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MODERN ASPECTS OF THE USE OF MAGNETIC RESONANCE IMAGING IN THE DIAGNOSIS OF OVARIAN CANCER.

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Abstract:

At present, ovarian malignancies occupy the third place among gynecologic cancers, being the main cause of death among female reproductive diseases. Due to the lack of effective screening programs and asymptomatic course in the early stages, ovarian cancer is most often detected in disseminated stages, which reduces the effectiveness of primary treatment and worsens the prognosis. Therefore, timely diagnosis, implementation of screening and careful monitoring of ovarian cancer recurrences are becoming key tasks in oncology. This review reviews the experience of using magnetic resonance imaging (MRI) for the diagnosis of primary ovarian cancer and its recurrence, and analyzes the effectiveness of this method taking into account different approaches. Modern MRI capabilities provide extensive information about the characteristics of ovarian masses, the spread of primary cancer and its recurrence. However, a review of the literature revealed a lack of research on the diagnostic capabilities of various MRI techniques, including diffusion-weighted images (DWI). This underscores the need for more extensive research in this area.

Keywords: Magnetic Resonance Tomography, Ovarian Cancer, Ovarian Cancer Recurrence, Diffusion-Weighted Images, Peritoneal Carcinomatosis.

Ovarian cancer is the third most common gynecologic malignancy and the fifth most common cause of death among women due to cancer. Despite the high five-year survival rate in developed countries (90%), the overall survival rate for ovarian cancer currently does not exceed 50%[1,2,3]. Late detection of the disease is the cause of high mortality, since more than half of the cases (59.7%) are diagnosed at advanced stages (III-IV), which increases the risk of recurrence. In the early stages (I–II), the risk of recurrence is 13–31%, while in the late stages (III–IV) this figure exceeds 75%. These findings underscore the need for timely diagnosis of ovarian cancer and strict monitoring of patients who have undergone specialized antitumor treatment for primary ovarian cancer.

MAGNETIC RESONANCE IMAGING IS USED TO DETECT TUMORS IN THE OVARIES.

The use of magnetic resonance imaging (MRI) is an integral component in the precise localization and characterization of tumors in the ovaries, especially in patients who do not have obvious signs of benign or malignant processes. At the moment, this method is considered reliable in determining local tumor invasion [4,5,6]. The advantages of MRI are the high resolution of images, the possibility of examination without the introduction of a contrast agent and the absence of ionizing radiation, which is especially important when diagnosing young patients. Pelvic anatomy and tissue characteristics of tumors use algorithms to produce T1-weighted and T2-weighted images. The use of gadolinium-based contrast agent with intravenous administration increases the likelihood of detecting a solid component in both the primary tumor and metastatic foci. In cases of ambiguous ovarian masses, MRI has a sensitivity of 76% and a specificity of 97% [11,12,17]. Compared to computed tomography (CT), MRI has been shown to be more effective in assessing the spatial relationships of pelvic tumors and differentiating their components. Although the efficacy of MRI is higher than that of CT, no statistically significant differences were found. The use of dynamic contrast-enhanced MRI significantly increases the sensitivity and specificity of the method to 81% and 98%, respectively[8,9,10]

APPLICATION OF DIFFUSION-WEIGHTED IMAGES IN MAGNETIC RESONANCE IMAGING FOR THE DIAGNOSIS OF OVARIAN CANCER: OPPORTUNITIES AND PROSPECTS.

Diffusion weighted magnetic resonance imaging (DV MRI) is a research method aimed at measuring the level of microscopic diffusion in body tissues. This method evaluates the intensity of movement of water molecules in the study area, which reflects the biophysical properties of the tissue, including cell density, structural organization, microcirculation indicators, and diffusion coefficient. By measuring the diffusion coefficient (ICD), which decreases with

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increasing tumor cells, a quantitative estimate can be obtained. DV MRI does not require the injection of a contrast agent, which allows it to be included in the study protocols even for patients with renal insufficiency. This is different from computed tomography (CT) scans, which require a contrast agent and are accompanied by ionizing radiation. Malignant tumors are characterized by higher signal intensity and lower ICD values, reflecting an increase in cellularity and a decrease in the volume of extracellular space. This makes DV MRI a more effective method for detecting malignant neoplasms, especially peritoneal metastases[15,16]. Although the opinions of researchers on the use of DV MRI in the diagnosis of primary ovarian tumors are contradictory, a number of studies show that the method can be effective for the differential diagnosis of malignant and benign ovarian tumors. Particularly high efficacy of DV MRI has been demonstrated in combination with other image sequences, which makes it possible to determine the nature of the lesions.

