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RESEARCH ARTICLE
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DIAGNOSTIC ACCURACY OF ULTRASONOGRAPHY IN THE DIAGNOSIS OF MALIGNANCY IN ADNEXAL MASS AND ITS CORRELATION WITH HISTOPATHOLOGICAL DIAGNOSIS

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ABSTRACT

BACKGROUND: To study the diagnostic accuracy of ultrasonography in the diagnosis of malignancy in adnexal mass and its correlation with histopathological diagnosis.

METHODS: This is hospital based observational study for a period of 1 year which included 133 patients of adnexal mass attending the OPD who required admission and operative intervention. All cases underwent clinical examination, ultrasonography and RMI scoring. Following surgery specimens were sent for histopathological examination and the reports were correlated with RMI scoring.

RESULT: The sonographic feature which was most prevalent among the malignant group was the presence of ascites (69.6%), closely followed by the presence of multilocularity (66.6%). Solid areas were significantly more common in malignant cases (48.84%) compared to benign cases (24.72%), with a chi-square value of 6.62 and a p-value of 0.010, indicating statistical significance. However, other features like multilocularity, bilateral involvement, ascites, and metastasis did not show statistically significant differences between benign and malignant cases, with p-values of 0.222, 0.430, 0.059, and 0.397 respectively. Evidence of metastasis in sonography of adnexal mass has the highest specificity and positive predictive value (100%) for malignancy. Presence of ascites came out to be next best predictor of malignancy. It had the sensitivity of 69.6% ,specificity of 95%, positive predictive value of 70.6% and negative predictive value of 91.8%.Presence of solid areas and bilaterality had low sensitivity and positive predictive value, but high specificity and negative predictive value for malignancy and hence, they were seen more commonly malignant mass as compared to benign mass. Overall, multilocularity was the sonographic feature which was the not a good predictor for malignancy . It was neither very sensitive (sensitivity =66%) nor specific (specificity =48%) and had very low positive predictive value for malignancy. The presence of ascites or metastasis on ultrasound examination were significantly associated with a higher possibility of malignant adnexal mass($p < 0.001$).

CONCLUSION: Ultrasonography has better efficacy in diagnosing malignant from benign adnexal lesions but indeterminate lesions supplemented with advanced imaging modalities like MRI and CT Scan will enhance the diagnostic certainty and help us to plan the course of the treatment and will have better outcome.

Keywords: Adnexal mass, malignancy, Ultrasonography, Histopathology

INTRODUCTION

"Adnexal masses are a common gynecological finding, with a reported prevalence of 1-5% in asymptomatic women. The ability to accurately diagnose the malignant potential of these masses is crucial, as it directly impacts treatment decisions and patient outcomes. While histopathological examination remains the gold standard for diagnosis, it is an invasive and resource-intensive process. Ultrasonography has emerged as a valuable tool in the initial evaluation of adnexal masses, offering a non-invasive, cost-effective, and widely available means of assessing their characteristics. Recent advances in ultrasonographic technology, including improved resolution and the use of Doppler and contrast-enhanced techniques, have enhanced its diagnostic capabilities. However, the diagnostic accuracy of ultrasonography in detecting malignancy within adnexal masses remains a topic of ongoing debate. Variability in operator expertise, equipment quality, and interpretation criteria can all impact the reliability of ultrasonographic findings.

This study aims to investigate the correlation between ultrasonographic findings and histopathological examination results in patients with adnexal masses, providing insights into the reliability of ultrasonography as a diagnostic modality and its potential to inform clinical decision-making. By exploring the concordance between ultrasonographic and histopathological diagnoses, this research seeks to contribute to the refinement of diagnostic algorithms, improve patient outcomes, and reduce unnecessary surgical interventions. Specifically, this study will examine the sensitivity, specificity, and positive and negative predictive values of ultrasonography in detecting malignancy within adnexal masses, as well as the factors influencing its diagnostic accuracy."

METHODS

This observational study was conducted on patients with an adnexal masses admitted for surgical management IPD from July 2018 to June 2019 for a total period of 1 year in department of Obstetrics and gynaecology , B.R.D. Medical college Gorakhpur.

Inclusion criteria -All consenting women who have an ovarian mass on presentation were recruited in this study and they were recruited in cohort and was operated and got histopathology reporting done.

Exclusion criteria – Patients with abdominal mass managed conservatively, Ectopic Pregnancy and patient diagnosed with malignant mass who are already on treatment for malignancy.

