

bal pregnancy, and can be recommended as a method of choice.

According to the literature data, the long-term results of ectopic pregnancy treatment cannot be considered as favourable.

Study of cases of organs preserving surgery with ectopic pregnancy showed that following uterine pregnancy occurred in 54% and repeated ectopic one — in 13% of women; 25–35% of women were infertile.

According to the literature, the fallopian tubes after use of methotrexate remain passable in 71–81% of women.

This scope of statistics depends on the clinical course of ectopic pregnancy (the nature of the damaged uterus or elsewhere and the stage of blood loss), the volume and technique of surgical treatment, the completeness and duration of rehabilitation in the postoperative period.

### Conclusions

The proposed therapy scheme results showed advantages of surgical laparoscopy versus laparotomy with ectopic pregnancy, what was reflected in

the maximal visualization of the pelvic organs with minimal access, reduction surgery duration ( $p < 0.05$ ), early mobilization of women ( $p < 0.05$ ), small septic risk, insignificant use of medications and lower economic cost for treatment by 1.4 times, reduction of scar changes at the anterior abdominal wall, better cosmetic effect.

The method of conservative treatment of progressive tubal pregnancy with methotrexate IM by the scheme provides effective resorption of the fertilized egg with the small side effects; helps preserve anatomical and functional integrity of the fallopian tubes by 72.5% of cases.

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## MANAGEMENT AND ENDOSURGICAL TREATMENT OF BENIGN OVARIAN CYSTIC FORMATIONS IN PREGNANCY

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ТАКТИКА ВЕДЕНИЯ И ЭНДОХИРУРГИЧЕСКОЕ ЛЕЧЕНИЕ ДОБРОКАЧЕСТВЕННЫХ КИСТОЗНЫХ ОБРАЗОВАНИЙ ЯИЧНИКОВ У БЕРЕМЕННЫХ

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В работе рассмотрены вопросы дифференциальной диагностики доброкачественных кистозных овариальных образований во время беременности, оценки показаний для оперативного вмешательства, разработки соответствующей тактики ведения и выбора хирургического доступа при выполнении вмешательств.



Крайне важно, чтобы акушер был специалистом в области диагностики и лечения овариальных образований во время беременности. Использование ультразвука для характеристики злокачественного потенциала овариальных образований дает возможность выбора нескольких вариантов ведения пациентки. Наблюдение осуществляется при бессимптомных, доброкачественных, без признаков злокачественности, образований, отмеченных на ультразвуковом изображении. Для пациенток с комплексными образованиями с риском озлокачествления может быть предложено до- и послеродовое наблюдение как приемлемый вариант.

**Ключевые слова:** беременность, доброкачественные кистозные образования яичников, тактика ведения, эндохирургическое лечение.

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### **MANAGEMENT AND ENDOSURGICAL TREATMENT OF BENIGN OVARIAN CYSTIC FORMATIONS IN PREGNANCY**

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This paper gives an experience on the differential diagnosis of benign cystic ovarian structures during pregnancy, assessing the indications for surgery, development of management and choice of surgical approach in carrying out interventions.

Therefore important that obstetrician should be a specialist in the diagnosis and treatment of ovarian lesions during pregnancy. Using ultrasound to characterize the malignant potential of ovarian formations gives the patient the possibility of more options. Observation is a viable option for asymptomatic, benign formations with no signs of malignancy detected by US. For patients with complex formation with the risk of malignancy observation may also be offered to childbirth as a viable option.

**Key words:** pregnancy, benign ovarian cystic formation, management, endosurgical treatment.

Registered incidence of ovarian formations during pregnancy ranges from 1 in 81 to 1 in 8,000 pregnancies or from 1 in 76 to 1 in 2,328 births, but studies based on ultrasound detection of this pathology, showed a higher prevalence — from 1 case in 19 childbirths to 1 in 88 [1; 2].

Most ovarian formations are diagnosed by chance during the first trimester ultrasound screening (US) [3; 4; 6]. Ovarian formation remained in the second trimester of pregnancy are at risk of torsion, rupture, or obstruction in labor.

The question of differential diagnosis of ovarian formations during pregnancy, evaluation of indications for surgical intervention, the development of appropriate strategy managing ovarian formations during pregnancy is relevant.

