AMERICAN ACADEMIC PUBLISHER

INTERNATIONAL JOURNAL OF MEDICAL SCIENCES

ISSN NUMBER: 2692 - 5206 Volume 6. No 02. February ,2026

MODERN NON-INVASIVE METHODS OF ENDOMETRIOSIS DIAGNOSTICS: POSSIBILITIES AND PROSPECTS

Jumaeva D.R.

Asia International University

Abstract

Endometriosis is a chronic estrogen-dependent disease characterized by the presence of endometriotic tissue outside the uterine cavity and accompanied by pain, reproductive dysfunction, and a reduced quality of life. Despite its significant prevalence among women of reproductive age, diagnosis remains challenging. Traditionally, laparoscopy with histological confirmation has been considered the "gold standard" for diagnosis verification. However, its invasive nature limits its use as a primary diagnostic method. Therefore, noninvasive methods for detecting endometriosis are particularly relevant. This article presents an analysis of modern instrumental, laboratory, and molecular diagnostic technologies, their information content, limitations, and prospects for their implementation in clinical practice.

Key words

endometriosis, non-invasive diagnostics, MRI, transvaginal ultrasound, biomarkers , deep infiltrating endometriosis.

Introduction

Endometriosis is diagnosed in 6-10% of women of reproductive age and in 30-50% of infertile women. The disease is characterized by variable clinical manifestations, ranging from asymptomatic to severe chronic pain. The average interval from the onset of symptoms to diagnosis is 7-10 years, due to the lack of a highly specific noninvasive diagnostic test.

In recent years, diagnostic advances have focused on minimizing surgical interventions and improving imaging and laboratory technologies. The current approach involves a comprehensive approach based on clinical assessment, imaging diagnostics, and the use of biomarkers .

The aim of this review is to systematize data on modern non-invasive methods for diagnosing endometriosis and to assess their diagnostic value.

1. Ultrasound diagnostics

1.1 Transvaginal ultrasound examination

Transvaginal ultrasound (TVUS) is the first-line method for suspected endometriosis. Its main advantages are its accessibility, safety, and high yield in detecting endometrioid ovarian cysts.

Endometriomas are visualized as single-chambered lesions with homogeneous, finely dispersed contents, producing a ground-glass appearance. The sensitivity of this method for cystic lesions reaches 90%, but is significantly lower for superficial peritoneal lesions.

AMERICAN ACADEMIC PUBLISHER
INTERNATIONAL JOURNAL OF MEDICAL SCIENCES
ISSN NUMBER: 2692 - 5206 Volume 6. No 02. February ,2026

In diagnosing deep infiltrating endometriosis, a dynamic examination assessing the mobility of the pelvic organs (the so-called "sliding sign") plays an important role. The absence of displacement between structures may indicate adhesions.

1.2 3D ultrasound and advanced protocols

Three-dimensional reconstruction improves the accuracy of assessing anatomical relationships and the depth of infiltration. The use of specialized expert ultrasound protocols allows for the detection of lesions of the uterosacral ligaments, rectovaginal septum, and intestines.

The main limitation of ultrasound diagnostics is the dependence of the results on the qualifications of the specialist.

2. Magnetic resonance imaging

Magnetic resonance imaging (MRI) is considered a highly informative diagnostic method for deep infiltrating endometriosis. Due to its high soft tissue contrast, MRI allows for detailed visualization of lesions in the retrocervical region, parametrium , bladder, and intestines.

The most informative are T1-weighted images with fat suppression and T2-weighted sequences. Endometriomas are characterized by a hyperintense signal on T1 and a signal attenuation phenomenon on T2.

The sensitivity of MRI for advanced forms of the disease ranges from 80 to 95%. This method is recommended for surgical planning to accurately map the extent of the disease.

The disadvantages of MRI remain its high cost and limited availability in routine practice.

3. Laboratory markers

3.1 CA-125

The serum marker CA-125 has been extensively studied as a potential diagnostic test. Elevated levels are more commonly observed in advanced forms of endometriosis, but its low specificity limits its use as a standalone diagnostic criterion.

3.2 Promising biomarkers

Current research is aimed at finding more specific molecular markers. The following are being studied:

proinflammatory cytokines (IL-6, TNF-α);

angiogenesis factors (VEGF);

microRNA ;

circulating extracellular DNA;

proteomic and metabolomic profiles.