Detailed history, presenting complaints and menstrual history were obtained. Complete general physical examination with gynecological examination were performed and provisional diagnosis was made. To evaluate the adnexal mass further and ultrasonography examination consisting of transabdominal ultrasound and transvaginal ultrasound were done where sonographic findings regarding size of adnexal mass, laterality, locularity, solid elements, hemorrhage, presence of ascites, evidence of metastasis. Color doppler was added in suspicious cases of malignancy and doppler studies with pulsatility index (PI) and resistance index (RI) were assessed and ultrasound scoring was made.

Laparotomy or Laparoscopy was performed and specimen was sent for histopathological examination and reports were correlated with pre operative clinical, imaging finding and RMI score.

OBSERVATION

A total of 133 patients of various age group who presented with an adnexal mass in Gynaecology OPD of BRD Medical college, Gorakhpur for prediction of benign or malignant nature of lesion by calculating the RMI Scores, and the verification of diagnosis was done by histopathological examination of the tissue obtained after laparotomy.

Table 1:Distribution of adnexal mass

Nature of tumor	Number	percentage
Malignant	33	24.8%
Benign	100	75.2%
Total	**133**	**100.0%**

Out of the total of 133 patients, 33(24.8) patients had malignant adnexal mass and 100(75.2%) patients had benign adnexal mass.

Table -2 :Distribution of malignant mass based on histopathology

Histopathological type	Number	Percentage
1.Epithelial cell tumors	**24**	**72.72**
Serous cystadenocarcinoma	11	33.33
Mucinous cystadenocarcinoma	7	21.21
Endometrioid cystadenocarcinoma	3	9.09
Clear cell adenocarcinoma	3	9.09
2.Sex-cord stromal tumors	**9**	**27.27**
Immature teratoma	2	6.06
Endodermal sinus tumor	2	6.06
Dysgerminoma	3	9.09
Granulosa cell tumor	2	6.06
Total	**33**	**100**

Out of 33 malignant tumors in our study, majority (72.72%) were epithelial cell ovarian carcinoma. Out of these serous cystadenocarcinoma was the most common (33.33%) and clear cell carcinoma was the least common (9.09%).

Sex cord stromal tumors were 9 in number, thus constituted 27.27% of all the malignant mass ,among these dysgerminoma was the most common (9.09%) and granulosa cell tumor was the least common (6.06%).

Table -3:Distribution of benign mass based on histopathology

Histopathological type	Number	percentage
1.Non -Neoplastic	**27**	**27**
Endometrioma	9	9
Follicular cyst	11	11
Tubercular TO Mass	3	3
Corpus luteal cyst	4	4
Hydrosalpinx,TO-Mass(non tubercular)	5	5
2.Neoplastic	**73**	**73**
Serous cystadenoma	32	32
Mucinous cystadenoma	24	24
Fibroma	5	5
Thecoma	4	4
Dermoid tumor	8	8
Total	**100**	**100**

Out of the 100 benign mass, majority were of epithelial cell type 73% . Among these, serous cystadenoma was the most common 44% (32/73) followed by Mucinous cystadenoma 33% (24/73).Among the non neoplastic tumours, follicular cyst is the most common.

Table 4:Distribution of malignant and benign masses based on sonographic morphology

Sonographic morphology	Malignant(n=33)		Benign(n=100)		Total(n=133)	
	No	%	No	%	No	%
1.Multilocularity	22	66.6	48	48	70	52.6
2.Presence of ascites	18	54.5	29	29	47	35.3
3.Bilaterality	16	48.4	15	15	31	23.3
4.Presence of ascites	23	69.6	5	5	28	21
5.Evidence of metastasis	7	21.2	0	0	7	21.2

The sonographic feature which was most prevalent among the malignant group was the presence of ascites (69.6%), closely followed by the presence of multilocularity (66.6%). Multilocularity was also the most common USG feature among the benign mass (48.%) . Evidence of metastasis was the most distinguishing sonography feature for malignancy, as this was found only among the malignant group (12.1% prevalence) and is never found in the benign mass. Solid areas and bilaterality were more commonly seen among the benign mass as compared to the malignant mass.

