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Research Article

Experience of Compression Elastography and Contrast-Enhanced Ultrasound Examination in Differential Diagnosis of Primary and Metastatic Ovarian Tumors in Uterine Cancer Patients

Chekalova MA and Borisova MI*

National Medical Research Center of Oncology Named After N. N. Blokhina of the Ministry of Health of the Russian Federation, Moscow, Russia

***Corresponding Author**: Borisova MI, National Medical Research Center of Oncology Named After N. N. Blokhina of the Ministry of Health of the Russian Federation, Moscow, Russia.

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Abstract

Objective: To study the possibilities of tissue elastography (RTE) and contrast-enhanced ultrasound (CEUS) in the differential diagnosis of primary and metastatic ovarian tumors in uterine cancer patients.

Materials and Methods: The results of observations of 8 patients were analyzed.

Results: We identified 8 patients with ovarian tumors, of whom 4 had synchronous primary cancers of the endometrium (synchronous group) and ovary and 4 had endometrial cancer with ovarian metastasis (metastasis group). Ovarian tumors in the synchronous group were more often unilateral, the structure of the ovarian tumor is more often multilocular-solid with uneven, clear contours, the size of the ovaries exceeds 6.0 cm and the ovaries were mapped with 4 types of elastograms during RTE. In this group dissemination of the process was not detected. Ovarian tumors in metastasis group were both bilateral and unilateral, represented by solid formations with clear, even contours, ovarian size did not exceed 6.0 cm, disseminated process was revealed in half of the cases (metastases in the greater omentum and in the retroperitoneal lymph nodes). With RTE solid formations in the structure of the ovaries were mapped mainly by type 5 elastograms. With CEUS in areas of a solid structure a rapid accumulation of the contrast agent in the arterial phase and its rapid excretion into the venous phase was revealed, only the contours of the walls and septum were visualized in the late phase with the multilocular-solid structure of the ovary.

Conclusion: When we conduct an ultrasound examination of patients with a uterine cancer, a thorough study of the structure of the ovaries is important for timely diagnosis of the tumor. Further development of differential diagnostic criteria for macrometastases and synchronous ovarian tumors using modern ultrasound technologies is a promising task, since this information is necessary to correct the volume of surgery in this category of patients.

Keywords: *Endometrial Cancer; Primary Multiple Tumor; Ultrasound Examination; Tissue Elastography*

Introduction

For example, in uterine body cancer (RTM), the main principle of surgical treatment is a differentiated approach to the application of various surgical treatment options should be supplemented with an omentectomy [1].

Literature data Kuznetsov VV 2004, Nechushkina VM, Morkhov KY 2012 [2], indicate that the presence of a number of factors, in particular, macrometastases in the ovaries, dissemination on the abdomen, etc. are the basis for the expansion of the scope of the operation

to the lumbar lymphodissection at RTM 2004 ranges from 5% to 10%, that is, the urgency of timely preoperative diagnosis of metastatic ovarian tumors [3-5].

Another problem that deserves attention is synchronous tumors of the uterus and ovaries, synchronous RTM and ovarian cancer occurs in 48% of cases. About the data of the NMISO Petrov in the 2009 study - synchronous combinations of RTM and ovarian cancer are noted in 28.7% [6]. YV Proshina with co-authors (2015) (nq131) identified n-a-bile tumor formations in the ovaries in MRI-rtM staging in 11.5% of patients, including metastatic lesion - in 5.3%, synchronous ovarian cancer - in 4.6%, the results are confirmed histologically. The results of domestic authors coincide with foreign studies [7]. Takeshima N with coauthor (1998) - Of the 439 patients diagnosed with RTM, 22 patients (5%) were diagnosed with ovarian metastases [8]. In the Walsh C study, co-authors. (2005) of 102 women diagnosed with RTM, synchronous ovarian cancer was found in 23 (22.5%), ovarian metastases in 3 (2.9%) [9].

In 2016, Chekalova MA, Torosyan IV analyzed the results of ultrasound and postoperative histological studies of 300 patients with primary diagnosis of RTM [10]. 8 (2.7%) patients - primary-multiple synchronous tumors (uterine body cancer and ovarian cancer); 18 (6%) of them have benign ovarian tumors in 12 (4%) patients - serous ovarian cystadenoma, in 3 (1%) endometrioid cysts, 3 (1%) Cases of teratoma of one ovary; follicular cysts were diagnosed in 10 (3.3%) patients.

