Chapter 8
TUMORS

8.1. GENERAL ASPECTS

The tumor (syn: neoplasm or blastoma) represents a pathologic process characterized by the unlimited and irrepressible proliferation of cells. The cellular proliferation in tumors is uncontrollable, uncoordinated and does not respond to any regulatory actions of the body, being relatively autonomous. Another major feature of the neoplasms is the fact that the proliferation process does not have an adaptive – compensatory character.

Tumors are subdivided into benign, malignant and locally destructive tumors.

Their general characteristics are given in table 32. The histogenetic classification (depending on the origin tissues) of tumors is the following:
1) epithelial tumors without specific localization (organ-non-specific);
2) epithelial tumors with specific localization (organ-specific – of the endo- and exocrine glands and epithelial covering layers);
3) mesenchymal tumors;
4) tumors of the melanopoietic tissue;
5) tumors of the nervous tissue and of the meningeal membranes;
6) tumors of the hemopoietic and lymphoid tissues;
7) teratomas;
8) tumors of unknown origin.

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Benign tumors</th>
<th>Malignant tumors</th>
<th>Tumors with local destructive proliferation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Growth rhythm</td>
<td>Slow</td>
<td>Fast</td>
<td>Slow</td>
</tr>
<tr>
<td>Tumor cell differentiation degree</td>
<td>Mature, differentiated cells</td>
<td>Immature, undifferentiated cells</td>
<td>Mature, differentiated cells</td>
</tr>
<tr>
<td>Atypism</td>
<td>Tissular</td>
<td>Tissular, cellular (ultrastructural, biochemical, histochecmal, antigenic)</td>
<td>Tissular</td>
</tr>
<tr>
<td>Growth character in relation with adjacent tissues</td>
<td>Expansive</td>
<td>Invasive (infiltrative)</td>
<td>Invasive (infiltrative)</td>
</tr>
</tbody>
</table>

Table 32
General characteristics of benign, malignant and local destructive tumors
8.1.1. MACROSCOPIC CHARACTERISTICS OF TUMORS

The macroscopic aspect of tumors is variable. In most cases the tumors have round or ovoid nodular appearance. This nodule may be localized inside an organ or on its surface; in the cavitary and tubular organs it may be in the wall thickness or in the organ’s lumen. The surface of the tumor nodules can be either smooth or with an irregular shape, rough, sometimes like cauliflower. Their dimensions and consistency are also various: from microscopic dimensions up to an adult’s head size or even bigger. Their consistency may vary from soft, flaccid to hard, and rocky. The color varies depending on the structural and functional peculiarities of the origin tissue and the secondary modifications which occur in the tumor tissue (dystrophic or necrotic lesions, circulatory disorders, inflammatory processes, etc.). The tumors can be circumscribed, encapsulated, and well delimited or can invade, and infiltrate the adjacent tissues. Depending on their number, tumors can be unicentric or multicentric.

Macrospecimens:

“Pulmonary chondroma” (fig.197).
The lung contains a tumor nodule that has a round shape, significant size, whitish color, and lobular appearance. It is delimited from the adjacent pulmonary parenchyma and has a hard consistency. It is a benign tumour from cartilaginous tissue, which is found in the pulmonary bronchial walls. Microscopically, it is composed of hyaline type cartilage tumor tissue.

“Neurofibromatosis of skin” (fig.198).
The skin contains multiple tumor nodules of various dimensions (up to several cm), round shape, and flaccid consistency; the nodules are prominent on the skin surface. The tumor originates from the nerve fiber sheaths (from the perineurium), is composed of connective tissue, and contains nerve cells and fibers. Usually it has a systemic character, generalized neurofibromatosis (Recklinghausen disease).

“Myxoma of the heart” (fig.199).
The cavity of the right ventricle contains a localized tumor situated at the level of the tricuspid valves. The dimensions are of about 9 - 10 cm, with an irregular lobular surface, soft consistency, and whitish color. It protrudes into the cavity, causing stenosis of the right atrioventricular orifice, explaining the hypertrophy of the right ventricle. The tumor is composed of connective tissue which has a mucoid, gelatinous appearance and originates from pluripotent embryonic mesenchymal elements.
8.1.2. MICROSCOPIC APPEARANCES OF TUMORS

Microscopically, tumors are composed of two tissular components: the stroma and the parenchyma. The stroma is composed of connective tissue, and contains blood and lymph vessels as well as nerve fibers. The parenchyma is composed of tumor cells. The relation between stroma and parenchyma can be varied; in some tumors the predominance of stroma is observed (fibrous tumors), while in others the parenchyma (histoid tumors) is greater. In some cases the stroma and parenchyma have a uniform relationship (organoid tumors).

The tumor differs from normal tissue by morphological, biochemical, histochemical and immunological atypism. The morphologic atypism can be tissular, cellular and ultrastructural.

Tissular atypism is manifest by the modification of the original tissue architecture, of structural element arrangement, and of the relation between them. For example there are modifications of the stroma-parenchyma relations, variations of number, shape and dimensions of the epithelial structures in epithelial tumors and diversity of distribution of fibrillar, cellular, vascular, etc. structures in mesenchymal tumors.

Microspecimen “Tissular atypism in fibroadenoma of the breast” (fig.200).
The fibroadenoma is a benign tumor, which originates from glandular epithelium and is associated with an excessive proliferation of connective tissue. It can be seen that the tumor nodule is composed of proliferative glandular formations, which are chaotically disposed and have varied shapes and dimensions. Simultaneously there can be observed an abundant proliferation of compact dense connective tissue disposed concentrically around the tubular structures; the canaliculi are carpeted with regular unistratified epithelium, reminiscent of the normal epithelium.

Microspecimen “Tissular atypism in leiomyoma”.
Leiomyoma is a benign tumor, which originates from smooth muscular tissue; usually it is associated with the fibroconnective tumoral proliferation, named fibroleiomyoma. It is seen most frequently in the uterus and digestive tract. The specimen (fig.201) contains a tumor of smooth muscle fiber fascicles, disposed chaotically, without any order. In some places whirls of varied thickness and orientation are interspersed with collagen fiber fascicles; the tumor muscular cells are well differentiated, like normal smooth myocytes from the original tissue.

The tissular atypism is characteristic for mature benign tumors.
The cellular atypism is manifest by the unevenness of shape, volume and size of cells, nuclei, and cytoplasmic organelles. There is a different ratio between the nucleus and the cytoplasm, an increase of mitotic activity, and the appearance of pathological mitosis, etc.

Microspecimens “Cellular atypism in undifferentiated cancer and in rhabdomyosarcoma”.
Cancer is a malignant tumor of epithelial origin without any specific localization.
The rhabdomyosarcoma is a malignant tumor which originates from striated muscular tissue; it is seen in skeletal muscles, myocardium, tongue, etc.

