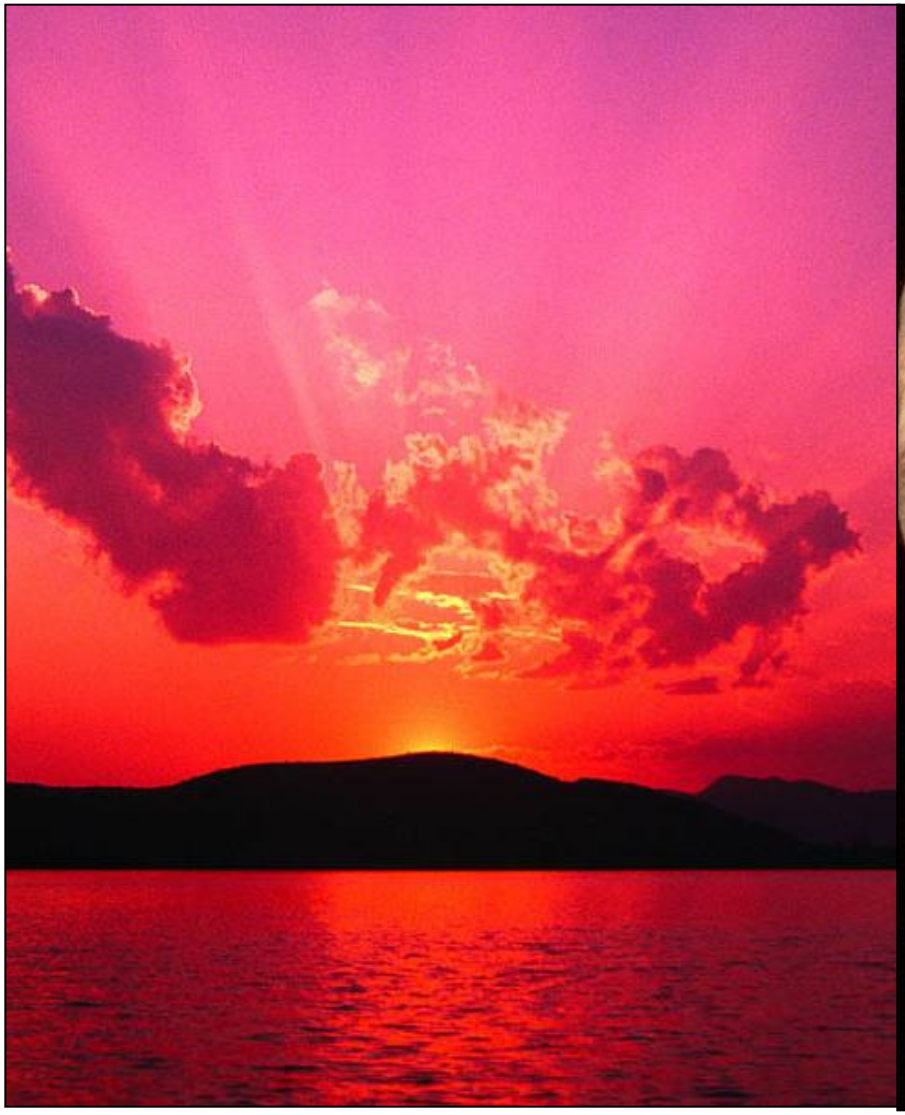
# Smoking – lung cancer

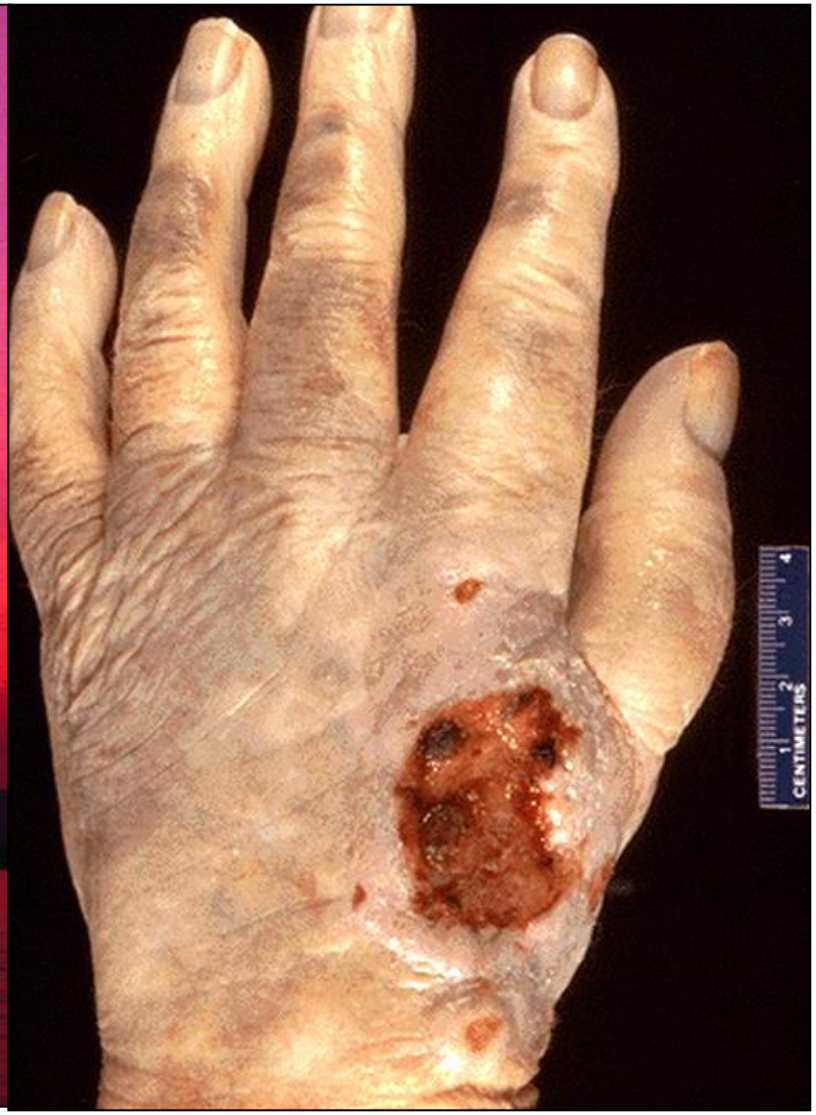


# Physical carcinogens

- Physical factors can also trigger the onset of tumors.
- Solar (cosmic, ultraviolet) radiation - skin cancer, skin melanoma.
- Ionizing and non-ionizing radiation (including X-ray radiation) - thyroid cancer, leukemia.

# Solar radiation – skin cancer

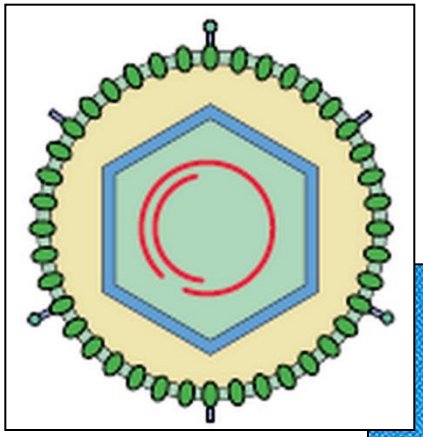


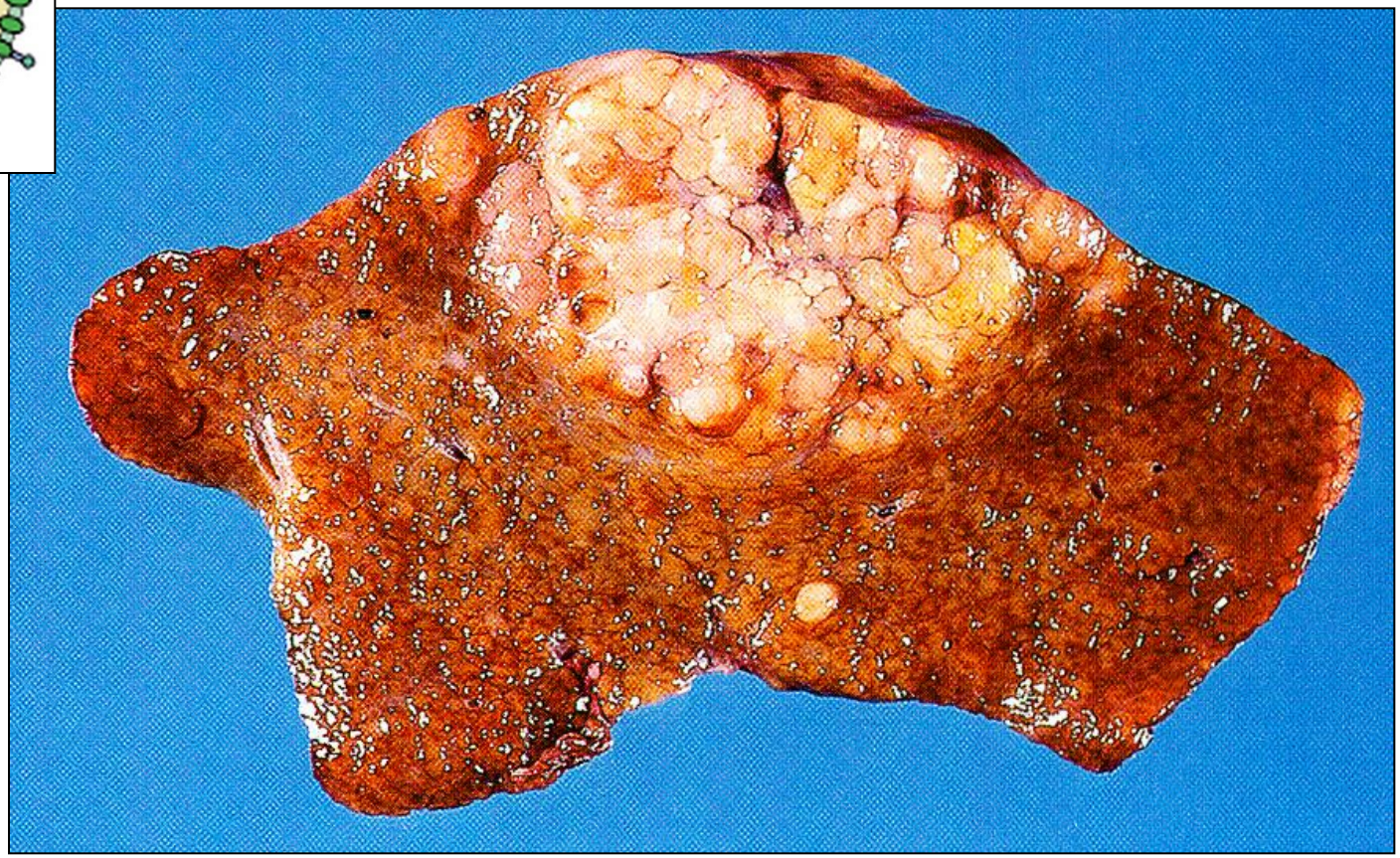


# Viral carcinogenesis

- The founder of the theory is rightly considered to be LA Zilber (1968). According to this theory, a number of tumors can develop under the influence of special viruses, which are called oncogenic viruses.
- The etiological role of the following viruses is proved:
  - Human papillomavirus (HPV) is a precancer and cervical cancer.
  - Epstein-Barr virus (EBV) is a nasopharyngeal carcinoma, Burkitt's lymphoma.
  - Hepatitis B viruses, C (HBV, HCV) are hepatocellular carcinomas.
  - Lymphotropic human virus (HTLV-1) - T-cell leukemia, T-cell lymphoma.

# Hepatitis B virus - liver cancer

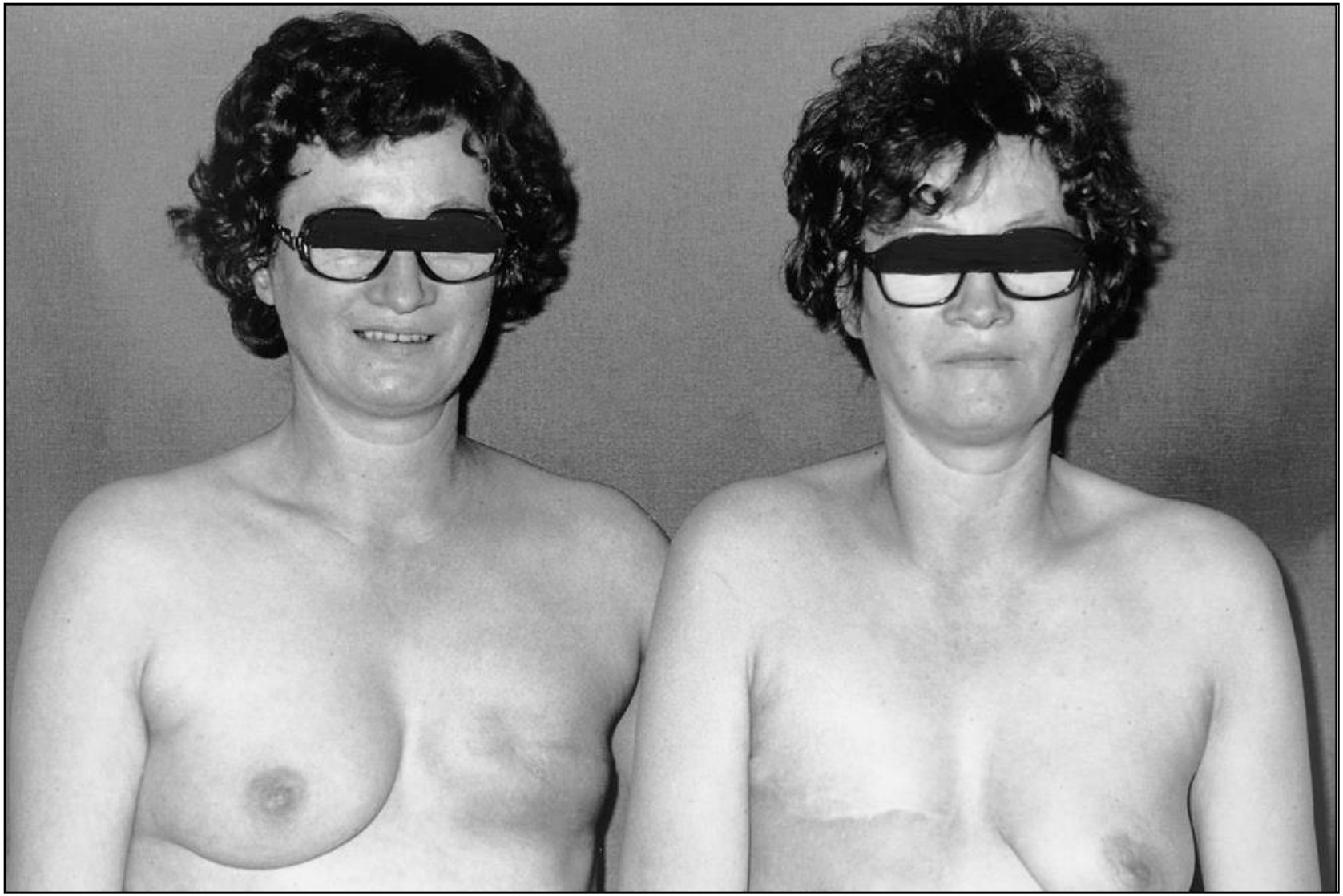




# Genetic disorders

- **The role of hereditary genetic disorders is confirmed:**
  - The presence of families with a high incidence of certain malignant tumors.
  - The presence of oncogenetic syndromes:
    - Disease of the Down (trisomy on the 21-chromosome) - often there is acute lymphoblastic leukemia;
    - Syndrome of dysplastic nevi (anomaly of the 1st chromosome) - skin melanoma often develops.

# Breast cancer in twins



# Pathogenesis of tumors

**Changes in the genome of a somatic cell under the action of various carcinogenic factors or hereditary pathology**

**Activation of cellular oncogenes or suppression of anti-oncogenes**

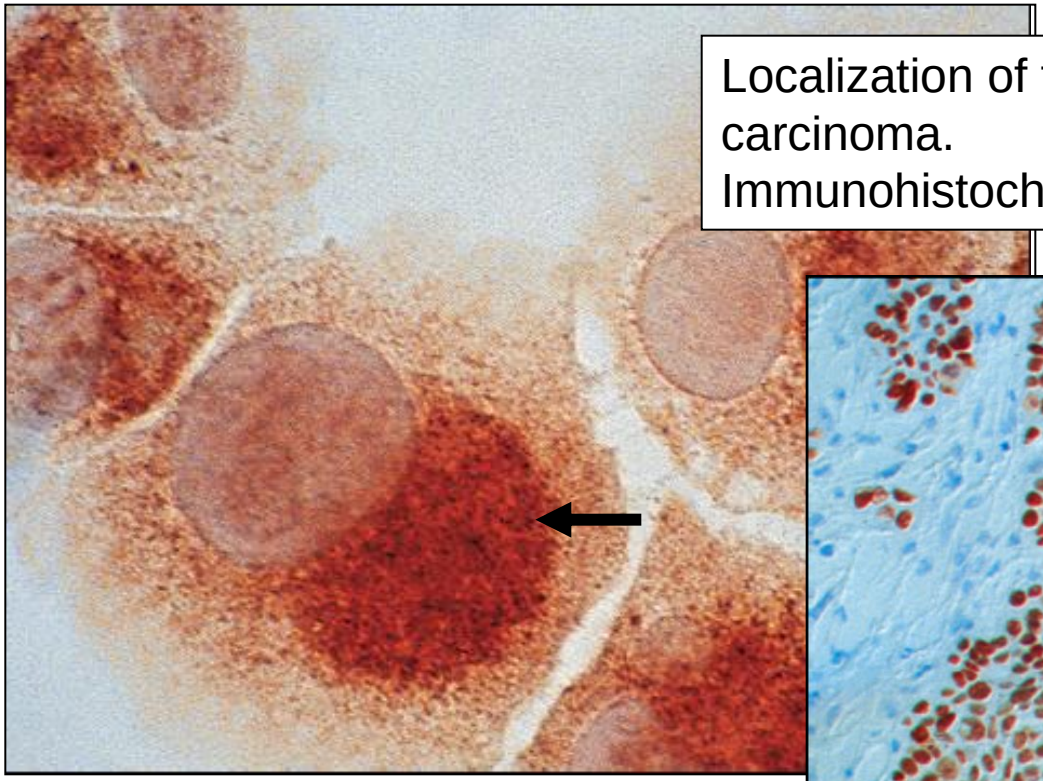
**Disruption of the production of regulatory genes**

**Tumor transformation of the cell and its acquisition ability to unlimited uncontrolled growth**

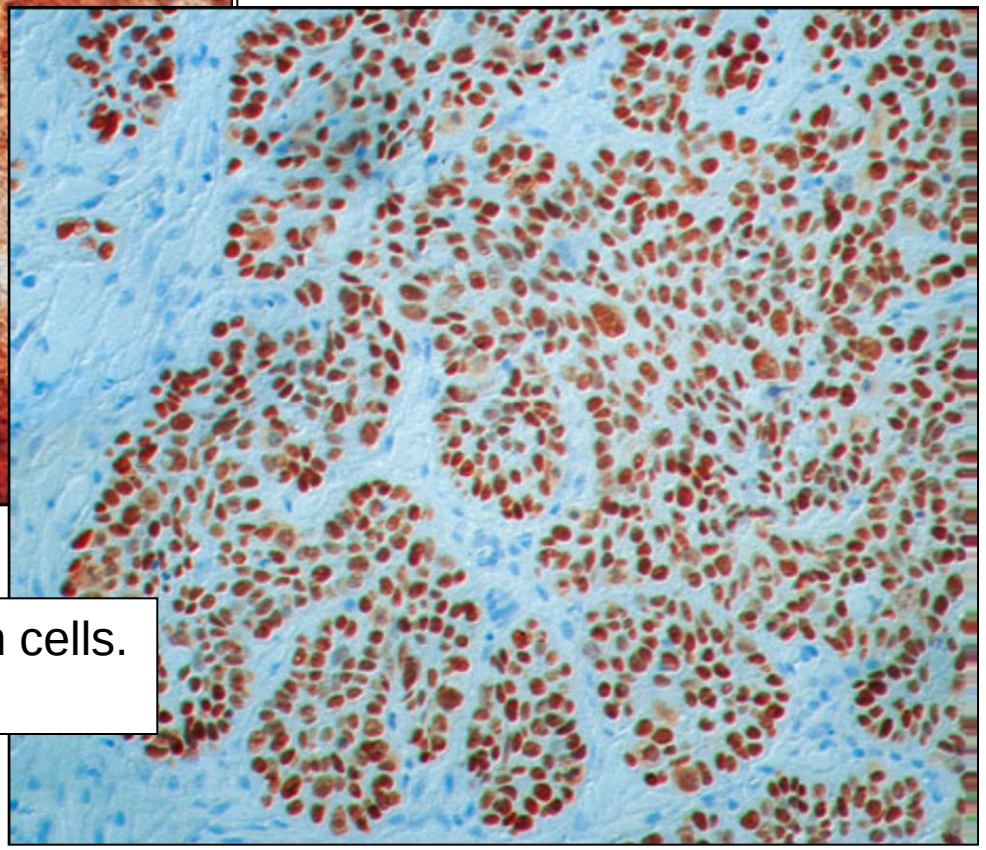
# Oncogenes and antinocogenes

- **Proto-oncogenes:**
  - These are normal cell genes, usually in an inactive state.
  - Their activation and conversion into oncogenes, encoding certain oncoproteins, is accompanied by cell proliferation.
  - Normally, this process takes place in embryogenesis, with the growth of organs and tissues, regeneration.
- **Anti-oncogenes:**
  - Genes that have the opposite effect.
  - The most studied anti-oncogene p53.
  - Pathological activation of oncogenes or suppression of anti-oncogenes can lead to tumor growth.