The complexity of differential diagnosis of primary and metastatic ovarian tumors is so great that the correct interpretation of changes in the ovaries in some patients is impossible even during laparotomy due to the similarity of the macroscopic pattern. Sometimes this problem is difficult to solve by a pathologist with an urgent histological study.

In recent years, the possibilities of the ultrasound method have expanded due to the introduction of modern technologies, such as elastography and contrast-enhanced ultrasound (CUSI). The question arises naturally what additional useful information can be obtained with these technologies to improve the quality of differential diagnosis of primary and metastatic ovarian tumors.

Materials and Methods

We analyzed the results of ultrasound and postoperative histological examinations of 8 patients with primary diagnosis of RTM, who were treated in THE NCICO between 2014 and 2018. All patients underwent surgical treatment in different amounts depending on the prevalence of the tumor process (2 group). All 8 patients were exturlocated with appendages, in addition to the 3rd - the removal of a large salnik, the 3rd - resection of a large salnik, 8 - an electric lymphadenectomy, the 1st - paraaortic lymphadenectomy. In 1 group in morphological study diagnosed: moderately differentiated endometrioid adenocarcinoma with squamous cell differentiation, glandular-squamous cell carcinoma, low-differentiated adenocarcinoma and endometrioid adenocarcinoma of low and moderate degree of differentiation. Dissected process: metastases in large slab and in the peritoneal lymph nodes. cystadenocarcinoma, 2 - moderately differentiated endometrioid adenocarcinoma and 1st (both ovaries are affected): in the right - low-differentiated endometrioid adenocarcinoma, in the left - moderately differentiated endometrioid adenocarcinoma.

The ultrasound consisted of several stages: an assessment of the echo structure in the gray scale mode, an analysis of vascularization with the help of the CDC, an ED and the study of tissue elasticity in the elastography mode. elastography and CUUSI. The results of the elastography were subsequently analyzed both by color assessment of the formation, depending on the type of elastographic image on a 5-point scale, and by the rigidity factor (Strain ratio). One patient on the Hitachi ARIETTA V70 was evaluated for accumulation (arterial phase) and the removal (venous phase) of the contrast drug.

Results

In ultrasound, ovarian growth was found in all 8 observations, and the echographic picture did not always appear to be unambiguous about the primary or metastatic process. Predominantly solid structure, rounded shape, smooth contours. In cases where the size of the ovaries did not exceed 3.0 cm, it was difficult to speak unequivocally about the nature of the tumor. At the same time, small pockets of a

solid structure with a diameter of 0.5 to 1.5 cm were visualized in unenlarged ovaries, which allowed to suspect metastases, because, in our experience, they are most often characterized by such an ultrasound pattern.

Clinical example number 1: Patient D, 41 years. In ultrasound: the uterus is not significantly enlarged, the contour is smooth, with signs of adenomyosis, in the uterine cavity in the middle and lower/3 is determined by a tumor with a length of 7.5 cm, a thickness of 2.6 cm (infestation less than 1/2 thickness of myometry), the lower pole of the uterus pushes and descends into the cervical canal to the middle/3 of the cervix (it is possible to express the cervical intrusion. The cervix is not hypertrophied, with thin-walled heroes. To 1.3 cm right ovary is not enlarged, sizes 3.6 x 2.3 cm, without features, the left ovary of a heterogeneous structure of 5.4 x 3.0 cm, its structure determines a solid rounded formation of increased echogenicity with clear smooth contours of 2.9 cm, with central loci of pathological blood flow of the CDC and ED (Figure 1). Elastography (CEG) solid formation in the structure of the ovary was mapped by 4 types of elastogram (Figure 2). In the conduct of elastometry of the tissue of the left ovary, the average speed of the shift wave was 2.9 m/s (Figure 3).

