

Tumors classification. Terminology

■ International TNM system is used in respect to tumor process extension, where T(tumor) – tumor characteristic, N(nodus) – presence of metastases in lymph nodes, M(metastasis) – presence of distant hematogenous metastases.

■ Seven groups of tumors were differentiated combining over 200 names:

■

■ **a) epithelial tumors without specific localization (organo-nonspecific);**

■ **b) organospecific epithelial tumors;**

■ **c) mesenchymal tumors;**

■ **d) tumors of melanin creating tissue;**

■ **e) tumors of nervous system and cerebral membranes;**

■ **f) tumors of hematopoietic and lymphoid tissue;**

■ **g) teratomas .**

Morphological features of mesenchymal tumors

Basic differential features of benign and malignant growth.

■ Non-malignant growth

■ Have minor deviations from parent tissue Expansive growth Grow slowly Reach big size Rare are subject to ulceration Do not give metastasis Recurrence is not characteristic Minor influence on patient's general condition

■ Malignant growth

■ Expressed atypism: tissue and cellular Infiltrative growth Grow fast Rear rich big size Often are subject to ulceration Give Metastasis Recur often Have major influence on the whole organism subject to ulceration

Morphological features of mesenchymal tumors

■ General characteristic of mesenchymal tumors

■ terminology of the mesenchymal tumors

■ Non-malignant growths from mesenchyma

■ Malignant growths from mesenchyma

■ Sarcoma, its types. Ways of sarcoma metastasis.

Mesenchymal tumors

■ are tumors growing from tissues derivative mesenchyma:

■ conjunctive,

■ adipose,

■ muscular,

■ vascular,

■ osteous,

■ cartilage tissues,

■ synovial membranes and serous tunics.

■ These tumors do not have organ specificity

Non-malignant (benign) tumors of conjunctive tissue

■:

■ fibroma (hard, soft) – is found in skin, ovaries, extremities, grow slowly, expansively;

■ fibrous histiocyoma or dermatofibroma – is found in skin, subcutaneous fat;

■ fibromatoses (desmoid), which have local-destructive infiltrative growth, but do not metastasis, occurs downstream fascias, angioneuroses.

Non-malignant growths of adipose tissue:

■ lipoma (fibrolipoma, angioliipoma, myeloliipoma),

■ hibernoma – tumor of brown fat.

Lipoma.

Specimen is colored with hematoxylin and eosin. Lipocytes are of various sizes. They are located in random way.

Non-malignant growths of muscles:

- leiomyoma – tumor of smooth muscles, the most often occurs in uterus;
- rhabdomyoma – tumor of transversal striated muscles, occurs mostly among children;
- granular-cell tumor or Abrikosov's tumor localizes in tongue, skin, esophagus

Leyomyoma of uterus

■ Uterine is enlarged. Node with distinct boundary of grey-white color, fibrous structure is seen in myometrium. Sharp limits indicate expansive growth. Tumor is surrounded with pseudocapsule, which occurred of myometrium

Fibromyoma of the uterus .

■ Tumor contours are distinct, tumor is limited by conjunctive tissue capsule – expansive growth. Tissue atypia is expressed with fibrous structures random way location and excessive excrescence of comparing with surrounding myometrium.

Non-malignant tumors of vessels

- hemangiomas,
- including capillary angioma,
- cavernous angioma,
- glomus angioma (Barre-Masson tumor) – occurs on toes and fingers,
- non-malignant hemangiopericytoma,
- lymphangiomas.

Cavernous hemangioma

■ Specimen is colored with hematoxylin and eosin. Spaces between vessels are thinned. Lumen is filled with erythrocytes

Tumors of synovial membrane

- are represented with synoviomas, which most of the authors attribute to malignant independently of morphologic structure.
- Among *mesothelial tissue* tumors the most often fibrous mesothelioma is seen.

Mesenchymal tumors from bones

- Osteous tumors include osteoma spongiosum and compact osteoma.
- Cartilage tissue tumors – chondroma – could be of two types: echondromas and enchondromas, as well as non-malignant chondroblastomas.
- Mesenchymal origin tumors include also giant-cell tumor.

Chondroma of lung.

■ Tumor is well-defined. Surrounding pulmonary tissue is sclerosed. Tumor hystogenesis is bronchi cartilage.