# Oncogenes and antinocogenes



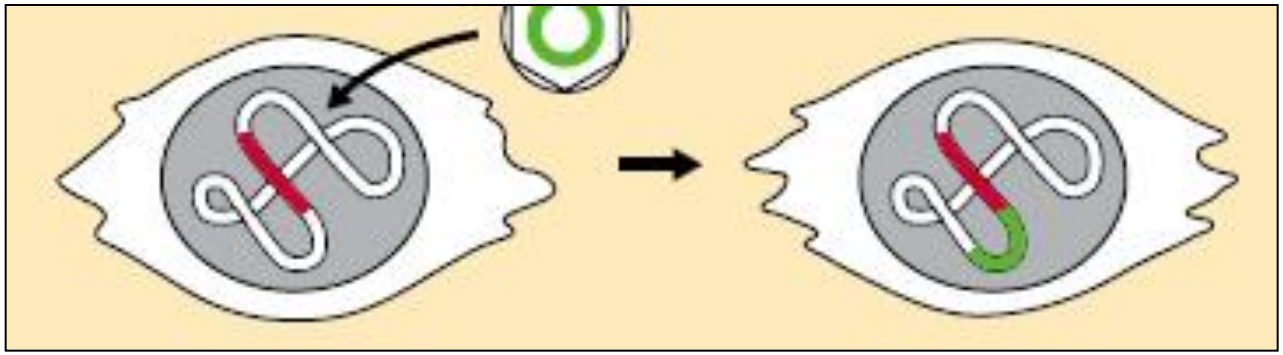
Localization of the anti-oncogene p53 in carcinoma.
Immunohistochemical method



Localization of the c-fos oncogene in cells.
Immunohistochemical method

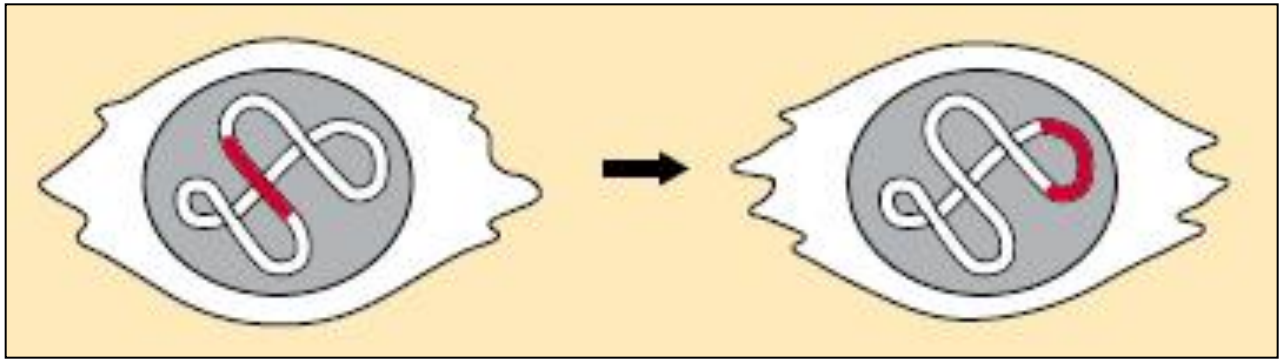
# Mechanism of activation of proto-oncogenes

- **Insertion mechanism:**
  - The integration of viral genes into the genome of the cell leads to the activation of a number of located protooncogenes.



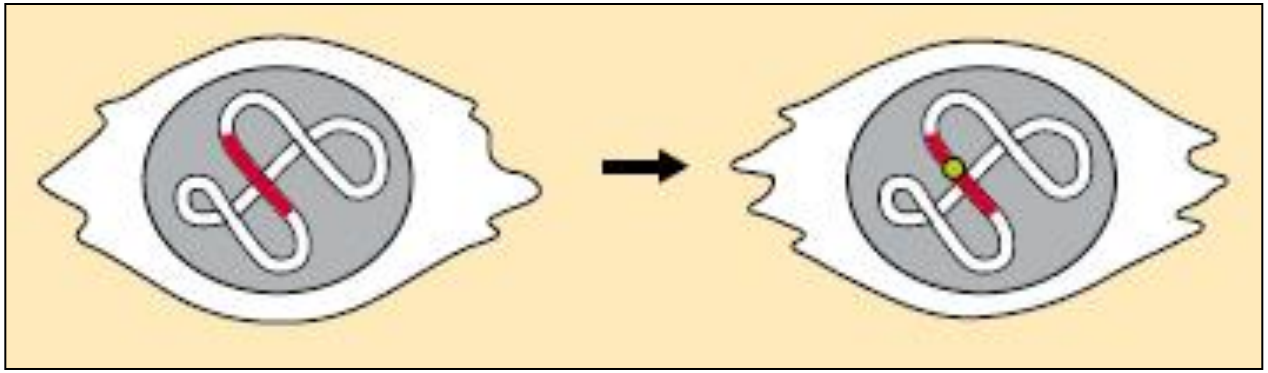
# Mechanism of activation of proto-oncogenes

- **Chromosome translocations (found in many tumors):**
  - Translocation 8 - 14 is characteristic of Burkitt's lymphoma.
  - Translocation 9 - 22 leads to the formation of a hybrid bcr-abl-gene, characteristic of chronic myeloid leukemia.



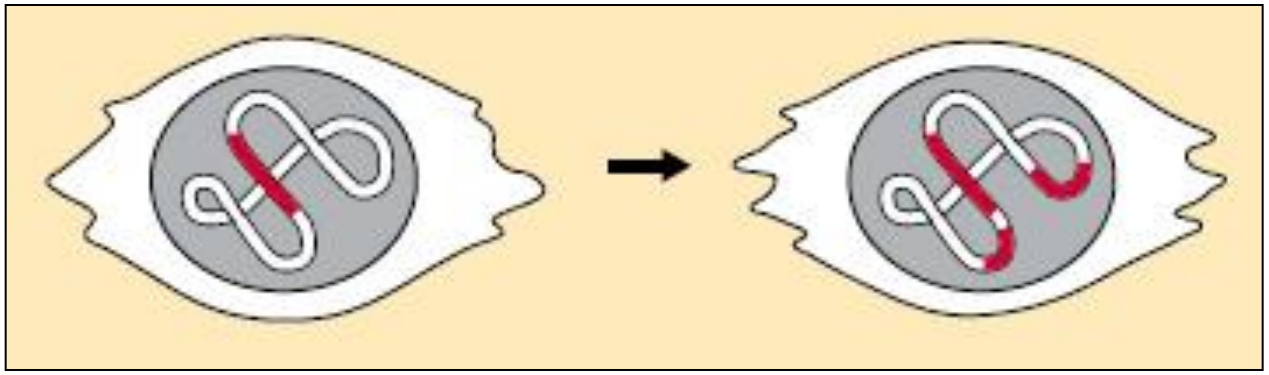
# Mechanism of activation of proto-oncogenes

- **Point mutations:**
  - The change in the single nucleotide sequence in codon 12 leads to a ras-oncogene mutation, which is found in many tumors.



# Mechanism of activation of proto-oncogenes

- **Amplification (increase in the number of copies of the gene):**
  - in neuroblastoma, significant N-myc amplification is detected.



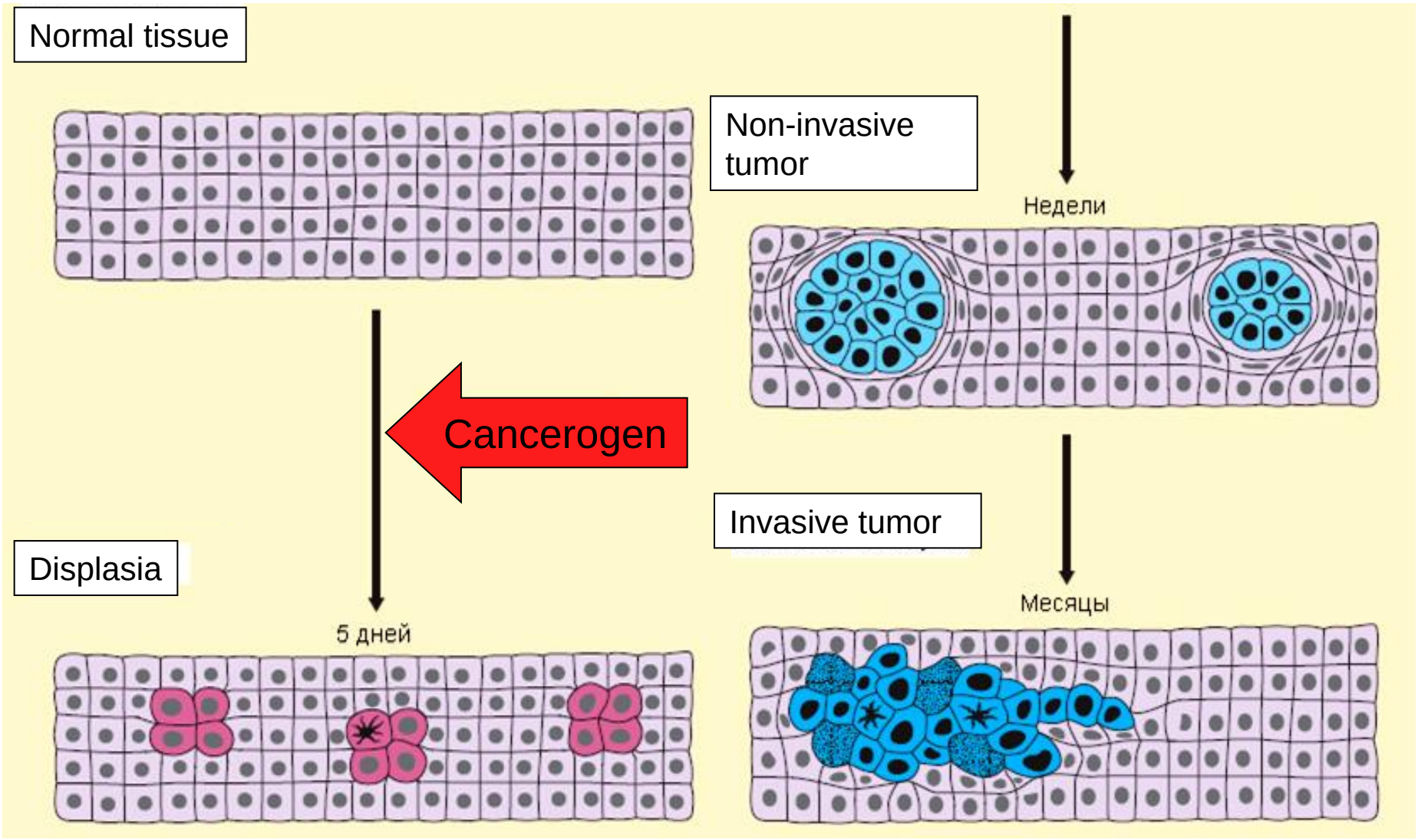
# Tumor morphogenesis

- **At the present time, two morphogenetic variants of tumor origin are allowed.**
- **1. Without previous changes - de novo ("off the bat").**
- **2. Tumor development through qualitatively distinct consecutive stages:**
  - Pre-tumors - hyperplasia and pre-tumorous dysplasia;
  - Non-invasive tumor (cancer in situ) - tumor growth in itself without destruction of the basement membrane and without the formation of stroma and vessels; the duration of the current can reach 10 years or more;
  - Invasive tumor growth;
  - Metastasis.

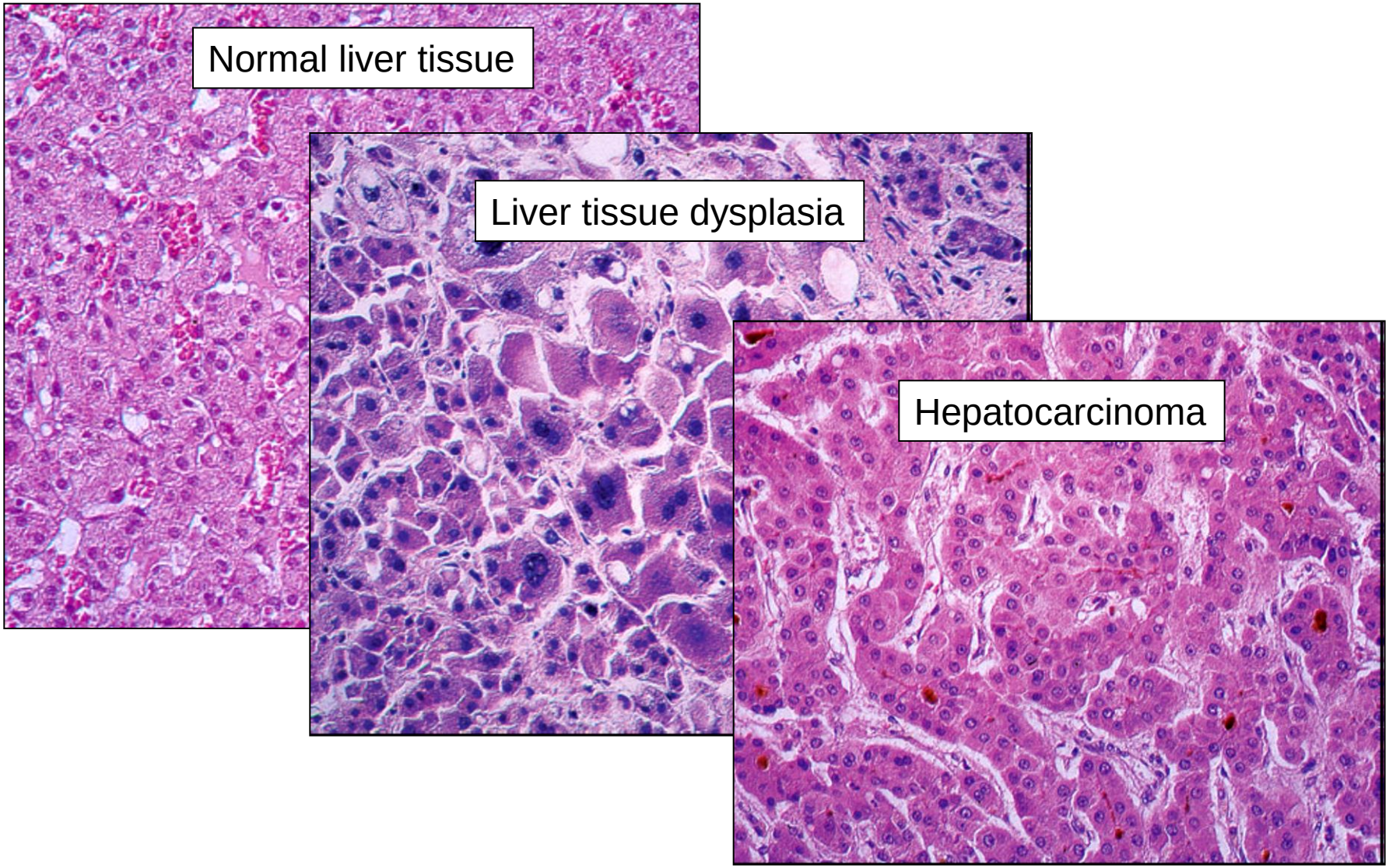
# Tumor morphogenesis

- **Some malignant tumors can also go through the stage of a benign tumor (for example, colon cancer, stomach cancer can develop from adenoma).**

# Tumor morphogenesis



# Tumor morphogenesis



# Pre-tumoral processes

- To the pre-tumoral processes are now referred to as dysplasia, which is characterized by the development of changes not only in the parenchymal but also in the stromal elements.
- Dysplasia of the epithelium was best studied.

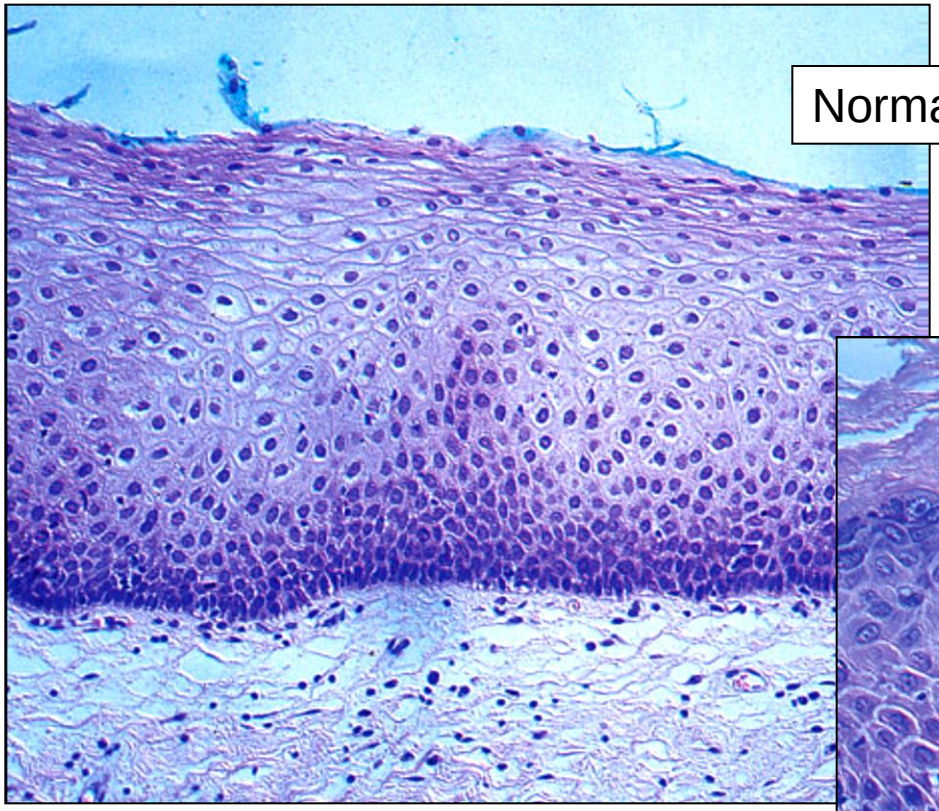
# Dysplasia of the epithelium

- **Dysplasia of the epithelium is characterized by a violation of proliferation and differentiation of the epithelium with the development of:**
  - Cell type atypia:
    - The different size and shape of the cells,
    - The increase in the size of the nuclei and their hyperchromia,
    - Accumulation of the number of mitoses and their atypia.
  - Violations of histoarchitectonics:
    - Loss of polarity of the epithelium,
    - The loss of histo- and organ specificity of the epithelium,
    - Thickening of the basement membrane,
    - Infringement of a parity of various components of a basal membrane.

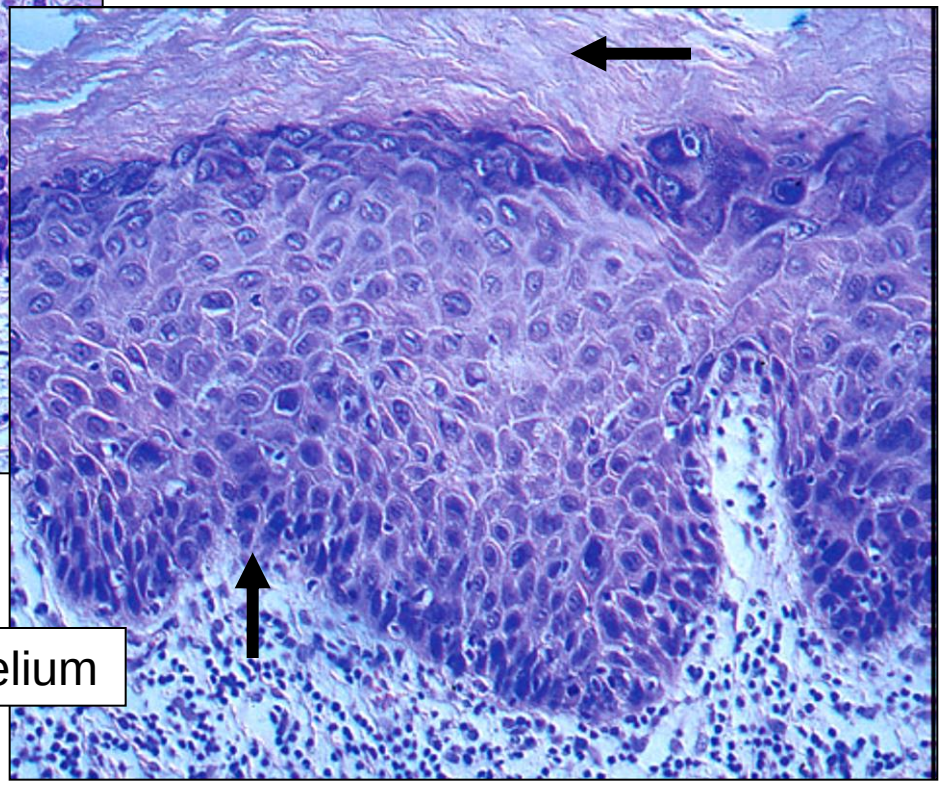
# Dysplasia of the epithelium

- At the stage of dysplasia, the methods of immunohistochemistry and molecular biology record the restructuring of oncoproteins, growth factors, integrin receptors and adhesion molecules in the work.
- Genetic rearrangements can significantly outstrip morphological and serve as an early method for diagnosing pre-cancer conditions.
- Dysplasia is a reversible process.
- There are 3 degrees of epithelial dysplasia: mild, moderate, severe.
- In severe dysplasia, there is a significant increase in the risk of a malignant tumor.
- Heavy dysplasia is difficult to distinguish from carcinoma in situ.

# Epitelium dysplasia



Normal cervical epithelium



Dysplasia of the cervical epithelium

# Tumor properties

- **The main properties of the tumor:**
  - Autonomous growth,
  - Atypism,
  - Tumor progression,
  - Invasion,
  - Metastasis,
  - Secondary changes.

# Autonomous growth

- **Autonomous growth is growth, independent of the regulatory mechanisms of the body.**
- Thus, the autonomy of a tumor should be understood not as the complete independence of tumor cells from the body, but as the acquisition of the ability of tumor cells to self-management.