Table 5 :Predictive value of sonographic morphologic features as predictor for malignancy

Sonographic morphology	Sensitivity	Specificity	PPV	NPV
Multilocularity	66.6%	52%	25.6%	82.9%
Presence of solid areas	54.5%	69%	33.3%	84.3%
Bilaterality	48.4%	85%	44.4%	85.0%
Presence of ascites	69.6%	95%	70.6%	91.8%
Evidence of metastasis	21.2%	100%	100%	85.9%

The five sonomorphological features were studied for their predictive values for malignancy among the adnexal mass. Evidence of metastasis in sonography of adnexal mass has the highest specificity and positive predictive value (100%) for malignancy. Presence of ascites came out to be next best predictor of malignancy. It had the sensitivity of 69.6% ,specificity of 95%, positive predictive value of 70.6% and negative predictive value of 91.8%.Presence of solid areas and bilaterality had low sensitivity and positive predictive value, but high specificity and negative predictive value for malignancy and hence, they were seen more commonly malignant mass as compared to benign mass.

Although ,multilocularity was one of the most common sonographic features seen among the malignant mass, it was not a good predictor for malignancy ,since it was also seen among 54.5% of benign mass. Overall, multilocularity was the sonographic feature which was the worst predictor for malignancy . It was neither very sensitive (sensitivity =66%)nor specific (specificity =48%) ,and had very low positive predictive value for malignancy. The presence of ascites or metastasis on ultrasound examination were significantly associated with a higher possibility of malignant adnexal mass($p < 0.001$).

Table 6:

Test Result variable(s)	Area under curve	Std.Error[a]	Asymptomatic Sig.[b]	Asymptomatic 95% Confidence interval	
				Lower Bound	Upper bound
USG	0.498	0.080	0.981	0.342	0.654
Solid areas	0.383	0.079	0.141	0.227	0.538
Multi-locularity	0.439	0.078	0.442	0.286	0.592
Bilaterality	0.347	0.081	0.054	0.188	0.505
Ascites	0.188	0.069	0.00	0.052	0.324
Metastasis	0.294	0.084	0.010	0.130	0.458

Although ,statistically significant differences were recorded between malignant and benign groups in the ultrasound score variable as a whole, the individual parameters of ultrasonography did not appear to be good predictor of malignancy when used individually. The area under the curve for solid areas was 0.383 , multilocularity was 0.349, bilaterality was 0.347 , ascites was 0.188 and metastasis was 0.294.

The test result variables serum has atleast one tie between the positive actual state group and negative actual state group. Statistics may be biased because of

a. Under the non parametric assumption

b. Null hypothesis :true area=0.5

Table 7: Association of frequency of solid areas, multilocularity, bilateral, ascities and metastasis between Benign and Malignant

		Benign		**Malignant**		**Chi Sq.**	**p-Value**
		n	%	n	%		
Solid areas	Present	22	24.72	21	48.84	6.62	0.010
	Absent	67	75.28	22	51.16		
Multilocularity	Present	10	11.24	9	20.93	1.49	0.222
	Absent	79	88.76	34	79.07		
Bilaterality	Present	7	7.87	6	13.95	0.62	0.430
	Absent	82	92.13	37	86.05		
Ascities	Present	3	3.37	6	13.95	3.58	0.059
	Absent	86	96.63	37	86.05		
Metastasis	Present	2	2.25	3	6.98	0.72	0.397
	Absent	87	97.75	40	93.02		

The data compares certain characteristics between benign and malignant cases. Solid areas were significantly more common in malignant cases (48.84%) compared to benign cases (24.72%), with a chi-square value of 6.62 and a p-value of 0.010, indicating statistical significance. However, other features like multilocularity, bilateral involvement, ascites, and metastasis did not show statistically significant differences between benign and malignant cases, with p-values of 0.222, 0.430, 0.059, and 0.397, respectively.

Discussion

1.Out of the total of 133 patients, 33(24.8) patients had malignant adnexal mass and 100(75.2%) patients had benign adnexal mass.

2. Out of the 100 benign mass, majority were of epithelial cell type 73% . Among these, serous cystadenoma was the most common 44% (32/73) followed by Mucinous cystadenoma 33% (24/73).Among the non neoplastic tumours, follicular cyst is the most common.

In this study Sokalska, A concluded that by Using subjective evaluation of gray-scale and Doppler ultrasound findings it is possible to make an almost conclusive diagnosis of a dermoid cyst, endometrioma and hydrosalpinx. Many other adnexal pathologies can be recognized but not confidently confirmed or excluded. [1]

Carballo et al, in conclusion, their analysis suggests that IOTA risk stratification is an effective adjunct in triaging adnexal masses and to decide conservative or surgical management in such a way that it does not increase surgical morbidity or delay treatment of malignancy. While there was not statistically significant increase in surgical morbidity of indeterminate masses with our small sample size, isolated cases were identified, making this an area where newer classification systems can provide advanced clinical guidance to further improve outcome in pregnancy.[2]