In the respective specimens (fig.202 and 203) a significant cellular and nuclear atypism and polymorphism can be observed. The tumor cells have varied shapes and size; some of them are giant, polynuclear, with uneven nuclei, some of them are very large, with many monstruosities.
Their staining intensity is also varied (hyper- or hypochromatosis of the nuclei), and the number of mitosis is considerably increased, including abnormal mitosis. The original tissue architectural disruption and the chaotic arrangement of the tumor cells must be mentioned.

**Microspecimen “Cellular atypism in hepatocellular carcinoma”**.

In the center of the specimen (fig.204) there can be seen a site of cancerous transformation (malignization) with characteristic signs of cellular atypism and polymorphism. It is composed of tumor cells of varied shapes and sizes, with large, giant and hyperchromic nuclei. The cytoplasm is more basophilic compared to the surrounding hepatocytes. The mitosis are aberrant; the arrangement of tumor cells is chaotic, with no order. Gradual transformation of the normal hepatic tissue into a tumor is taking place.

The cellular atypism is common for the malignant immature tumors.

The ultrastructural atypism includes ribosome number increase, shape and volume diversity of mitochondria, nuclei, mitosis atypism, and the appearance of some hybrid or chimaera-cells (cells that possess the function of two different types of cells).

The histochemical atypism reflects the biochemical and metabolic peculiarities of the tumor tissue which distinguish it from the origin tissue, for example the predominance of anaerobic glycolytic metabolism and the increased content of nucleic acids, etc.

### 8.1.3. METASTASIZING AND RELAPSE OF TUMORS

Metastasis is the process of transferring the tumor cells, their dissemination and multiplication at some distance from the primary tumor, leading to the formation of secondary tumor nodules or metastases. It is characteristic for malignant tumors (cancer, sarcoma, melanoma).

It can evolve via the following ways: a) through blood (hematogenous metastasizing); b) lymphatic (lymphogenic metastasizing); c) by continuance (for example perineurally) and d) by contiguity (implantation or contact metastasizing), which are more frequently seen on the serous membranes (for example, the carcinomatosis of peritoneum, pleura). The metastasizing in the brain can take place through the cerebrospinal fluid (fluid metastasizing).

**Microspecimen “Tumor embolus in a blood vessel”**.

The vascular (vein) lumen contains a collection of tumor cells (cellular embolus), which adhere to the intima, implanting partially into the vascular wall (fig.205). Subsequently the extravasation of tumor cells takes place leading to the occurrence of secondary tumor lesions, or metastases. The tumor embolism is mostly seen in veins and capillaries, more rarely in arteries. Hematogenous (venous) metastasizing is characteristic especially for sarcomas, melanomas, chorioncarcinomas, etc.

**Microspecimen “Cancerous embolism of the pulmonary lymphatic vessels”**.

The specimen (fig. 97) contains lymphatic vessels, which are obliterated by collections of tumor cells (cellular tumor emboli). The lymphatic metastasizing is typical for cancerous tumors, the first metastases being found in the regional lymph nodes (satellite nodes of the respective region). After the taking over the regional lymph nodes, the tumor cells invade the blood circulation and varied organs and tissues.
Microspecimen "The perineural spreading of glandular carcinoma".

The specimen (fig.206) contains glandular cancerous structures (adenocarcinoma), which spread by continuance along the nervous trunk sheath (perineurally). The primary tumor is located in the pancreas (pancreatic adenocarcinoma).

Macrospecimen "Cancer metastases in liver (fig.207) and lung (fig.98), and ocular melanoma metastases in bones (fig. 208)".

The respective organs contain multiple secondary metastatic tumor nodules, disposed without any order. They are more or less well delimited, and of variable sizes.

The hematogenous metastases in the liver are more frequently seen in gastric, pancreatic, colon, etc. carcinomas. In lungs, mammary gland, and stomach cancer metastases, are more frequently seen. Melanoma metastases contain melanin pigment, the primary tumor being located in the eye (in the enucleated ocular globe there can be seen a tumoral lesion of a brown-black color).

Microspecimen "Gastric adenocarcinoma metastases in the liver".

In the focus, (fig.209) two zones can be seen: cancerous atypical glandular structures and adjacent compressed hepatic tissue, with dystrophic changes.

Relapse of the tumor represents its reappearance in the same place after surgical excision or after radiotherapy. It grows from the cells that can remain at the tumor site or from the near by lymphatic metastases. It is characteristic for the malignant tumors. It is also seen in tumors with local destructive growth (intermediary type), for example in basalioma or a basal-cell carcinoma (a tumor localized more frequently on the skin of the face), desmoid (connective tissue tumor localized usually in the anterior abdominal wall), in ameloblastoma (odontogenic epithelial tumor located in the mandible).

8.1.4. MORPHOGENESIS AND GROWTH OF TUMORS

The evolution of tumors can begin de novo, but more frequently it begins with the background of some pretumoral (precancerous, preneoplastic) lesions. These lesions represent pathologic processes, which create a high risk for tumor occurrence. The pretumor lesions are subdivided into obligatory (they end up with cancer in the majority of cases) and optional (they rarely lead to cancer). The most eloquent examples of obligatory precancer are the congenital polyposis of the large intestine and xeroderma pigmentosum; both diseases are hereditary in nature. The optional pretumor conditions include some hyperplastic, dysplastic and dysembryoplastic processes, accompanied by morphologic restructuring of tissues and functional disorders. Examples are leukoplakia, squamous metaplasia and inflammatory polyposis of the mucous membrane, dysplasia of mucosal epithelium, endocervicosis of the uterine cervix, glandulo-cystic hyperplasia of the endometrium, hepatic cirrhosis, chronic gastric ulcer, chronic atrophic gastritis, senile keratosis, etc.

Depending on the degree of tumor differentiation and the relation with adjacent tissues, there can be distinguished the following variants of tumor growth:

a) expansive – the tumor grows slowly, "by itself", eliminating and compressing the surrounding tissues which gradually form a fibroconnective capsule around the tumor nodule (the parenchymatous elements undergo atrophy). The tumor has precise limits and can be easily eliminated (enucleated); it is common for benign tumors;
b) appositional – the tumor evolves by tumoral transformation of the surrounding normal cells and their subsequent proliferation no further than the tumor field;

c) invasive (infiltrative) – the tumor cells infiltrate and destroy the adjacent normal tissues (destructive growth); the invasion can evolve along nerve fibers, blood and lymph vessels, intertissular spaces, etc. The tumor nodule does not have precise limits; it is characteristic for malignant tumors.

Depending on the number of initial tumor growth sites, the tumors can be unicentric (with a single site) and multicentric (with multiple sites). In the cavitory and tubular organs the tumor can grow exophytic – expansive growth in the cavity of the organ and endophytic – the tumor is localized in the wall of the respective cavity.