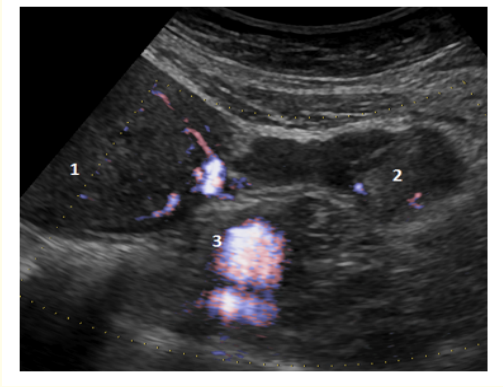

Figure 1: *Ultrasonic tomogram of the metastatic tumor of the left ovary patient D diagnosed with moderately differentiated endometrioid endometrial adenocarcinoma with squamous cell differentiation (ED mode): 1- myometry; 2- tumor; 3- ideal vessels.*

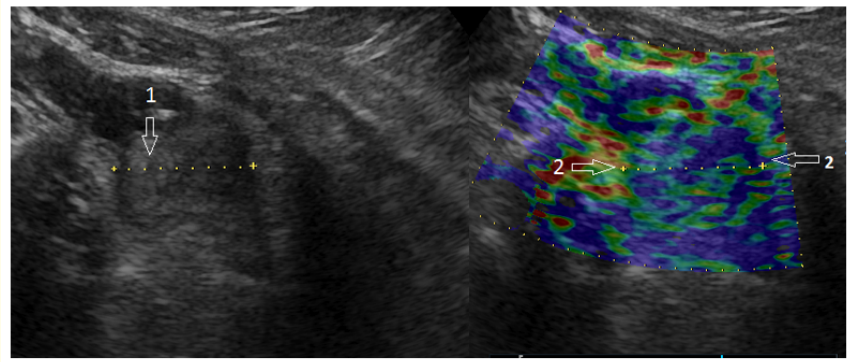

Figure 2: *Ultrasonic tomogram of the metastatic tumor of the left ovary patient D diagnosed with moderately differentiated endometrioid endometrial adenocarcinoma with squamous cell differentiation: 1- metastatically altered ovary; 2- compression elastography regimen.*

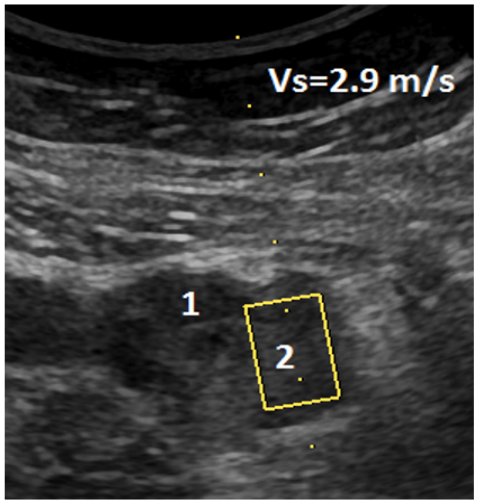

Figure 3: *Ultrasonic tomogram of the metastatic tumor of the left ovary patient D diagnosed with moderately differentiated endometrioid endometrial adenocarcinoma with squamous cell differentiation: 1- unaltered ovarian structure; 2- metastatic tumor (shift wave elastometry mode).*

December 18, 2017: Extirpation of the uterus with appendages, 2-x side illuscarid lymphadenectomy. Macroscopic description: Teel of the uterus measuring 9 x 9 x 7cm. From the internal yawn, occupying the entire cavity of the uterus, the tumor's growth sizes of 7 x 6 x 2 cm, represented by a dense, grayish-pink, grainy-looking tissue that sprouts in the myometrium in the back wall near the inner yawn to a depth of 1.2 cm. The right uterine twisted length of 7 cm, with a diameter of 0.5 cm. Right ovary measuring 6 x 3 x 2 cm is represented by dense elastic, grayish-pink fabric with single cystic cavities up to 0.5 cm in diameter. The left ovary, measuring 6 x 3 x 2 cm, is a densely elastic grayish pink tissue with dense white tissue and yellow bodies, with a tumour-sized knot measuring 2.5 x 2 x 2 cm, partially surrounded by a capsule represented by a dense grey grainy-looking fabric. Microscopic description: In the endometrium of the growth of moderately differentiated endometrioid adenocarcinoma with squamous cell differentiation, sprouting in myometrium to a depth of 1.2 cm (1/2 thickness of myometry), sprouting through the endocervix to the outer yawn. endometrioid adenocarcinoma with squamous cell differentiation. No signs of a tumor were detected in the large sling and lymph nodes. Conclusion: In the endometrium - moderately differentiated endometrioid adenocarcinoma with squamous cell differentiation.

