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MODERN METHODS OF EARLY DIAGNOSIS OF ONCOLOGICAL DISEASES AND THE IMPORTANCE OF EARLY DIAGNOSIS OF DISEASES

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Abstract : During the diagnosis and treatment of malignant tumors, methods are often used to objectively assess the degree of the tumor process, to make a treatment plan and to evaluate the dynamics of the tumor size during therapy to understand whether the treatment will help the patient or not. . . For this, various methods are used to "look" inside the human body, for example, X-rays, ultrasound, radio waves or radioactive radiation from various chemicals. This section contains information about the main methods of instrumental research used in oncology.

Key words: Radiography, Positron emission tomography (PET) and PET-CT), Magnetic resonance imaging, Ultrasound examination, Computed tomography

Radiography is the oldest and longest used method of obtaining images of organs and tissues. This method makes it possible to evaluate the structure of internal bodies using X-rays. Imaging is based on the phenomenon of attenuation of X-ray radiation when passing through various structures and tissues (for example, through the lungs, heart, bones), the severity of the attenuation depends on the density of the object through which the rays pass. transition

The image obtained during the study is flat, so this study is usually performed in two projections (on both sides). The image taken during the study (more precisely, its "shadow") is recorded on a special film (X-ray or radiography) or, when using more modern digital equipment, on a disk or other storage medium.

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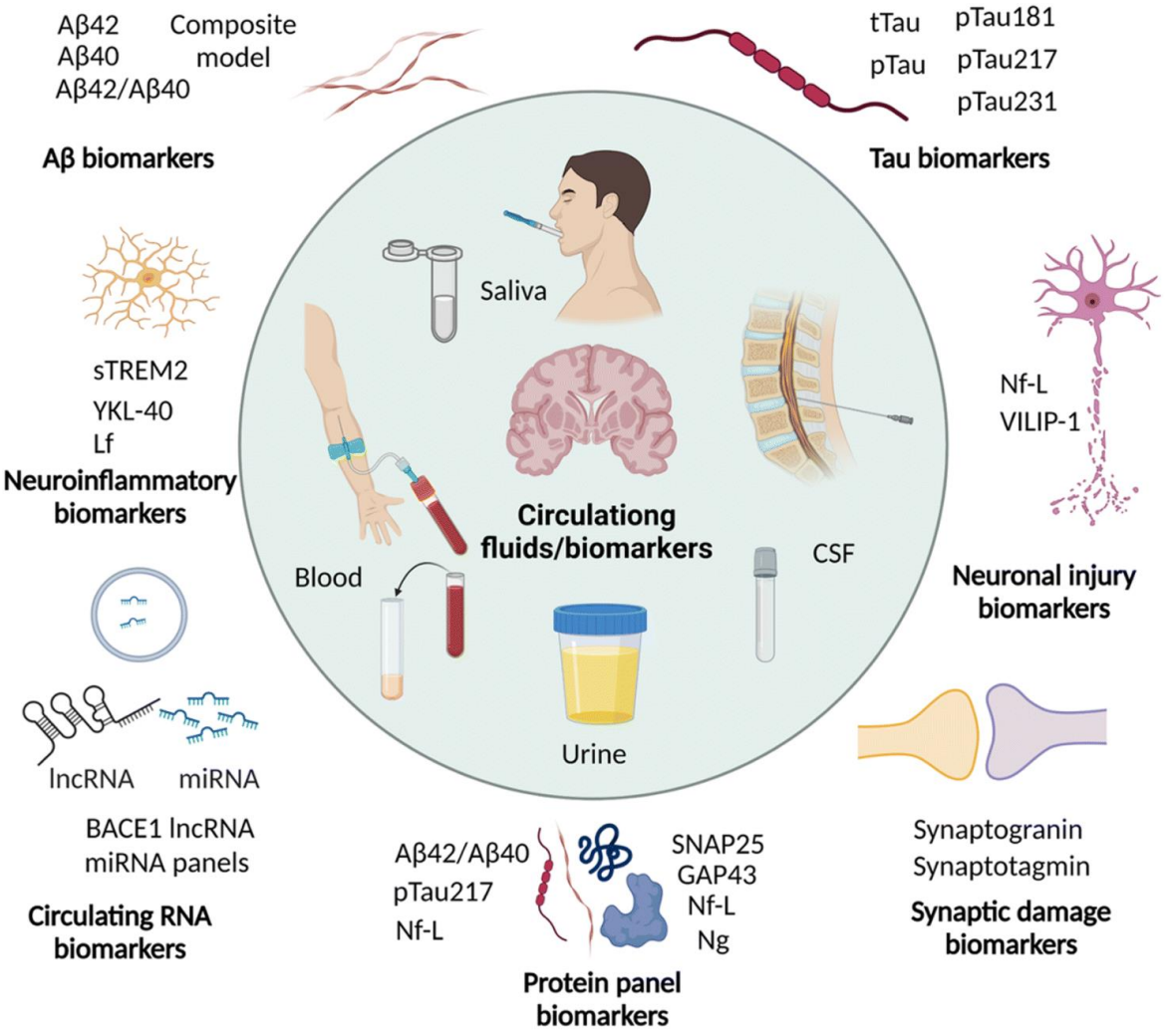