**Differential Diagnosis.** Like in non-pregnant state, functional cysts are the most common ovarian formations of uterine appendages during pregnancy. Differential diagnosis during pregnancy should be made with the benign tumors, such as benign cystic teratoma (7–37% of cases), serous (5–28%) and mucinous (3–24%) cystadenoma, endometrioma (0,8–27%), para-

ovarian cysts (< 5%) and leiomyoma (1–2.5%) [2; 5]. Ovarian malignancy (including with low malignant potential) is approximately 1,8% of all ovarian formations during pregnancy [6; 7].

**Diagnosis.** Ovarian formation during pregnancy is asymptomatic in 65–80% of cases [1]. Most of them are diagnosed by chance during ultrasound screening in the first trimester [2], it is believed that between 50% and 80% of ovarian formations are detected in the first two trimesters of pregnancy [1]. If the tumor of the uterus is palpated on examination, ultrasound is the preferred method of radiological confirmation because of its ability to differentiate the morphology. This allows the stratification of risk without harm to the mother and fetus [8]. The ultimate goal of ultrasound evaluation is to assist to the doctor in a prior determination of the histological structure of formation, that determines the choice between conservative treatment and surgery.

Ultrasound is very accurate in determining tumors with the malignant potential. Ultrasound characteristic of the complexity and size of ovarian forma-

tions may help in predicting malignancy. Prognostic sign of malignancy is the presence of septa, solid structure, nodes, papillary components or average diameter larger than 5 cm. Thus, the higher complexity of formation — higher risk of malignancy.

Recent studies have assessed the usefulness of adding Doppler flow evaluation by gray scale ultrasonography to improve the sensitivity of prenatal diagnosis of malignant neoplasms. There is evidence that the 3D-Doppler investigation can help in stratification of complex ovarian formations.

Other terms of image processing such as computed tomography (CT) and magnetic resonance imaging (MRI) may be a useful addition when the ultrasound image does not give the required results. CT provides better access to identify nonobstetrical causes of abdominal pain. Although CT relatively safe during pregnancy, the mother and fetus received the absorbed dose of at least 2=4 rads during one investigation [8]. Contrast agents may pass the placental barrier and should be used with caution, because their action is not really known [3]. MRI is considered as generally safe during



pregnancy. There are two specific situations in which MRI is the method of choice. MRI better detect paraovarian cystic lesions, which can then be carried out conservatively during pregnancy [3]. MRI also can provide the best features of tissue allowing more accurate assessment of large formations that are difficult to fully visualize with ultrasound. MRI can also determine the degree of malignancy and possible help in the diagnosis of acute process of the gastrointestinal tract such as appendicitis and intestinal inflammation [3]. However, the purpose for MRI examinations during pregnancy should be reasonable and it should be used exclusively as an explanation for the results inconclusive ultrasound data.

Tumor markers should be used with caution in pregnant women due to big differences in results and interpretation of these tests during pregnancy. Level of CA-125 increases during pregnancy, especially in the first trimester [9], and its detection has a limited role. Levels of CA-125 is also elevated in other benign processes, such as uterine leiomyoma, endometriosis and others [6; 8]. Other tumor markers are useful for stratification of germ cell malignancy such as  $\alpha$ -fetoprotein,  $\beta$ -human chorionic gonadotropin, lactate dehydrogenase, are of limited use because they can significantly change during pregnancy [2; 9].

The main value of determination of tumor markers during pregnancy lies in determining their levels as indicators of tumor control, but it should not be considered as a basis for therapeutic activity, especially in case of presence of asymptomatic ovarian formations.

**Management.** Currently, management of ovarian formations during pregnancy is arguable, some researchers recommend observation, others — surgery [2; 6; 7].

Most ovarian formations identified during pregnancy regress spontaneously, and surgery is not required. Characteristics favorable for observation are the following: simple cysts according to ultrasound, the diameter of structures smaller than 5–6 cm, the diagnosis established before 16 weeks of pregnancy [3]. The large size and complex structure with more complex morphology rarely regress spontaneously, may represent tumor process [10] and lead to complications during pregnancy: torsion (1–22%), rupture (0–9%), labor obstruction (2–17%) [4; 6].

Surgical treatment is recommended when a persistent or large ovarian formation represents an increased risk of acute abdomen, secondary torsion or rupture [4; 6]. In addition, 10% of persistent complex ovarian formations will eventually be exhibited diagnosis of malignant tumors; the observation may worsen outcome [6; 10]. Finally, researchers that support the surgical treatment suggest a tendency to improve mother and fetus condition through the use of surgery in mid-pregnancy (12–27 weeks) [4; 7]. Finally, the decision about observation or surgical intervention should depend on individual patient's symptoms and the degree of malignancy probability.