8.2. ORGANO-NON-SPECIFIC EPITHELIAL TUMORS

This group of tumors evolve from the squamous, transitional and glandular epithelium which do not have specific functions. They can be benign or malignant. Their classification is given in table 33.

<table>
<thead>
<tr>
<th>Origin tissue</th>
<th>Benign tumors</th>
<th>Malignant tumors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pluristratified squamous epithelium</td>
<td>Papilloma</td>
<td>Carcinoma in situ Squamous carcinoma (epidermoid)</td>
</tr>
<tr>
<td>Transitional epithelium</td>
<td></td>
<td>Transitional carcinoma</td>
</tr>
<tr>
<td>Monostratified cuboidal, cylindrical or prismatic epithelium of the glandular organ mucous membranes</td>
<td>Adenoma (acinic, tubular, trabecular, papillary, fibroadenoma, adenomatous polyp)</td>
<td>Carcinoma in situ adenocarcinoma muciparous carcinoma (colloidal)</td>
</tr>
<tr>
<td>Stem cells or predecessor cells of the epithelium</td>
<td></td>
<td>Fibrous carcinoma (scirrhous) Trabecular carcinoma (solid)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Parenchymatous carcinoma (medullary)</td>
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<tr>
<td></td>
<td></td>
<td>Undifferentiated carcinoma (anaplastic)</td>
</tr>
</tbody>
</table>

The benign epithelial tumors without specific localization are papilloma and adenoma.

Papilloma. A papilloma arises from pluristratified squamous and transitional type epithelium. It is seen in skin and on the mucous membranes covered by the respective epithelium: buccal cavity, pharynx, larynx (vocal plicae), esophagus, bladder, uterine cervix.

Macro- and microspecimen “Papilloma of the skin”.

Macroscopically (fig. 210), the surface of the skin contains a tumor structure of spherical shape, with a rough surface, dense consistency, having a large implantation base. The size can vary from 1-2 mm up to 1-2 cm.

Microscopically (fig. 211), the papilloma is composed of parenchyma and stroma, the parenchyma being represented by proliferating pluristratified squamous epithelium. The tumor epithelium is unevenly thickened, forming prominent papillary projections on the surface of the skin; the corneous layer is thickened (hyperkeratosis), as well as the
malpighian layer (acanthosis). The stroma is abundant; the blood vessels are chaotically disposed. All these modifications show a tissular atypism in papilloma. The integrity of the basal membrane and the morphological polarity (the localization of varied cytoplasmic organelles either at the basal or apical pole of the cell) of the epithelium are unaffected; facts that are characteristic for the benign tumors.

The clinical manifestations and evolution depend on the localization, and can be complicated with ulcerations and secondary inflammation. Papillomas can be single or multiple (papillomatosis). Sometime after excision they relapse (especially the papilloma of the vocal plicae and bladder). In cases of long mechanical irritation the papilloma can become malignant, transforming into adenocarcinoma (glandular cancer).

Adenoma. Adenoma evolves from glandular epithelium. It is seen in glandular organs (prostate, pancreas, liver, salivary, sudoriferous glands, mammary gland, endocrine glands, etc.) and in mucous membranes covered by glandular cylindrical-cuboidal epithelium (gastrointestinal, tracheobronchial, uterine, of biliary tract and gall bladder mucous membranes). In compact organs the adenoma appears as a well delimited, encapsulated nodule (expansive growth), having the same color and consistency as the origin tissue. On the mucous membranes it has either a pediculated polyp appearance or a large implantation base. The adenoma can become malignant, transforming into adenocarcinoma (glandular cancer).

Macrospecimen “Prostate adenoma” (fig. 187).

The prostate is bigger in volume, has a rough surface, and hard consistency. It consists of gray or yellowish nodules of varied size, composed of glandular and tubular structures, covered with regular cylindrical-cuboidal epithelium. It can be complicated with the urinary stasis in the bladder, hypertrophy of the bladder wall, and the association of inflammatory processes in the urinary tract (cystitis, urethritis, ascending pyelonephritis).

Macrospecimen “Adenomatous polyps of the colon” (fig. 212).

The mucous membrane of the large intestine contains multiple pediculated polyps of varied sizes, irregular surface and cauliflower-like appearance. They can be complicated with intestinal hemorrhage and secondary inflammation. Colon polyposis is a hereditary, familial disease and is considered to be an absolute precancerous condition, because very often the adenomatous polyps of the large intestine can become malignant, transforming into adenocarcinoma.

Microscopically, the following adenoma varieties can be distinguished: 1) acinic (alveolar); 2) tubular; 3) trabecular; 4) papillary. In cases when the connective stroma predominates over the glandular parenchyma, the tumor is called fibroadenoma or adenofibroma.

Microspecimen “Adenoma (adenomatous polyp) of the large intestine”.

Macroscopically, it has a pediculated polyp appearance (adenomatous polyp), a spherical shape and a smooth surface.

Microscopically (fig. 213), the tumor consists of glandular structures. These structures have varied shapes and sizes. Some of them are cystically distended, with mucus hypersecretion, and intact basal membrane. The complications are ulceration, hemorrhage, and secondary inflammation; it can become malignant.
8.2.1. CARCINOMA

Carcinoma is a malignant tumor of epithelial origin without a specific localization. Term “cancer” is more generic, referred to all malignant tumors. The microscopic classification of cancer is given in Table 34.

It can arise in pluristratified squamous, transitional or glandular epithelium. It is characterized by cellular and tissular atypism, invasive (infiltrative) growth, metastases (predominantly lymphatic) and recurrence.

Macroscopically, it has a nodular appearance, without precise limits, infiltrates the neighboring tissues (invasive growth), and has a flaccid or dense consistency. It has a whitish color on section. It may be localized in the depth of the compact organs or on their surface, while in the cavitary and tubular organs it may be on the surface (exophytic growth) or in the thickness of the walls (endoepthytic growth).