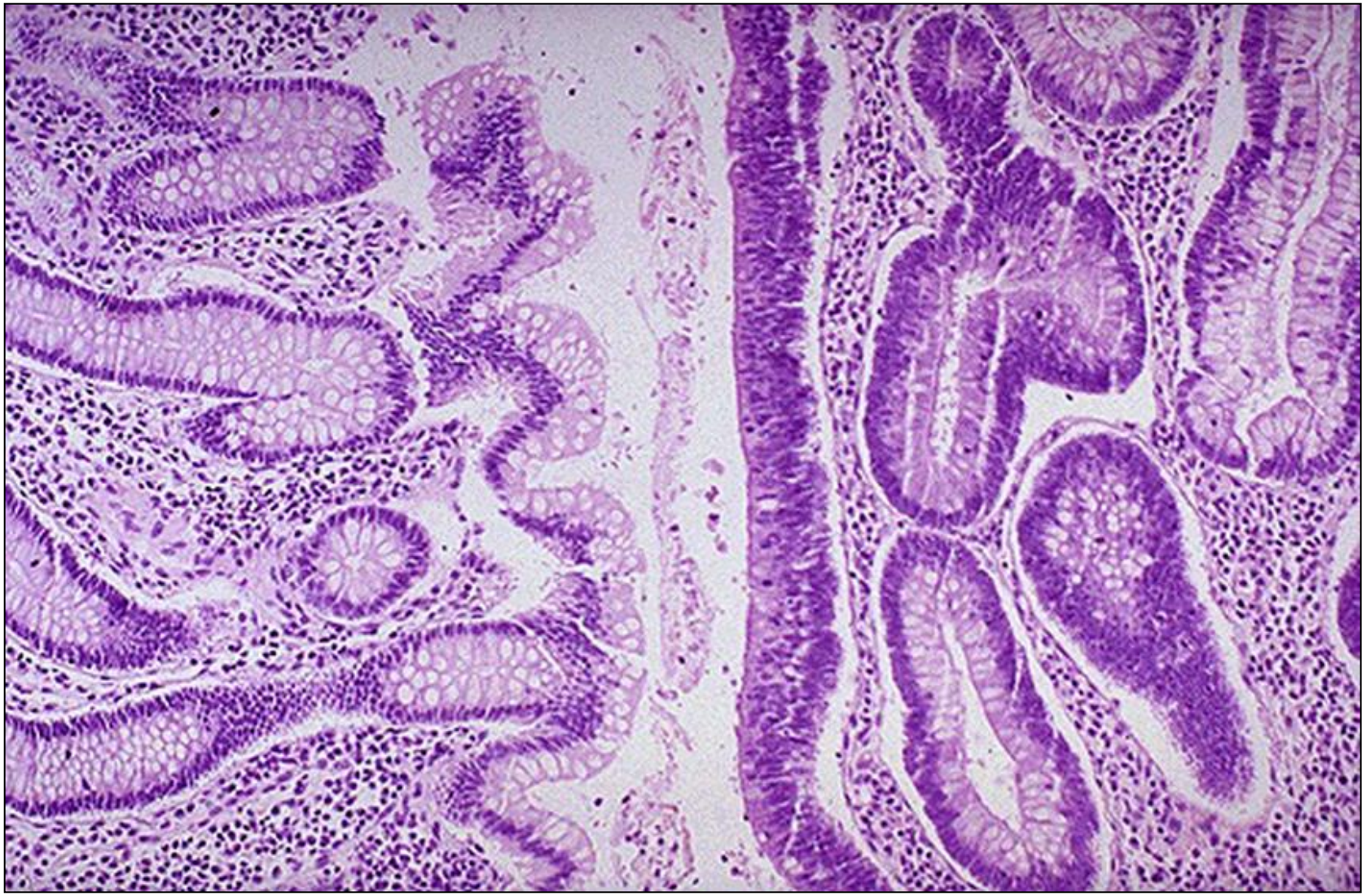
# Atypism

- **Atypism is a deviation from the norm.**
- **There are following types of atypism:**
  - Morphological,
  - Biochemical,
  - Antigenic,
- **Functional.**

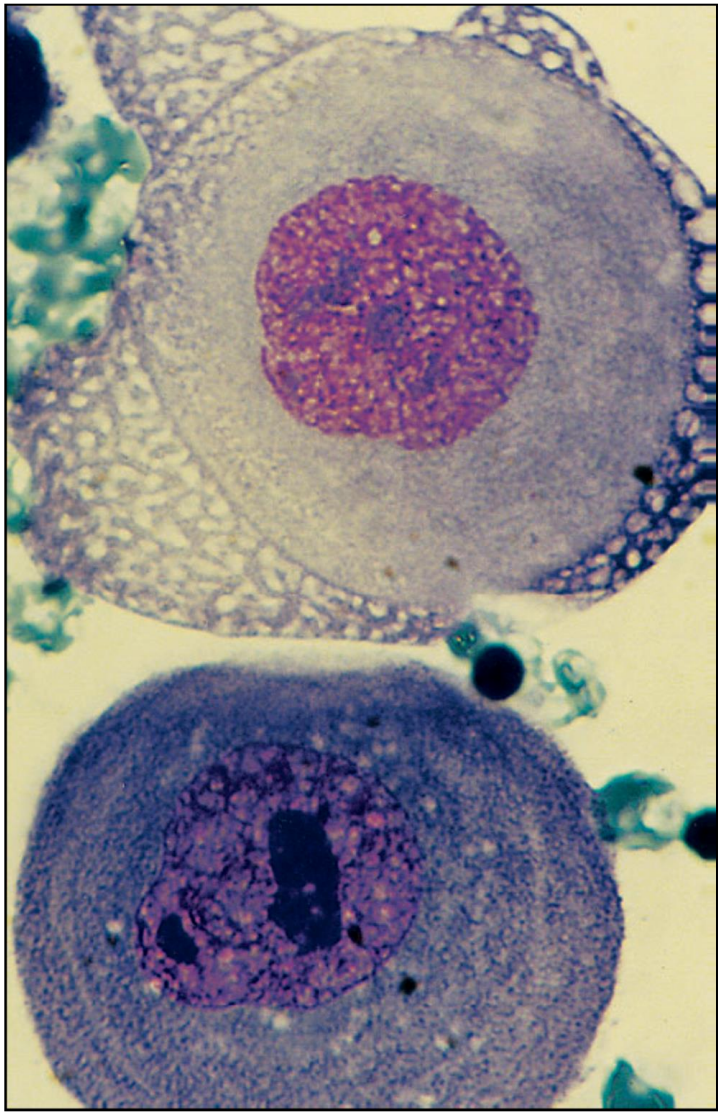
# Morphological atypism

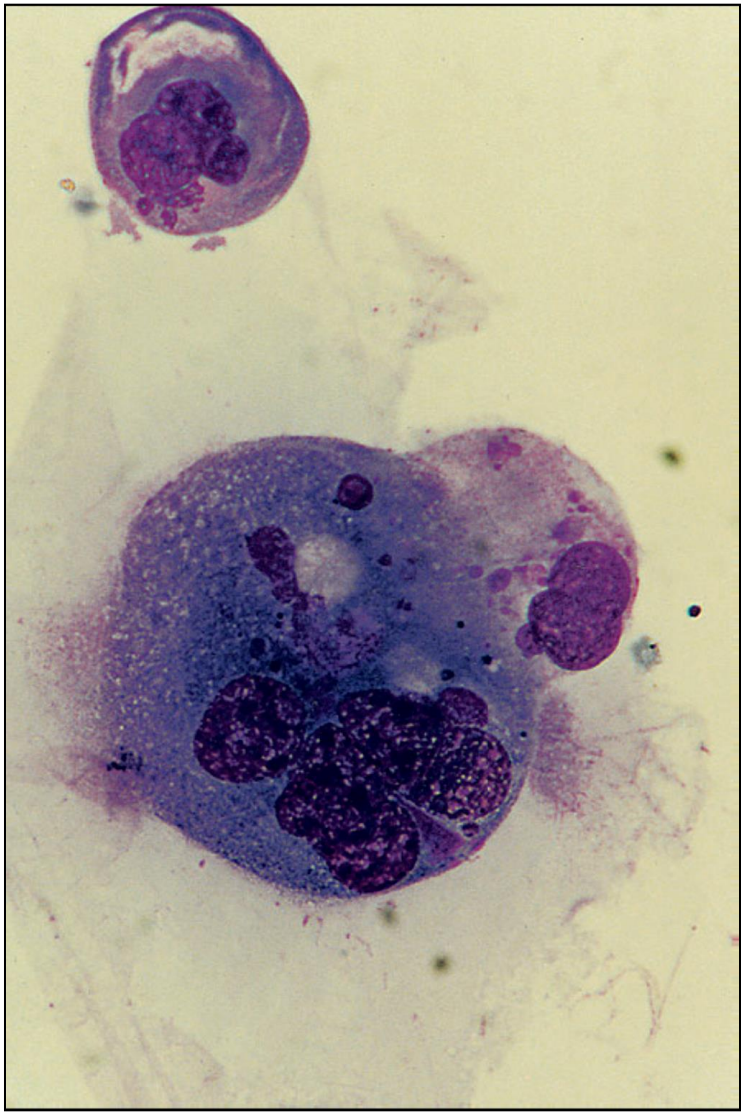
- **There are 2 types of morphological atypism.**
  - Tissue atypism:
    - The violation of parenchyma and stroma ratio,
    - Change in the size and shape of tissue structures.
  - Cellular atypism:
    - Polymorphism (different form and magnitude) of cells and nuclei,
    - The increase in the nuclear-cytoplasmic ratio,
    - An increase in the amount of DNA, often aneuploidy (odd number of chromosomes),
    - Hyperchromy of nuclei,
    - The appearance of large nucleoli,
    - Increased number of mitoses, abnormal mitoses.

# Morphological atypism

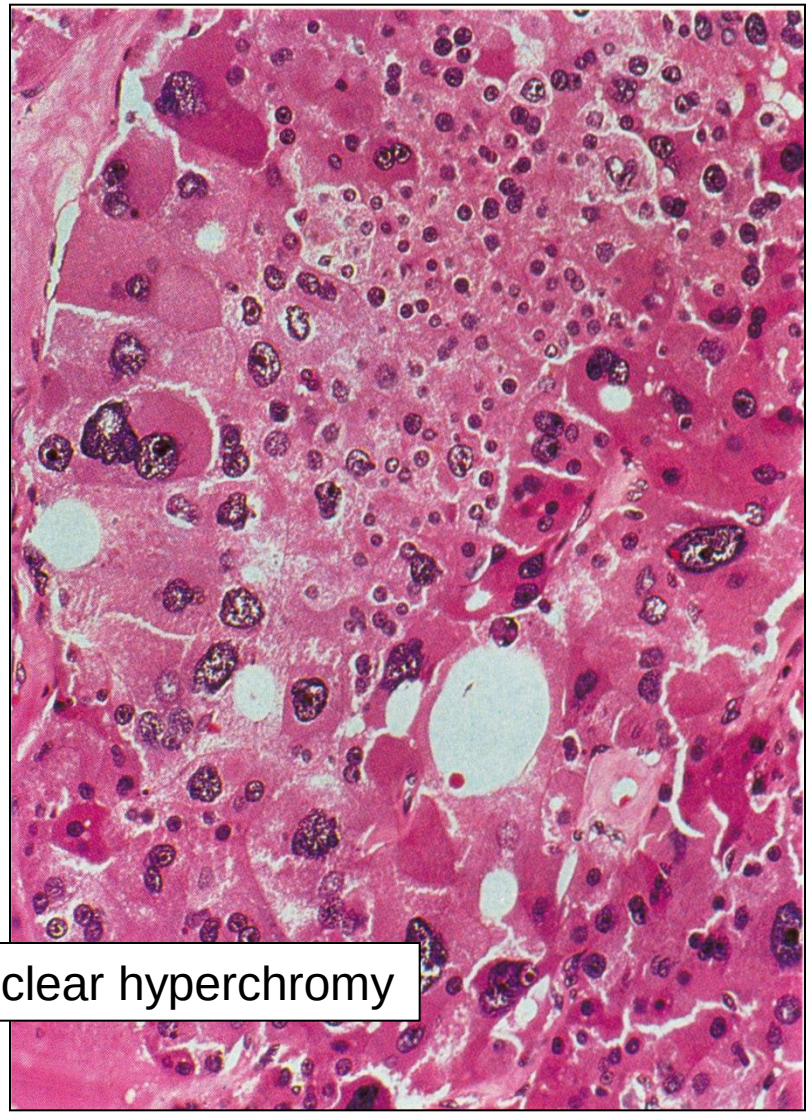


# Cellular atypism

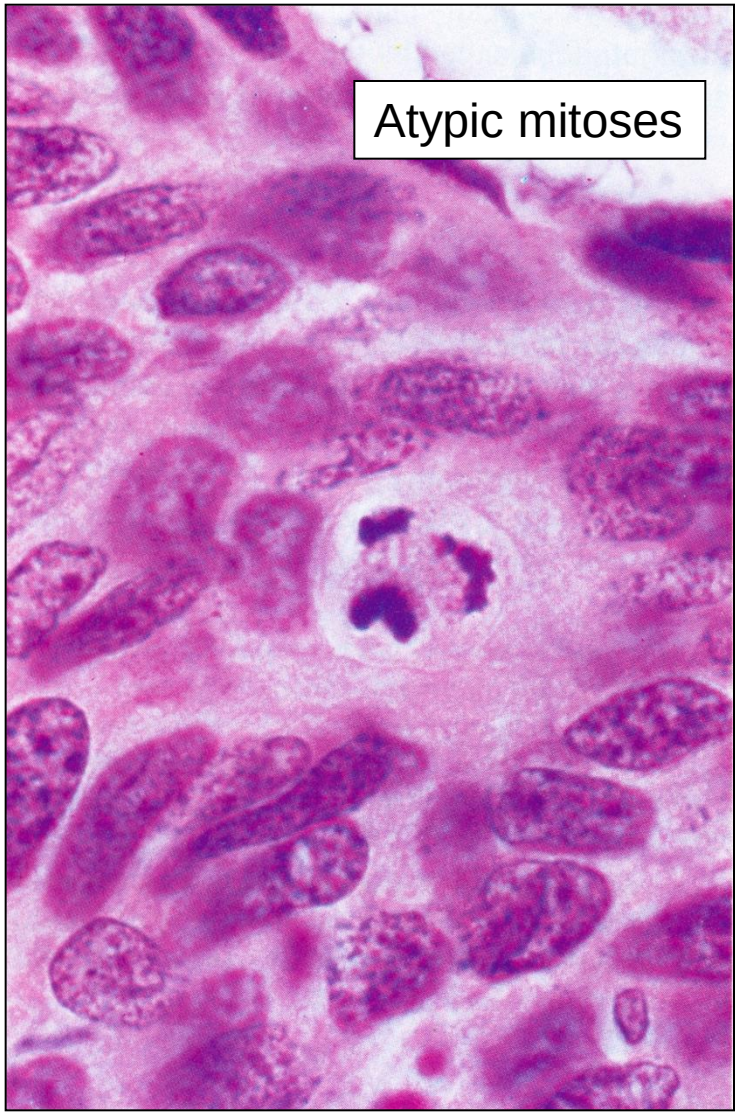




# Cellular atypism



Nuclear hyperchromy



Atypic mitoses

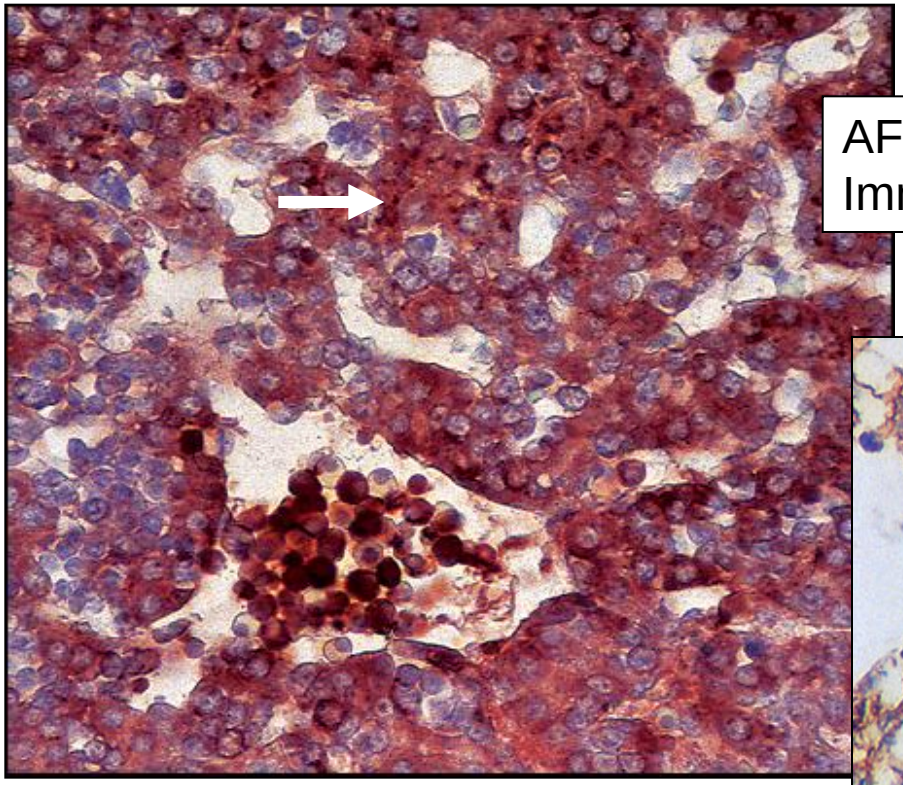
# Biochemical atypism

- **Biochemical atypism:**
  - Change in metabolism,
  - Deviations from normal metabolism, detected using histochemical methods, are called histochemical atypism.

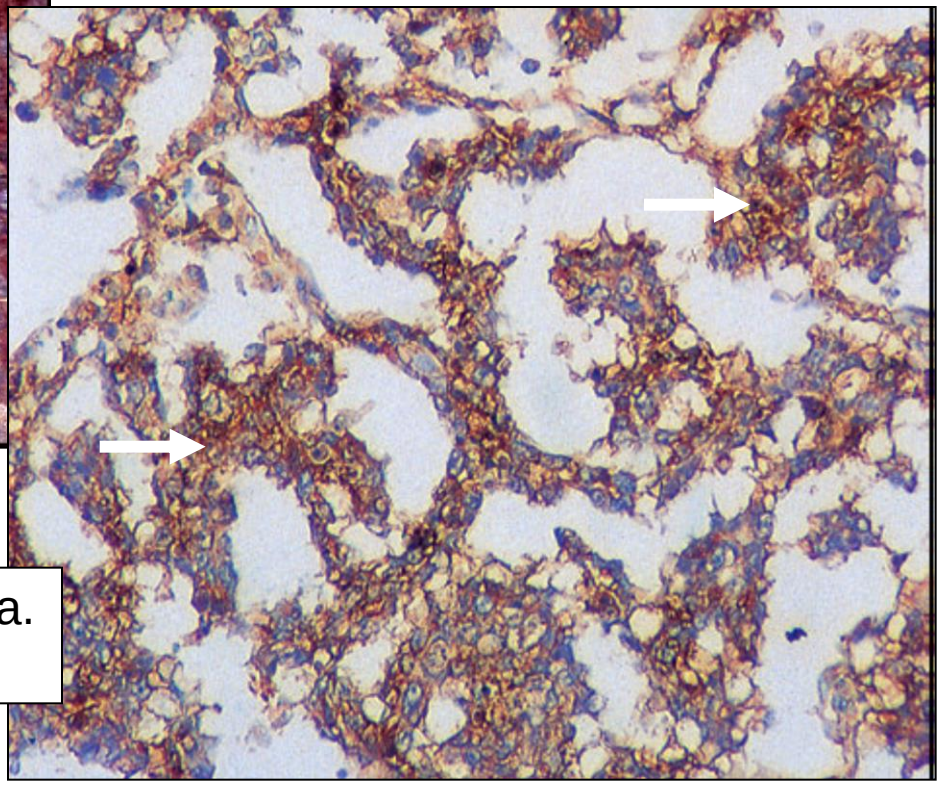
# Antigenic atypism

- **In tumor cells, there can be 5 types of antigens:**
  - Antigens of tumors associated with viruses,
  - Antigens of tumors associated with carcinogens,
  - Isoantigens of transplant type - tumor-specific antigens,
  - Oncofetal (embryonic) antigens:
    - Carcinoembryonic antigen (more often detected in colorectal carcinomas),
    - α-Fetoprotein (determined in hepatocellular carcinoma and germinogenic tumors).
  - Heteroorganic antigens.

