

PATHOLOGICAL PROCESS OF-TUMORS

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Annotation: This article describes types of tumors, etiology, pathogenesis and distribution in the animal world, biological features of tumors and features of the spread, anaplasia, the connection of tumors with the body, theories about the ethology of tumors

The tumor process is a typical pathological process, which is an unregulated infinite growth of tissue that is not associated with the general structure of the affected organ and its functions. A tumor is an excess pathological growth of tissues uncoordinated with the body, consisting of cells that have become atypical with respect to differentiation and growth and transmitting these properties to their descendants. Along with the presence of many questions and a wide unexplored area in this direction, today we can assume that the following are precisely determined:

A tumor appears in the body as a result of the transformation of normal cells into tumor cells, in which the gene mechanism of regulation of division is violated and the natural cell death is abolished.

Tumor tissue is characterized by infinite growth; This process ends only with the death of the organism, and in tissue culture is maintained indefinitely. The capacity for unlimited growth is inherited by the daughter cells; capable of selecting the cells that are most resistant to immune surveillance.

The tumor grows "from itself", i.e. its increase is due to the reproduction of a single malignant (altered) cell; neighboring cells are not involved in the process.

The tumor has relative autonomy; goes out of control of the regulatory systems of the body, providing homeostasis; able to influence the nature of the exchange and subordinate its focus on their own needs.

Tumor tissue differs from the original, from which it originated, in structure, biochemical, physico-chemical and other properties (tissue atypia). The tumor is characterized by anaplasia (return to the embryonic state) or metaplasia (acquisition of the properties of another tissue). The antigenic properties of tumor cells (the degree of foreignness) are much less pronounced compared with antigens of viruses and bacteria, which allows the tumor to escape from immune surveillance.

Tumor growth can be expansive (characteristic of a benign tumor; healthy tissue expands as the tumor grows), or infiltrative (characteristic of a malignant tumor; tumor cells grow between normal and through the vascular wall; parts of the tumor can move with blood or lymph flow other organs and form new foci of tumor growth - metastasis).

Etiology of tumors. The cause of tumors are carcinogenic factors - agents of any nature that can cause the transformation of a normal cell into a tumor. Such a transformation is a violation of the gene mechanism of regulation of cell division due to non-lethal damage to genetic material. It has been established that the target of genetic damage leading to the development of a tumor are two regulatory genes - a regulator gene that stimulates proliferation (proto-oncogene) and a regulator gene that inhibits proliferation (suppressor gene, or an anti-oncogene). In this regard, the occurrence of a tumor is possible due to hyperactivity of the stimulating gene or inactivation of the inhibitory gene. Mutations that lead to hyperactivity of the stimulating gene are dominant, inactivating the inhibitory

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gene are recessive. It was also established that for carcinogenesis, the role of genes of the third category — genes controlling apoptosis (programmed cell death) — is important.

Various factors of a physical nature (radioactive radiation, ultraviolet and sunlight) act as carcinogens; chemical compounds (hydrocarbons, amino compounds, amines, fluorenes, etc., among which benzpyrene, phenols, methyl cholanthrene, cholesterol and its metabolites, estrogens, and a number of others) are most known; biological factors - tumor viruses (bovine leukemia, chicken sarcoma, viral papilloma and others).

It has been established that exposure to a carcinogenic factor does not always lead to the appearance of a tumor. Often, a malignant cell that turns into a tumor cell does not multiply. There are cases of sequential exposure to several factors, as a result of which the development of a tumor begins (leukemia virus and radiation, etc.).

1. Initiation: the action of a carcinogenic factor and the occurrence of latent irreversible genetic damage; the transformation of a normal cell into a tumor cell.

2. Promotion: action on a cell initiated by factors that stimulate cell division or delay their final differentiation.

3. Progression of the tumor: the formation of a clone of tumor cells and its excessive reproduction; additional mutations and the occurrence of heterogeneity (polyclonality). In malignant tumors unrestrained growth, invasiveness, ability to metastasize.

The effect of a tumor on the body. Malignant tumors have a greater effect on the body than benign ones. However, both types of tumors can cause problems caused by the local and general effects of the tumor on the body. Local influences are caused by compression of adjacent structures, bleeding and infection of the ulcerated surface formed by the tumor; activation of the inflammatory process due to disintegration or necrosis of the tumor. So, pituitary tumors lead to serious endocrinopathy; benign insulin-producing pancreatic adenoma less than 1 cm in diameter, capable of producing insulin in an amount that causes fatal hypoglycemia; etc.