<table>
<thead>
<tr>
<th>Type of cancer</th>
<th>Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Carcinoma in situ (preinvasive, intraepithelial)</td>
<td>The cellular atypism and polymorphism is observed no further than the epithelial layer; the tumor invasion does not pass across the basal membrane, which remains intact; dynamically it becomes invasive (infiltrative); it is seen in squamous, transitional or glandular epithelium</td>
</tr>
<tr>
<td>2. Squamous carcinoma (epidermoid)</td>
<td>Arise in squamous (skin, buccal cavity, esophagus, pharynx, larynx, uterine cervix, vagina), transitional (renal pelvis, ureters, bladder) or glandular epithelium which has suffered epidermoid metaplasia (bronchi, endometrium, gall bladder, etc.); it is composed of fascicles of atypical epithelial cells, which invade the adjacent tissue. In epidermoid keratinizing carcinoma, the corneification ability is maintained, forming “keratin pearls”</td>
</tr>
<tr>
<td>3. Glandular (adenocarcinoma), tubular, alveolar or papillary carcinoma</td>
<td>Derives from the prismatic, cylindrical or cuboidal epithelium from the mucous membranes and from glandular organs (stomach, intestine, uterus, lungs, liver, pancreas, prostate, salivary, sudoriferous, mammary, endocrine glands, etc.).</td>
</tr>
<tr>
<td>4. Muciparous (colloidal) carcinoma</td>
<td>Derives from glandular epithelium, the tumor cells are producing great amounts of mucus; macroscopically it has a mucinous or colloid appearance; the cells can gain the shape of a “sealed ring”.</td>
</tr>
<tr>
<td>5. Undifferentiated carcinoma</td>
<td>The tumor cells are monomorphous. They do not form specific structures. The quantity of stroma is small; it is a very malignant form of carcinoma, which metastasizes widely in the body.</td>
</tr>
<tr>
<td>a) with small cells</td>
<td></td>
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<tr>
<td>b) with large cells</td>
<td></td>
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<tr>
<td>c) with giant cells</td>
<td></td>
</tr>
<tr>
<td>6. Parenchymatous (medullary) carcinoma</td>
<td>Parenchyma predominates in this tumor; the amount of stroma is small. It is an undifferentiated form of carcinoma, giving off multiple widespread metastases</td>
</tr>
<tr>
<td>7. Fibrous (scirrhouss) carcinoma</td>
<td>Stroma predominates in this tumor. Among the abundant fascicles of connective tissue, thin strings of atypical hyperchromatic tumor cells are observed. It has a high malignancy, with widespread metastases.</td>
</tr>
<tr>
<td>8. Trabecular (solid) carcinoma</td>
<td>The stroma and parenchyma are uniformly disposed; the tumor cell fascicles alternate with fibroconnective fascicles; it is an undifferentiated form of carcinoma with rapid growth and widespread metastases.</td>
</tr>
<tr>
<td>9. Dimorphous carcinoma</td>
<td>This is a mixed type of carcinoma, in which there can be observed both glandular and epidermoid structures</td>
</tr>
</tbody>
</table>
Macrospecimens:

"Laryngeal carcinoma" (fig. 214).
In the laryngeal cavity there can be observed a tumoral nodule with exophytic growth, prominent on the mucous membrane surface. It has a hard consistency, a necrotic center and a ulceration zone. It can be complicated by mechanical asphyxia, hemorrhage, secondary inflammation, superinfection, and metastases, especially in the regional lymph nodes. In most cases it occurs at vocal plicae level. The most frequent histologic form is the epidermoid (squamous) carcinoma with or without cornification. It appears often with the background of chronic inflammation, leukoplakia and dysplasia of the laryngeal mucous membrane, etc.

"Fungiform gastric carcinoma" (fig. 215).
In the stomach there can be observed a voluminous tumor with exophytic growth, irregular surface, hemorrhagic foci, flaccid consistency, and a mushroom-like (fungiform) appearance. It is more often localized in the region of the smaller curve and pylorus. It can be complicated with hemorrhage, perforation, inflammation of the gastric wall (phlegmon), invasion of the neighboring organs (pancreas, transverse colon, etc.), and metastasizes firstly in the regional lymph nodes, liver. Histologically, in most cases the glandular type of gastric cancer is observed (adenocarcinoma). It is most frequently preceded by precancerous conditions like the chronic gastric ulcer, chronic gastritis (especially achylia) and gastric poliposis.

" Peripheral pulmonary carcinoma" (fig. 216).
In the peripheral subpleural zone of the lung there can be observed a tumor nodule of large size, which almost entirely occupies the inferior lobe of the lung. It has a dense consistency, unairied, whitish color, with destruction and necrotic lesions. It derives from bronchiolar or small bronchi epithelium, usually having a glandular structure (adenocarcinoma). It frequently causes oblitative atelectasis, hemorrhage, abscess, gangrene, fibrinohemorrhagic pleuritis, pleural carcinomatosis, and metastases in the bronchial, bifurcational and distant lymph nodes. It usually appears following chronic bronchitis, chronic abscess, bronchiectatic disease, pneumosclerosis, chronic pneumonia, chronic tuberculosis, pneumoconiosis and other precancerous conditions.

"Diffuse gastric carcinoma" (fig. 217).
The stomach wall is thickened, indurated, immobile and of a whitish color on section. The layers of the stomach wall are erased and the mucous membrane is uneven, with massive thick plia. These modifications are due to the infiltrative cancerous process, which spreads diffusely through the gastric wall (endophytic growth). Histologically, it usually has a scirrhus or trabecular carcinoma appearance.

"Carcinoma of the cervix" (fig. 177).
The uterine cervix is deformed, caused by a tumoral mass without precise limits. It has a cauliflower-like papillary surface, with destructive and necrotic areas, infiltrating the inferior portion of the uterine cervix. Microscopically, it can have a glandular or squamous carcinoma structure. It frequently invades the bladder and rectum, metastasizing to the regional lymph nodes and widely from the primary tumor. Clinically it is manifest by uterine hemorrhage (metorrhagia). The precancerous conditions are endocervicosis of the uterine cervix, polyps, leukoplakia, dysplasia and chronic inflammation.
Microscopic specimens:

"Carcinoma in situ".
The squamous epithelium (fig. 219) is thickened, with a pronounced cellular atypism. There is polymorphism of cells and nuclei, some of the nuclei being very large and hyperchromic, with monstrousies and pathological mitosis in the superficial layers. The nuclear-cytoplasmic ratio is increased, and the cells are unevenly arranged, without polarity. Vertical stratifying, characteristic for the normal pluristratified squamous epithelium is erased. The basal membrane appears to be intact, continuous, without the tumor cells penetrating it. It is a preinvasive form of carcinoma (syn. preinvasive or intraepithelial carcinoma). The carcinoma in situ becomes invasive (infiltrative) if given enough time.

"Epidermoid (squamous) keratinizing carcinoma".
The tumor consists of columns of atypical and polymorphous cancerous cells (fig. 220). The basal membrane is altered (torn) so that the tumor proliferation infiltrates the underlying tissue. The neoplastic cells keep their capacity to keratinize. Keratin masses accumulate in the center of some neoplastic cell islands, forming so called "keratin pearls", the characteristic sign of the epidermoid keratinizing carcinoma (fig. 221).

"Epidermoid non-keratinizing carcinoma".
The tumor masses (fig. 222) are composed of atypical, polymorphous cancerous cells, with large monstrous and hyperchromatic nuclei and numerous pathological mitosis. The loss of epithelial stratification is observed. The tendency towards keratinization and keratin pearl formation is lost. The degree of malignancy of this form of carcinoma is greater than that of epidermoid keratinizing carcinoma.

