TUMOR MARKERS

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ОНКОМАРКЕРЫ ОПУХОЛЕЙ

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Annotation. In order to assess the effectiveness of treatment, identify residual and recurrent tumors, diagnose and predict the tumor process, the article presents data on the immunodiagnosis of tumors using tumor markers. A special place in the diagnosis of tumors is occupied by the determination of the increase in blood serum of tumor markers, the increase of which in the blood serum is associated with the development of tumor processes of various origins. The main methods that determine the level of tumor markers in peripheral blood are enzyme-linked immunosorbent and chemiluminescent immunoassays.

Key words: immunodiagnostics, tumor markers, tumors, diagnostic methods.

Аннотация. С целью оценки эффективности лечения, выявления резидуальных и рецидивных опухолей, диагностики и прогнозирования

опухолевого процесса в статье представлены данные об иммунодиагностике опухолей с использованием онкомаркеров. Особое место в диагностике опухолей занимает определение повышения в сыворотке крови онкомаркеров, повышение которых в сыворотке крови ассоциировано с развитием опухолевого процесса различного генеза. Основными методами, которые определяют уровень онкомаркеров в периферической крови являются иммуноферментный и иммуно-хемилюминесцентный анализы.

Ключевые слова: иммунодиагностика, онкомаркеры, опухоли, методы диагностики.

Introduction. An important place in the diagnosis of a tumor process is occupied by the determination of the increase in blood serum of tumor markers, the synthesis of which is determined by the peculiarities of the metabolism of the cancer cell. The main methods for determining the level of tumor markers in peripheral blood or other biological fluids of the body are enzyme-linked immunosorbent and immunochemiluminescent [2, 14].

Tumor markers are proteins produced by a tumor cell, the presence and changes in concentration of which in peripheral blood or other biological fluids of the body correlates with the presence and growth of a tumor.

The main requirements for tumor markers are: reliability and reproducibility of the study; high specificity and sensitivity; prognostic significance; correlation with tumor weight; low cost of research.

The concentration of the tumor marker depends on in vivo factors: tumor mass; tumor prevalence; the degree of synthesis, release and catabolism of the tumor marker; functional state of the liver and kidneys; taking medications; bad habits of the patient.

When studying tumor markers, the permissible upper limit of tumor marker concentration in healthy people and in patients with benign tumors and inflammatory diseases is of great importance [1, 6].

Carcinoembryonic antigen (CEA) is a glycoprotein formed during embryonic development in the gastrointestinal tract (GIT). Reference value in serum is 0-5 ng/ml; for those suffering from alcoholism - 7-10 ng/ml; in smokers - 5-10 ng/ml. An increase in blood serum is observed in cancer of the pancreas, colon, stomach, thyroid gland, organs of the female reproductive system, and breast. Moderate increases were also found in benign diseases of the intestines, pancreas, liver and lungs.

Indications for CEA research: monitoring the course and effectiveness of treatment of gastrointestinal, lung, and breast tumors; disease prediction [1, 8].

Alpha fetoprotein (AFP) is a glycoprotein produced by the yolk sac of the embryo. Reference value in serum: adults - up to 10 IU/ml; in women in the II-III trimester of pregnancy - 28-120 IU/ml; newborns in the first day of life - up to 100

IU/ml. It increases during pregnancy with a peak at 32-36 weeks, with liver cirrhosis, chronic hepatitis. Has high diagnostic sensitivity for hepatocellular carcinoma. Increased in teratocarcinoma containing elements of the yolk sac.

Indications for AFP testing: diagnosis of primary hepatocellular carcinoma; liver cancer screening in patients with liver cirrhosis and chronic hepatitis once every 6 months; monitoring of primary cancer treatment; early detection of liver cancer relapses; prenatal diagnosis of lesions of the fetal neural tube and Down's disease.

Cancer antigen CA 19-9 is a glycoprotein found in the fetal epithelium of the pancreas, stomach, liver, small and large intestine, and lungs. The discriminatory constant is 40 U/ml for clinically healthy individuals and 120 U/ml for patients with chronic pancreatitis.