General effects may be due to the functional activity of the tumor, in particular, the synthesis of hormones; possible development of tumor cachexia and the development of para-tumor syndromes. Tumor cachexia is characterized by progressive loss of fat and total body weight, accompanied by increasing weakness, anorexia and anemia.

Hypercalcemia, endocrinopathy, vascular and hematological syndromes (“migrating thrombophlebitis”, disseminated intravascular coagulation syndrome - DIC, and a number of others) should be referred to paraneoplastic syndromes. Para-tumor syndromes can be the first manifestation of a tumor; may cause disturbances more significant than the effect of the tumor itself; they can simulate metastases, as a result of which an unreasonable change in therapy during a tumor is possible.

Some aspects of carcinogenesis will be discussed in more detail in the section of this course relating to leukemia and hematosarcoma.

Antitumor immunity. In the body there is a system of protection against tumors, which is represented by: cytotoxic T-lymphocytes; NK cells - lymphocytes capable of destroying a tumor without prior sensitization (possibly due to the presence of hidden antigens in the tumor cells); macrophages (by exposure to active metabolites of oxygen or tumor necrosis factor); humoral factors - enzymes of the activated complement system and stimulation of NK cells.

It has been established that the mechanisms of the body’s immune defense against tumors are insufficient. This is due to the low antigenicity of tumor cells, the evolutionary selection of the most resistant malignantly transformed cells, the depressing effect on the immune system of toxic products of tumor metabolism and the immunosuppressive effect of antitumor chemotherapy and radiation. It is also known that when the number of tumor cells at the level of 10^9 , the immune mechanisms are ineffective. However, specific tumor antigens, characteristic only of tumor cells (SOGH), as well as tumor-associated antigens, which are present on both tumor and some normal cells, have been identified. This provided the basis for the creation of anticancer vaccines, which at the World Congress of Oncologists in Rio de Janeiro in 1998, along with the development of technologies for the creation of monoclonal anticancer antibodies and the nutrition factor in the prevention of oncological diseases, were called the most promising direction in oncology.



The above types of tissue growth during hypertrophic regenerative processes are a kind of adaptation of the organism to various environmental influences. For example, hypertrophy of an organ or tissue provides enhanced work necessary to compensate for the functional insufficiency of themselves or other organs or systems. Consequently, these pathological processes are protective. In contrast to such coordinated, to a certain extent useful growth, sometimes excessively pathological growth of tissues occurs that damages the body. These pathological growths include tumors.

A tumor (blastoma) is a local, resistant pathological growth of tissues of the organoid structure, characterized by atypia, features of chemical composition, metabolism and (potentially) unlimited, uncoordinated, relatively autonomous growth. A tumor is a local manifestation of a common disease of the body.

The section of pathology that studies the problem of tumor growth is called oncology (Greek: oncos - parost, tumor).

The name of the tumor is usually derived from the name of the tissue from which it consists, with the addition of the "ohm": the epithelioma is a tumor from epithelial tissue, myoma from muscle, lipoma from fat, fibroma from connective and neuroma from nervous tissue. Some tumors have retained their ancient names for similarities with other objects; malignant epithelioma (cancer) is similar to branching with crayfish (cancer, carcinoma), malignant connective tissue sarcoma (sarcoma) - with meat (Greek. sarcos - meat). Tumors are usually constructed from parenchyma and stroma, the connective tissue framework, where vessels and nerves pass

A true tumor should be distinguished from various swellings caused by inflammatory processes, as a result of exudation, infiltration or proliferation of connective tissue (infectious granulomas).

It must be borne in mind that tumor growth is not always accompanied by swelling, but may manifest itself with a predominance of destruction processes not only in the tumor itself, but also in the surrounding tissue, so that no increase in the size of the tumor focus is detected.

The spread of tumors in animals. Tumors were found in all species and classes: fish, amphibians, reptiles, birds and mammals; however, their distribution among different classes and types of animals is different. They are often found in fish, in particular in the locomotive, in the form of thyroid tumors. In fish, with natural breeding, tumors are less common than with artificial breeding; in the latter, they may appear in the form of enzootia. To a lesser extent tumors are found in amphibians.