Malignant growths of mesenchyma

- origin are called sarcomas from Greek word sarcos – meat and are found rarely.
- On the section tumors are of whitish-grey color,
- look like fish meat,
- these tumors metastasis mostly in hematogenous way.

Fibrosarcoma

■ occurs of conjunctive tissue, which depending on cataplasia level could be differentiated and poorly differentiated, as well as malignant histiocytoma.

Polymorphonuclear sarcoma

Pay attention that there are cells of various shape and size. Nuclei are also of various shape and size, hyperchromic as a rule (intensive blue), many of them are of undefined shape, often mitoses are seen. Some cells contain a number of nuclei. Atypical cells do not create any tissue structure, they are located in random way or autonomous, which is called decomplexation.

liposarcomas

■– Malignant tumors of adipose tissue and malignant hibernomas grow rather slowly and do not metastasize for a long time. Among liposarcomas the following are recognized: high differentiated, myxoid, round cell polymorphonuclear sarcoma.

Malignant growths of muscles and vessels :

■From muscles **malignant leiomyoma**, malignant granular cell tumor and malignant rhabdomyoma occur.

■Malignant growths from vessels – **angiosarcomas** develop from endothelium and pericytes – malignant hemangioendothelioma hemangiopericytoma, lymphangioendothelioma, Kaposi's sarcoma.

Malignant tumors of synovial membrane, mesothelium, bones

■In joints **malignant synoviomas** are found, in peritoneum, pleura, pericardium – **malignant mesothelioma**.

In bones osteogenic and osteolytic sarcomas develop as well as Ewing's sarcoma, and in cartilage tissue - **chondrosarcomas**.

Osteosarcoma.

■Specimen is colored with hematoxylin and eosin. Invasion with atypical cells is observed as well as osteous beams destruction.

Nomenclature and morphological features of nervous tissue tumors.

Features of CNS tumors

Tumors of neural tissue.

■Neural tissue tumors have a number of clinical peculiarities:

■- referring to their course practically all of them are malignant independent of their morphological characteristic as they press neighbour portions of cerebrum,

■- their extension goes on the limits of neural tissue without distant hematogenous metastases.

■ Nervous system tumors are distributed into neuroectodermal and meningovascular.

Neuroectodermal tumors

■are divided into

■astrocytic,

■oligodendroglial,

■ependymal tumors of choroid epithelium,

■neuronal,

■ poorly differentiated and embryonal.

Astrocytic tumors

■occur in any part of cerebrum and could be

■*non-malignant (benign) – astrocytoma*

■fibrillar,

■protoplasmatic,

■fibrillar-protoplasmatic

■*malignant – astroblastoma*

Oligodendroglial tumors

■are represented with

■oligodendrogliomas and

- oligodendroglioblastomas.

Oligodendroblastoma.

■ Specimen is colored with hematoxylin and eosin. Tumor is built of large and polymorphic cells with the signs of pathologic mitoses.

Ependymal tumors

include

- ependymomas,
- ependymoblastomas,
- choroidpapillomas and choroidcarcinomas.

Neuronal tumors

■ the following is differentiated:

- ganglioneuroma or gangliocytoma,
- ganglioneuroblastoma,
- neuroblastoma

Poorly differentiated and embrional tumors

include

- *medullary blastoma* (the most often is found in cerebellum and among children) and
- *glioblastoma* (occurs among adults in white substance, second by frequency, grows fast and causes death).

Glioblastoma.

■ Little cells with hyperchromic nuclei of round shape are situated in the medullary substance. Cells are located in random way, they do not create any structure. Tumor contour is not distinct. There is massive necrosis in tumor.

Meningovascular tumors

- develop from cerebral membranes and are represented with
- - meningiomas and
- - meningial sarcomas.
- Meningiomas could be
- arachnoidendotelial and
- fibrous.
- Meningial sarcoma by its histological picture looks like fibrosarcoma.

Tumors of peripheral nervous system

develop in most cases from nerve sheathes are separated. They include

- neurinomas (Schwannomas),
- neurofibromas,
- neurofibromatosis (von Recklinghausen's disease) and
- neurogenic sarcomas.

Neurinoma.