The level of the marker increases in cancer of the pancreas, stomach, colon, biliary tract, and hepatocellular carcinoma. An increase in level is also found in chronic pancreatitis and other benign gastrointestinal diseases.

Indications for the study of CA 19-9: monitoring in patients with pancreatic cancer after surgical removal of the tumor. In some cases, differential diagnosis of inflammatory, benign diseases of the gastrointestinal tract (increase to 100-120 IU/ml) and cancerous tumors. In combination with other markers - diagnosis of stomach cancer, pancreatic carcinoma, colorectal carcinoma [1, 10].

Cancer antigen CA 72-4 is a glycoprotein that is expressed in many fetal tissues and is practically not detected in adult tissues. Reference values in blood serum are 0-4.6 IU/ml. Levels are increased in colon carcinoma, gastric carcinoma, and non-small cell lung cancer. An increase is possible in leukemia, lymphoma, sarcoma, mesothelioma and melanoma.

Indications for the CA 72-4 study: monitoring and evaluation of the therapeutic response of gastric carcinoma; in combination with other markers - diagnosis of stomach cancer.

Neuron-specific enolase (NE) is an intracellular enzyme of the central nervous system (CNS), the discriminatory constant is 12.5 ng/ml for clinically healthy individuals and 25 ng/ml for patients with benign lung diseases. Provides information about the severity of neuronal damage and violations of the integrity of the blood-brain barrier. Characterizes the degree of ischemic brain damage. Determined in cerebrospinal fluid and blood.

Indications for study No. E: diagnosis and monitoring of small cell lung cancer, neuroblastoma (sensitivity 85%); the increase is less pronounced in tumors of neuroendocrine origin, pancreatic islet cell carcinoma, and medullary thyroid carcinoma. It can also increase with epilepsy, subarachnoid hemorrhages, benign lung diseases, and radiation therapy. It increases nonspecifically during hemolysis, since it is contained in erythrocytes and platelets [1, 16].

S-100 - belongs to the family of calcium-binding proteins, is present in high concentrations in the cells of the nervous system, the discriminatory constant is 0.1-0.11 μg/l. Almost all melanomas and tumors of neuroendocrine origin are capable of producing S-100 protein [2, 11]. Marker of brain damage in trauma, Alzheimer's disease, subarachnoid hemorrhage, stroke.

Indications for the S-100 study: prognosis, detection of relapses and metastases of melanoma; used in combination with NSE in the diagnosis of brain tumors. In subarachnoid bleeding, a level of more than 0.3 μg/l correlates with an unfavorable course. During a stroke, it increases in the first 8 hours and correlates with the volume of damage. During cardiac arrest and resuscitation, levels above 1.5 μg/L indicate a high risk of neurological consequences.

UBC - urinary bladder cancer - soluble fragments of cytokeratins 8 and 18, discriminatory constant -12 μg/l. It is a highly sensitive marker of bladder cancer (80% sensitivity).

Indications for the UBC study: primary diagnosis of invasive bladder cancer; detection of recurrent bladder cancer (sensitivity 67-97%); increases slightly in cystitis with bacteriuria, hematuria of various origins [3, 12].

Tumor-M2-PK is a dimeric form of pyruvate kinase, ensures the respiration of tumor cells under hypoxic conditions, the discriminatory constant is 4 U/ml. This is one of the universal and nonspecific tumor markers. The level of marker in feces correlates with the size of the tumor and is inversely proportional to the degree of its differentiation [2, 13]. Determined in feces, less often in EDTA plasma.

Indications for the study TU-M2-PK: increases in cancer of the kidney, colon, rectum, esophagus, stomach with high sensitivity and stage dependence; also increases in breast cancer with low sensitivity; used to monitor patients with kidney cancer and colorectal carcinoma after completion of treatment. Slowly decreases after surgery and chemotherapy, so it is not suitable for quickly assessing the effectiveness of treatment.

Cancer antigen CA 15-3 - membrane antigen of metastatic breast carcinoma cells, reference values in blood serum up to 27 IU/ml; in the third trimester of pregnancy - up to 40 IU/ml. It is highly specifically increased in breast cancer [1, 5].

