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МЕТОДЫ ЛЕЧЕНИЯ И ДИАГНОСТИКИ РАКА ШЕЙКИ МАТКИ

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TREATMENT AND DIAGNOSIS OF CERVICAL CANCER

Аннотация. Данная статья рассматривает такую болезнь, как рак шейки матки. В статье предоставлена общая информация о данном заболевании, его проявление на разных стадиях, об устоявшихся методах и современных разработках в лечении и диагностики рака шейки матки. Основная цель статьи – это собрать данные в целом о заболевании и предоставить сведения о современных методах лечения, открытиях.

Ключевые слова. Рак шейки матки, вирус папилломы человека (ВПЧ), терапия, диагностика и лечение, исследователи.

Abstract. This article discusses a disease such as cervical cancer. The article provides general information about the disease, its manifestation at different stages, established methods and modern developments in the treatment and diagnosis of cervical cancer. The main purpose of the article is to collect data on the disease in general and to provide information on modern methods of treatment, discoveries.

Key words. Cervical cancer, human papilloma virus (HPV), therapy, diagnostics and treatment, researchers.

There's no way humanity can control such a terrible disease as cancer right now. Everyone knows that it manifests itself in different forms, stages and clear reasons have not yet been identified, respectively, to prevent or predict its occurrence, we are not yet in a position to do so. In this article, I would like to review cervical cancer and current approaches to its treatment and diagnosis. Cervical cancer is a malignant tumour originating from the cervical mucosa (ectocervical or cervical canal). Cervical cancer is caused by HPV. Oncogenic subtypes of HPV 16/18 are found in most patients with cervical cancer. In countries with high rates of cervical cancer, persistent HPV is found in 10-20% of women, while in countries with low incidence only in 5-10%.

Treatment for cervical cancer depends on the stage of the disease and its characteristics. The cervix is the lower part of this organ that protrudes into the vagina. Cancer usually develops from its thin outer shell (squamous cell cancer).

Adenocarcinoma, which is formed from the glandular cells of the cervical canal (cervical canal), is less common. Sometimes both types of cells are involved in the formation of the tumor. The sexually transmitted human papillomavirus (HPV) has been shown to play a leading role in the development of the disease. In addition to HPV, cervical risk factors include: sexually transmitted infections, weakened immunity, smoking.

Cervical cancer exists in several types and stages, as reflected in the medical classification of this terrible disease. In the treatment of cervical cancer in stage 1, the treatment is simplified by the fact that the cancer is limited to the neck itself. Favorable prognosis for treatment, most patients manage to avoid relapse (return) of the disease.

In the 2nd stage the tumor grows into the upper part of the vagina. In the absence of metastases in the lymph nodes, the prognosis is also favorable (persistent remission, absence of signs of disease, up to 80% of cases in a five-year period, depending on the type of disease).

Stage 3 of cervical cancer spreads down to the lower vagina or penetrates the side wall of the pelvic area.

At the 4th stage, metastases are found in neighboring bladder or rectum organs. Cancer may also migrate to the lungs, liver or bones. Despite the severe form of the disease and the prognosis, even at this stage there is a chance to achieve positive remission.

Until a few decades ago, doctors believed that quality methods in the fight against cancer (including cervical cancer) - a combination of radiation therapy, surgery. Modern medicine has refuted this view, greatly expanding the possibilities of these and alternative methods. Modern diagnostics of cervical cancer makes treatment effective. Scientists are currently developing new methods of treatment and detection of this disease. They hope to minimize the number of deaths in a short time to overcome cancer.

The treatment of this disease requires a comprehensive approach that includes the following aspects:

Surgical effect. If cancer cells progress quickly enough, there is the use of constructive hysterectomy, in which the uterus, appendages, 70% of the vaginal tube is removed surgically. In emergency cases, all organs are removed from the internal pelvis, but this procedure is fraught with negative consequences for the patient. In terms of fecundity, it is not inferior to hysterectomy, so it is practically not used in medical practice today.

Application of radiotherapy. It is prevalent among women in the treatment of cervical cancer. If the disease in question is at the last stage, then in combination with chemotherapy radiation therapy is the only real option for treatment. This procedure is based on the effect of remote gamma therapy with a single dose of 2 g, which is used in conjunction with internal cervical irradiation.