■ Specimen is colored with hematoxylin and eosin. Schwann cells are located in the way of parallel bunches. Tumor boarder is not distinct.

Nomenclature of tumors which derived from melanin-producing tissue. Morphological features of tumors which derived from melanin-producing tissue

Tumors of melanin-producing tissue

develop from cells of neuroectodermal origin – melanocytes, which are located in :

- - basal layer of epidermis,
- -hair follicles,
- soft cerebrum membranes,
- eye retina and cornea.
- Melanocytes could be a source of
- tumor-like lesions – nevuses and
- malignant growthes – melanomas.

Nevuses

- are found in skin of face, extremities and other parts of the body in the form of dark protruding lesions.
- They could be of several types:
- epidermic-dermic (junction) nevus,
- intradermal nevus,
- complex (mixed) nevus,
- epithelioid or spindle-cell (juvenile),
- blue.

Melanomas (melanoblastomas)

- mostly occur among females and
- are found on skin,
- pigment chorioid,
- cerebral layer of adrenal glands,
- cerebral membranes.
- They grow in the form of a node or with surface extension.

Melanoma

- as a rule, looks like brown spot with red or black impregnations, bluish-black soft node or plaque.
- In cells cytoplasm melanin of yellow-brown color is found often,
- nevertheless sometimes pigmentless melanomas are found.
- Melanoma gives hematogenous and lymphogenous metastases early.
- Melanomas development is often connected with high solar irradiation.
- Sometimes melanomas occur in the place of pigment formations, Lentigo maligna,
- dysontogenetic nevus,
- congenital giant nevus.

Skin melanoma

There is an excrescence on skin surface of dark color with necrosis portions. Tumor of hard consistence, ingrowths surrounding tissue of skin.

Eye melanoma.

- Tumor-like node of black color could be seen on section

Nomenclature and morphological features of tumors derived from epithelium

Pretumor process

- The first step toward neoplasia is cellular transformation. Here, there is metaplasia of normal respiratory laryngeal epithelium on the right to squamous epithelium on the left in response to chronic irritation of smoking.

■The two forms of cellular transformation that are potentially reversible, but may be steps toward a neoplasm, are:

■Metaplasia: the exchange of normal epithelium for another type of epithelium. Metaplasia is reversible when the stimulus for it is taken away.

■Dysplasia: a disordered growth and maturation of an epithelium, which is still reversible if the factors driving it are eliminated.

■This biopsy of the lower esophagus in a patient with chronic gastroesophageal reflux disease shows columnar metaplasia (Barrett's esophagus), and the goblet cells are typical of an intestinal type of epithelium. Squamous epithelium typical of the normal esophagus appears at the right.

■This is the next step toward neoplasia. Here, there is normal cervical squamous epithelium at the left, but dysplastic squamous epithelium at the right. Dysplasia is a disorderly growth of epithelium, but still confined to the epithelium. Dysplasia is still reversible.

■At high magnification, the normal cervical squamous epithelium at the left merges into the dysplastic squamous epithelium at the right in which the cells are more disorderly.

■Some epithelia are accessible enough, such as the cervix, that cancer screening can be done by sampling some of the cells and sending them to the laboratory. Here is a cervical Pap smear in which dysplastic cells are present that have much larger and darker nuclei than the normal squamous cells with small nuclei and large amounts of cytoplasm.

Classification of Epithelial tumors.

■Depending on *histogenesis* we differentiate:

■ - tumors of covering epithelium (multilayer, flat and transitional) and

■-glandular epithelium.

■By their *course and differentiation* epithelial tumors could be

■non-malignant (benign) and

■malignant.

■ Depending on *organ specificity* epithelial tumors are divided into

■organ specific tumors and

■tumors without specific localization.

Non-malignant Epithelial tumors

■without characteristic localization of *covering epithelium - papillomas*

■They are found in skin,

■larynx,

■urinal bladder, etc.,

■ of *glandular epithelium – adenomas*

■are found in all glandular organs.

Morphologic variants of adenomas

■The following *morphologic variants of adenomas* are differentiated: acinous (alveolar),

■ tubular,

■trabecular,

■solid,

■pappiloma cystoadenoma,

■villous adenoma,

- fibroadenoma.