# α-Fetoprotein

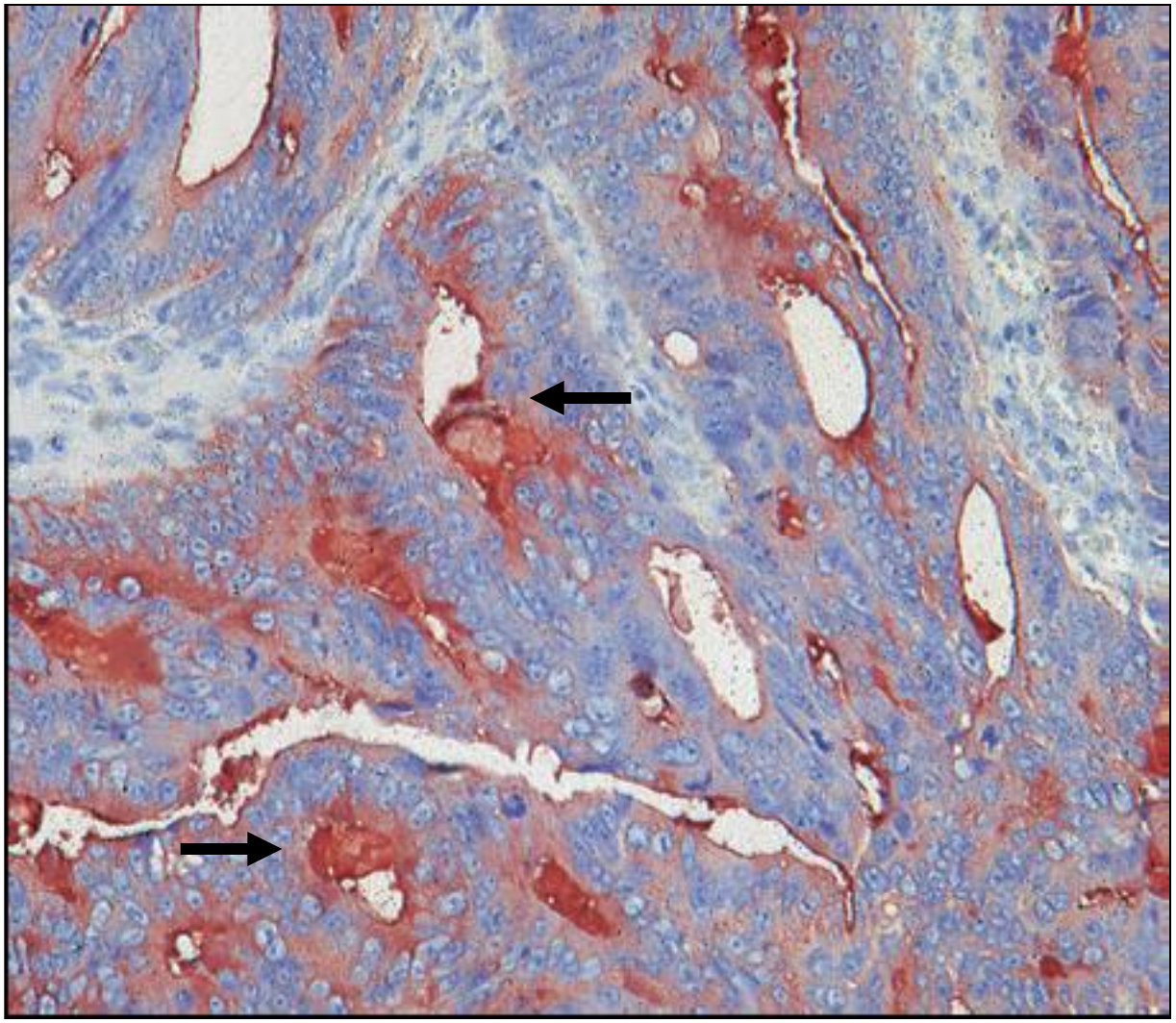


AFP in the cells of the embryo liver.
Immunohistochemistry



AFP in hepatocellular carcinoma.
Immunohistochemistry

# Carcinoembryonic antigen (colon cancer)



# Functional atypism

- **Functional atypism - decrease or disappearance of the function inherent in mature tissue.**

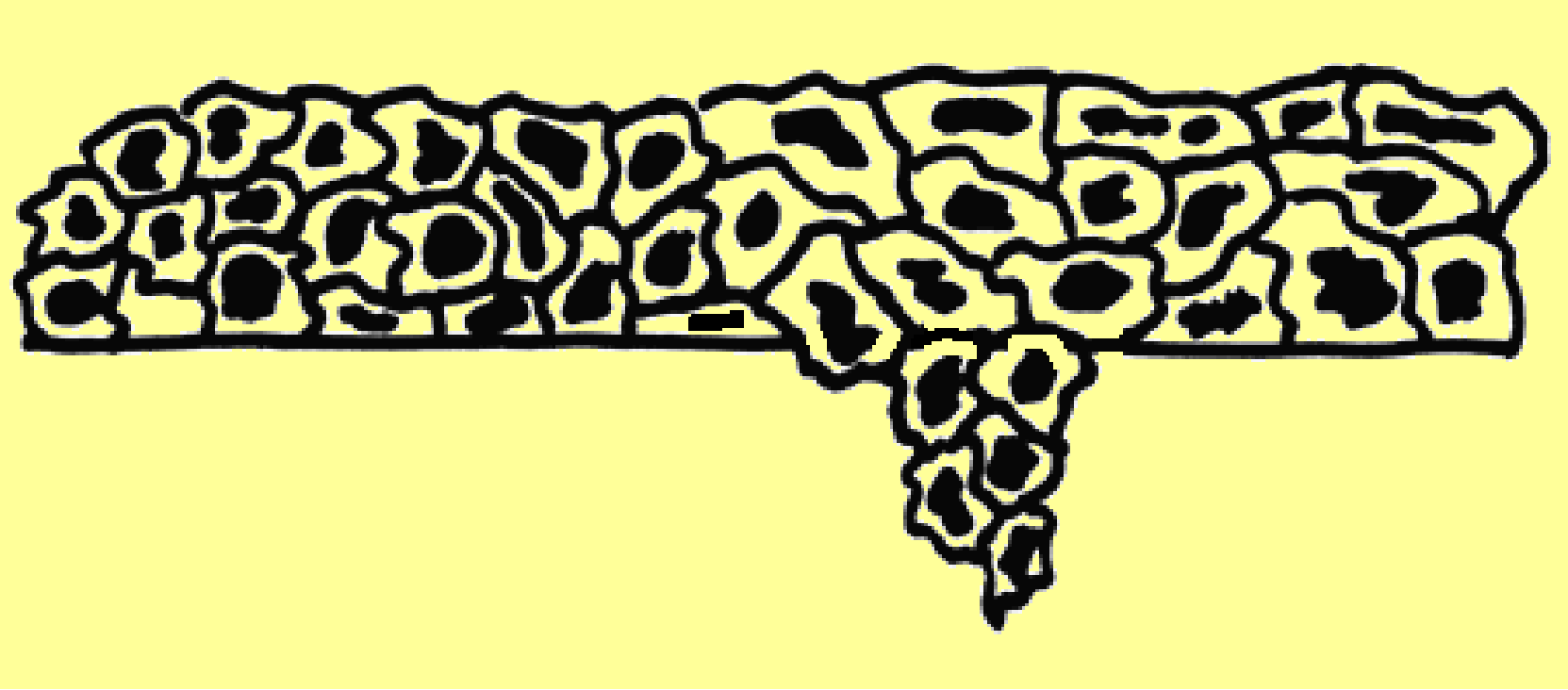
# Tumor progression

- The theory of tumor progression was developed by L. Foulds (1969) on the basis of experimental oncology data.
- Tumor progression (clonal evolution):
  - Most tumors develop from one cell, i.e. are initially monoclinic.
  - As the tumor grows, the tumor becomes heterogeneous: subclones of cells appear that have new properties, in particular, the ability to invade and metastasize.
  - As a rule, the selection of newly emerging clones leads to a greater malignancy of the tumor.

# Invasion

- **Invasion is characterized by infiltrating tumor growth, i.e. the ability to spread into surrounding tissues and blood vessels.**
- **Is carried out due to:**
  - Loss of contact inhibition (continued growth when in contact with other cells);
  - Decreased expression of adhesive molecules, resulting in tumor cells growing separately from each other without forming complexes;
  - Changes in receptors to the components of the extracellular matrix (an increase in the expression of receptors for laminin promotes the penetration of tumor cells into the basal membrane);
  - Isolation of cellular proteases (collagenase, elastase), destroying the extracellular matrix.

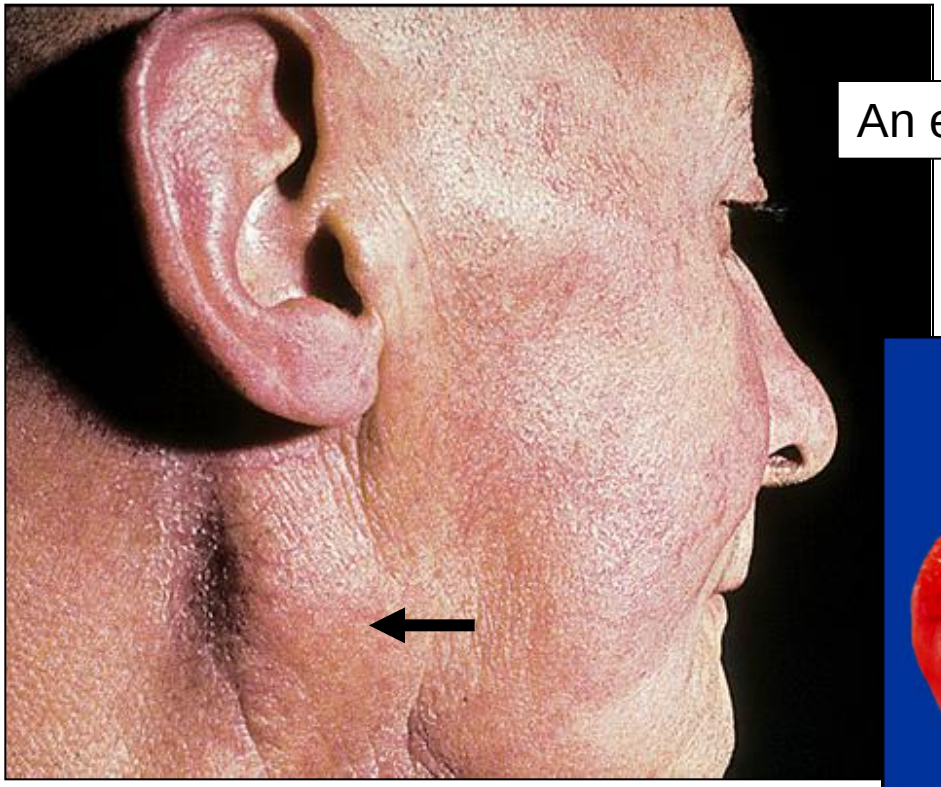
# Invasion



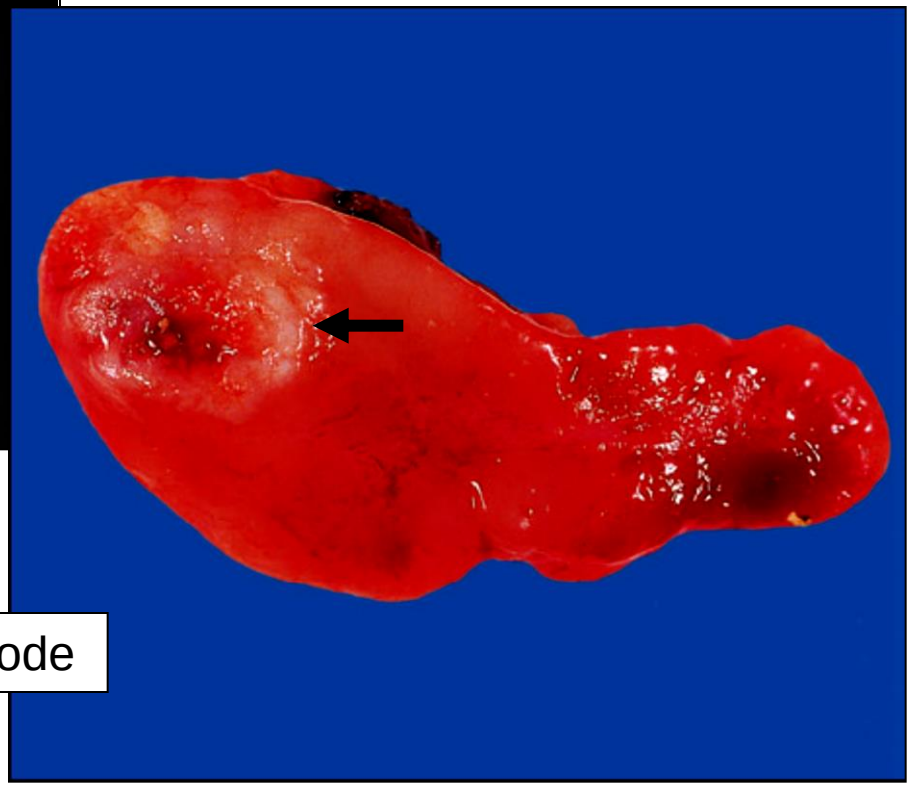
# Metastasis

- **Metastasis is the spread of tumor cells from the primary tumor to other organs with the formation of secondary tumor nodes - metastases.**
- **It is carried out in various ways:**
  - Lymphogenically,
  - Hematogenous,
  - Implantation (more often on serous membranes with tumor germination into serous cavities),
  - Perineural (in the central nervous system for the current of the cerebrospinal fluid).

# Lymphogenous metastasis

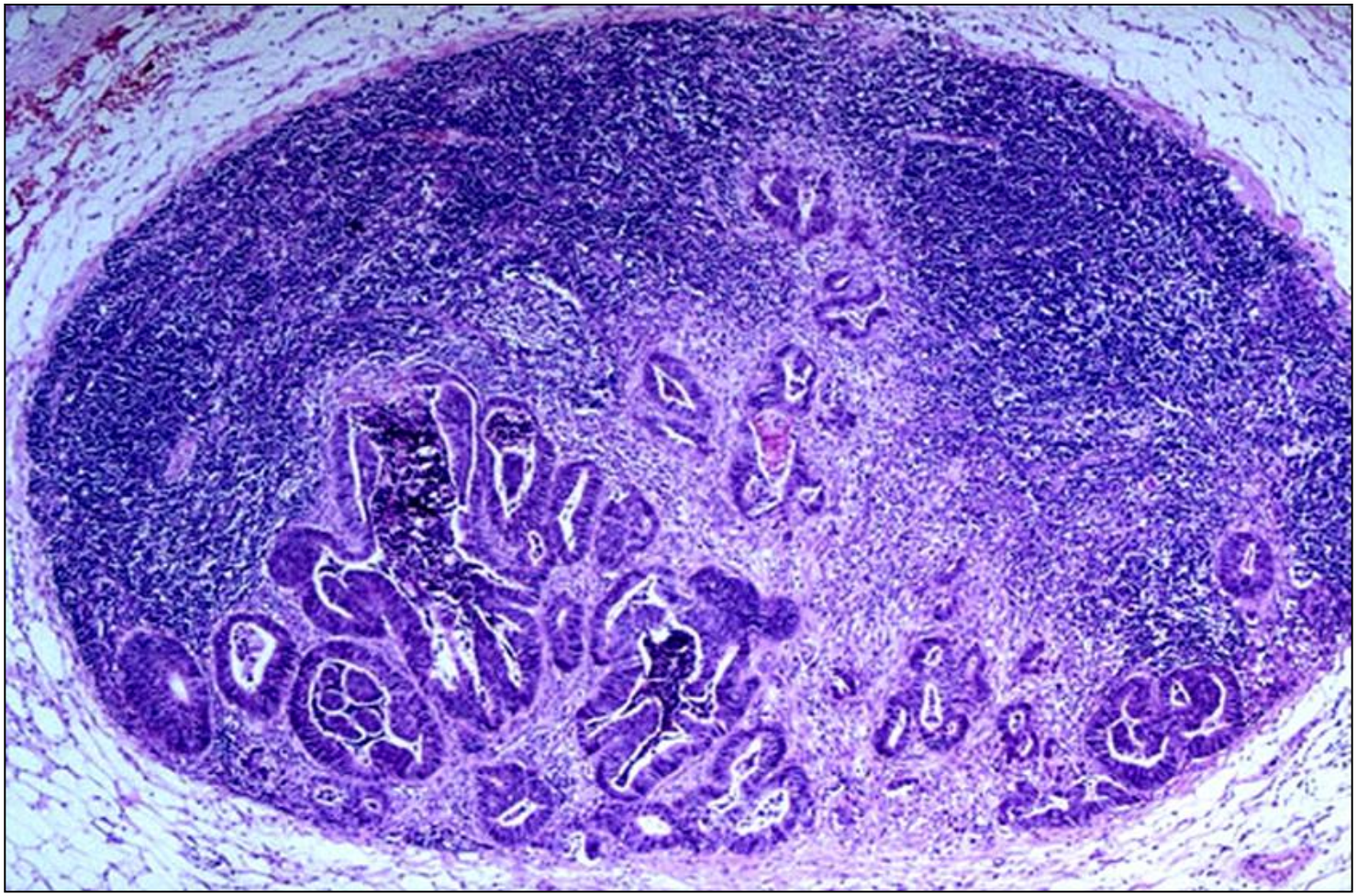


An enlarged submandibular lymph node

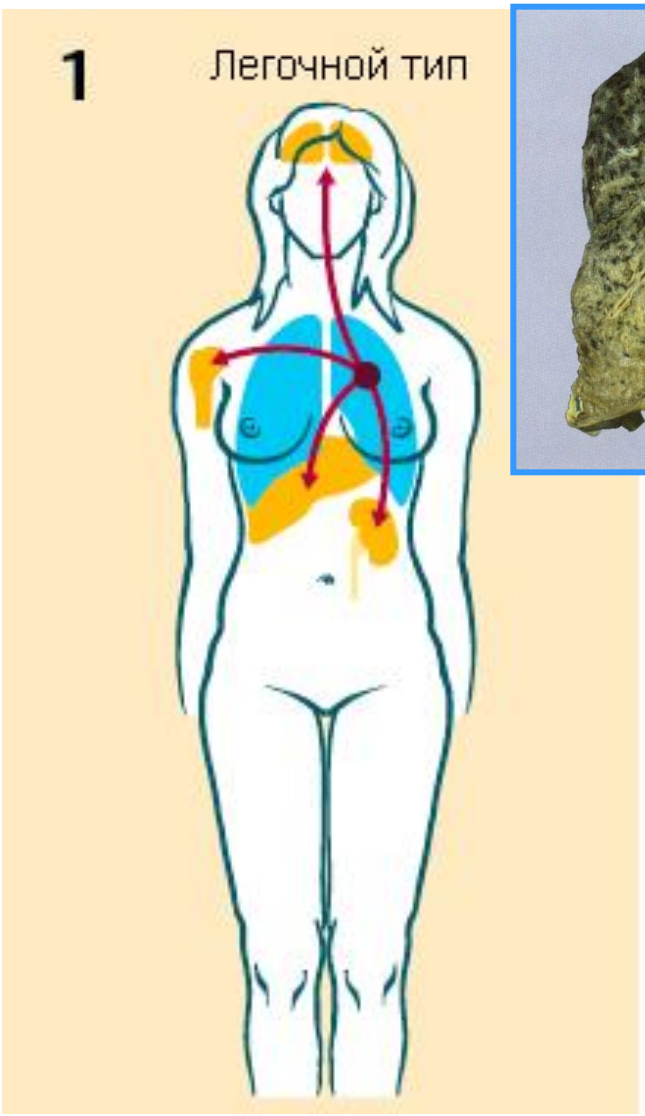


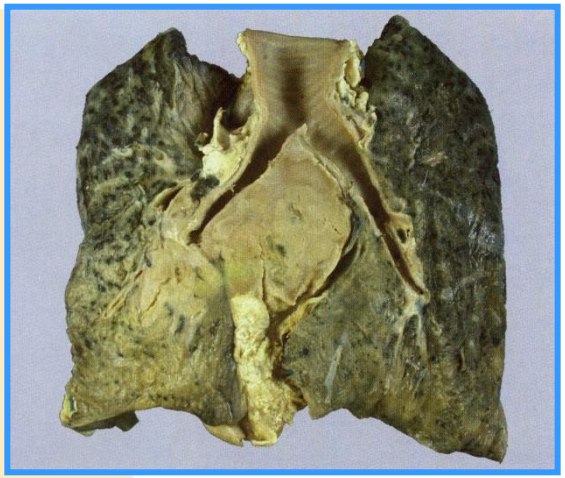
Metastasis of cancer in the lymph node

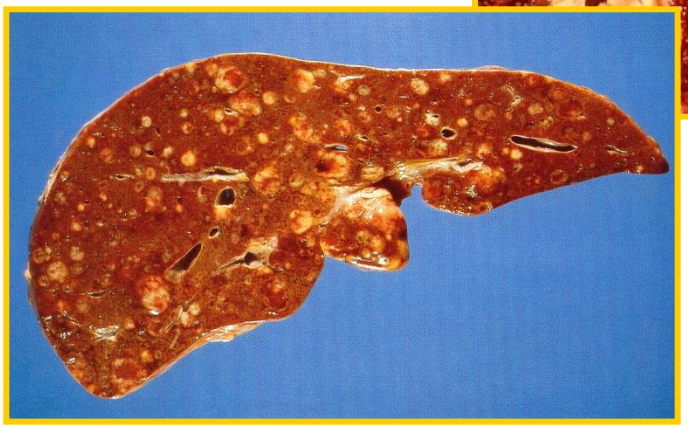
# Tumor cells (adenocarcinoma) in the lymphatic vessel

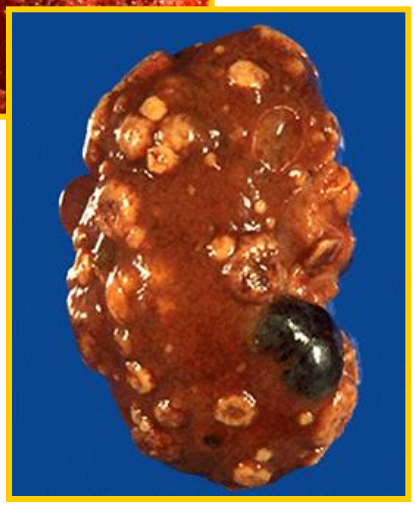


# Types of hematogenous metastasis







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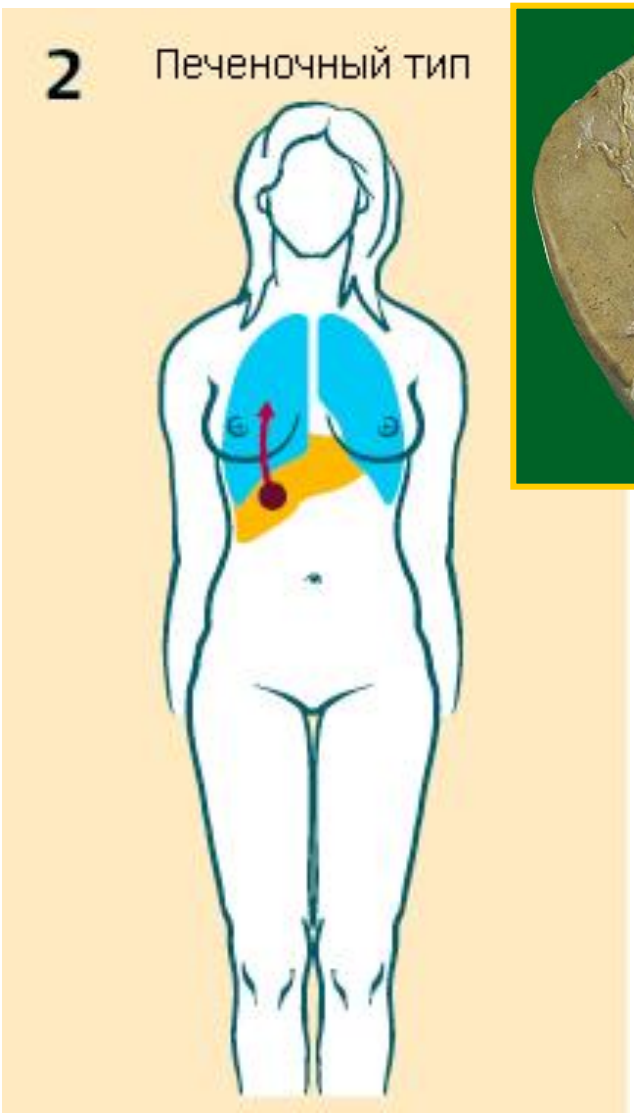