Clinical example number 2: Patient L, 69 years old, in January 2014 there were blood slashing out of the genital tract. At ultrasound: paraaortic and paracaval/nodes are not enlarged, next to the common iliac vessels on the left - an enlarged lymph node measuring 3.4 x 2.1 cm, below the level of bifurcation of the axillary vessels - a knot measuring 4.0 x 2.2 cm. In the small pelvis: the uterus is slightly enlarged, the contour is uneven, with single myomatous nodes to 5.0 cm diameter. Lower pole of which at the level of the internal uterine yawn (infestation in myometrium almost to the serous layer), the length of formation of 6.2 cm. Cervical without features up to 1.5 cm with hypoechogenic rim. The right ovarian rounded shape, heterogeneous structure, sizes 3.2 x 2,0 x 1.5 cm, in its structure is determined by a solid rounded formation of increased echogenicity with clear uneven contours of 2.5 x 2.7 cm, in both ovaries on the contour of the identified hearths is determined peripheral pathological vascularization in the CDC and ED. During the CEG, the structure of the formations was mapped to the advantage of 5 types of elastogram (Figure 4). Conclusion: About the swelling of the uterus; metastatic ovarian damage.

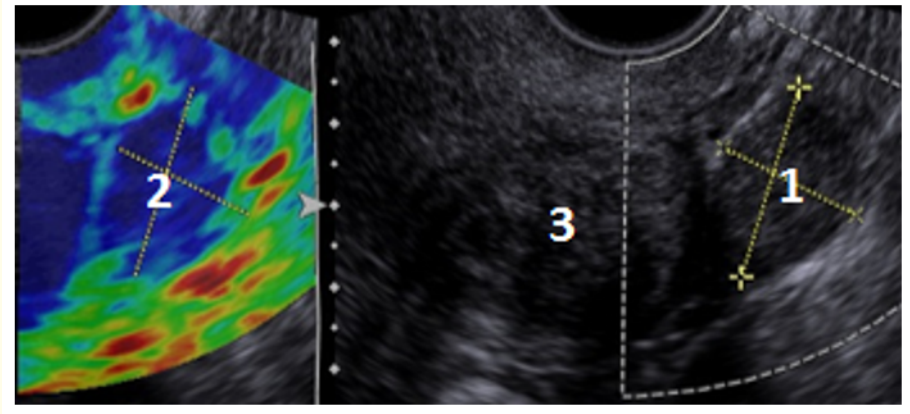

Figure 4: *Ultrasound tomogram of metastatic ovarian tumor patient L with diagnosis of low-differentiated endometrial adenocarcinoma: 1- to the left of the uterus a solid metastatic tumor; 2- compression elastography mode - structures of high rigidity; 3- myometry.*

March 11, 2014: Macroscopic description: Matka with appendages measuring 12.0 x 8,0 x 5.5 cm, cervix with a diameter of 2.5 cm. In the body cavity of the uterus is defined tumor node with a diameter of 7.0 cm. In the thickness of myometrium is defined by a node formation with a diameter of 5.0 cm. Ovaries measuring 3.0 x 2.0 x 1.5 cm, in one ovary - a cyst 1.0 cm in diameter, in the other - a cyst 2.0 cm in diameter, with brown contents. 1.0 cm to 4.0 cm. Microscopic description: In the endometrium - the growth of low-differentiated adenocarcinoma, piercing for the entire thickness of myometry. In both ovaries - cancer metastases, cancer complexes are located mainly in lymphatic and blood vessels.

As the observations show, the ultrasound method in patients of RTM allows to clearly identify tumors in unenlarged ovaries and suspect metastases. The detection of small (0.5 - 1.5 cm) metastatic tumors is certainly facilitated by the high resolution of the method, especially when using expert equipment equipped with modern technologies. In our many years of experience, as in these observations, metastasis in unenlarged ovaries are characterized by the presence of one or more solid pockets of predominantly hyperechogenic structure, often with hypoechogenic rim. Vascular ovarian architecture is disturbed by the appearance of pathological vascularization either around or inside the hearth.