Thus, DV MRI is a promising method for the evaluation of ovarian epithelial tumors and the differential diagnosis of benign and malignant neoplasms, surpassing other methods such as CT in terms of diagnostic efficiency.

THE IMPORTANCE OF MAGNETIC RESONANCE IMAGING IN THE DETECTION OF OVARIAN CANCER RECURRENCE.

Let's move on to the analysis of ovarian cancer (OC) recurrences, noting that a tumor is considered recurrent if it is detected after a complete response to the first course of chemotherapy, and the time interval without a tumor exceeds 6 months. Magnetic resonance imaging (MRI) is the preferred method for detecting tumor recurrence in the pelvic cavity, as well as for detecting recurrences associated with organs and structures difficult to assess using computed tomography (bladder, vagina) [18]. With high levels of tumor markers and suspicion of tumor recurrence, computed tomography and magnetic resonance imaging (CT and MRI) are the leading methods.

Studies show that the accuracy of the use of contrast-enhanced MRI in detecting OC recurrence is comparable to the results of laparotomy and exceeds the assessment of the level of the tumor marker CA-125. For example, one study compared the survival rates of two groups of patients with recurrent epithelial OCs detected by CA-125 levels or radiological diagnostics (CT and MRI) [19,21]. A retrospective study of the medical records of 99 patients who underwent secondary cytoreductive surgery showed that recurrence was initially detected by the CA-125 level in 41% of patients and by radiological diagnostics in 58.6%. Patients with recurrence, determined by the level of the tumor marker, more often had extrapelvic localization (87.8%) and multiple recurrences (78.0%). However, the group that was diagnosed with recurrence by radiological methods showed higher overall survival and progression-free survival compared to the group diagnosed by CA-125 levels.

With regard to the diagnosis of OC recurrence, diffusion-weighted magnetic resonance imaging (DV MRI) appears to be an effective method. For example, in a study by K.L. Michielsen et al., the use of DWI in the diagnosis and prediction of tumor resection results in patients with suspected OC recurrence was evaluated [20]. For a 94% accuracy in detecting OC recurrence, DV MRI outperformed computed tomography, which showed an accuracy of 78%. DV MRI also showed better sensitivity in detecting aspects important for surgical treatment, such as infiltration of the mesenteric root, small and large intestinal walls, and inoperable distant metastases.

According to the results of our own study of 28 patients, conducted to determine the effectiveness of MRI in the diagnosis of pelvic recurrences of OC, it was revealed that DV MRI in combination with a standard MRI protocol significantly increases the parameters of diagnostic efficiency. Thus, the use of DV MRI to include in the examination protocol patients with unfavorable prognosis factors after antitumor therapy of primary OC and in the presence of biochemical recurrence is justified.

CONCLUSION

Despite advances in medical technology, accurately diagnosing ovarian cancer remains a challenge for oncologists around the world. Solving this problem requires answers to a number of questions, including the feasibility and feasibility of introducing screening to detect the disease in the population, the effectiveness of the therapy used, and careful monitoring of possible relapses. Based on the analysis of literature data, it becomes clear that determining the nature of ovarian formations is a key task in clinical diagnosis. The state-of-the-art capabilities of magnetic resonance imaging (MRI) provide the extensive information needed to characterize tumors and differentiate them into benign and malignant. However, the analysis of literature studies revealed the lack of work devoted to the assessment of the diagnostic capabilities of various MRI techniques, including diffusion-weighted images (DWI), in detecting ovarian

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cancer recurrences. Thus, further research is required to comprehensively assess the potential of MRI, including DWI, for the timely detection and effective management of recurrence of this disease in patients.

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