AMERICAN ACADEMIC PUBLISHER
INTERNATIONAL JOURNAL OF MEDICAL SCIENCES
ISSN NUMBER: 2692 - 5206 Volume 6. No 02. February ,2026

Of particular interest is the analysis of microRNAs as stable regulatory molecules reflecting pathological changes at the cellular level. Preliminary data suggest the possibility of developing highly sensitive diagnostic panels, but standardized methods are still lacking.

4. Analysis of menstrual blood and endometrial biomarkers

New research areas include studying the cellular and immunological composition of menstrual blood. It is suggested that identifying specific inflammatory and molecular changes could be used as a non-invasive screening tool.

The expression of genes and receptors in the endometrium, reflecting systemic changes in endometriosis, is also studied.

5. Artificial intelligence and digital technologies

The use of machine learning algorithms to analyze ultrasound and MRI images offers the potential to improve diagnostic accuracy. Automated systems can detect subtle changes and reduce the subjectivity of interpretation.

Integrating clinical data, imaging results, and molecular markers into a single digital model can facilitate the creation of personalized diagnostic algorithms.

6. An integrated approach to non-invasive diagnostics

The modern diagnostic strategy involves a sequential algorithm:

Assessment of clinical symptoms and risk factors.

Expert transvaginal ultrasound.

MRI if a deep infiltrative process is suspected.

Use of laboratory markers as auxiliary criteria.

This approach allows us to reduce the need for diagnostic laparoscopy and initiate therapy based on clinical and instrumental data.

Conclusion

The development of non-invasive methods for diagnosing endometriosis has significantly changed the approach to patient care. Modern imaging technologies, primarily expert transvaginal ultrasound and MRI, provide high accuracy in detecting endometriotic lesions, especially in advanced forms of the disease. Laboratory and molecular markers are being actively studied and may eventually become the basis for early diagnosis.

Despite significant progress, a universal noninvasive test with absolute sensitivity and specificity currently does not exist. The most effective approach appears to be the integration of clinical data, imaging methods, and molecular testing within a personalized approach.

Further research should be aimed at standardizing diagnostic algorithms and introducing digital technologies to improve the accuracy and accessibility of diagnostics.

AMERICAN ACADEMIC PUBLISHER

INTERNATIONAL JOURNAL OF MEDICAL SCIENCES

ISSN NUMBER: 2692 - 5206 Volume 6. No 02. February ,2026

Literatures:

1. Podzolkova N.M., Fadeev I.E., Mass E.E. et al. Non-invasive diagnosis and non-surgical treatment of endometriosis: review // Gynecology. - 2022. - T. 24, No. 3. - P. 167–173.

2. Kiselev M. A., Repina N. B. Non-invasive diagnostics of endometriosis: a review of modern biomarkers of peripheral blood and endometrium // Bulletin of the I. P. Pavlov Russian Medical Biological Academy. - 2020. - Vol. 28, No. 3. - P. 371–376.

3. Rusina E. I., Yarmolinskaya M. I., Ivanova A. O. Modern methods of radiation diagnostics of endometriosis // Journal of obstetrics and women's diseases. - 2020. - Vol. 69, No. 2. - P. 59-72.

4. Saiddanesh S. F., Chuprynin V. D., Khilkevich E. G., et al. Modern methods of diagnosing common forms of endometriosis // Obstetrics and Gynecology. - 2017. - No. 5. - P. 39-43.

5. Barinov S. V., Lazareva O. V., Ignatiev Yu. A. et al. Clinical significance of diagnostic methods for genital endometriosis // Obstetrics and Gynecology. - 2018. - No. 12. - P. 75-81.

6. Yarmolinskaya M. I., Rusina E. I., Khachaturyan A. R., Florova M. S. Clinic and diagnostics of genital endometriosis // Journal of obstetrics and women's diseases. - 2016. - Vol. 65, No. 5. - P. 4–21.

7. Efimova A. A., Sergienya O. V., Mashchenko I. A., Zazerskaya I. E. Magnetic resonance imaging for non-invasive diagnosis of various forms of endometriosis in women with infertility // Digital Diagnostics . - 2023. - T. 4, No. 1S. — pp. 57–59.