Indications for the study of CA 15-3: monitoring after surgical treatment of breast cancer; differential diagnosis of cancer and benign breast diseases.

Mucin-like cancer-associated antigen MSA is a serum mucin-glycoprotein, reference values for MSA in blood serum are up to 11 IU/ml. It also specifically increases in breast cancer [2, 15].

Indications for MSA study: monitoring of breast cancer treatment; life expectancy forecast; detection of disease relapses (ahead of the relapse clinic by 18 months).

Cancer antigen CA-125 is a glycoprotein present in serous membranes and tissues, reference values in women's serum are up to 35 IU/ml; during pregnancy - up to 100 IU/ml; in men - up to 10 IU/ml. It is specifically detected in serous ovarian carcinomas and serous adenocarcinomas, but not in mucinous ovarian carcinomas. Increases with endometriosis and induced pregnancy. The level of CA-125 in the contents of ovarian cysts is 100-10,000 times higher than its level in blood serum.

Indications for the CA-125 study: monitoring the course and effectiveness of response to therapy in patients with serous ovarian carcinoma; early detection of tumor relapse: an increase in CA-125 by more than 50% precedes relapse by 4 months. An increase in the level of CA-125 during conservative treatment indicates the presence of residual tumor nodes. When preparing to stimulate ovulation, a level above 20 IU/ml should be regarded as a contraindication to this procedure [2, 14].

Chorionic gonadotropin (hCG) is a glycoprotein secreted by the syncytial layer of the trophoblast during pregnancy, reference concentrations in blood serum: adults - up to 5 IU/ml; during pregnancy 7-10 days - more than 15 IU/ml, 30 days -100-5000 IU/ml, 10 weeks - 50,000-140,000 IU/ml, 16 weeks - 10,000-50,000 IU/ml. It is detected in serum on the 6-10th day after fertilization, after 1-2 days - in urine. The level increases by the 40-80th day of pregnancy, then decreases.

Indications for hCG testing: early diagnosis of pregnancy; a decrease in hCG is an indirect sign of ectopic pregnancy and threatened miscarriage; diagnosis of chorionic carcinoma, chorionepithelioma, seminoma, testicular and ovarian teratoma [3, 13].

The squamous cell carcinoma antigen SCCA is a glycoprotein formed in the squamous epithelium, the discriminatory constant is up to 1.5 ng/ml. It increases in squamous cell carcinoma of the cervix [1, 7].

Indications for the SCCA study: monitoring the course and effectiveness of treatment of squamous cell carcinoma of the cervix (sensitivity 70-85%); increased levels in carcinoma of the nasopharynx and ear (sensitivity 60%); 31% increase in lung squamous cell carcinoma; an increase in level may be noted in renal failure and diseases of the hepatobiliary system.

Prostate-specific antigen - PSA - is a tissue-specific tumor marker of prostate cancer (PCa), the discriminatory constant of total PSA is 4 ng/ml. Normally, PSA is synthesized by epithelial cells lining the acini and tubules of the prostate gland in low concentrations and then enters the seminal fluid. It is necessary to reduce the viscosity of sperm.

Malignancy, inflammatory processes, hypertrophy and hyperplasia of the prostate gland are accompanied by a significant increase in PSA levels in the blood serum. When entering the blood, PSA binds to α1-antichemotrypsin. A small portion of PSA circulates in free form [3, 9].

Indications for PSA testing: diagnosis of prostate cancer; differential diagnosis of prostate cancer and benign prostatic hyperplasia (BPH) in individuals with PSA levels ranging from 4 to 30 ng/ml.

The results of the PSA study are influenced by: rectal palpation of the prostate gland; prostate biopsy and irradiation; coitus or “sex games”; hormonal or anti-inflammatory therapy; eating spicy food and alcohol.

The study is carried out no earlier than two weeks after the listed manipulations. The PSA result also increases if the serum has not been separated from the red blood cell sediment for more than 2 hours and has been at room temperature.

Conclusions. Thus, it is necessary to make wider use of the available tumor immunodiagnosis capabilities in clinical practice; It is advisable to use tumor markers to assess the effectiveness of treatment, identify residual and recurrent tumors, diagnose and predict the tumor process.

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