The main advantage of this method is its almost universal availability and technical convenience, as well as the low cost of the study, as well as the relatively small dose of radiation that a person receives during the study. On the other hand, radiography has relatively low accuracy compared to methods such as computed tomography or magnetic resonance imaging, which means that small injuries may not be detected when the results of the study are evaluated. Like any type of research that uses X-ray radiation, radiography is associated with the effect of radiation on the body, but in almost all cases, the value of the diagnostic information obtained during the study outweighs the potential if it is ordered according to the instructions. radiation hazard.

In oncology, radiography is used to study the organs of the chest, bone structure, mammary glands (mammography) and organs of the digestive system. For more accurate visualization of the gastrointestinal tract, for example, to study their patency, this study is carried out using special contrast agents, for example, barium.

Ultrasound examination

Ultrasound examination (ultrasound) is a research method based on the use of ultrasound waves that are not perceived by the human ear, but are reflected from the internal structures of the body in the form of an "echo". In this case, the characteristics of the reflected wave depend on the type and composition of the tissue. Then, an image (sonogram) of the organ under study is created by processing the reflected wave on a special computer.

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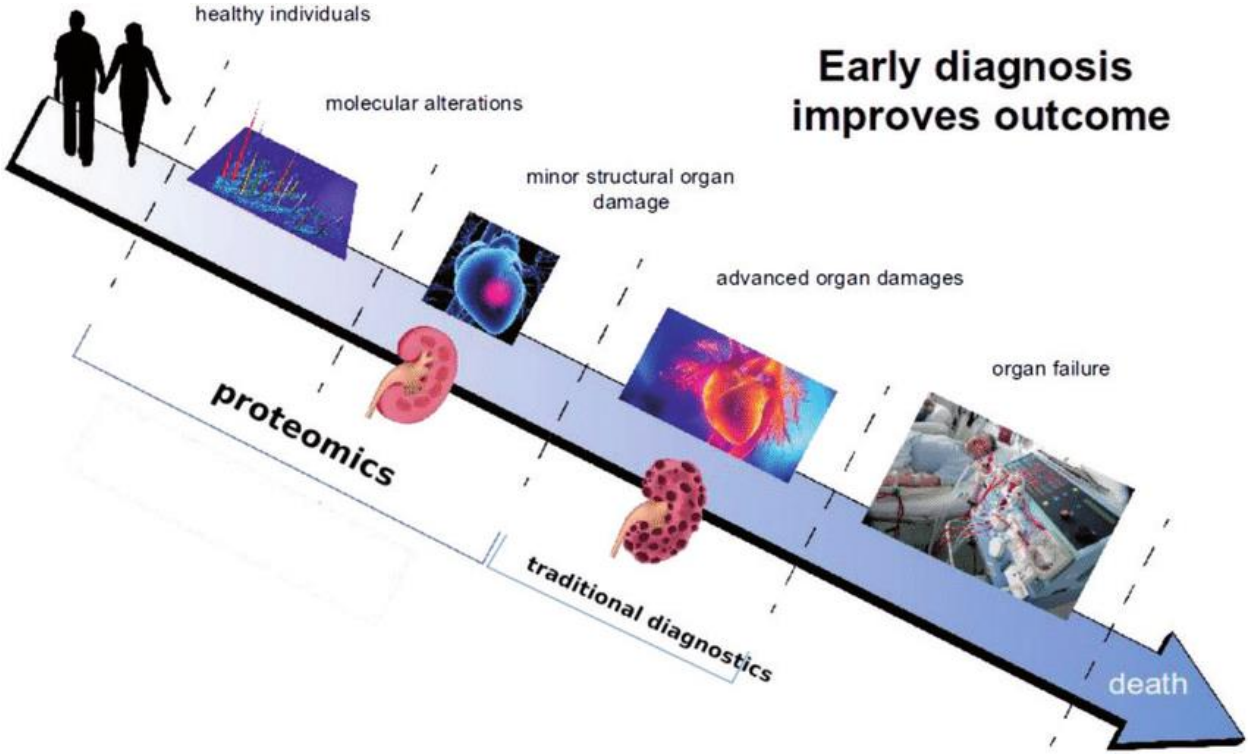

Ultrasound is widely used in oncology, it can be used to assess the spread of the disease, as well as the dynamics of the process during treatment. Ultrasound is also used in the process of taking a puncture or biopsy (inserting a needle into the right place and taking tumor material for further studies) to increase diagnostic accuracy. In addition, ultrasound is an indispensable method for assessing the condition of blood vessels, for example, vessels of the lower extremities. The main advantages of ultrasound are its non-invasiveness, lack of harmful radiation effects on the body, accessibility and wide application.