Malignant epithelial tumors

- are called **cancer** or **carcinoma**.
- The following forms of *carcinoma without specific licalization* are differentiated:
 - -epidermoid cancer, developing from multilayer flat epithelium and
 - is found in corresponding tissues or in mucus tunics where squamous cell metaplasia occurred.

Carcinomas

- **Carcinomas** could be
 - -*high differentiated*. Cancerous keratin perls presence is characteristic for high differentiated carcinomas.
 - - *moderate differentiated* and
 - - *poorly differentiated*.

Squamous cell carcinoma of skin without keratinization.

■ Epithelial cells with hyperchromic nuclei are seen, they ingrow deep into adjacent tissue. Cellular atypia is seen in epithelial cells as well as numerous mitoses.

Squamous cell carcinoma of skin with keratinization

■ Epithelial cells with hyperchromic nuclei are seen, they ingrow deep into derma and adjacent tissue. Among cells with hyperchromic nuclei round shape formations are seen of homogenous red color – epithelial cancerous perls.

This is a squamous cell carcinoma of the lung that is arising centrally in the lung (as most squamous cell carcinomas do). It is obstructing the right main bronchus. The neoplasm is very firm and has a pale white to tan cut surface.

This is a larger squamous cell carcinoma in which a portion of the tumor demonstrates central cavitation, probably because the tumor outgrew its blood supply. Squamous cell carcinomas are one of the more common primary malignancies of lung and are most often seen in smokers.

Carcinoma in situ

carcinoma which

- does not penetrate through basal membrane and
 - does not invade tissue depth is marked out separately.
- When the entire epithelium is dysplastic and no normal epithelial cells are left, then the process is beyond dysplasia and is now neoplasia. If the basement membrane is still intact, as shown here, then the process is called "carcinoma in situ" because the carcinoma is still confined to the epithelium.

Adenocarcinoma

- Carcinoma from glandular epithelium is called glandular neoplasm or adenocarcinoma.
- It occurs in organ with corresponding epithelium and also could be of three stages of differentiation
- (-*high differentiated*, - *moderate differentiated* and - *poorly differentiated*).

Large intestine carcinoma

■ Wall of large intestine, deformed in favour of bank – like thickening, which considerably narrows clearance of intestine Bulge of

- mucus tunic.

Gastric carcinomatosis.

■ Multiple nodes of white color and various size are seen on gastric serous tunic.

Pancreas cancer.

■ Organ is represented with white color nodes which are interunitid .

This adenocarcinoma of the pancreas is very extensive, sparing only the uncinat process at the lower left center. Chronic biliary tract obstruction from this mass produced icterus, marked by the green color of the

liver after formalin fixation. Tumor invades into the hilum of liver, and small metastases to liver are also present.

At high magnification, this adenocarcinoma of the gallbladder is composed of columnar cells forming glandular and papillary structures. The prognosis with adenocarcinoma of the gallbladder is usually poor, because they have often invaded and metastasized by the time they are discovered.

The medium power microscopic appearance of an adenocarcinoma of the pancreas is seen. Just to the left of center can be seen perineural invasion by the neoplasm, which is composed of very irregular glands.

At high magnification, the microscopic appearance of an adenocarcinoma of the pancreas is seen. At the left can be seen normal pancreatic acini, but the neoplasm is composed of small irregular glands.

Poorly differentiated adenocarcinoma

■-Peculiar for of *poorly differentiated adenocarcinoma* is **scirrhous carcinoma**, containing big quantity of fibrous stroma squeezing tumor parenchyma.

■Undifferentiated forms of epithelial malignant growths are represented with **small cell carcinoma**,

■Carcinoma, signet **ring cell carcinoma** and

■**medullary carcinoma**.

At high magnification, this adenocarcinoma of the pancreas has very poorly differentiated glands and extensive desmoplasia (production of collagenous stroma).

An islet cell tumor of the pancreas is seen at medium power. Note the similarity of the cells forming the neoplasm with the cells in the normal islets of the pancreas at the right.

Malignant organ-specific epithelial growths

■ include chorioncarcinoma and trophoblastic tumor,

■clear-cell carcinoma of kidney, etc.

■

Renal cell carcinoma (hypernephroma).

■Tumor node is in kidney upper pole. It is striped on section, yellowish color portions alternate with portions of hemorrhages.