It should be noted that the gray-necked picture of such a metastatic tumor is not specific and a similar image can be obtained in benign and non-tumor pathology. An important distinguishing feature in this case is the visualization of pathological vascularization (CDC and ED) and 5 elastotype in compression elastography.

In the group of patients with primary-multiple tumor (PMO) of the uterus and ovaries in 3 patients there was a unilateral organ damage and in the 1st - bilateral. In all cases, the size of the ovaries was more than 6.0 cm in the longitudinal measurement.

Clinical example number 3: Patient T, 46 years old. In January 2018 began to note the pulling pain in the lower abdomen, abundant menstruation. Turned toa gynecologist in the place of residence, performed ultrasound of the pelvic organs, detected endometrial hyperplasia, recommended RDVYGS. According to ultrasound: matka is not enlarged, the contour is flat, on the front wall is determined myomatous node 2.0 cm. Endometrium thickened 1,1 - 1.3 cm, uneven due to polypoid formations, no signs of infestation. The cervix is not hypertrophied, without features. From the right of the uterus is defined cystic-solid formation with clear uneven contours of sizes 9.0 x 9.0 cm, in

the structure of formation are defined septums and cystic cavities, in which hyperechogenic solid structures are visualized, the CDC in the septum and papillae structures are defined by the loci of the pathological blood flow. predominantly solid formation with clear uneven contours, heterogeneous structure sizes 6.1 x 4.0m, in its structure under the CDC defined peripheral pathological vascularization. In the course of the CEG, the structure of both ovaries was mapped mainly by 4 types of elastogram. CUUSI: no additional data on endometrial were obtained; in the ovaries: when the contrast drug is administered, there is a rapid accumulation of contrast ingesis in the papal structures in the arterial phase (Figure 5) and its rapid removal (Figure 6), in the late phase only the contours of the walls and septums in the structure of the ovaries (Figure 7) are visualized.

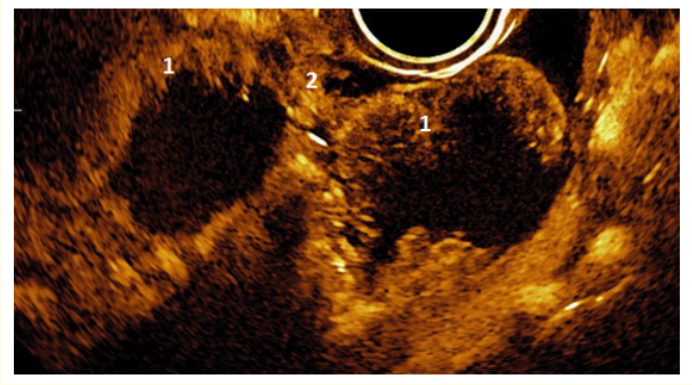

Figure 5: *Ultrasound tomogram of the tumor of the right and left ovary patient T with the diagnosis of moderately differentiated endometrioid endometrial adenocarcinoma (the mode of contrast-enhanced ultrasound - arterial phase): 1- papillae structures; 2- fragment of the fallopian tube.*

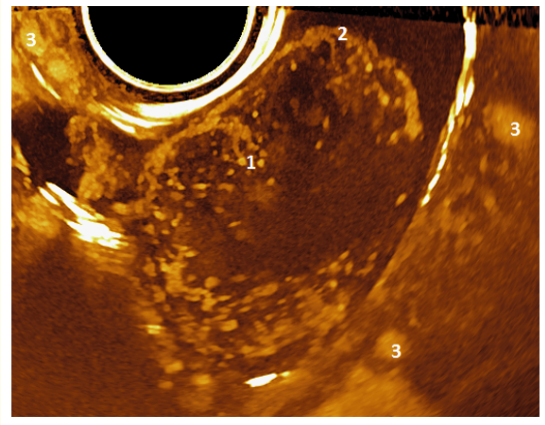

Figure 6: *Ultrasound tomogram of the tumor of the right ovary patient T diagnosed with moderately differentiated endometrioid adenocarcinoma of the endometrium (the regime of contrast-enhanced ultrasound examination - late phase, MTI mode): 1- papillae structures; 2- capsule; 3- pelvic vessels.*