Epidermoid carcinoma is seen on the skin and on mucous membranes covered with pluristratified squamous epithelium or on mucous membranes covered with glandular epithelium, which has undergone squamous (epidermoid) metaplasia.

"Glandular carcinoma (adenocarcinoma)".
The tumor consists of atypical tubular (fig. 223) or papillary (fig. 224) glandular structures of varied shape and sizes, which infiltrate the adjacent tissues. The basal membrane is absent; the tumor cells are atypical, polymorphous and in some places disposed in several rows. The adenocarcinoma can be acinic, tubular or papillary. It derives from prismatic, cylindrical and cuboidal epithelium of the mucous membranes and glandular organs. It is more frequently located in the stomach, large intestine, uterus, lungs, biliary tract, pancreas, etc.

"Muciparous carcinoma" (fig. 225).
The cancerous cells secrete large quantities of mucus, and due to this fact they have a characteristic appearance, that of "sealed ring cells". The nucleus is moved toward the cell membrane and flattened by the mucus masses. Macroscopically, the tumor has a gelatinous appearance. It is a form of undifferentiated carcinoma of adenogenic (glandular) origin. It is seen in the stomach, intestines, lungs, endometrium, etc.

"Scirrhous (fibrous) carcinoma".
The tumor consists of great quantities of mature, fibrillary connective tissue, whose fascicles contain chaotically disposed, highly atypical cancerous cells, with large, hyperchromatic nuclei (fig. 226). It is an undifferentiated, adenogenic tumor, with an
increased degree of malignancy. The main characteristic is the prevalence of connective tissue stroma over the cellular parenchyma. Microscopically, the scirrhous carcinoma has a hard, wood-like consistency, deforming the respective organ; it has an endophytic growth pattern in the cavitary and tubular organs (fig. 217).

"Carcinoma with small cells",

The cancerous tumor consists of small, monomorphous, round, lymphocyte-like cells, disposed unevenly, diffusely, in a poor stroma (fig. 227). Macroscopically, it has a flaccid consistency. It is a undifferentiated form of carcinoma with increased malignancy, which metastasizes early. In some cases it is difficult to determine the histogenesis of the tumor (anaplastic carcinoma).

The cancerous tumors are usually accompanied by dystrophic, necrotic, circulatory and secondary inflammatory lesions. These lesions are stronger and earlier in tumors with an increased degree of malignancy. As mentioned, the carcinoma metastasizes more often by lymphatic system, the first metastases being localized, usually in the regional lymph nodes.

8.3. MESENCHYMAL TUMORS

The mesenchymal group of tumors includes the tumors which originate in mesenchymal tissues, loose and dense connective tissue, smooth and skeletal striated muscles (including the cardiac muscle), cartilaginous and osseous tissues, serous and synovial membranes. They usually have a histoid structure, composed with a prevalence of parenchymatous elements. The stroma is poorly developed. They may be subdivided into benign and malignant mesenchymal tumors (table 35).

<table>
<thead>
<tr>
<th>Mesenchymal tumors</th>
</tr>
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<tbody>
<tr>
<td><strong>Origin tissue</strong></td>
</tr>
<tr>
<td>Connective tissue</td>
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<td>Adipose tissue</td>
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<tr>
<td>Muscular tissue</td>
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<tr>
<td></td>
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<tr>
<td>Blood vessels</td>
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<tr>
<td></td>
</tr>
<tr>
<td>Lymphatic vessels</td>
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</tbody>
</table>
8.3.1. BENIGN MESENCHYMAL TUMORS

The benign tumors of mesenchymal origin, like all benign tumors, have a slow, expansive growth, are well delimited, and encapsulated. They are composed, microscopically, of mature differentiated cells, being characterized only by the tissular atypism.

Macro- and microspecimens:

“Fibroma” (macro- and microspecimen).

Fibroma is a benign tumor which derives from connective tissue. Macroscopically (fig. 228), it is a well delimited tumor nodule, which is encapsulated (expansive growth) with the diameter reaching up to several cm. It is whitish in color, with varying consistency: soft (soft fibroma, with the predominating cellular elements) or dense (dense fibroma, predominantly composed of collagen fibers). On section it has a fibrillar structure, an evident tissular atypism, the connective fascicles being disposed chaotically, and in some places forming whirls.

Microscopically (fig. 229), the tumor consists of connective tissue cells (fibroblasts and fibrocytes) and collagen fibers, arranged without any orientation order in unevenly thick fascicles. The relation of cells and vessels is also uneven. Small sites of hyalinosis can be seen.

The location of fibroma is most variable, but is more often seen in skin, uterus, mammary gland, fascias, tendons, orbit, cranial basis. The clinical importance and manifestations depend on the localization of the tumor.

“Desmoid tumor” (microspecimen).

The desmoid tumor (desmoma) is a variety of fibroma. It is a tumor with local destructive character. The difference is that it has an infiltrative growth, though histologically the tumor is mature (the cellular atypism and polymorphism are absent, and so are the mitoses). It is more frequently seen in the anterior abdominal wall of females, especially in the rectus abdominis muscles, but it can be also located extraabdominally.

It can be seen in the specimen (fig. 230) that the tumor tissue consists of fibroblast type cells and collagen fibers, like the hard fibroma. The tumor nodule does not have precise limits, infiltrating and dissociating the adjacent muscular fibers, which undergo dystrophic changes. Due to its invasive character, the desmoma can recur after surgical excision.

“Lipoma” (macro- and microspecimen).

Lipoma is a benign tumor of adipose tissue.

Macroscopically (fig. 231), in the thickness of the skeletal muscle a tumoral nodule can be observed. It has an oval shape (particularly it is a smaller one, of a round shape), soft consistency, well delimited, encapsulated and lobulated. When sectioned it has a yellowish color.
Microscopically (fig. 232), the tumor consists of adipose cells (adipocytes) of varied sizes, with the nuclei moved to the cell periphery. The cytoplasm contains a large lipidic vacuole. The stroma is poor, forming thin fibrous septa, which contain blood vessels.

The lipoma can be very large (several kg). It is more frequently seen in the subcutaneous cellular adipose tissue, mediastinum, retroperitoneal space, mesentery, epiploon, mammary gland, soft tissues (skeletal muscles), etc.

**“Hibernoma” (microspecimen).**

Hibernoma is a benign tumor, which derives from the brown adipose tissue (brown lipoma). It is composed of (fig. 233) polyhedral cells containing vacuolized cytoplasm (fat multicellular cells), the nucleus being situated in the center of the cell. The vacuoles are small fat drops, containing lipochrome. Small cells, containing homogeneous eosinophilic cytoplasm with a decreased quantity of fat can be seen. Macroscopically, the tumor nodule has a yellowish-brown color. The tumor can be localized in the interscapular region, mediastinum and neck region, places where brown adipose tissue is usually present. This tissue is more abundant in infants, while in adults it is exceptional.

