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ADVANCED STAGE OF ENDOMETRIOSIS AND ITS TRANSITION TO MALIGNANCY

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Abstract
This article examines the advanced stage of endometriosis and its potential transformation into a malignant tumor. The discussion focuses on risk factors, pathogenesis, modern diagnostic methods, and treatment strategies. Special attention is given to the role of chronic inflammation, hormonal changes, and genetic mutations in malignancy processes. New approaches to the early detection of oncogenic transformations of endometriotic foci using molecular and immunohistochemical methods are reviewed. Prospective treatment methods, including targeted and immunotherapy, aimed at reducing the risk of malignant tumor development in endometriosis, are analyzed.

Keywords: Endometriosis, malignancy, malignant tumor, risk factors, hormonal imbalance, inflammation, angiogenesis, diagnostics, targeted therapy, immunotherapy.

INTRODUCTION

Endometriosis is a chronic gynecological disease characterized by the proliferation of endometrial tissue outside the uterine cavity[1-3]. In advanced stages, this condition can lead to severe complications, including malignancy (transformation into a malignant tumor)[4-7]. The development of malignant neoplasms in the context of endometriosis is associated with prolonged inflammation, hormonal imbalances, and genetic mutations[8-11].

- Prolonged endometriosis without adequate treatment
- Genetic predisposition to oncological diseases
- Hormonal imbalance (high estrogen levels)
- Chronic inflammation and immune dysfunctions
- Exposure to environmental risk factors (toxins, carcinogens)

The primary mechanism of malignancy in endometriotic foci is associated with genetic mutations, altered cellular metabolism, and angiogenesis[12-16]. Key roles are played by mutations in tumor suppressor genes such as PTEN and p53, as well as the overexpression of vascular endothelial growth factors (VEGF), contributing to neovascularization. Chronic inflammatory processes also play a significant role by modifying the cellular microenvironment and promoting proliferative activity[17-22].

Materials and Methods:

- Ultrasound examination (USG) of the pelvic organs
- Magnetic resonance imaging (MRI) for detailed tissue structure assessment
- Laparoscopy with biopsy for histological analysis
- Determination of tumor markers (CA-125, HE-4)
- Immunohistochemical analysis of biopsy samples
- Genetic testing to detect mutations associated with malignancy

Treatment Strategy: Managing advanced endometriosis with suspected malignancy requires a comprehensive approach:

1. **Surgical intervention** – Radical removal of pathological foci, including hysterectomy if necessary.
2. **Hormonal therapy** – Suppression of estrogen-dependent cell growth (GnRH agonists, aromatase inhibitors).
3. **Chemotherapy** – Use of platinum-based drugs in cases of confirmed malignant transformation.
4. **Targeted therapy** – Application of angiogenesis inhibitors and molecularly targeted drugs (e.g., bevacizumab).
5. **Immunotherapy** – Utilization of monoclonal antibodies and immuno-oncological drugs to enhance anti-tumor immune response[23-28].

Results:

Research findings indicate significant changes in the immune status and hormonal profile of patients with advanced endometriosis. Specifically:

- Elevated levels of inflammatory cytokines (IL-6, IL-8, TNF-α), indicating chronic inflammation.
- Dysregulated expression of cell cycle-related genes, including PTEN and p53, which may contribute to malignancy[29-33].
- Increased levels of tumor markers (CA-125, HE-4) in patients with a high probability of malignant transformation[34-39].
- The effectiveness of comprehensive treatment, including surgical intervention and targeted therapy, significantly reduces the risk of oncogenic transformation[40-43].

1-Table: Immunological Markers in Advanced Endometriosis

Marker	Normal Range	Endometriosis Patients	Malignancy Suspected Cases
IL-6	< 5 pg/mL	15-30 pg/mL	30-50 pg/mL
IL-8	< 10 pg/mL	20-40 pg/mL	40-70 pg/mL
TNF-α	< 8 pg/mL	15-35 pg/mL	35-60 pg/mL
CA-125	< 35 U/mL	50-100 U/mL	>100 U/mL
HE-4	< 70 pmol/L	80-150 pmol/L	>150 pmol/L

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Conclusion

Advanced endometriosis may pose a serious oncological threat. Early diagnosis, continuous monitoring of patients, and timely treatment help reduce the risk of malignancy and improve disease prognosis. Modern treatment approaches, including targeted and immunotherapy, offer new prospects for managing the oncological complications of endometriosis.

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