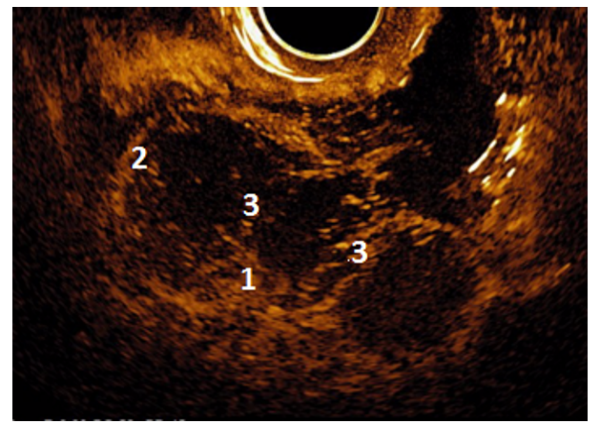

Figure 7: *Ultrasonic tomogram of the tumor of the left ovary patient T diagnosed with moderately differentiated endometrioid endometrial adenocarcinoma endometrium (the regime of contrast-enhanced ultrasound - late phase): 1- papillae structures; 2- capsule; 3- partitions.*

June 20, 2018: Extirpation of the uterus with appendages. Lymphadenectomy pelvic. Microscopic description: In the uterine body, the growth of moderately differentiated endometrioid adenocarcinoma, growing predominantly within the endometrium with the focus of infestation in myometry toa depth of 0.4 cm (surface infestation - less than 1/2 thickness of myometrium), with no signs of vascular infestation. In all lymph nodes reactive changes. Conclusion: n-multiple synchronous cancer of the organs of the female reproductive system.

Clinical example number 4: Patient P, 52 years old. Received complaints of spotting from the genital tract. In ultrasound: the uterus is not enlarged, the contours are smooth, the structure determines the ed. myomatous nodes d. In the uterine cavity, solid structures of up to 2.5 cm length, thickness of up to 1.6 cm, infestation less than ½ thickness of myometry are defined. The meals are determined. Follicles of up to 0.6 cm and a solid oval formation of mixed echogenicity with clear smooth contours of sizes of 4.9 x 2.4cm, with the CDC and ED defined peripheral pathological vascularization. In the course of the CEG, a solid formation in the structure of the right ovary is carded by 4 types of elastogram, the average stiffness factor when compared to unmodified ovarian tissue was 3.0 (Figure 8). Free liquid in the pelvic area up to 1.5 cm.

November 17, 2017: Extirpation of the uterus with appendages. Resection of a large sledgehammer. Macroscopic description: Matka with a neck measuring 12 x 6 x 6 cm. The body of the uterus measuring 8 x 6 x 6 cm. Height up to 1 cm, in the form of an overgrowth of grayish-white papal tissue. 2 x 1.5 x 1 cm of papillae tissue. Microscopic description: In the endometrium against the background of atypical glandular hyperplasia there are growth areas of highly differentiated endometrioid adenocarcinoma, growing mainly within the endometrium with an infestation site in myometry to a depth of 0.2 mm, with no signs of vascular infestation. Conclusion: n-multiple synchronous cancer of the organs of the female reproductive system.

In the presented observations MRI elastography in all cases in metastatic struck and ovaries in solid areas determined the component of high rigidity, mapping I 5 type of elastogram (blue color). Solid-cystic formations in cases of synchronous defeat were mapped by the 4th type (in which equally met and rigid and elastic areas, dapped blue and green colors) and 5 type (the structures of high rigidity - blue).

In CUUSI study in areas of solid structure there is a rapid accumulation of the contrast drug in the arterial phase and its rapid withdrawal into the venous phase, in the late phase of the cystic-solid structure of the ovary visualized only the contours walls and partitions.