**“Uterine fibroleiomyoma” (macro- and microspecimen).**

Leiomyoma is a benign tumor of smooth muscle tissue. It is most frequently seen in the uterus, but can also be found in the digestive tract, bladder, prostate, etc. It originate from smooth muscles, or from the walls of blood vessels. Due to the fact that muscular parenchyma proliferation is accompanied by fibroconnective tissue stroma proliferation, the name fibroleiomyoma is more fitting.

Macroscopically (fig. 234), the uterine wall contains three tumor nodules of varied size, two of them are in an intramural position, partially endocavitary, well delimited, encapsulated, with a yellowish-white color. A pedunculated nodule is situated in the cervical canal undergoing expulsion from the uterine cavity. The consistency of the nodules is usually hard; in cases where secondary modifications occur (hemorrhages, edema, necrotic foci, myxomatosis), the consistency can be more soft. The uterine fibroleiomyoma is usually multiple, the tumor nodules being localized under the mucous membrane, intramural or subserous and can reach giant sizes. On section, they have a fibrillar structure, the muscular and connective fascicles being chaotically disposed, and whirled.

Microscopically (fig. 201), the leimyomatous tumor nodule consists of smooth muscle fiber fascicles, arranged unevenly without any order. They are interspersed with collagen fiber fascicles and connective tissue cells which are being also chaotically arranged (tissular atypism).

Uterine fibroleiomyoma can frequently be complicated with uterine hemorrhage (metrorrhage). The leiomyoma can transform into leimyosarcoma.

**“Myocardial rhabdomyoma” (macrospecimen).**

Rhabdomyoma is a benign tumor derived from striated muscles. It is predominantly seen in the myocardium, skeletal muscles and tongue. It is a relatively rare tumor.

The specimen (fig. 235) contains multiple tumor nodules (multicentric growth), situated in the thickness of the left ventricle wall. These nodules are well delimited, of a whitish-pink color and with a diameter up to 2-3 cm. The cardiac rhabdomyoma is usually associated with developmental anomalies.
"Rhabdomyoma" (microspecimen).

The tumor nodule is composed of striated muscle cells of varied shapes and sizes (fig. 236). The diagnosis can be made with the help of those techniques that highlight the transverse striation of the myocyte sarcoplasm.

"Capillary hemangioma" (microspecimen).

Hemangioma is a benign tumor of the blood vessels, originating from all elements of the vascular wall. The following variants of hemangioma can be distinguished: capillary, venous, cavernous and arterial.

The capillary hemangioma (fig. 237) consists of capillary type vessels of varied size. Their walls are covered with endothelial cells. It is more frequently seen in children, being localized in the skin, mucous membrane of the digestive tract and in the liver. It is nodular with a red or cyanotic color and smooth or papillary surface.

"Cavernous hemangioma of the liver" (macro- and microspecimen).

The tumor nodule is well delimited from the adjacent tissue (fig. 238), having a bluish-red color, flaccid consistency and a spongy structure.

Microscopically (fig. 239), the tumor is represented by small, distended, interconnected vascular cavities, of varied size, covered with endothelial cells and are filled with blood. These cavities have thin walls made of fibrous connective tissue.

Besides the liver, cavernous hemangioma is also seen in skin, spongy bones, skeletal muscles, etc.

"Chondroma" (macro- and microspecimen).

Chondroma is a benign tumor of cartilaginous tissue. It is more frequently seen in bones of the extremities (phalanx of the hands and feet), pelvis, ribs and vertebrae. It can also be seen in extraosseous locations, especially in lungs. Macroscopically, it is a well delimited nodule, of dense consistency and bluish-white color, like hyalin cartilage (fig. 197). In bones, it can be localized on the surface (echondroma) or intraosseously (enchondroma).

Microscopically (fig. 240), the tumor is composed of chondrocytes. They are disposed unevenly, chaotically, and have unequal shapes and sizes. Between the cells, the homogeneous basophilic ground substance can be seen.

All the benign mesenchymal tumors can be accompanied by dystrophic, necrotic lesions, circulatory disorders, edema, myxomatosis, calcification, etc.

8.3.2. MALIGNANT MESENCHYMAI TUMORS

The malignant tumors of mesenchymal origin are called 'sarcomas' (table 35). They are characterized by cellular and tissular atypism, rapid and invasive (infiltrative) growth. They do not have precise limits, are not encapsulated and weakly delimited from the surrounding tissues. The tumor mass has a fish meat-like appearance macroscopically. These tumors metastasize and relapse.
Macrospecimens:

"Fibrosarcoma" (fig. 241, general and section appearance).
"Chondrosarcoma" (of the spinal column, fig. 242).
"Osteosarcoma" (fig. 243).

Fibrosarcoma is a malignant tumor of the connective tissue, localized more frequently in the subcutaneous tissue and in the deep soft tissues of the extremities and trunk. It is rare in the internal organs.

Chondrosarcoma is a malignant tumor of cartilaginous tissue. It is more frequently seen in the long bones of the extremities (the upper extremities of the femur and humerus), ribs, scapulae, pelvic bones, vertebral column. In bones it can be localized in the medullary or periosteal zones.

Osteosarcoma is the most frequent malignant tumor of the osseous tissue and can have two variants: osteoblastic and osteoclastic. It is localized predominantly in the femur, humerus, tibia, scapular and pelvic bones.

In all three macrospecimens an irregular shape of the tumor can be seen. There are unprecise limits, the absence of capsules, whitish color, flaccid consistency, and a fish meat-like appearance on section. Some of these tumors can be accompanied by dystrophic lesions and hemorrhage.

Microspecimens:

"Fibrosarcoma" (fig. 244).
"Leiomyosarcoma" (fig. 245).
"Liposarcoma" (fig. 246).

In the microscopic specimens the specific histological characteristics of sarcomas, especially the cellular atypism and polymorphism, can be seen.

Fibrosarcoma consists of immature, fibroblast type cells and an insignificant quantity of collagen fibers. The tumor has a histioid structure (predominance of cellular elements), relatively uniform, though there can be seen some large, hyperchromatic nuclei with few atypical mitoses. The neoplastic cells are arranged in fascicles, which are without orientation or order. It is a form of fibrosarcoma with medium malignancy.

Leiomyosarcoma is a malignant tumor of smooth muscle tissue, localized more frequently in the uterus and digestive tract. It can occur by malignant transformation of the benign muscular tumor (leiomyoma) or it can evolve as a malignant tumor from the very beginning. It consists of poorly differentiated muscle cells with an evident cellular and nuclear polymorphism. Some of the nuclei being large, monstrous, hyperchromatic, with pathological mitoses; the connective stroma is poorly developed.