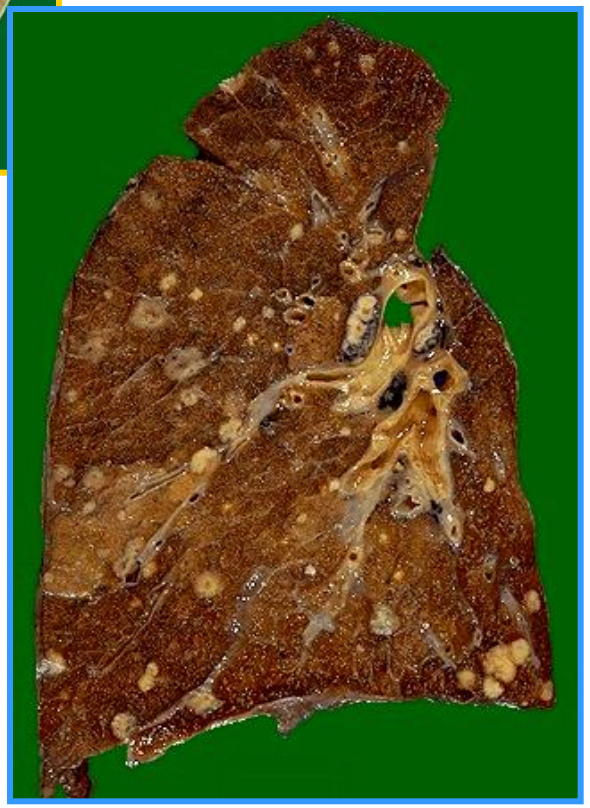

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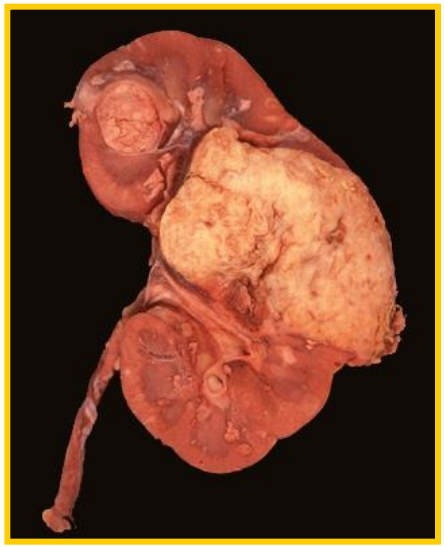
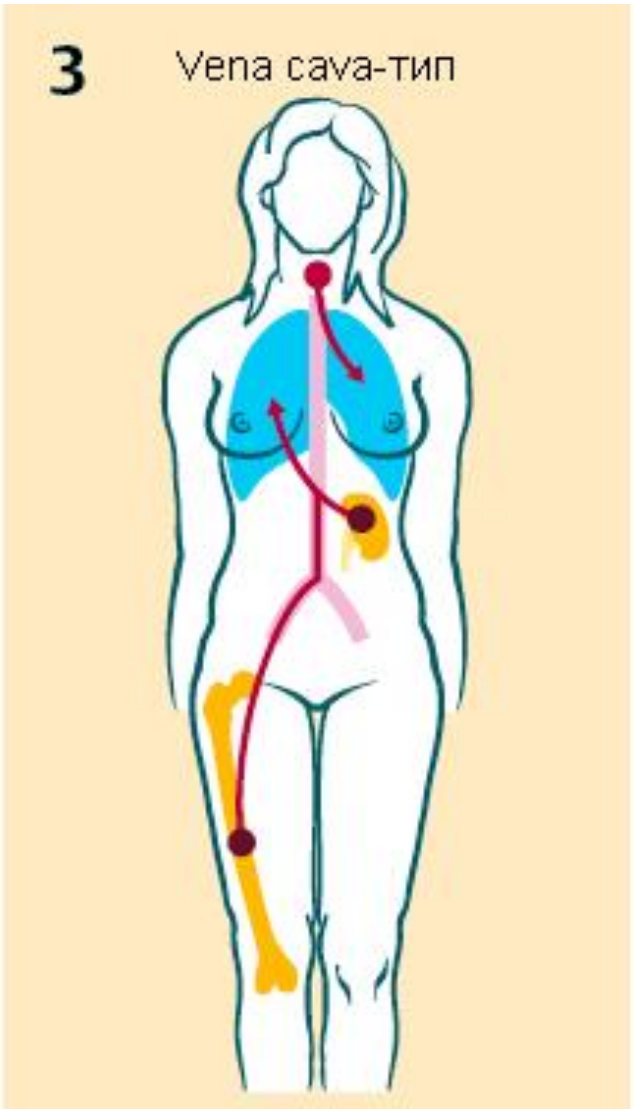
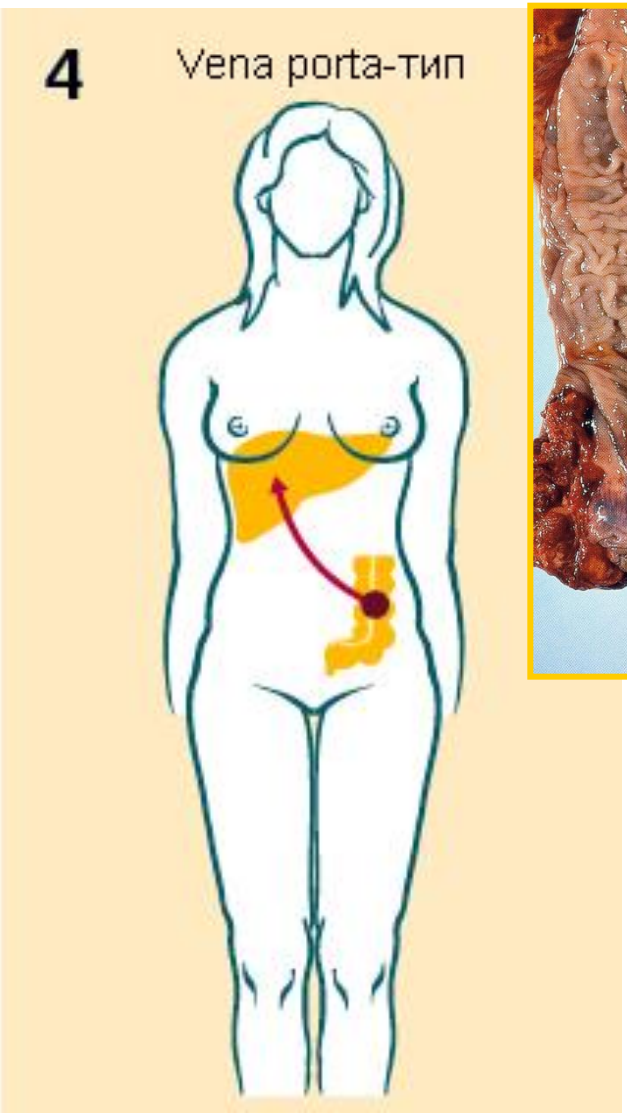
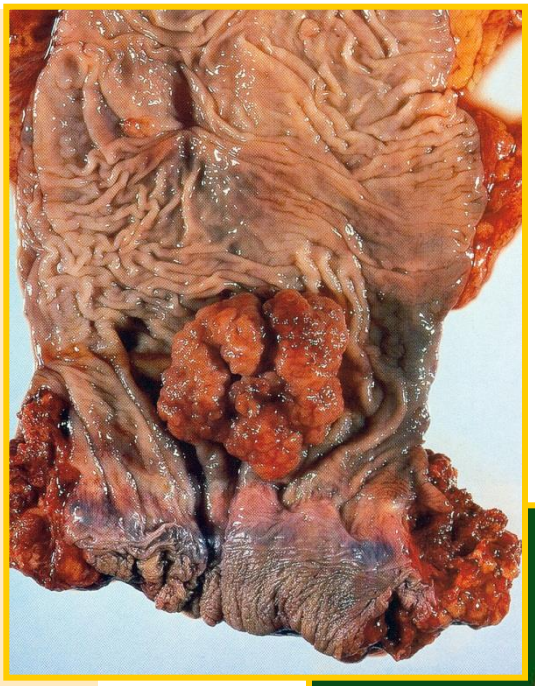


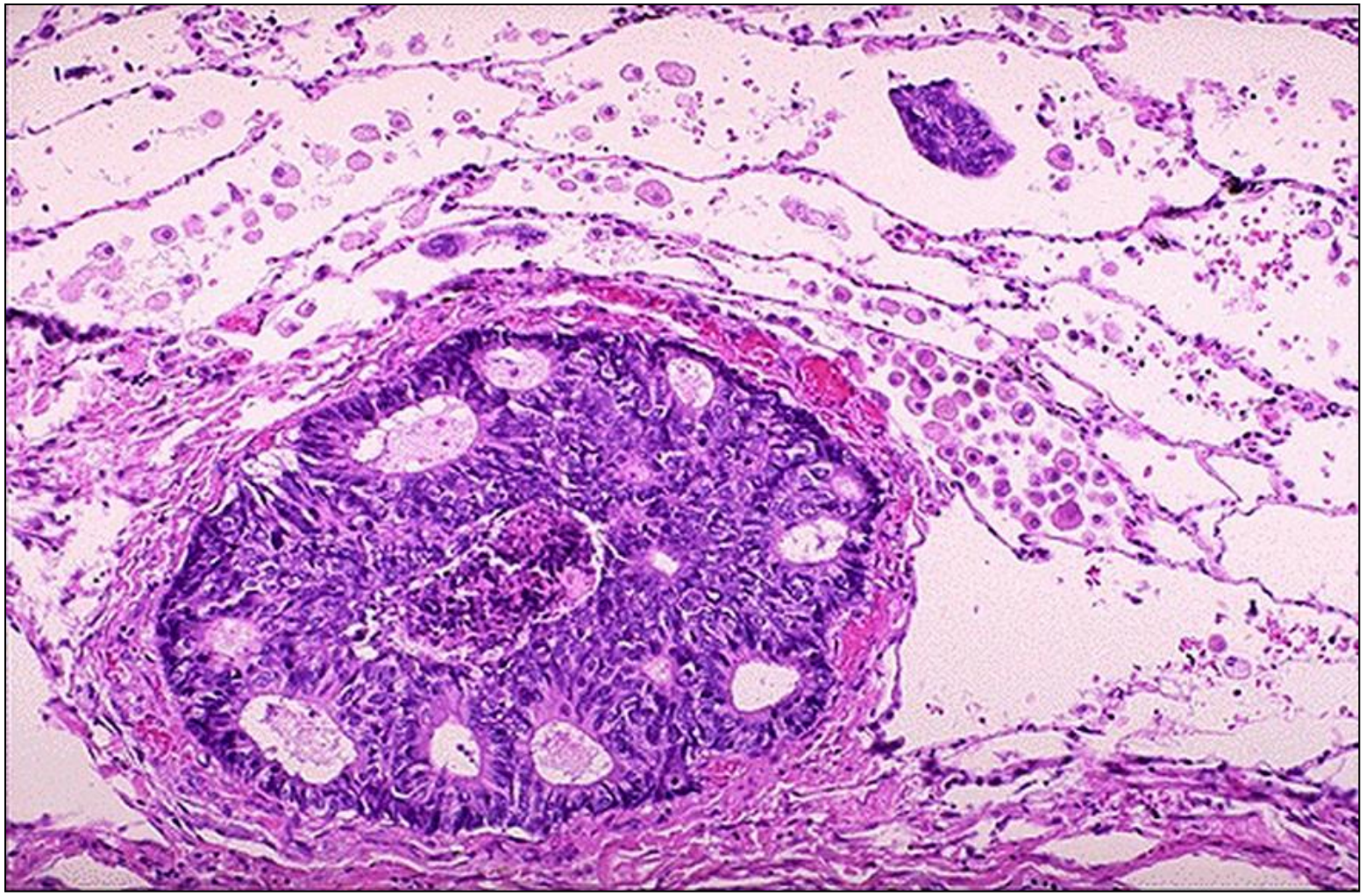



# Types of hematogenous metastasis

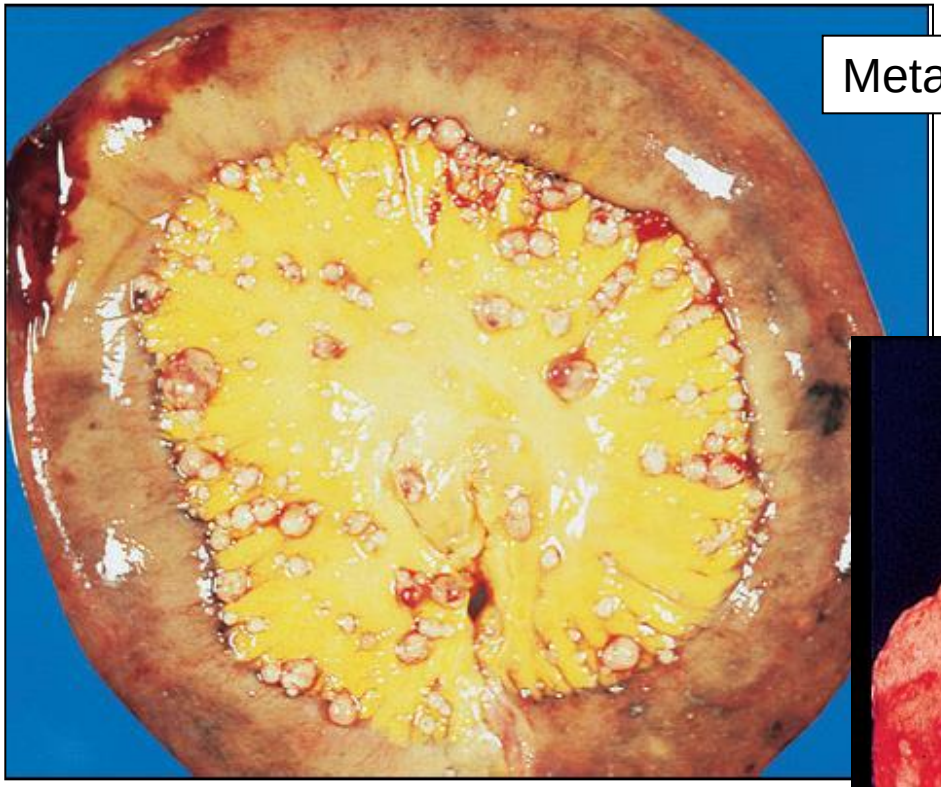


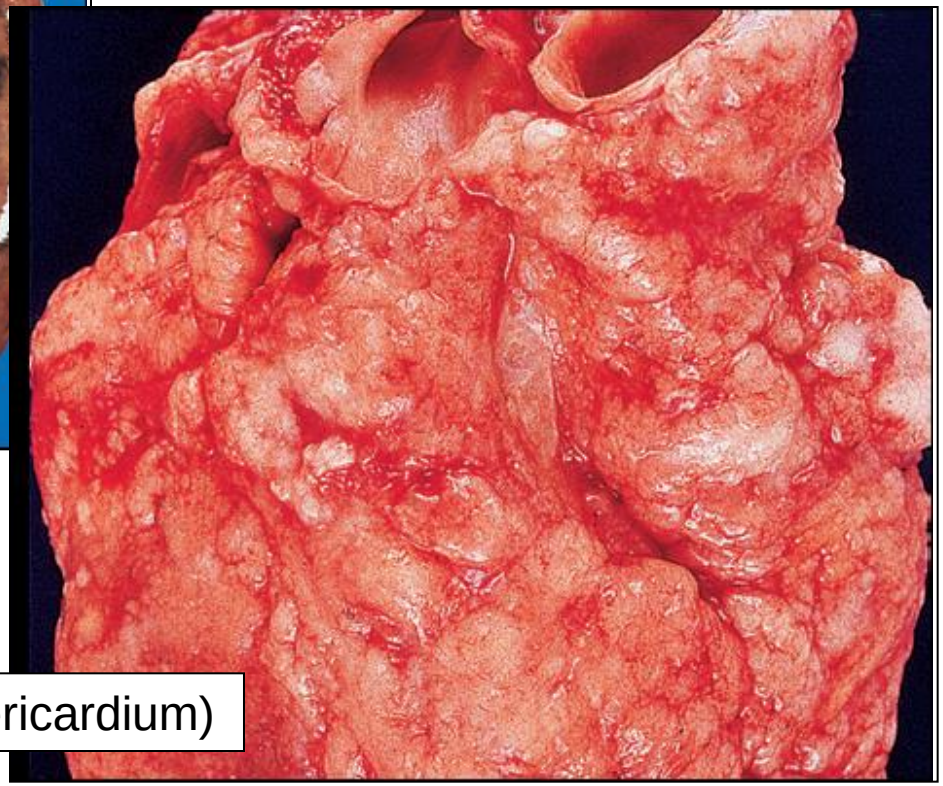
# Tumor cells (adenocarcinoma) in a blood vessel (vein)



# Implantation metastases



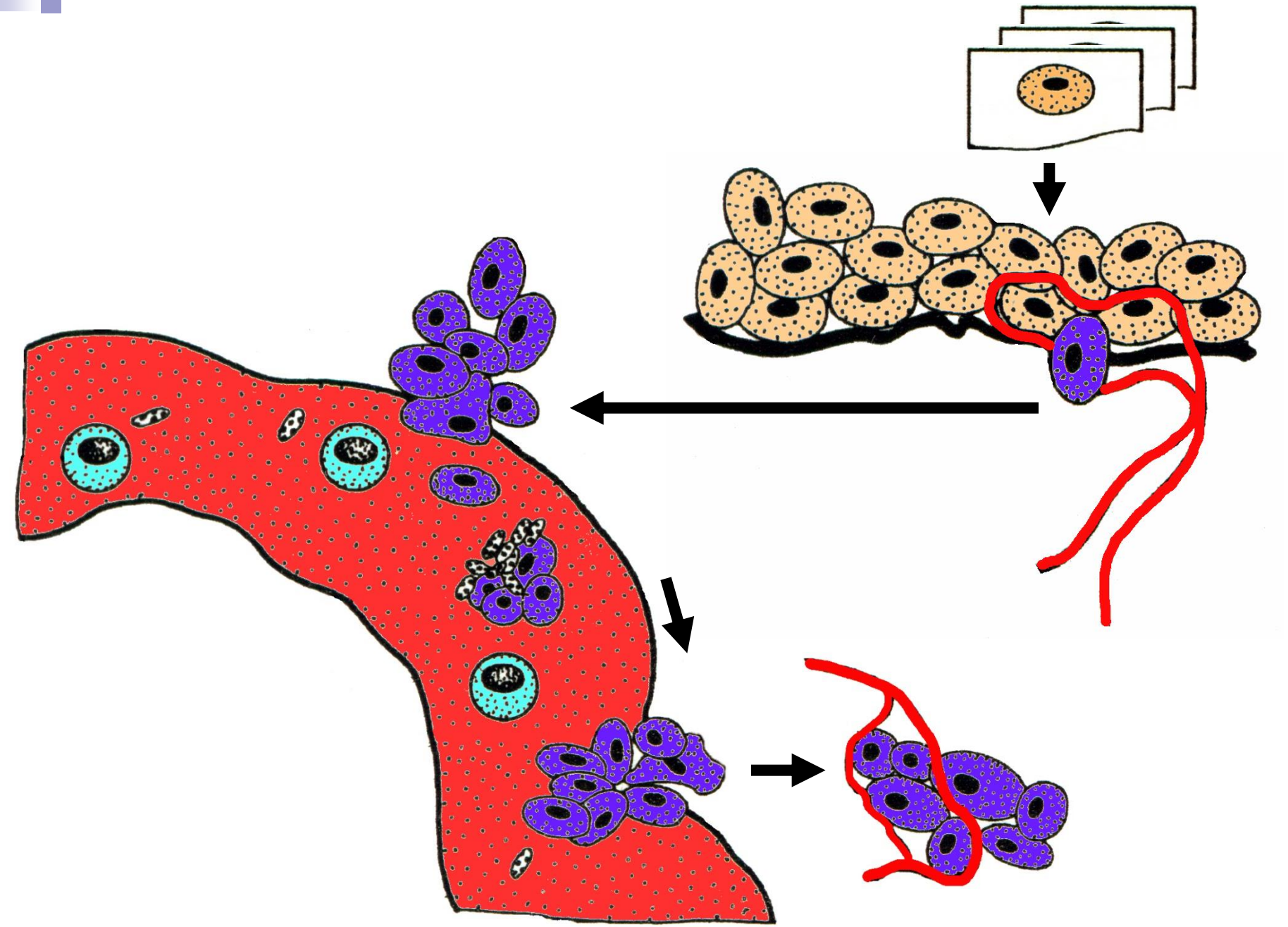
Metastasis of colorectal cancer (peritoneum)



Metastasis of uterine cancer (pericardium)