However, the images obtained during this study are "operator dependent", i.e. depends on the actions of the doctor conducting the study, the location of the sensor and the equipment used for the study. This means that the results of ultrasound are mostly subjective and cannot be exactly repeated by different equipment and/or further studies conducted by another specialist. Therefore, in most cases, patients who turn to other medical institutions for advice, despite the conclusions they have, often ask to retake this test.

Ultrasound examination is used to examine mammary glands, abdominal and retroperitoneal space, pelvic organs, peripheral lymph nodes and vessels of the extremities.

Computer tomography

Like radiography, computed tomography (CT) is based on the use of X-rays and their weakening as they pass through various tissues. The method is based on measuring the attenuation of X-ray radiation of tissues of different relative density and subsequent processing on a complex computer. The main difference between CT and traditional radiography is that during CT, a volumetric layer-by-layer image of the studied area is created, not a flat one. During the study, images of many sections of the human body are created, with a thickness of 1 to several millimeters. This is achieved by using several x-rays at the same time, which are emitted at different angles, which increases the resolution of the method.

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This research method allows for a reliable assessment of the size, shape and location of the tumor, as well as its relationship with the surrounding structures. In some cases, contrast-enhanced CT is used to increase the accuracy of the obtained image, in which special radiopaque agents are administered orally or intravenously. Like any type of research that uses X-ray radiation, radiography is associated with the effect of radiation on the body, but in almost all cases, the value of the information obtained during the study, if determined according to the guidelines, outweighs the potential risks. from radiation. The images obtained as a result of the study are recorded on special film (CT images) or digital media, for example, on a CD. These images can then be used for consultation at another medical facility.

After performing a CT scan, ask that the images taken be recorded on a disk or other storage medium and stored in a safe place.

CT is used to accurately assess the structure of the chest, abdomen, pelvis and bones. As a rule, this method gives more accurate results than radiography or ultrasound. However, due to its high technical complexity, CT is a more expensive examination method, which limits its use. Interpreting the results of a CT scan requires more specialist skills and time than interpreting ultrasound or X-ray data; Often, a conclusion based on the results of a CT scan is issued a few days after the examination.

Magnetic resonance imaging

The use of this method is based on the use of radio waves and a strong magnetic field, which makes it possible to obtain a layer-by-layer image of the internal organs of a person. The quality of the obtained image is comparable to that of computer tomography, but magnetic resonance imaging (MRI) does not include the effect of radiation on the body. MRI is ideal for studying the structure of soft tissues and organs such as the brain and spinal cord, kidneys, pelvis and blood vessels.

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In most cases, CT and MRI are interchangeable examination methods, but in some cases, MRI is more sensitive in assessing the condition of soft tissues and blood vessels. Like CT, MRI is an expensive imaging modality that limits its use.

Positron emission tomography (PET) and PET-CT)

In the presence of tumor cells, they multiply actively, which leads to an increase in metabolic processes in them, primarily the breakdown of glucose and the production of the necessary energy from it. Metabolic processes in tumor tissue are much stronger than in normal tissue, and these differences can be determined using special examination methods.

Positron emission tomography is a method that allows assessing the intensity of metabolism in various organs and tissues of the body. To do this, a special contrast radiopharmaceutical is injected into the patient's body, usually by intravenous injection. Most often, radioactive glucose (18-fluorodeoxyglucose, 18-FDG) is used for this purpose, but other contrast agents are also used. Within approximately 1 hour after intravenous administration, labeled glucose is distributed throughout the body's tissues. The increased metabolic activity of tumor cells is manifested by a more specific absorption of the contrast agent, which causes the tumor cells to "glow".

This is the glow detected using special sensors in a PET scan. Thus, unlike methods such as radiography, ultrasound, CT and / or MRI, PET allows us to assess not the anatomical structure of the tumor, but its metabolic activity. The PET-CT method is a "hybrid" of PET and CT, in which both studies are performed at the same time. Special equipment allows to evaluate the structure and anatomical features of the studied organs and tissues along with their metabolic activity.

This makes it possible to use this method for differential diagnosis of formations occupying a defined space in the human body, i.e. PET-CT helps to determine whether the detected lesion is a malignant

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tumor or not. In addition, PET-CT is sometimes used to assess the extent of the tumor process, early diagnosis of tumors and, in some cases, to evaluate the effectiveness of treatment.

However, PET has a number of disadvantages. It cannot always detect small tumors and metastatic lesions (for example, less than 8 mm in size), as well as tumors characterized by a slow growth rate. PET-CT data does not replace the need for a biopsy and does not invalidate its results.

PET-CT is the most expensive instrumental examination method used in oncology, which leads to active promotion by centers that offer it as the best and universal diagnostic method.

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