Liposarcoma is a malignant tumor derived from adipose tissue. It consists of poorly differentiated adipose cells, with unequal fat content. Cells with a homogeneous eosinophilic cytoplasm, with or without a reduced quantity of fat, and bizarre, monstrous, hyperchromatic nuclei can be seen. It is more frequently seen in the subcutaneous, retroperitoneal and mediastinal cellular adipose tissue.

All sarcomas are accompanied by circulatory disorders (hemorrhages), edema, dystrophic and necrotic lesions, myxomatosis, and cystic cavities. Sarcomas metastasize predominantly by the hematogenous way, the first metastases being produced in the lungs or liver.
8.4. TUMORS OF THE MELANIN-FORMING TISSUE

The tumors of the melanin-forming tissue are called melanomas. They can be either benign or malignant.

The benign melanomas are also called nevi. The nevi are seen predominantly on skin, especially on the skin of the face, neck and trunk. The classification of cutaneous nevi is given in table 36.

<table>
<thead>
<tr>
<th>Nevus type</th>
<th>Most frequent localization</th>
<th>Macroscopic appearances</th>
<th>Microscopic characteristic</th>
<th>Evolution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Junctional nevus</td>
<td>On every part of the body</td>
<td>Macule or papule, of a brown color, several mm in diameter</td>
<td>Consists of nevic cell collections, with or without pigment, at the epidermis-dermis junction</td>
<td>Can become malignant</td>
</tr>
<tr>
<td>Intradermal nevus</td>
<td>In the region of the head, neck and trunk</td>
<td>Prominence with a narrow or large base, of brown-black color, with smooth or rough surface, up to several mm in diameter</td>
<td>Consists of nests and fascicles of nevus cells, with or without pigment, situated in the dermis; the epidermis is intact, atrophic</td>
<td>Has a benign evolution; becomes malignant extremely rarely</td>
</tr>
<tr>
<td>Mixed (compound) nevus</td>
<td>On every part of the body</td>
<td>The association of junctional and intradermal nevi</td>
<td>The proliferation of nevus cells is localized both in the basal layer of the epidermis and in the thickness of the dermis</td>
<td>Malignant transformation can take place</td>
</tr>
<tr>
<td>Nevus with epithelioid or fusiform cells</td>
<td>In the region of the face, especially in children and teenagers (syn. juvenile nevus)</td>
<td>The nodule has a narrow or large base, of reddish-brown color, with smooth or irregular surface, having up to 1-2 cm in diameter</td>
<td>Consists of fusiform or/and epithelioid fascicles of cells with a clear cytoplasm and a decreased melanin content, localized both in the junctional zone and intradermally; there can be seen giant polynuclear cells of Langhans or Touton type</td>
<td>Has a benign evolution</td>
</tr>
<tr>
<td>Blue nevus</td>
<td>In the gluteal and extremity region</td>
<td>Nodule of a bluish color, up to 1-1,5 cm in diameter; it has a smooth surface</td>
<td>Consists of melanocyte nests, which penetrate deeply in the dermis to the subcutaneous adipose tissue layer</td>
<td>Has a benign evolution; can relapse</td>
</tr>
</tbody>
</table>
Macroskopically, nevi are prominent structures on the skin, with smooth or rough surface, brown to black color (can even have a bluish shade), and a diameter from 1-2 mm to 1-2 cm (fig. 26).

Histologically, the nevus consists of so called nevus cells of neuroectodermal origin.

**Microspecimen “Intradermal nevus”**.

Intradermal nevus is the most frequently seen form of cutaneous nevi.

The dermis (fig. 247) contains collections of small cells, of elongated shape, which contain melanin pigment at the surface. They do not contain melanin deep in the cytoplasm. The epidermis is intact. The intradermal nevi very rarely become malignant.

The malignant melanoma is one of the most malignant tumors of the human body. It can begin by malignant transformation of nevi. It is more frequently localized in the skin, eye, meninges, adrenal glands, and mucous membranes.

Macroscopically, it can have a macular, plaque or pigmented nodular shape, have a blue-black color, and a flaccid consistency (fig. 248); the pigmentation persists in the metastases (fig. 208).

Macroscopically (fig. 249), the tumor consists of polymorphous cells, some of them are monstrous. The majority of cells contain melanin granules of brown color; multiple mitoses can be also observed.

The malignant melanoma is characterized by rapid growth, and early polyvisceral (pulmonary, hepatic, cerebral, osseous, etc.) hematogenous metastases. In the tumor tissue necrotic and hemorrhagic lesions occur, accompanied by melaninuria. Less often the malignant melanoma can be achromic (amelanotic).

**8.5. TUMORS OF THE NERVOUS TISSUE AND OF THE MENINX**

The tumors of nervous system can arise from varied elements of the central, peripheral and vegetative nervous system. They are subdivided into benign and malignant tumors, though all the intracranial tumors have a malignant clinical evolution due to the compression of some nervous centers of vital importance.

The histogenetic classification of the nervous system tumors is given in table 37.

The tumors of the central nervous system can be either of neuroectodermal or meningo-vascular origin. The neuroectodermal tumors can arise from nervous, neuroepithelial and glial cells.

Among the neuroectodermal tumors derived from nerve cells, ganglioneuroma (gangliocytoma) is the most frequently met tumor.

**Microspecimen “Ganglioneuroma (gangliocytoma)” (fig. 250).**

The tumor consists of ganglion cells of mature type, disposed chaotically, without any order. They are interspersed with glial fiber fascicles. Macroscopically, it has the appearance of an encapsulated tumor nodule. It is situated more frequently in the third ventricle region, and rarely in the hemispheres of the brain.

Ganglioneuroma is also seen in the vegetative peripheral system.

The malignant analogue of ganglioneuroma is the ganglioneuroblastoma or the malignant ganglioneuroma, characterized by significant cellular polymorphism (fig. 251). It is often located extracerebrally, in the sympathetic ganglia.