# Metastasis

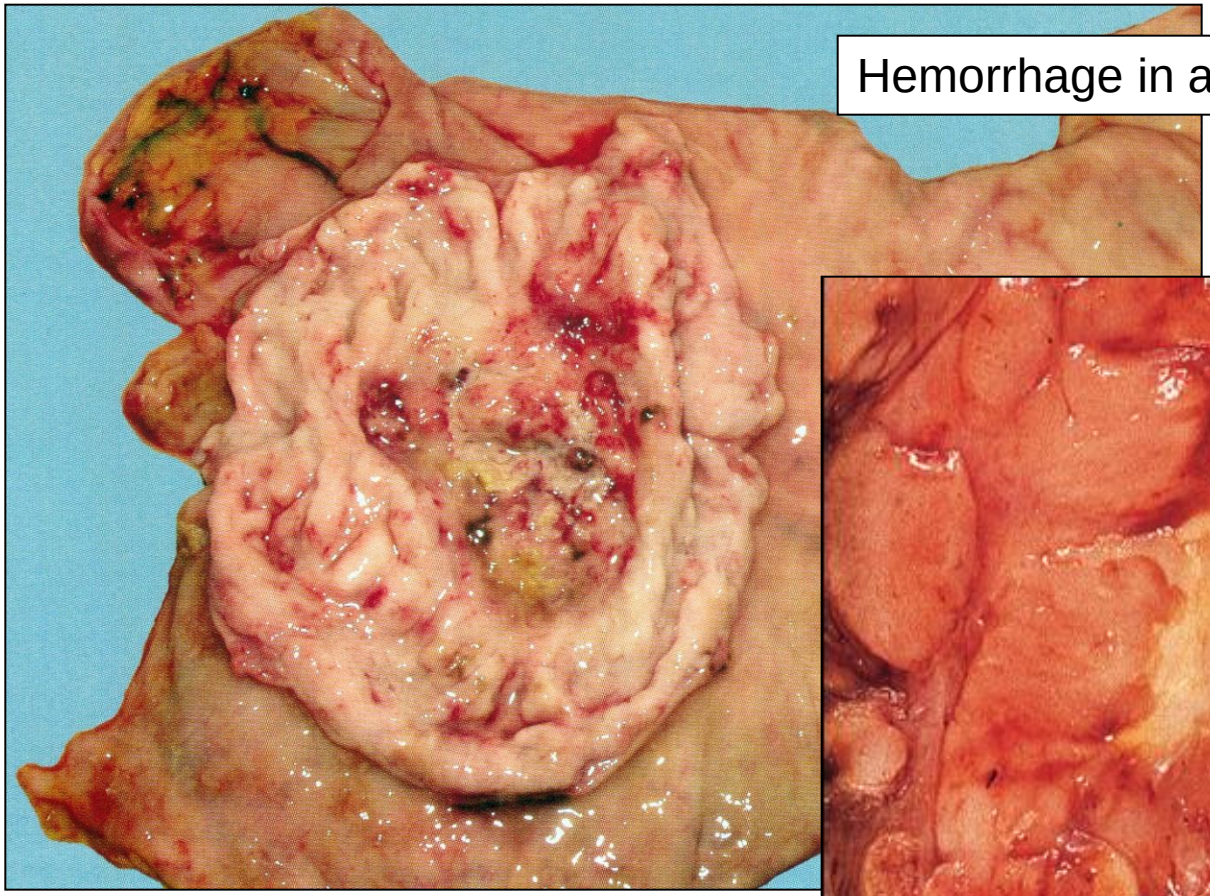
- **Metastasis is a multistage process (metastatic cascade), consisting of the following stages:**
  - Growth and vascularization of the primary tumor (tumors less than 0.1 - 0.2 cm do not own vessels), the appearance of a tumor subclone capable of metastasizing;
  - Invasion into the lumen of the vessel (intravasation);
  - Circulation and survival of the tumor embolus in the bloodstream (lymph flow);
  - Attachment to the wall of the vessel in a new place and exit into the tissue (extravasation); is carried out by means of receptor mechanisms;
  - Overcoming tissue protective mechanisms and formation of a secondary tumor.



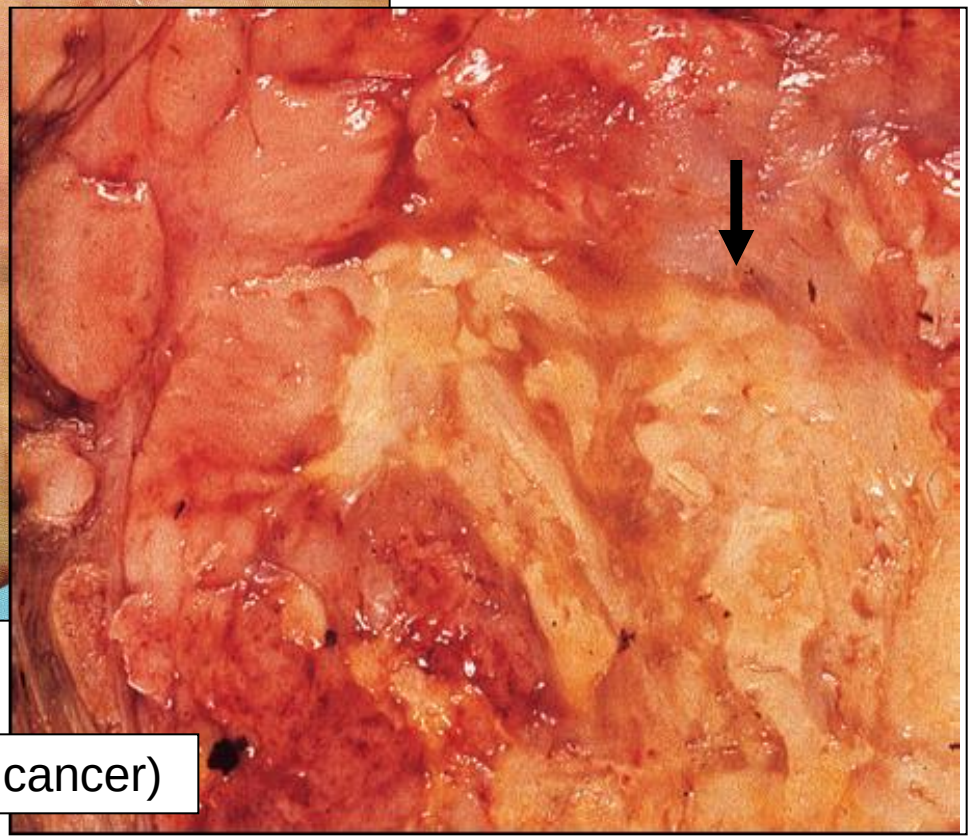
# Secondary changes in the tumor

- **Foci of necrosis and apoptosis:**
  - are associated with the effect of immune defense factors, cytokines, particularly TNF, ischemia in poorly vascularized tumors.
- **Hemorrhages:**
  - are associated with imperfect angiogenesis in tumors and invasive growth.
- **Mucilagination**
- **Calx deposits (petrification).**

# Secondary changes in the tumor



Hemorrhage in a tumor (stomach cancer)



Necrosis of tumor node (endometrial cancer)

# Recurrent tumors

- Tumor recurrence is the appearance of a tumor in its original place after surgical removal or radiation treatment.
- A recurrent tumor develops from the remaining tumor cells or an undeveloped tumor field.
- The most dangerous period in terms of recurrence is the first year after removal of the tumor, then the frequency of recurrence decreases.

# Tumor growth

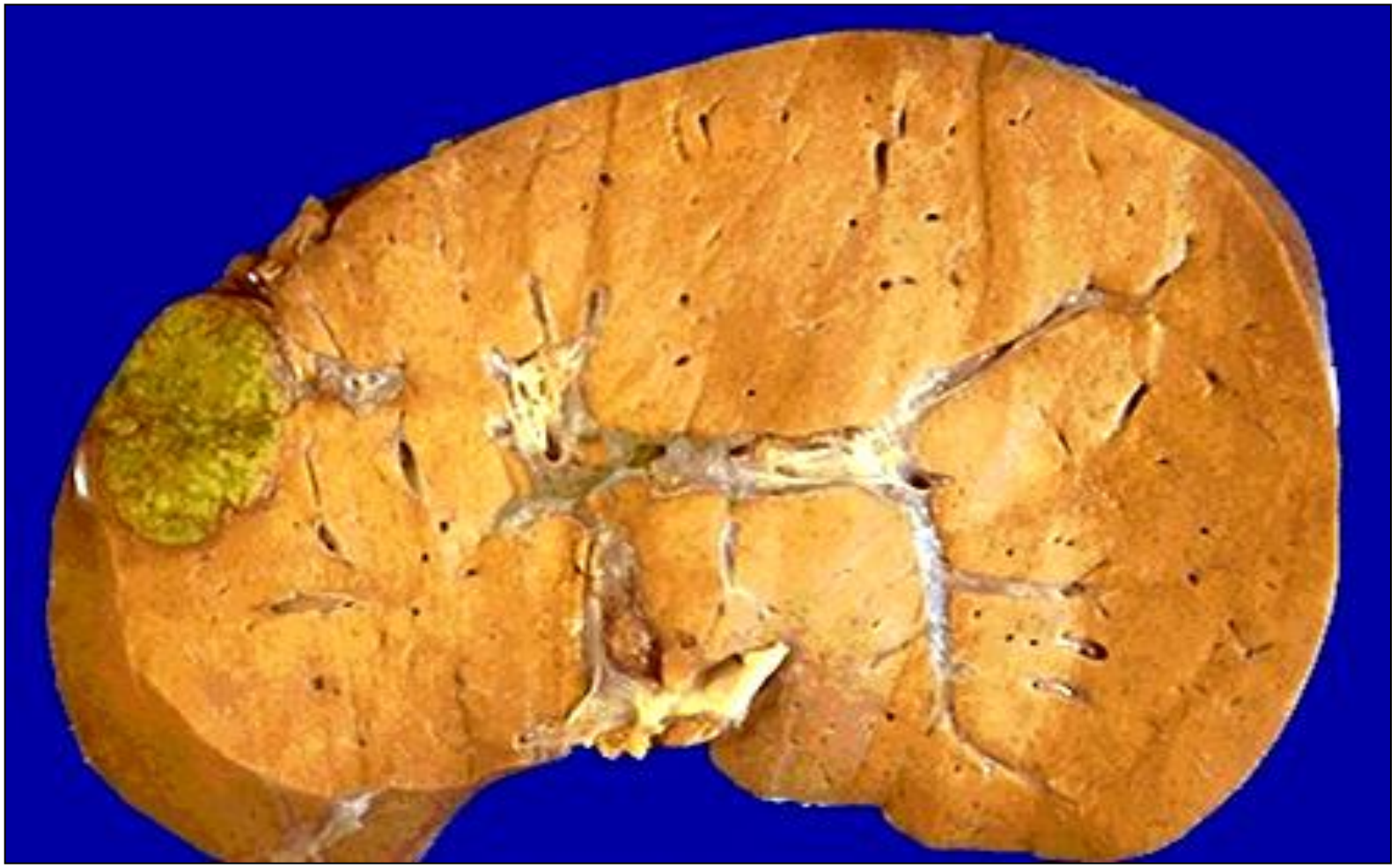
There are three types of tumor growth:

- expansive;
- infiltrative;
- apposition.

# Expansive growth

- With expansive growth, the tumor grows, pushing away surrounding tissues.
- The surrounding tissue is atrophied, replaced by a connective tissue and the tumor is surrounded by a capsule (pseudocapsule).
- Expansive tumor growth is usually slow.
- Characteristic for mature benign tumors.
- However, some malignant tumors, for example fibrosarcoma, kidney cancer, can grow expansively.

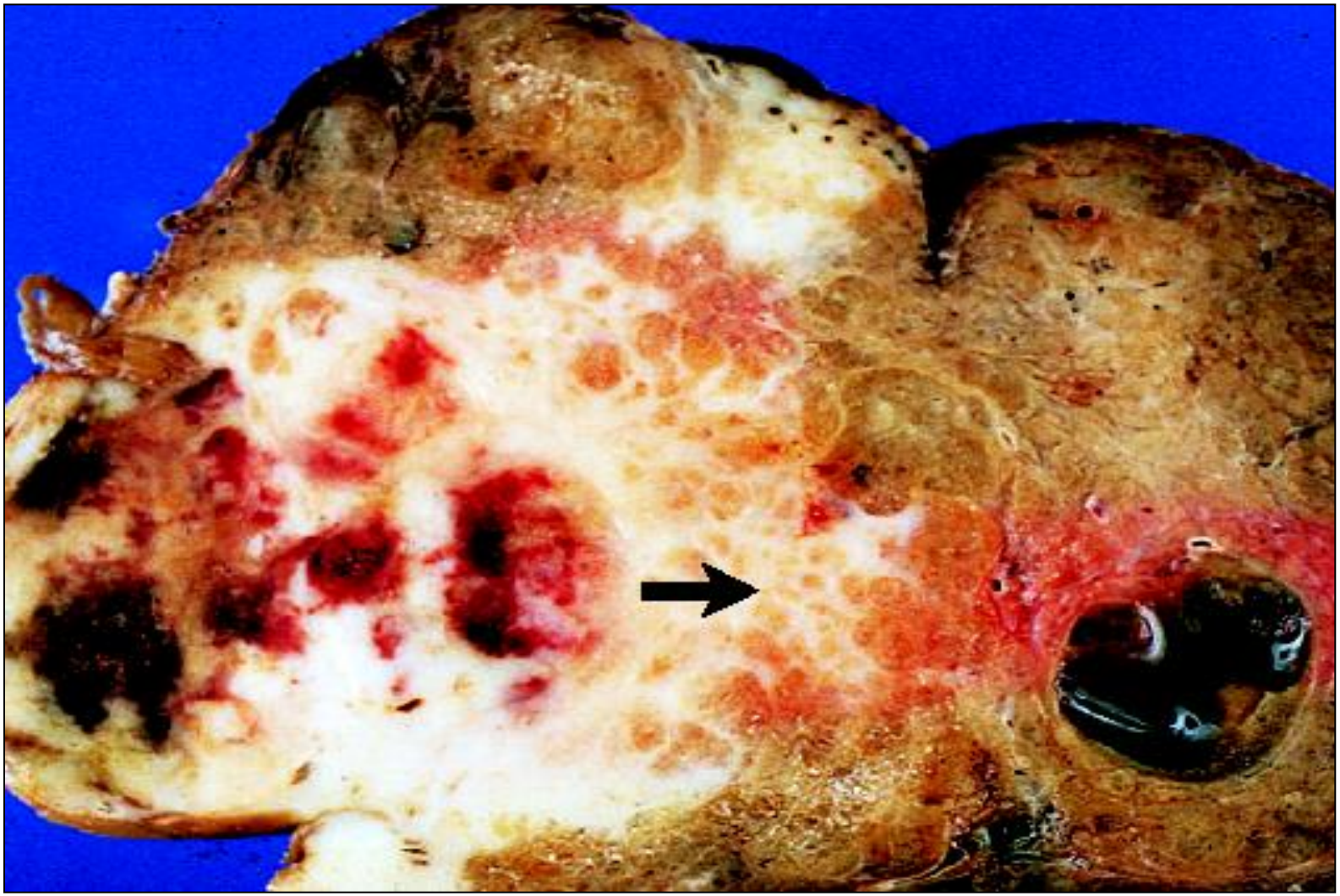
# Expansive growth



# Infiltrative growth

- With infiltrative growth, tumor cells grow into surrounding tissues and destroy them.
- The boundaries of the tumor with infiltrative growth are not clearly defined.
- Infiltrative tumor growth is usually rapid and is characteristic of immature, malignant tumors.

# Infiltrative growth



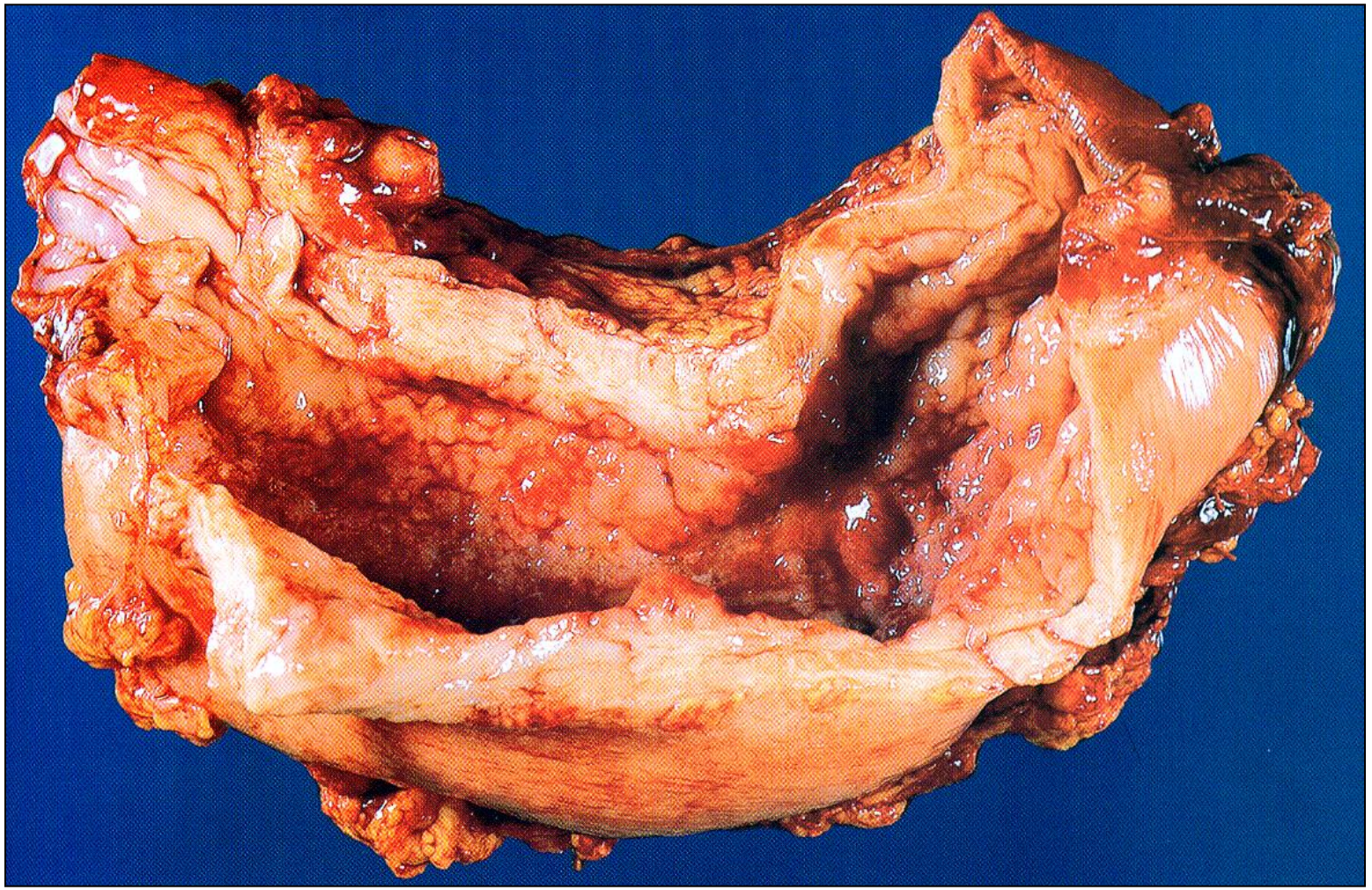
# Apposition growth

- Apposition growth of the tumor occurs due to neoplastic transformation of normal cells into tumor cells, which is observed in the tumor field.
- An example of this growth is the desmoid of the anterior abdominal wall.

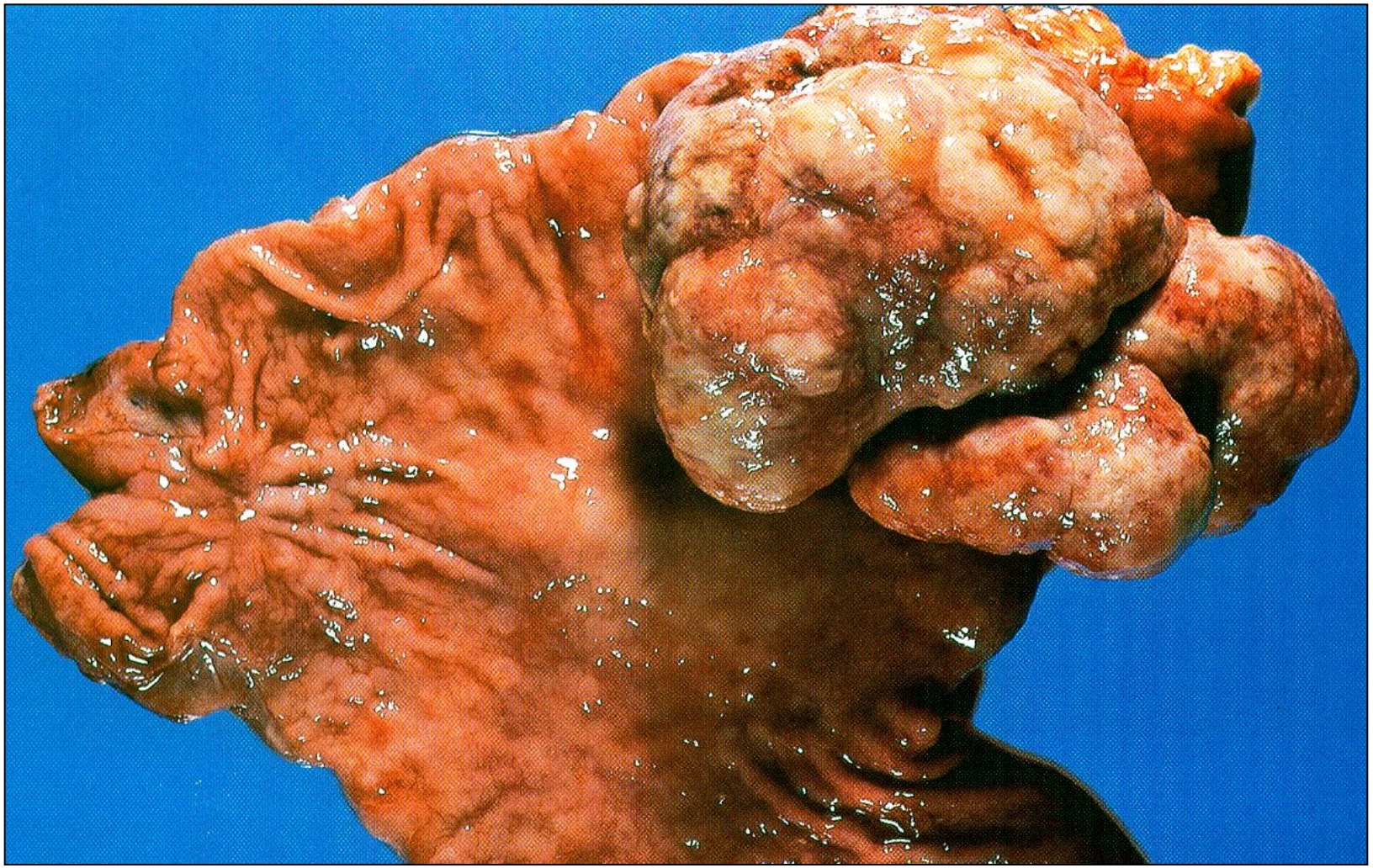
# Growth of tumors

- In relation to the lumen of the hollow organ, endophytic and exophytic tumor growth is distinguished.
- Endophytic growth is the infiltrative growth of the tumor into the interior of the organ wall.
- Exophytic growth is the expansive growth of a tumor into the cavity of the organ.