Various types of tumors are described in invertebrates (new formation of kidneys in snakes). Among agricultural, domestic and laboratory animals (especially in old ones) tumors are quite common.

In cattle from malignant tumors, sarcomas are more common, and from benign tumors - fibromas, osteomas and lipomas. Malignant tumors have also been described in sheep, goats and pigs. In horses, melanosarcomas and osteosarcomas are more common. In bulls and stallions, the penis is usually affected, less often other organs. Animals rarely have tumors in the gastrointestinal tract and uterus.

All kinds of tumors are found in old dogs. Most often, malignant tumors occur in the mammary glands and genitals.

Rarely there are tumors in rabbits, even less often in guinea pigs and rats. Mice often develop cancer.

Tumors are quite common in birds, especially in chickens (sarcoma). They are usually malignant.

In animals, tumors are solitary and multiple (cf. fibroma, myoma); detected various types of tumors at the same time. Tissue atypia. Tumor tissue is significantly different from normal in its structure, shape, size and maturity of the cells, chemical composition, metabolism, activity and growth of its growth, antigenicity; All this is called *kaneneva* and atypia. Depending on the degree of atypia, the originality of growth and their influence on the vital activity of the organism, tumors of pre-qualitative and malignant tumors are distinguished.

Benign tumors are characterized by the following signs:



1. Central slow growth; the tumor grows and grows in size, not germinating, but pushing, pushing aside surrounding healthy tissues (expansive growth); they grow slowly, although they can reach large sizes;

2. Do not give metastases and relapses, i.e., their cells and tissues are not transported by blood and lymph to other parts of the body; they can be completely removed (exfoliated) surgically;

3. differ in less atypia, because in structure, degree of cell propensity, nature of metabolism, they are close to healthy cells;

4. do not cause cachexia, depletion of the body, because the exchange substances in them are slightly perverted, toxic products accumulate a little and they are usually neutralized in the body; However, it should be borne in mind that a benign tumor, depending on its location, can have a detrimental effect on the body (brain tumors, etc.).

Malignant tumors are also characterized by a number of properties and features:

Rapid infiltrative growth; they grow into the surrounding healthy tissue, penetrate it, causing destruction of cell destruction; due to the increased reproduction of cellular elements, malignant tumors grow rapidly, but usually do not reach a large value, since the body quickly dies from cachexia and intoxication; give relapses and metastases.

Tumor cells can be rejected from the tumor and, getting into the blood and lymphatic vessels, can be transferred to other organs. Therefore, when a malignant tumor is removed, tumor cells often remain in other tissues, which subsequently cause metastasis. There is a direct relationship between the degree of metastasis of a tumor in the liver, kidneys, lungs and a decrease in the albumin fraction. The deactivation of the anterior nuclei of the hypothalamus causes a stronger deproteinemia due to a sharp decrease in albumin; turning off the posterior nuclei reduced protein fractions during all periods of metastasis. Small doses of hydrocortisone, used before tumor transplantation, activate the adrenal cortex, inhibit the formation of metacidiasis. These experiments confirm the importance of nerve and endocrine factors in the formation of metastases.

The atypical nature of malignant tumors appears very sharply; it concerns their structure, chemical composition, antigenicity, metabolism and, finally, the impact on the organism.

Morphological atypia consists in lowering the differentiation of cells and tissues: they are similar to embryonic in their structure, morphological properties and growth activity. The transition of tumor tissue to a lower degree of differentiation is called anaplasia (Greek ana - back, plasis - formation). The cells of the parenchyma are heterogeneous in size, their normal ratio between the size of the nucleus and protoplasm is disturbed, the shapes of the chromosomes are altered, and the interposition of cellular elements is disturbed. In glandular tumors, irregular lobules are formed or they are completely absent.

The function of tumor tissue is not much different from the original. For example, liver tumors produced bile, tumors of the endocrine glands — the corresponding hormones, tumors of the digestive glands — enzymes, etc. There are cases when after the removal of the thyroid gland (due to the presence of a cancer in it) time did not come hypothyroidism. It turned out that the hormonal function was performed by a metastasized site, which produced thyroxin in sufficient quantities. Similar phenomena were found during removal of the adrenal glands in connection with a cancer.

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