Among the tumors of glial origin, most frequent is the astrocytoma.
Tumors of the nervous tissue

<table>
<thead>
<tr>
<th>Origin tissue</th>
<th>Benign tumors</th>
<th>Malignant tumors</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1. Neuroectodermal tumors</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A. Glial elements</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1) Astrocytes</td>
<td>Astrocytoma</td>
<td>Malignant astrocytoma (astroblastoma)</td>
</tr>
<tr>
<td>2) Oligodendrogliaocytes</td>
<td>Oligodendrogliaoma</td>
<td>Malignant oligodendroglioma (oligodendroblastoma)</td>
</tr>
<tr>
<td>B. Ependymal cells</td>
<td>Ependymoma</td>
<td>Malignant ependymoma</td>
</tr>
<tr>
<td>C. Choroid plexus epithelium</td>
<td>Choroidpapilloma (choroid plexus papilloma)</td>
<td>Choroidcarcinoma (choroid plexus carcinoma)</td>
</tr>
<tr>
<td>D. Nerve cells</td>
<td>Ganglioneuroma (gangliocytoma)</td>
<td>Ganglioneuroblastoma Neuroblastoma</td>
</tr>
<tr>
<td>E. Undifferentiated and embryonic cells</td>
<td>-</td>
<td>Medulloblastoma Glioblastoma</td>
</tr>
</tbody>
</table>

**II. Meningovascular tumors**

| Meningothelium | Meningioma | Meningeal sarcoma |

**III. Tumors of the autonomous nervous system**

| Sympathogonia | Ganglioneuroma | Malignant paraganglioma (malignant chemodectoma) |
| Ganglion cells | Benign paraganglioma (chemodectoma, glomus tumor) | |
| Cells of the non chromaffin paranglians (glomus) | | |

**IV. Tumors of peripheral nerves (cranial and rachidian (spinal))**

<table>
<thead>
<tr>
<th>Schwann cells</th>
<th>Neurilemoma (schwannoma, neurinoma)</th>
<th>Malignant neurilemoma (neurogenic sarcoma)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Neurofibroma</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Neurofibromatosis (Recklinghausen disease)</td>
<td></td>
</tr>
</tbody>
</table>

Macro- and microspecimens “Astrocytoma”.

Astrocytoma is a benign tumor, which arises from the astrocytic glia. Macroscopically (fig. 252), the tumor has the appearance of a nodule localized in the white matter, well or less delimited from the adjacent tissue. It can reach up to 5-10 cm in diameter. It has a flesh-like, homogeneous, whitish, dense appearance on section. In the central part a cystic cavity is formed; the gray matter from the tumor site is atrophic.

Microscopically (fig. 253), the tumor consists of glial fiber fascicles and a relatively small number of well differentiated astrocytic cells. Histologically, the astrocytoma can be either protoplasmatic or fibrillar, depending on the predominance of cells or glial fibers. The astrocytoma is clinically characterized by slow growth. It can be seen at all ages.

Of all the neuroepithelial tumors, derived from cells that cover the cavities of the brain and spinal cord, the most common are the ependymoma and the choroid plexus papilloma (benign tumors), and the ependymoblastoma as well as choroid plexus carcinoma (malignant tumors).
Microspecimen “Ependymoma”.

The ependymoma can be located either intra- or extraventricular. The specimen (fig. 254) contains a prominent tumor nodule with irregular surface and circulation disorders, situated in the left lateral ventricle. Microscopically, the ependymoma is characterized by rosette-like arrangement of the tumor cells around the vessels.

Microspecimen “Choroid plexus papilloma”.

This tumor is a benign tumor derived from the epithelium of the choroid plexus. It is seen in the lateral ventricles and in the IV-th ventricle. Macroscopically, it has a rough, cauliflower-like surface. Microscopically (fig. 255) the tumor consists of papillary branches, covered with 1-2 layers of prismatic or cuboidal epithelial cells. The choroid plexus papilloma grows in the lumen of the respective ventricle, and can associate with hydrocephaly due to the hypersecretion of cerebrospinal fluid.

Of the poorly differentiated and embryonic tumors the most frequent are the glioblastoma and medulloblastoma.

Macro- and microspecimens “Glioblastoma”.

Glioblastoma is a malignant tumor that arises from undifferentiated glial elements of the brain. It is one of the most frequent tumors that are localized in the white matter of the brain hemispheres. Macroscopically (fig. 256), the occipital zone contains a tumor nodule of an irregular shape, without precise limits, infiltrating the adjacent zones of the encephalic substance. On section it has multiple necrotic and hemorrhagic sites, which explain the variegated appearance and uneven consistency of the tumor; the peritumoral zones are edematous. Clinically, it is manifest by intracranial hypertension, and varied functional disorders, depending on the tumor location.

Microscopically (fig. 257), the tumor is characterized by a strong cellular polymorphism, being composed of atypical cells, of various shapes and sizes. Some of them are monstrous, giant cells, with hyperchromatic nuclei (that is why it is also called multiforme glioblastoma). Necrotic and hemorrhagic sites are also characteristic. Glioblastomas metastasize more often by the cerebrospinal fluid, but can also metastasize extracranially.

Microspecimen “Medulloblastoma”.

Medulloblastoma is highly malignant tumor, arising from the most immature, undifferentiated cellular elements of the brain, the medulloblasts. These embryonic neuroectodermal cells can differentiate into neuroblasts and spongioblasts (glioblasts). It is usually seen in cerebellum in children, being situated in the vermis. The tumor invades the IV-th ventricle, cerebral trunk and the leptomeninges, the excision of the tumor is impossible. Microscopically (fig. 258), it consists of small, uniform cells, with round or oval, hyperchromatic nuclei and limited cytoplasm. The cells are arranged densely, compactly, often in rhythmic or rosette-like structures. The medulloblastoma metastasizes by the cerebrospinal fluid.

The most frequent meningovascular tumor is the meningioma, which arises from the cellular elements of the meninges. It can be situated in the dura mater, arachnoid or pia mater, usually parasagittal, on the convexity and in the spinal channel. The histological variants: meningotheialnial (endotheliomatous), fibromatous and angiomatous.
Microspecimen “Fibromatous meningioma”.
The tumor nodule (fig. 259) consists of fibroblastic cell fascicles and chaotically arranged connective tissue fibers. In some places whirls are formed, like the fibroma from other organs.

The meningioma is a benign tumor that grows slowly, compressing the brain. Macroscopically, it can have the appearance of a nodule, with a smooth, irregular or flat shaped surface, extending on the meningeal membrane surface. The tumor can cause atrophy by compression of the neighboring cranial bone. The malignant variant of the meningioma looks like fibrosarcoma and is called meningeal sarcoma.

The tumors of the peripheral nerves arise from the elements of their sheaths. The most frequent are the neurilemoma (neurinoma) and the neurofibroma.

Microspecimen “Neurinoma”.
Neurinoma is a tumor derived from the Schwann cells of the peripheral nerves, being situated along these nerves (syn. schwannoma). Microscopically (fig. 260), the tumor consists of prolonged cell fascicles, with stick-like, parallel arranged nuclei (these cell collections are called Verocay bodies). These fascicles alternate with the collagen fibers, forming rhythmic structures, the characteristic sign of neurinoma.

The malignant homologue of this tumor is the malignant neurinoma, characterized by cellular density, atypism, polymorphism and rhythmic structures (fig. 261).

Microspecimen “Neurofibroma”.
The tumor arises from the connective elements of the nervous sheaths. Microscopically (fig. 262), it consists of collagen and nerve fiber fascicles disposed chaotically, and also a number of nervous cells. It is more frequently seen in skin and subcutaneous cellular adipose tissue. It can be single or multiple (fig. 198), and is often seen in Recklinghausen disease (multiple neurofibromatosis).