# Endophytic growth



# Exophytic growth



# Appearance of tumors

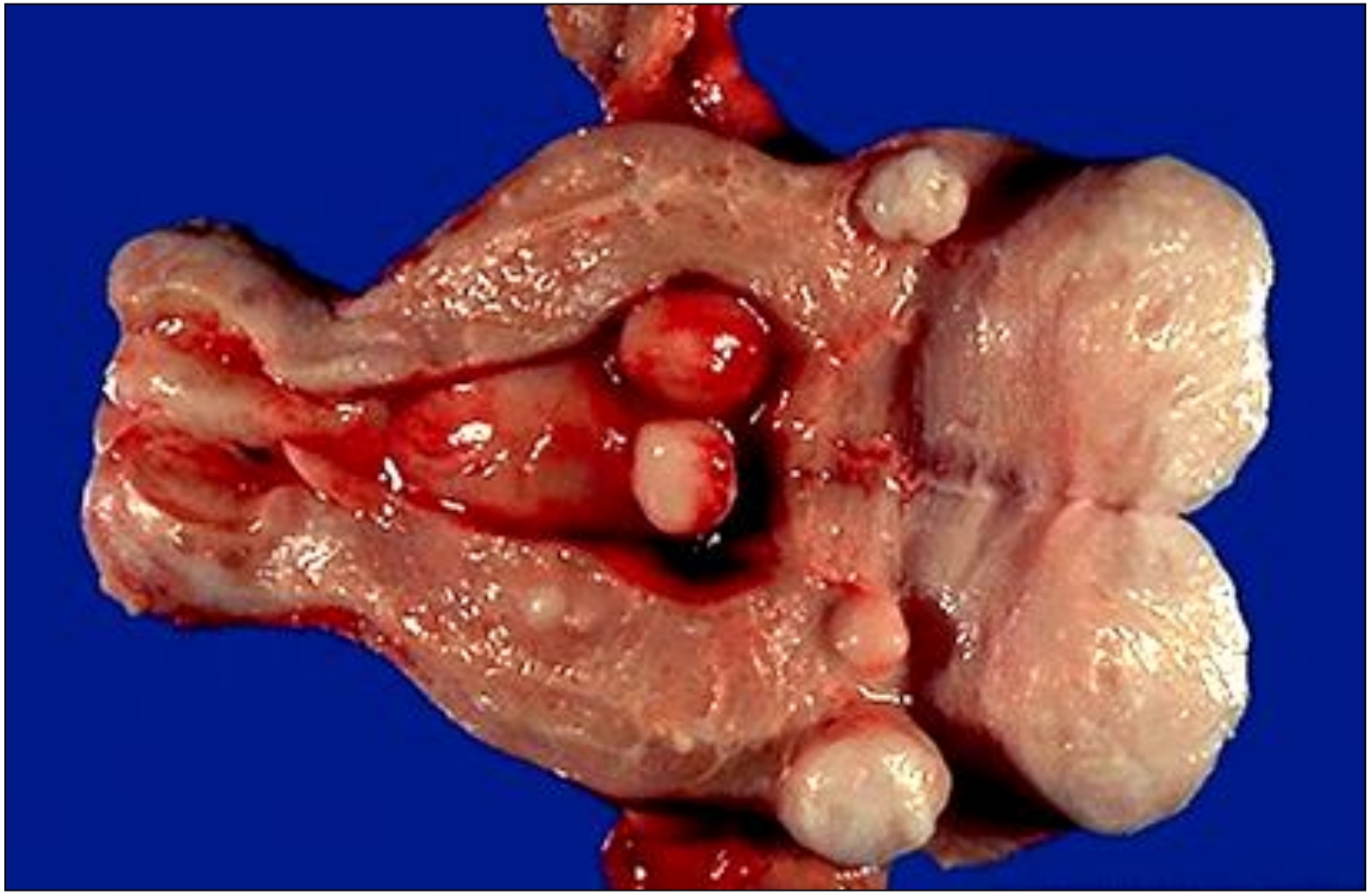
There are four main types of tumor in a macroscopic picture:

- node;
- infiltrate;
- ulcer;
- cyst.

# Node

- *The node* is a compact new formation with distinct boundaries.
- The node can have the form of a mushroom cap on a broad pedicle, a polyp.
- Its surface can be smooth, bumpy or papillate and remind cauliflower.

# Node



# Infiltrate

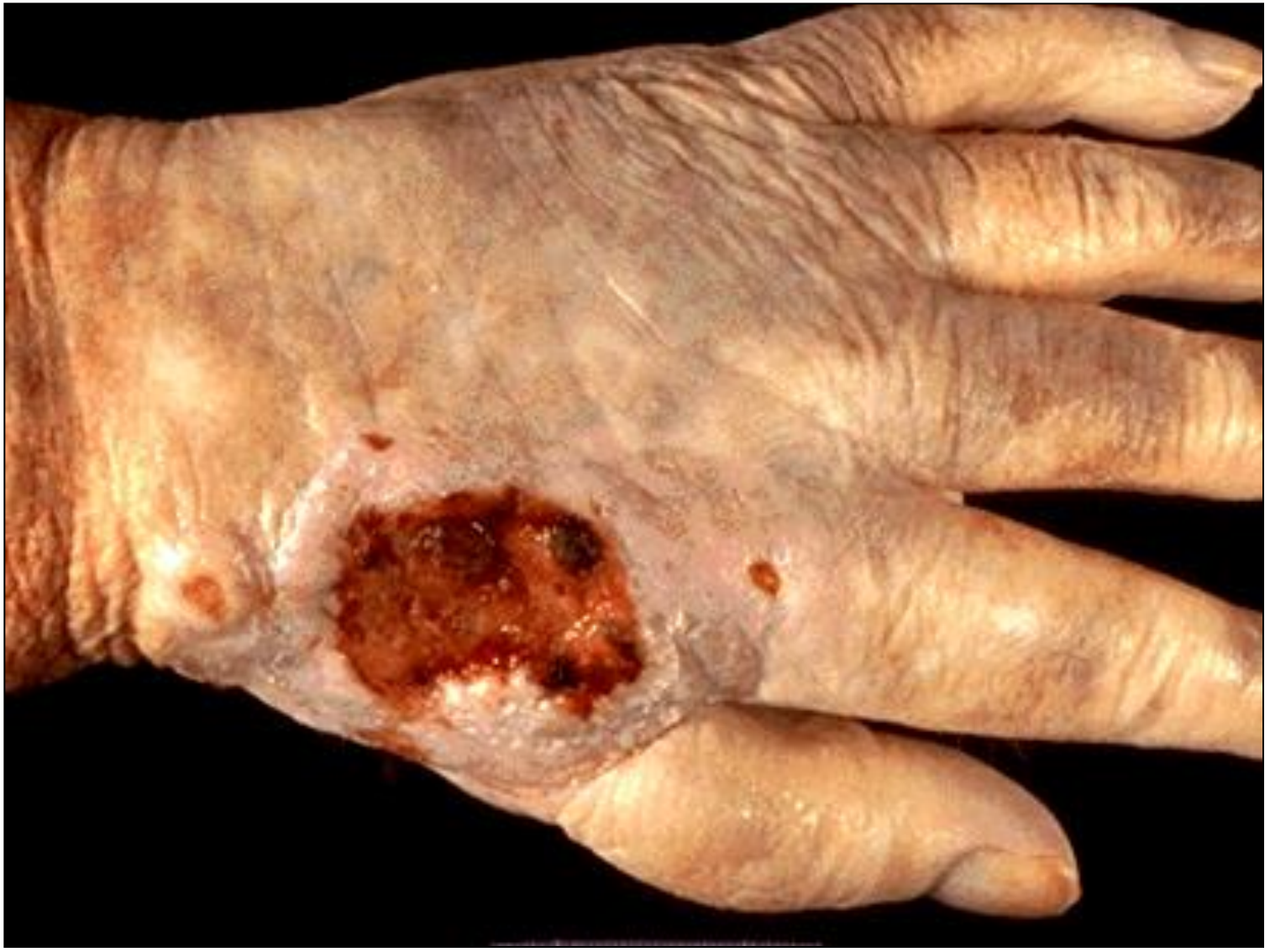
- *Infiltrate* is a compact neoplasm without clear boundaries.

# Infiltrate

# Ulcer

- Ulcer is a macroscopic type of tumor in the form of a tissue defect with valovian margins, a tuberous bottom, and infiltrating growth.

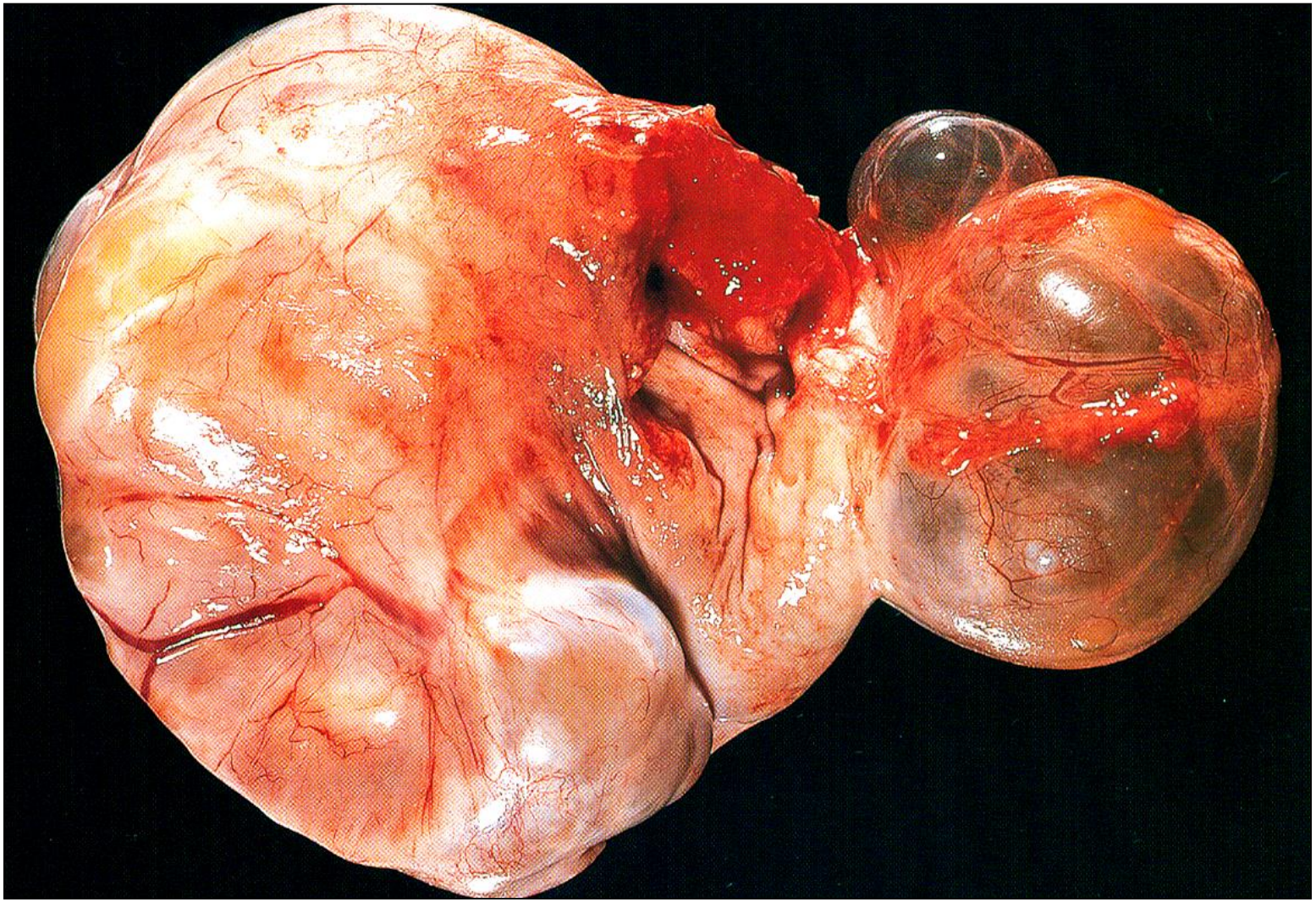
# Ulcer



# Cyst

- The cyst is a neoplasm with clear boundaries that has a cavity.

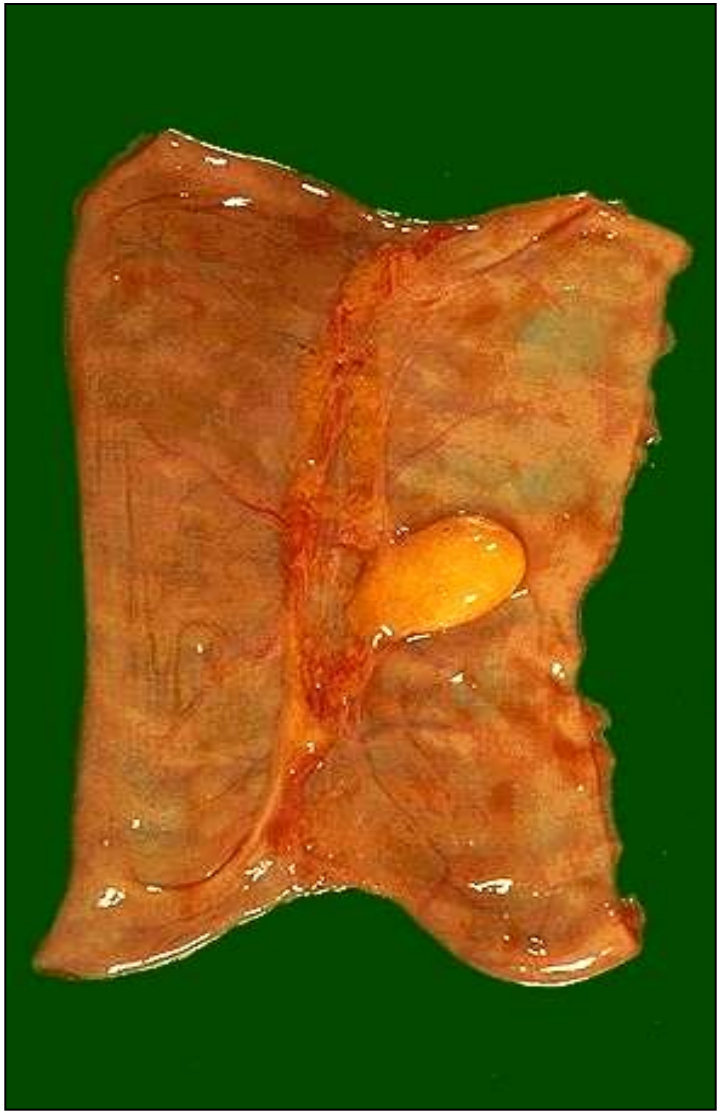
# Cyst

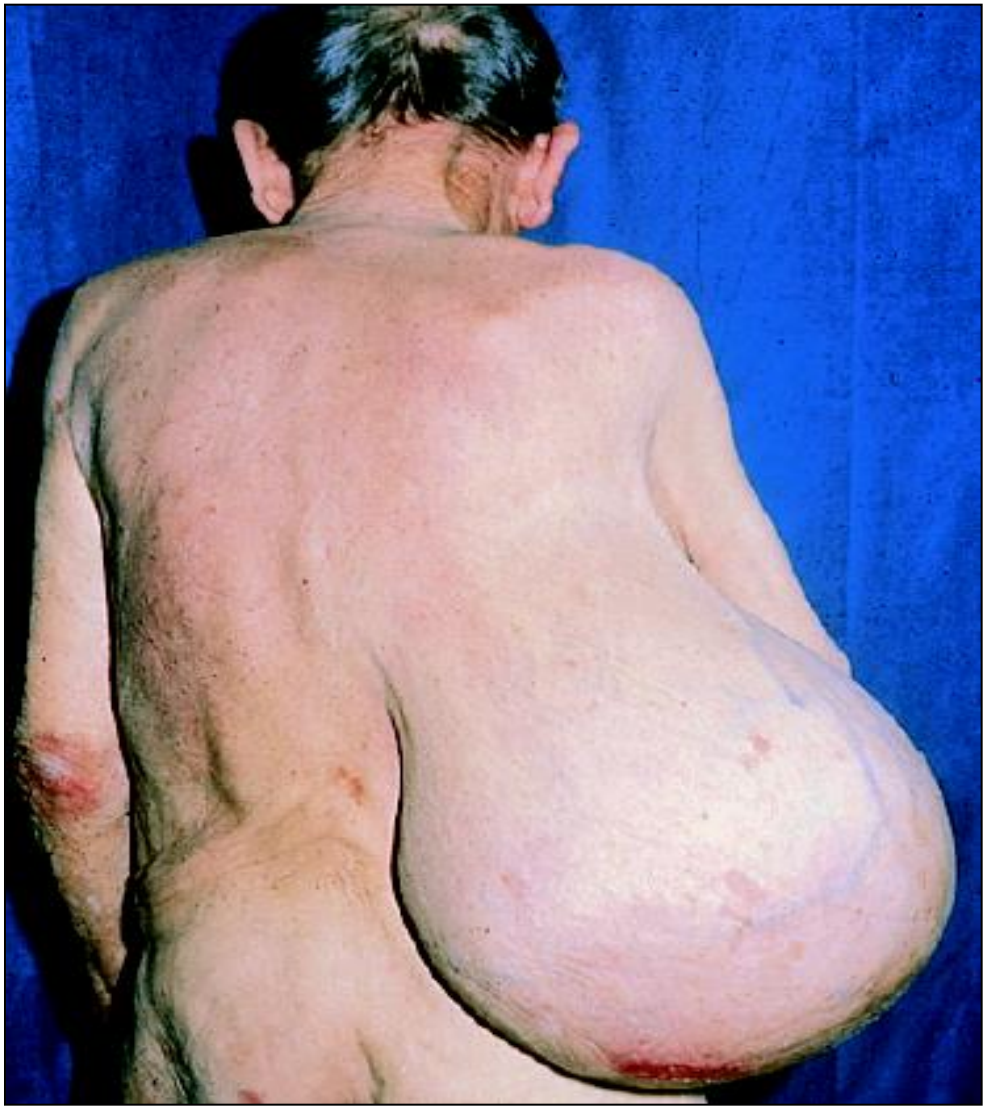


# Tumor size

- The size of the tumor can vary from a few millimeters to tens of centimeters.
- Also, its mass can be diverse - in the literature, a tumor from adipose tissue - lipoma - weighing more than 100 kg is described.
- The size of the tumor is determined by the rate of its growth, duration of existence, localization.
- The size of the tumor can not be judged by the degree of its malignancy, because very small tumors (for example, a small lung cancer - Penkost cancer, the size of a cherry stone) can be malignant and first manifest in the clinic with its metastases.

# Tumor size





# Blood supply to the tumor

- Blood supply of the tumor is carried out from the bloodstream of the body through the preexisting vessels in the surrounding tissue.
- In addition, under the influence of a protein substance, angiogenin, produced by tumors, a tumor of the capillary network of the stroma of the tumor is newly formed.

# Classification of tumors

- **When classifying tumors take into account:**
  - Features of clinical and morphological behavior of the tumor,
  - Histogenesis (tissue origin),
  - The degree of malignancy,
  - Stage of the tumor process.

# Classification of tumors

- **Depending on the characteristics of clinical and morphological behavior (which is mainly determined by the degree of differentiation), all tumors are divided into two main groups:**
  - Benign (differentiated),
  - Malignant (undifferentiated).
- **In addition, a group of tumors with local-destroying growth (borderline tumors) was isolated.**

# Classification of tumors

- **Depending on the histogenesis, 7 groups of tumors are isolated (according to WHO):**
  - Epithelial tumors without specific localization (organospecific),
  - Tumors of exo- and endocrine glands, as well as epithelial integuments (organ-specific),
  - Mesenchymal tumors,
  - Tumors of melanin-forming tissue,
  - Tumors of the nervous system and brain membranes,
  - Tumors of the blood system,
  - Teratomas.
- **Separation of epithelial tumors into organ-specific and organ-specific tumors is currently not justified (organ-specific markers have been found for most).**

# Nomenclature of tumors

- The name of benign tumors usually has the ending -oma (adenoma, fibroma).
- Malignant epithelial tumors are called carcinomas, or cancers (adenocarcinoma).
- In foreign literature, the term "cancer" ("cancer") refers to all malignant tumors in general.
- Malignant mesenchymal tumors are called sarcomas (fibrosarcoma).
- Tumors arising from germ cells and represented by tissue components of various embryonic sheets are called teratomas.
- Tumors arising from the tissues of the fetus or their derivatives are called blastomas.

# Nomenclature of tumors

- There are numerous exceptions to the rules:
  - For example, lymphoma and seminoma - malignant tumors,
  - Many tumors are named after the authors (Hodgkin's disease, Wilms tumor, Kaposi's sarcoma, etc.).