**Observation.** The management mode of cystic ovarian formations during pregnancy is connected to the fact that 71% of them reduce in size or regress. Some of them with more complex structure self-regresses too [8; 9].

Consensus of Society of Radiologists for Ultrasound was published in 2010 and provides instructions for management of accidentally discovered by ultrasound asymptomatic ovarian lesions in nonpregnant women. The purpose of this project was to determine which ovarian formation did not require or needed further ultrasound follow up, or require surgery. This

consensus proposed ultrasound criteria for further evaluation. Simple cysts (anechoic, with smooth, thin wall, without membranes) size to 5–7 cm in premenopausal women or larger than 1 cm in postmenopausal women should be reviewed each year.

Hemorrhagic cysts more than 5 cm in size in premenopause should be reviewed in 6–12 weeks. Hemorrhagic cysts of any size in early menopause (within 1–5 years after the last menstrual period) should be reviewed in 6–12 weeks, however hemorrhagic cysts of any size in the late menopause (> 5 years since last menstrual period) require surgical treatment. Endometrioid cyst (homogeneous hypoechogenic formation) or dermoid cystoma (focal or diffuse hyperechogenic component) should be screened annually if not surgically removed at any age. Hydrosalpinx and peritoneal cysts should be reviewed if they have clinical manifestations. Cysts with thin membranes should be revised once in 6–12 weeks or, if they are stable, can be examined annually up to the menopause. However, surgical approach should be considered in postmenopausal women. Cystic formation containing nodules with blood flow or thick membrane (> 3 mm) obligatory require surgical treatment at any age. These recommendations are intended for non-pregnant women with accidental detection on ultrasound [7].

Thus, the observation is a viable option for ovarian formations with low complexity, detected by ultrasound [6].

Using transvaginal ultrasound for risk stratification and low probability of malignancy in pregnancy, you can use delay surgery even in complex formations in asymptomatic pregnant women.

**Surgical approach.** Traditionally, surgery on the ovarian formations during pregnancy were performed by laparotomy.



However, recently there are many opposing views about the role of laparoscopy in the surgical treatment of ovarian formations during pregnancy [4]. Supporters of laparotomy exhibit concerns about laparoscopy, including lack of data on the effects of pneumoperitoneum, the possibility of penetration of carbon dioxide into the uterus, damage of pregnant uterus by Veresh needle, trocar or surgical instruments, as well as the risk of fetal acidosis by maternal conversion of carbon dioxide to carbon dioxide [10].

On the other hand, supporters of laparoscopy emphasize on reducing postoperative pain, less use of narcotic analgesics, shorter hospital stay and less need for traction of the uterus, resulting in less irritation of the uterus during surgery. In addition, laparoscopy leads to faster physical recovery and return to normal activities, which is very important during pregnancy because of the phenomenon of hypercoagulation [7].

Currently there are no prospective studies that compare laparotomy and laparoscopic accesses to determine which approach is better. This is unlikely due to the limited number of pregnant patients who require surgery to remove ovarian formations [22]. However, several review studies have shown that laparoscopic removing of ovarian formations during pregnancy is technically feasible and should no longer be regarded as contraindicated in pregnancy [4; 5].

A large number of reports and observations in the world scientific literature have shown the benefits of laparoscopic surgery in relation to reducing pain, reducing hospital stay, earlier mobilisation, reducing blood loss, low levels of infection. All these provide advantages over traditional open laparotomy access.

Although data suggest a similar risk to the fetus during laparoscopic access, there are still disputes the impact of CO<sub>2</sub> by imposing pneumoperitoneum on the fetus. There are reports of more than 500 laparoscopic operations in pregnant patients [26]. From this literature, only one publication includes reports of adverse effects on the fetus compared with the expected at laparotomy [4].

When considering the surgery for ovarian formations during pregnancy surgeon should weigh both: the mother result and fetal condition during surgery. Pregnant women who had undergone surgery have increased general risk of preterm delivery (22%) compared with those without surgery, regardless of surgical access [8]. In addition, those who are needed urgent surgical intervention, such as in cases of rupture or torsion, usually have higher risk to the fetus compared with planned surgery [8]. However, other researchers have concluded that fetal condition probably related to the nature of underlying diseases, which leads to the necessity of surgical intervention rather than surgical intervention alone [4; 9].