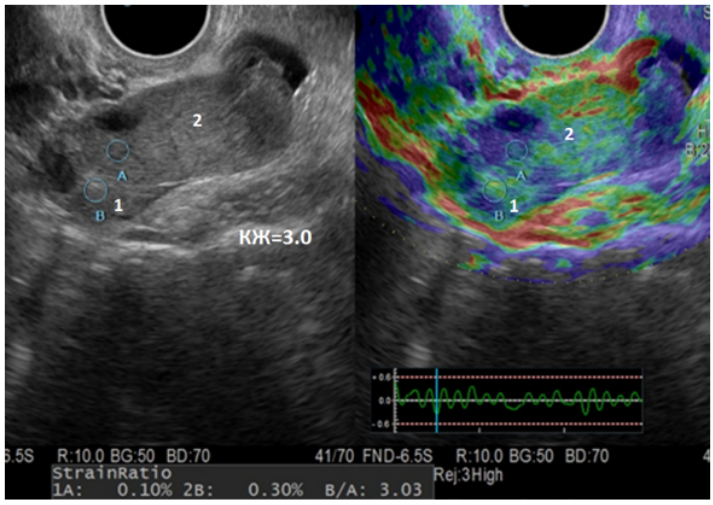

Figure 8: *Ultrasound tomography of the tumor of the left ovary patient P diagnosed with highly differentiated endometrioid endometrial adenocarcinoma and moderately differentiated adenocarcinoma of the ovary (compression elastography mode): 1- unaltered ovarian structure; 2- solid formation (tumor).*

Thus, our observations demonstrate the following echographic criteria of primary and metastatic ovarian cancer (Table 1).

Criteria	Primary ovarian cancer	Metastatic ovarian cancer
Side of defeat: Unilateral bilateral	3	2
	1	2
Structure: Cystic solid	3	0
	1	4
Tumor dimensions: Over 6.0 cm	4	0
	0	4
Tumor contours: Clear, uneven clear, smooth	3	0
	1	4
Distribution: There is no dissemination	0	2
	4	2
Elastography: 4 type of elastogram	4	1
	0	3

Table 1: *Echographic criteria for primary and metastatic ovarian cancer.*

According to table 1, in synchronized RTM and ovarian damage more often one-sided, the structure of ovarian tumors is more often solid-cystic with uneven contours, the size of the ovaries exceeds 6.0 cm and none of our observations confirmed the suspended process. The ovaries were both bilateral and one-sided, represented by solid formations and with rosary contours, the size of the ovaries did not

exceed 6.0 cm, in half of the cases the dissected process (metastases in large slab and in the peritoneal lymph nodes) elastograms.

Of course, the observations presented are few and selected, but we have noted a number of signs, the totality of which may contribute to the differential diagnosis between primary and metastatic ovarian tumor in RTM.

Discussion

These literature indicate that the most common combination of RTM and ovarian cancer is most common among the pmo of the female reproductive system, which confirms the need for timely detection of ovarian lesions and the correct interpretation of the nature of changes (metastatic or primary-multiple) at the preoperative stage of the 11-14.

According to various authors who studied synchronous and metastatic tumors of the female sex tract, in metastatic ovarian damage in patients diagnosed with RTM most often bilateral lesions, the size of the ovaries does not exceed 5.0 cm, their structure is solid, in this group most often in the primary diagnosis the process is dissected (metastasis in a large slab, in the abdominal lymph nodes, sanctorum). In the group in synchronous lesion of the uterus and ovaries on the contrary, most often occurs one-sided lesion, the size of the ovaries more than 5.0 cm, their structure is more often cystic-solid, the signs of the dissemal process are less common.

At the present stage, new ultrasound developments such as elastography and CUUSI are widely introduced into gynecological practice (2009) point to the benefit of elastography in differential diagnosis of benign and malignant ovarian formations. We have a solid-cystic formation in cases of synchronous lesions carded by 4 types (in which equally met and rigid and elastic areas, dapped blue and green), while metastatic ovarian tumors were characterized mainly by 5 type (high rigidity structures - blue).

The effectiveness of CUUSI in differential diagnosis of ovarian formations began to be studied relatively recently, in 2015. The first meta-analysis was carried out to assess the overall diagnostic effectiveness of the method in the diagnosis of ovarian cancer. Similar data have been obtained by us in the case of ovarian tumours in the case of synchronized cancer [11-19].

Conclusion

In ultrasound of patients diagnosed with RTM it is important to carefully study the structure of the ovaries for timely diagnosis of the tumor.

Conflict of Interest

The authors state that there is no conflict of interest.

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The study was conducted without sponsorship.

Informed Consent

All patients signed an informed consent to participate in the study.

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