Features of childhood neoplasia. Dysontogenetic tumors. Teratomas and teratoblastomas

Tumors in infants.

■***Peculiarities:***

■-they often develop from embryonal tissues as the result of their development and formation disorder – these are *dysembryomas or teratoid tumors (teratomas)*;

■ - benign tumors (angiomas, nevi) occurs more often than malignant,

■- certain benign tumors are inclined to infiltrative growth – angiomas.

■- sarcomas (lymphosarcomas, osteosarcomas) are found more often than cancers which occur mostly in internal organs, endocrine glands;

■- malignant tumors (embryonal carcinosarcomas, hepatoma) in infants keep expansive growth for quite a long time,

■don't metastasize for long and even are able to reverse – to transfer into benign tumor – neuroblastoma into ganglioneuroma;

■- malignant tumors in infants most often are found in children of 3-5 years, which confirms significance of antenatal cancerigenic influences;

Tumors in infants.

■***Classification:*** - the first type are dysembryomas, teratoid tumors or teratomas.

■They could be histoid,

■ organoid,

- organismoid and
- embryonal,
- which could be homologous – teratomas and
- heterologous – teratoblastomas.
- Histoid teratomas are also called hamartomas (angiomas, nevi, embryonal tumors of internal organs) or hamartoblastomas;

Tumors in infants

■*Classification*

■- the second type are tumors with embryonal cambial tissues in nervous tissue, sympathetic ganglia, adrenal glands (medulloblastomas, retinoblastomas, neuroblastomas). They are also could be referred to as hamartoblastomas,

■- the third type are tumors developing like adults' tumors - these are tumors of mesenchymal origin: haemoblastomas, osteogenetic and tumors of soft tissues.

Dysembryomas:

■- *hamartomas and hamartoblastomas of vascular origin*, among which

■*capillary and cavernous hemangiomas on skin* (in the form of red-bluish node) are found most often as well as in **liver** and other organs.

■ Capillary hemangiomas have ability for infiltrative growth, so they can recur after oncotomy.

■Angiosarcomas and lymphangiomas are found rarely, they can reach big size on the neck with endothelium and capillaries proliferation and infiltrative growth;

Dysembryomas:

■- *hamartomas and hamartoblastomas of cross-stripped muscles – rhabdomyomas*, which are found in heart, extremes' muscles as a 10-15 cm node of grey-brown color, *rhabdomyoblastomas or embrional rhabdomyosarcoma* – malignant tumor which is found in small pelvis organs;

Dysembryomas:

■ ***hamartomas of internal organs:***

■Wilms tumor or embryonal carcinosarcoma (Wilms tumor, adenosarcoma) grow expansively in capsule for long, can reach giant size, reddish-white color with hemorrhages. Histologically in tumor among kidney tissue structures elements of mesenchymal origin are found;

■ hepato blastoma or embryonal hepatoma – malignant tumor of hepar, on section it looks like numerous white-yellowish nodes of solid fields of embryonal hepatic tissue and structures of mesenchymal origin.

Metastasize, complicates with internal hemorrhages

embryonal carcinosarcoma of kidney

■ grow expansively in capsule for long,

■can reach giant size, reddish-white color with hemorrhages.

Teratomas and teratoblastomas

■organismoid and organoid teratomas – tumors derivated from three germ layers are found in *testis, ovaries, mediastinal, extraperitoneal, base of brain*.

■In girls' ovaries malignant teratoblastomas develop more often and benign teratomas – in testis, throat teratomas grow as polyps, are of benign course,

■intracranial teratomas more often are of malignant course, they often are hormonally active.

Tumors of cambial embryonal tissues:

■ medulloblastoma is malignant tumor in tentorium,

■ retinoblastoma is malignant tumor from embryonal poorly differentiated cells of retina,

- neuroblastoma is malignant tumor in sympathetic ganglia, adrenal medulla, fast metastasizes, discharge catecholamine.

Tumors developing like adults' tumors

- are tumors of *nervous system*: astrocytomas,
 - *hematopoietic system*: leucosis, malignant lymphomas;
 - *bones' tumors*: osteomas, chondromas, osteosarcomas, Ewing's sarcomas.
- malignant lymphomas of mediastinum