Chemotherapy procedures. These methods of treatment can enhance the positive effect of radiation therapy, reduce the dose of radiation, minimize the admissibility of radiation-induced formations. But the combination of these two treatment options can cause a number of exacerbations in the patient, and they are poorly perceived by the body. A number of medical scientists believe that the use of radiation therapy, chemotherapy is not justified; it can be dangerous to the life of the patient. The opposing view is that radiotherapy is appropriate for intraarterial therapy with parallel use of cytostatic drugs. The latter are used to control the growth and functioning of cancerous microparticles.

Immunotherapy. Quite an actual method of recovery within the framework of the destruction of the body's defenses using radiation and chemotherapy. In order to activate the internal mechanisms of the patient, which would participate in the fight against malignant tumors, the use of interferons is practiced. But there is no consensus on the adequate dosage of this substance, so this method has not been able to fully prove itself.

Chemoradiotherapy is a promising approach to improving the effectiveness of cervical cancer treatment and introducing standardized chemotherapy programs in combination with radiation therapy and/or surgery into clinical practice. This approach has a number of theoretical underpinnings. Antitumor drugs enhance

radiation damage to tumor cells by disrupting the mechanism of DNA repair, synchronizing the entry of tumor cells into the cell cycle, reducing the number of tumor cells at rest and the ability to devitalize radiation-resistant tumor cells in hypoxia. In addition, the antitumor drugs themselves have cytostatic action against primary tumors and regional metastases.

It's hard to determine the exact location of cancer cells. There are currently developments in the use of luminescence for "cancer cell illumination" and photodynamic therapy. Scientists have been conducting experiments not only on plants for many years. The properties of luciferase and other genes, proteins, enzymes or substances that can produce luminescence have been actively investigated to identify new methods of cancer diagnosis and treatment for more than a decade.

Fluorescent nanoprobes. Today, most operations to remove tumors and metastases are very traumatic, because it is not always possible to visualize where the tumor ends and healthy tissue begins. In 2017, Professor Haiying Liu of Chemistry at Michigan Technology University found a way to make cells glow so that Cancer literally became visible. Thanks to antibodies that attach themselves only to cancer cells, malignant tumors glow in the near infrared range - other tissues glow green or blue. The same method can also allow the surgeon to make sure that all the tumor cells are actually removed and that no metastases have been missed.

Photodynamic therapy of tumors. A method of bioluminescence cancer cell destruction has been developed and is in the experimental phase. It consists in transforming tumor cells in such a way that they receive both a photosensitizing gene and a "luminous" luciferase gene. Photosensitization reacts to luminescence in such a way that scientists try to force cancer cells to commit some kind of suicide.

Cancer cell illumination with mutant viruses. Andrew Brown and his team have created a genetically modified herpes virus that only infects tumor cells. This virus is surrounded by luciferase cells that allow the infected tumor to glow. If the method is effective, the viruses will be used everywhere to visualize the tumor instead of a tomograph.

The human immune system can fight cancer itself. But why doesn't it happen? The fact is that cancer is disguised as normal, healthy human cells, so the immune system does not recognize it. For example, cancer cells with leukaemia have a CD19 protein on the surface that masks malignant cells as normal, and they remain unnoticed for human immunity. Scientists have found a way to add CD19 receptor genes to the lymphocytes of patients and to return the altered cells to the leukemia patients with the help of neutralized retroviruses, which have the ability to infiltrate human DNA. Cancer cells that have lost their disguise have been attacked by modified lymphocytes. 90% of patients with severe leukemia have recovered.

Preparations for gene therapy were also invented in Russia. For example, AntioncoRan and AntioncoRan-F drugs add 2 genes: one kills malignant cells and the other stimulates the immune system. About 150 million rubles is needed to continue research. In an interview with Maxim Koksharov, the executive director of the developer of "gene chemistry", he calls for investments in cancer drugs, not in Bitcoin.

Research is also under way and scientists are willing to share their successes.

In 2018, the Nobel Prize in Physiology and Medicine was awarded to two scientists from around the world, James Ellison of the United States and Tasuk Honje of Japan, who independently discovered and studied the same phenomenon. They found two different control points-mechanisms by which the body suppresses the activity of T-lymphocytes, immune killers. If you block these mechanisms, the T-lymphocytes "go free" and go into battle with cancer cells. This is called cancer immunotherapy, and it has been used in clinics for several years.