Laparoscopic removal of ovarian lesions should be performed only by qualified surgeons in countries with advanced laparoscopy and the presence of gynecological oncology. The Society of American Gastrointestinal and Endoscopic Surgeons published the following recommendations for laparoscopy during pregnancy [8]:

— laparoscopy can be performed at any gestational age, but nonurgent cases should optimally be scheduled at 16–20 weeks. This recommendation is based on providing time for spontaneous regression of ovarian formations, optimizing visualization of ovarian structures with an increase of uterus size, and reducing the frequency of

preterm birth associated with a greater term of pregnancy;

— patient should be placed on the left or right tilt to reduce compression on the vena cava and improving cardiac return;

— should be used intraoperative monitoring of CO<sub>2</sub> capnography;

— there is no necessity for routine blood gas monitoring;

— open Hasson technique is the best way for initial laparoscopic access, because it offers the possibility of visual input, although the use of Veresh needle is not contraindicated. The surgeon may consider using Veresh needle in combination with ultrasound control;

— trocar should be placed at least 6 inches above uterine fundus or in the upper left quadrant;

— intraoperative intra-abdominal pressure must be maintained below 15 mm Hg at Trendelenburg position to ensure adequate venous return and utero-placental blood flow;

— currently no evidence for using tocolytics.

**Personal experience.** In department of endoscopic surgery of the Donetsk Regional Center of Mother and Child during the period from 2000 to 2011 there were operated 72 pregnant women with benign ovarian cystic formations. In 37 (51.39%) cases it was the first pregnancy, in 17 (23.61%) — the second, in 14 (19.44%) — the third, in 1 (1.39%) — the fourth, in 2 (2.78%) — fifth and in one (1.39%) — the tenth. The average time detection of ovarian cystic formations at pregnancy was (9.29±0.57) weeks of gestation. The size of formations range from 4 to 30 cm and at the time of operation was in average (10.94±0.70) cm. 68 (94.44%) women had a unilateral formation and 4 (5.56%) — bilateral. In 3 (4.17%) patients were observed rupture of cysts, in 14 (19.44%) — torsion.

In 58 (80.56%) surgery were performed through laparoscopic



access, in 14 (19.44%) — laparotomic. Laparotomy was rational with a high risk of injury of pregnant uterus, technical difficulties if laparoscopic surgery performed at gestational term more than 16 weeks of pregnancy, suspected malignancy. In 1 (1.39%) case was performed conversion from laparoscopy to laparotomy due to gestation 17–18 weeks and adhesive process in the pelvis around endometriosis cyst with size 8 × 8 cm.

When conducting laparoscopy surgery it was used the technique of applying four troacar ports and the use of bipolar current in cutting and coagulation mode. The average time of surgery was (35.4±8.5) min. All surgical interventions were without complications. Sutures were removed on the fifth-seventh day. All wounds were healed by primary intention.

Among operated were 9 (11.11%) women with mature cystic teratoma, 15 (20.83) — with mucinous cystadenoma, 30 (41.67%) — with serous cystadenoma, 3 (4.17%) — with persistent functional cysts, 7 (9,72%) — with endometrioid cysts, 3 (4.17%) — with paraovarian cysts, 2 (2.78%) — with cystadenocarcinoma.

### Conclusions

Because of widespread use of prenatal ultrasound and aneuploidy screening detection of ovarian formations during pregnancy is becoming more common. It is therefore important that obstetrician should be a specialist in the diagnosis and treatment of ovarian lesions during pregnancy. Using ultrasound to characterize the malignant potential of ovarian formations gives the patient the possibility of more options. Observation is a viable option for asymptomatic, benign formations with no signs of malignancy detected by US. For patients with complex formation with the

risk of malignancy observation may also be offered until child-birth as a viable option.

The decision on whether to postpone the surgical treatment of complex formation to delivery or after delivery should be based on the balance of risks and benefits: malignancy risk against unnecessary surgical risk for mother and fetus. Patients selected for observation should be informed about a possibility of torsion, rupture, need for surgery in late pregnancy and the potential delay in diagnosis of malignancy. They should also know that ante- or prenatal surgery may be necessary if symptoms or formations change with time.

Those patients who need surgical treatment have no benefits for choosing a particular surgical approach. Laparoscopy and laparotomy have a similar risk of complications during pregnancy. Taking into account advantages that laparoscopy versus laparotomy in relation to pain, hospital stay, infection risk and recovery time, laparoscopic approach should be considered affordable in the presence of appropriate skills and training.

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