# Benign tumors

- **The main properties of benign tumors:**
  - They grow mainly expansively in the form of a node surrounded by a capsule.
  - In hollow organs, growth is exophytic (in the lumen of the organ).
  - Characterized by slow growth.
  - Have signs of tissue atypism.
  - Cell atypism, as a rule, is absent: the cells are mature, very similar to cells of normal tissue.
  - Do not metastasize.
  - Do not recur.
  - Secondary changes occur rarely, usually in large tumors and are more often represented by petrification and mucus.
  - Clinical manifestations are relatively rare, often in later stages.

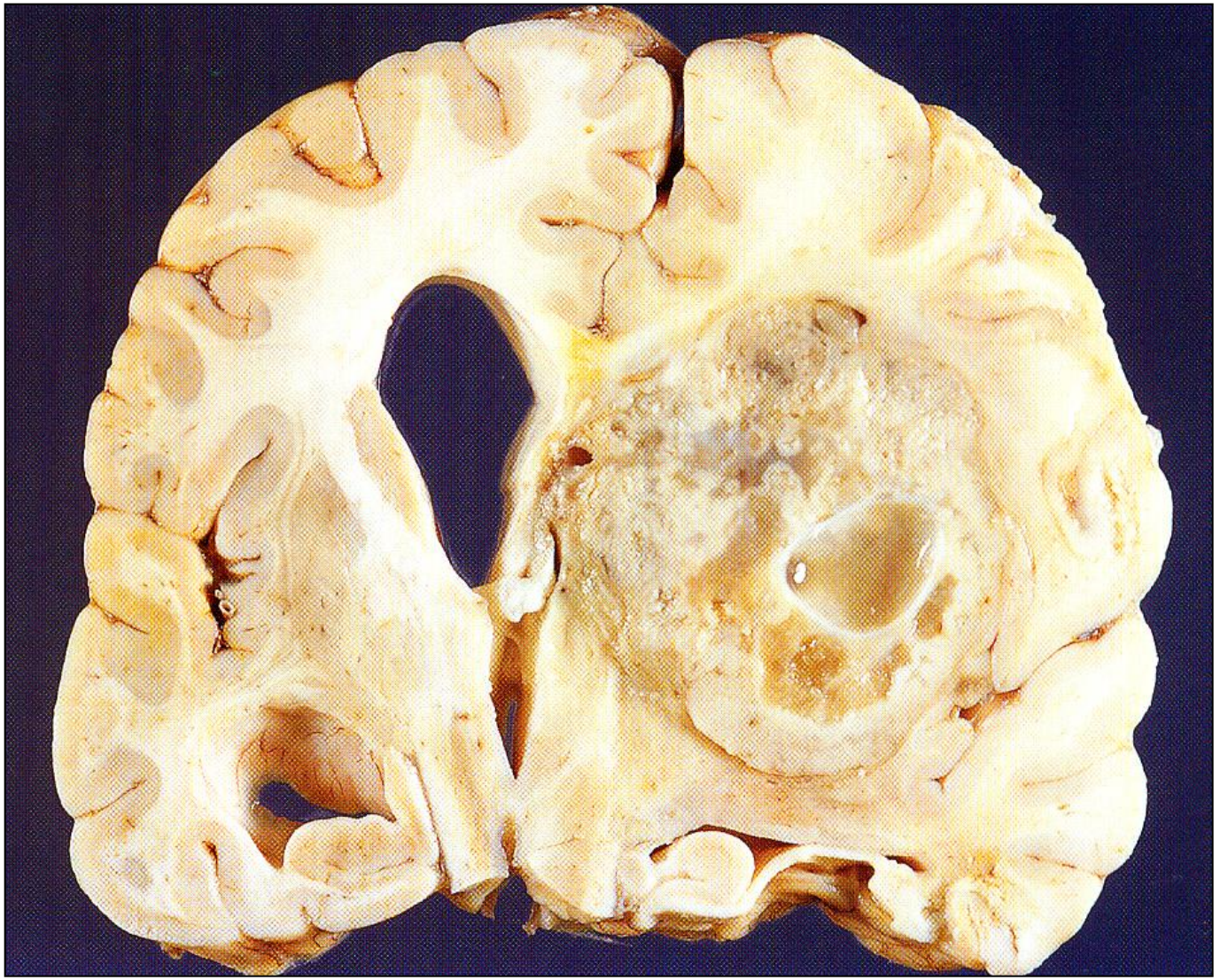
# Benign tumors

- **Local manifestations of benign tumors:**
  - Compression of adjacent tissues
    - For example, a meningioma squeezes the tissue of the brain.
  - Obstruction
    - Bronchial obstruction of the adenoma with the development of atelectasis.
    - Obstruction of the aqueduct of the brain with ependymoma followed by the development of hydrocephalus.
  - Ulceration and bleeding from the tumor
    - Intestinal bleeding in colon adenoma.
  - Torsion of the foot of the tumor with the development of necrosis
    - Torsion of the legs of the subferrous myoma of the uterus.
  - Rupture of cystic tumors
    - The rupture of ovarian cystadenoma.
  - Malignancy of the tumor
    - Malignancy of the adenoma of the stomach.

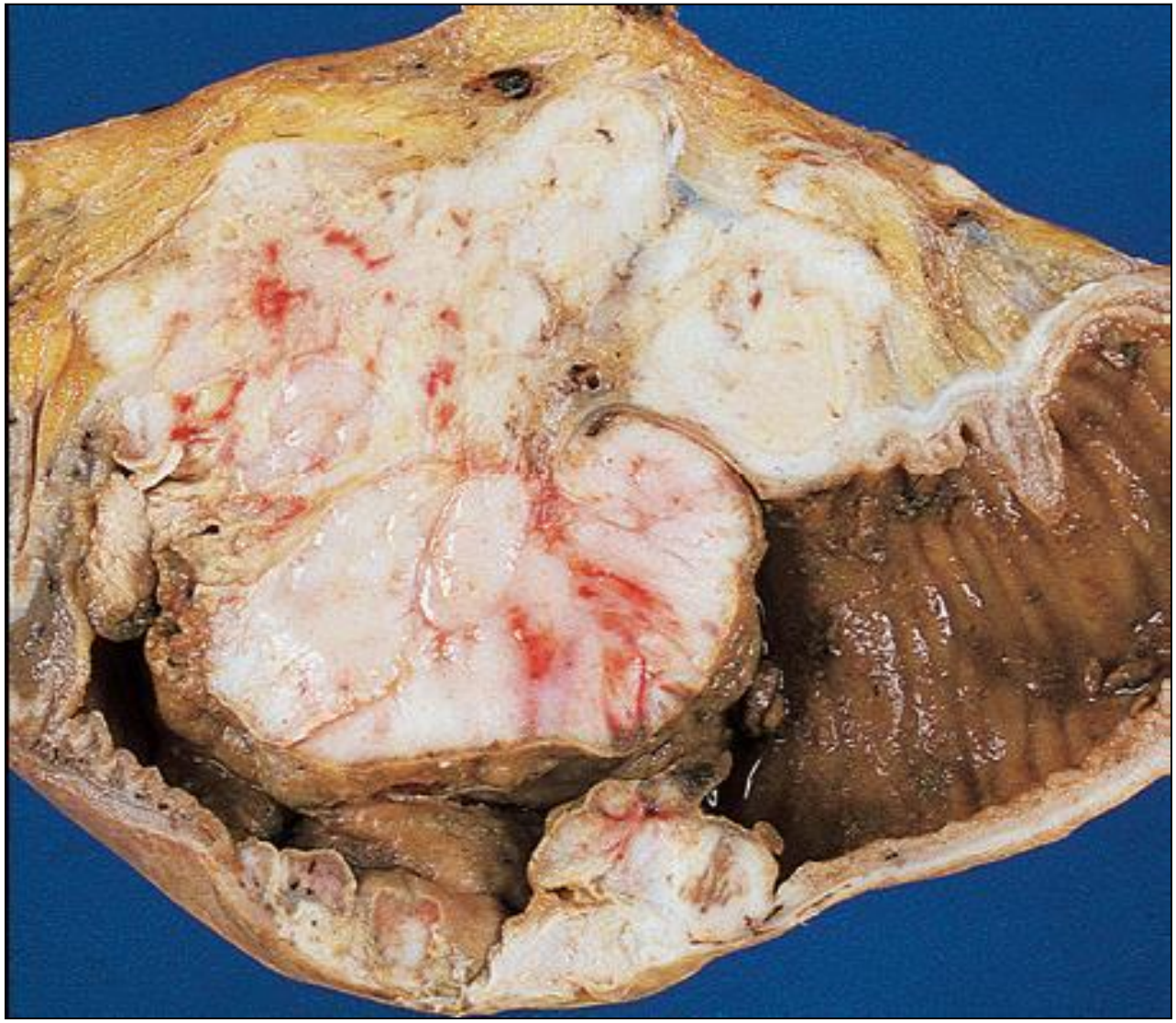
# Benign tumors

- **Common manifestations:**
  - Associated with the production of hormones by tumors of the endocrine organs and the APUD system and the development of appropriate endocrine syndromes.
  - For example, acromegaly with a somatotropic adenoma of the pituitary gland.
- **Outcome:**
  - As a rule, favorable.

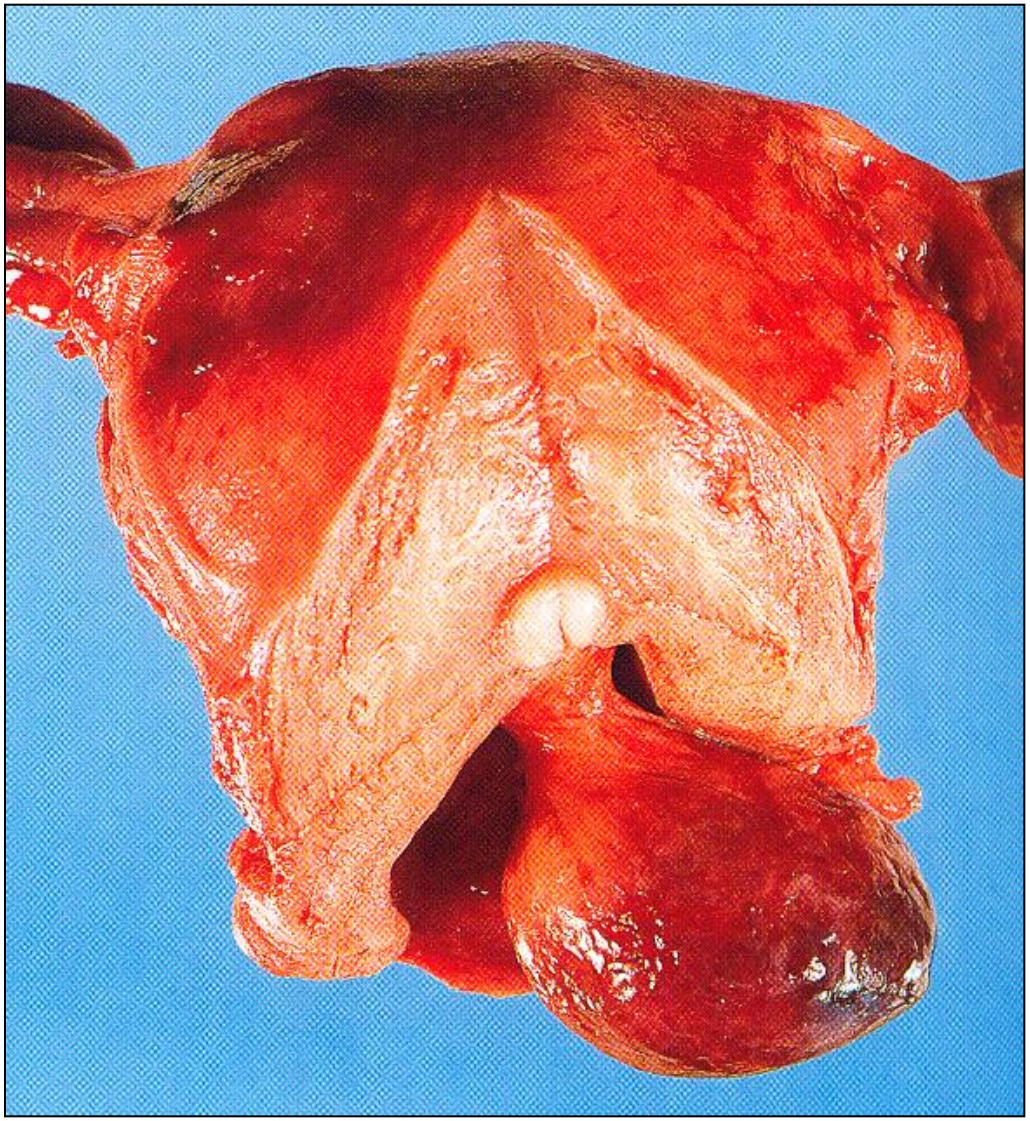
# Tumor compression of tissues



# Obturation with an intestinal tumor



# Torsion of a tumor on the pedicle



# Malignant tumors

- **The main properties of malignant tumors:**
  - They have predominantly infiltrating growth.
  - In hollow organs, growth is endophytic (in the thickness of the wall and beyond).
  - Grow quickly.
  - They have signs of both tissue and cellular atypism.
  - The degree of differentiation of cells can be different (high, moderate, low), but cells do not reach full maturity.
  - Metastasize.
  - Recur.
  - Typically, secondary tumor changes are expressed: necrosis, hemorrhage.

# Malignant tumors

- **Local manifestations of malignant tumors:**
  - Compression, destruction of surrounding tissues and organs with the development of their insufficiency.
  - Decay of the tumor.
  - Ulceration accompanied by bleeding.
  - Inflammation.
- **Common manifestations:**
  - Cachexia
  - Strengthen catabolism of adipose tissue under the influence of α-TNF, secreted by macrophages.
  - Paraneoplastic syndrome
- **Outcome:**
  - Unfavorable (lethal in the absence of adequate therapy).

# Paraneoplastyc syndrome

- **Paraneoplastic syndrome - clinical manifestations of the tumor, observed in the distance from the primary focus and resulting from biochemical or immunological disorders induced by the tumor.**
- **Diseases of connective tissue:**
  - Dermatomyositis (tumor frequency 15-42.8%, most often nasopharyngeal cancer in 50% of cases, less often - renal cell and hepatocellular carcinoma, ovarian cancer, breast cancer, etc.).
- **Neurological manifestations:**
  - Myasthenia gravis (in 10% of cases it accompanies thymoma)
  - Lambert-Eaton syndrome (70% of cases associated with small cell lung cancer),
  - Peripheral neuropathies (tumors of the lung, stomach, breast).

# Paraneoplastyc syndrome

- **Nephrological manifestations:**
  - Glomerulonephritis with nephrotic syndrome (incidence of tumors 0.1-10%, most often with lymphogranulomatosis in 70% of cases, lymphomas).
- **Cardiorespiratory manifestations:**
  - Non-bacterial thromboendocarditis (gastric cancer),
  - Bronchospasm (carcinoid).
- **Hematological manifestations:**
  - Migrating phlebothrombosis, the phenomenon of Tissot (often associated with pancreatic carcinoma),
  - DIC-syndrome (more often with prostate cancer, lung, stomach),
  - Anemia (hemoblastosis, gastric cancer),
  - Thrombocytopenia (lymphogranulomatosis, lymphomas),
  - Polycythemia (renal cell carcinoma).

# Paraneoplastyc syndrome

- **Endocrinopathy:**
  - Production of a tumor of the ectopic hormone, i.e. not specific to this tissue (Cushing syndrome in small-cell lung cancer producing ACTH, Zollinger-Ellison syndrome with gastrinoma producing gastrin).
- **Cutaneous manifestations:**
  - Acanthosis nigricans, hyperpigmentation of axillae, neck, anal region, groin (100% probability of oncological pathology, most often in the digestive tract).

# Tumors with local-destroying growth

- **Tumors with local-destroying growth (borderline) occupy an intermediate position between benign and malignant tumors:**
  - They have signs of infiltrating growth,
  - Do not metastasize.

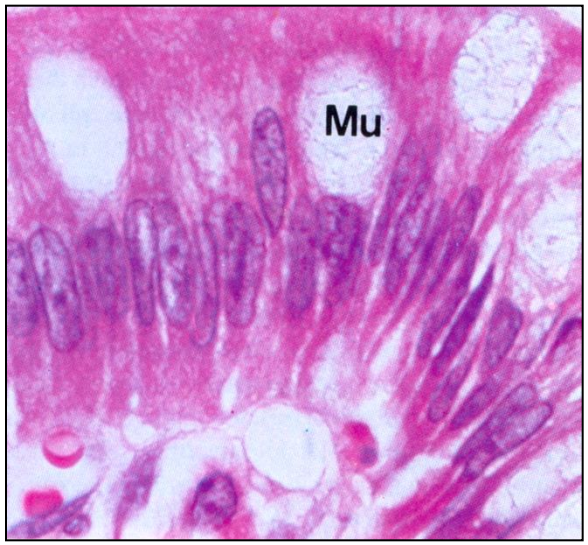
# Tumor prognosis

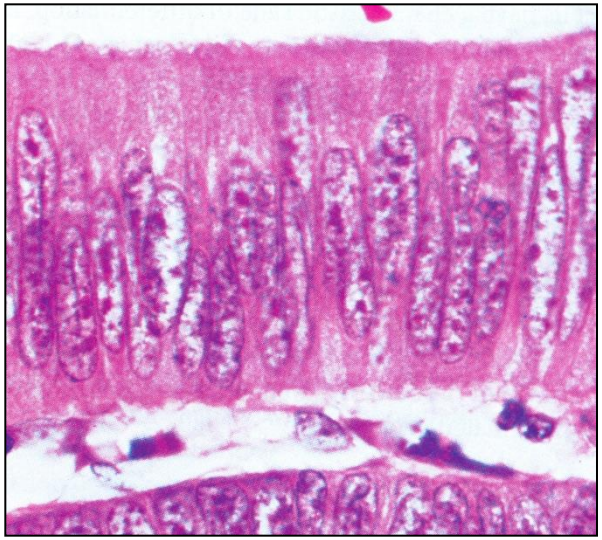
- **To determine the prognosis at present, it is necessary to take into account:**
  - morphological degree of tumor malignancy,
  - stage of the tumor process at the time of diagnosis.

# Tumor prognosis

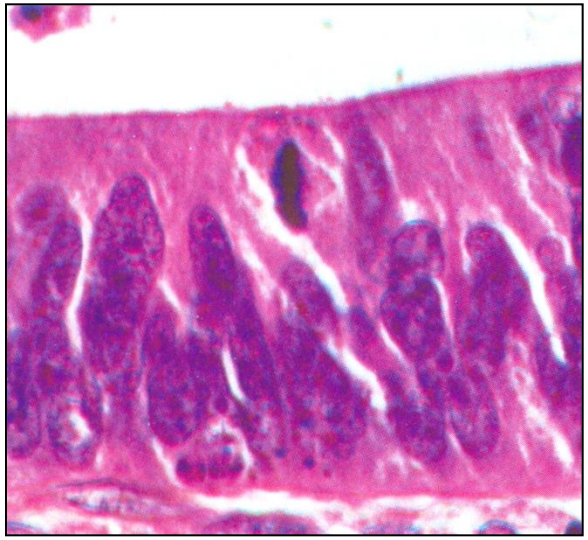
- **The degree of malignancy of the tumor depends on the degree of differentiation, which is determined by the severity of the signs of cellular atypism.**
- **Three degrees of malignancy (gradation, grading, G) are distinguished:**
  - Tumors of low grade (grade G1) are usually highly differentiated tumors with minimal signs of cellular atypism.
  - Tumors of a moderate degree of malignancy (G2 grade) are moderately differentiated tumors.
  - Tumors of a high degree of malignancy (G3 grade) are low-grade tumors with pronounced signs of cellular atypism.

# Tumor prognosis

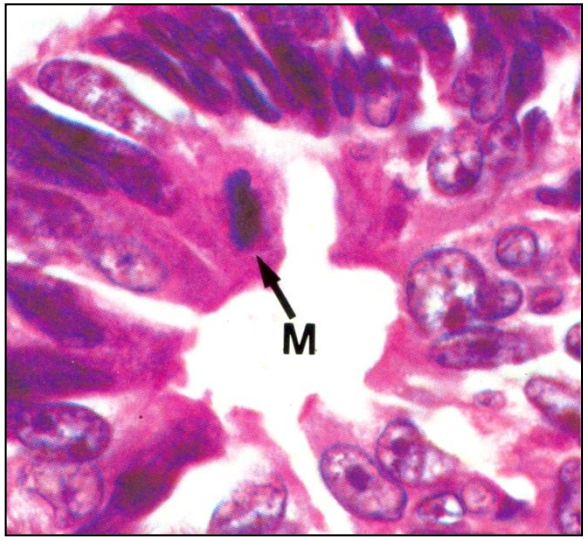


G1



G2




G3

# Tumor prognosis

- **The stage of the tumor process is determined by:**
  - The degree of invasion of the primary tumor node in the organ and surrounding tissues,
  - The expressiveness of the metastatic process.
- **To determine the stage of most tumors, both clinicians and morphologists use the TNM classification, which takes into account:**
  - the size and spread of the tumor (tumor, T),
  - presence of metastases in regional lymph nodes (nodulus, N),
  - distant metastases (methastases, M).

# Tumor prognosis

- **Size and spread of the tumor (T):**
  - $T_x$ – primary tumor can not be evaluated
  - $T_0$ – no signs of primary tumor
  - $T_{is}$ – carcinoma in situ
  - $T_1$ – $T_4$ – tumor sizes
- **Presence of metastases in regional lymph nodes (N):**
  - $N_x$ – The presence of metastases in regional lymph nodes is unclear
  - $N_0$ – there are no metastases in the regional lymph nodes
  - $N_1$ – $N_3$ – severity of regional metastasis
- **Distant metastases (M):**
  - $M_x$ – presence of distant metastases
  - $M_0$ – distant metastases are absent
  - $M_1$ – distant metastases present