Almost 90% of the 570,000 registered cases of cervical cancer are in low- and middle-income regions, which mean that in addition to using outdated treatment methods, there is no possibility of affordable cancer screening in the area. Timely detection and intervention can reduce the number of deaths. MobileODT has developed a manual colposcope that produces high quality cervical images. The device called EVA has been improved algorithm and can now provide an accurate diagnosis in a short time. An experimental study in Korea has shown that cervical

cancer screening is more than 90% accurate. Yael Misrahi, head of the international MobileODT partnership, says the device is mobile and easy to use. The algorithm of detection of precancerous diseases allows you to do without scraping and laboratory tests in most cases, ie, the result can be obtained on the spot in a short time. The equipment is paired with a gadget, thanks to which you can immediately provide online consultation.

In June 2018, the Food and Drug Administration (FDA) further expanded its approved use of the Pembrolizumab (Keitruda) immunotherapy product. The last two statements cover the use of Pembrolizumab for some women with advanced cervical cancer and for adults and children with recurrent or treatment-resistant primary mediaastinal large cell lymphoma (PMBCL), a rare type of aggressive non-Hodgkin's lymphoma. Both FDA actions have been accelerated by the claims, which mean that further research is needed to confirm the clinical utility of the drug in patients with these cancers. Pembrolizumab is a type of immunotherapy called immune control inhibitor. It works by blocking the binding of PD-1, a protein expressed on cytotoxic cells T, to the protein PD-L1 expressed on some cancerous cells, an interaction that acts as a brake on the immune system and prevents cells T from attacking cancer.

In 2019, scientists from the National Institutes of Health and Global Kindness have created a computer algorithm, which analyzes the image of the cervix and detects precancerous changes. This approach will help make progress in screening for cervical cancer. The approach was developed by researchers from the National Cancer Institute and Global GoodExit Disclaimer, the Foundation for Intelligent Enterprises, and the results were validated by the National Medical Library. Compared to acetic acid visual inspection, which is widely used in medical organizations, the new development is a priority. The algorithm created can use the images to detect precancerous changes that, if not treated, can develop into cancer. Health professionals can use any camera gadgets for screening and treatment. In addition, this approach does not require much training, so it is perfectly suited to all countries. This algorithm has shown impressive results. Automated visual assessment revealed a precancer with greater accuracy (0.91) than the expert's

assessment (0.69) or conventional cytology (0.71). According to Maurizio Vecchio, Executive Vice President of Global Good, this algorithm, combined with new methods of diagnosis and treatment, will provide an opportunity to control the disease. Researchers plan to continue training the algorithm using images of precancerous and normal cervical tissues.

What else are scientists working on?

Arizona. USA. Scientists from Arizona State University worked in collaboration with researchers from the National Center for Nanoscience and Technology to develop robots and announced a new universal technology.

According to Hao Yan, director of the Molecular Design and Biomimetics Center at the Institute of Biodesign at AGU and Professor Milton Glick of the School of Molecular Sciences, the autonomous robotic DNA system we have developed will enable us to accurately develop drugs for cancer. They argue that this technology can be applied to many cancers.

In Australia, researchers at Newcastle University and Hunter Medical Research Institute have created the world's first "virtual biobank" platform to host 3D copies of human cancers. These copies can be made widely available to researchers. However, the process of obtaining and conducting research on tissue samples from Biobank will take a long time.Not only that, but once the researcher has completed his research, this sample usually cannot be used again. As experts say, each sample of cancer cells in Biobank consists of high-resolution images in both 2D and 3D, and contains important clinical and molecular information that can be widely used for virtual cancer research. “We took a tiny sample from a tumor biopsy stored at Biobank Hunter Cancer Biobank and turned it into a virtual copy, so anyone in the world can connect to the Internet and do research from their computers.”: Dr. Flynn and Palmer announced. The importance of the invention is that the physical sample remains intact and the 3D digital copy is stored on the Internet for future use. This opens up opportunities for research on rare cancers, the number of which is limited.

Summing up, we would like to draw attention to this problem. About 12% of women worldwide are infected with human papillomavirus (HPV). HPV infection

with strains such as HPV 6, 11, 16 and 18 causes almost all cases of cervical cancer. An estimated 13,000 cases of invasive cervical cancer will be diagnosed in the United States alone this year. Due to the current problem of cervical cancer and, in principle, any type of cancer, researchers are developing and improving screening and treatment methods for this disease. Progress in diagnosis and treatment should lead to effective treatment of cervical cancer in 2019-2023. Many health facilities are focused on developing and using best practices for screening and diagnosis of the disease. In addition, advances in this area will not only help to determine the correct stage of carcinoma, but will also help oncologists to ensure the correct treatment.

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