Simple cysts are easily identified on grayscale sonography by their unilocular appearance and lack of cyst wall papillae. On further studies should be undertaken of the cyst's diameters, since small simple cysts, usually less than 2.5–3 cm, are of little clinical importance in reproductive-age women.[3]

Benign cystic teratoma, also known as dermoid cysts, are the most common type of germ cell tumors. Most oftenly diagnosed in adolescents and reproductive-age women. When the cyst contains bone or teeth, these also appear as solid hyperechoic part of the cyst. Inspite of the diverse appearance of dermoid cysts on sonography, their diagnosis is often confirmatory, reaching a sensitivity of 99%.[4]

Hydrosalpinx is defined as fluid trapped in a distended fallopian tube with distal occlusion, and occurs in the patients with history of pelvic inflammatory disease. The appearance on grayscale ultrasound is a tubular and elongated cystic mass with incomplete septations or indentations along its walls that is called by waist sign or cogwheel.[5]Paratubal cysts or paraovarian cysts, typically appear on grayscale ultrasound as unilocular, thin-walled cysts with smooth margins and anechoic contents. To diagnose these cysts from simple ovarian cyst it is necessary to visualize the ipsilateral ovary separately from the cyst.[6]

Endometriomas are also called as chocolate fluid coloured filled cysts indicates the involvement of the ovaries in endometriosis. Endometriomas have a typical appearance on grayscale ultrasound, as uni-or multiloculated cysts with diffuse low-level homogenous echoes also known as "ground glass" appearance .[7]

Inclusion cysts, also known as pseudocysts, commonly seen in the patients of previous pelvic surgeries, pelvic inflammatory disease, or advanced stage endometriosis. The pseudocysts contains fluid trapped between peritoneal adhesions, and therefore it doesn't have actual cyst wall. Thus, the shape of the pseudocyst appears irregular as it is delineated by the surrounding structures and adhesions.[8]

3. Out of 33 malignant tumors in our study, majority (72.72%) were epithelial cell ovarian carcinoma. Out of these serous cystadenocarcinoma was the most common (33.33%) and clear cell carcinoma was the least common (9.09%).Sex cord stromal tumors were 9 in number, thus constituted 27.27% of all the malignant mass ,among these dysgerminoma was the most common (9.09%) and granulosa cell tumor was the least common (6.06%).

E.A. Sadowski in this research study concluded that Ultrasound has a high specificity for the diagnosis of a benign lesion in cases of classic simple cysts, hemorrhagic cysts, endometriomas and dermoids. Ultrasound is specific investigation for the diagnosis of ovarian neoplasms when there is vascular solid tissue associated with the lesion, particularly when associated peritoneal disease is seen on ultrasound or in patients where there is marked elevated serum CA-125 levels. However, ultrasound is less specific in the case of isolated and indeterminate adnexal lesions on ultrasound. MR imaging with the ADNEx MR score can increase the specificity for the diagnosis of malignancy in isolated and sonographically indeterminate adnexal lesions. Incorporating the ADNEx MR score into the evaluation of adnexal lesions can enhance diagnostic certainty and guide clinical management potentially avoiding inappropriate surgery in benign lesions and expediting appropriate treatment in malignant lesions.[9]

4. The sonographic feature which was most prevalent among the malignant group was the presence of ascites (69.6%), closely followed by the presence of multilocularity (66.6%). Multilocularity was also the most common USG feature among the benign mass (48.%) . Evidence of metastasis was the most distinguishing sonography feature for malignancy, as this was found only among the malignant group (12.1% prevalence) and is never found in the benign mass. Solid areas and bilaterality were more commonly seen among the benign mass as compared to the malignant mass.

Although ,multilocularity was one of the most common sonographic features seen among the malignant mass, it was not a good predictor for malignancy ,since it was also seen among 54.5% of benign mass. Overall, multilocularity was the sonographic feature which was the worst predictor for malignancy . It was neither very sensitive (sensitivity =66%) nor specific (specificity =48%) ,and

had very low positive predictive value for malignancy. The presence of ascites or metastasis on ultrasound examination were significantly associated with a higher possibility of malignant adnexal mass($p < 0.001$).

Di Legge conducted a study and came to conclusion that very small malignant tumors manifest generally accepted ultrasound signs of malignancy. Small unilocular cysts are usually benign, while small non-unilocular masses, particularly ones with solid components, incur a risk of malignancy and pose a clinical dilemma.[10]

In a study conducted by Pereira based on the results obtained gave a conclusion that although this study leaves no doubt about the superiority of magnetic resonance score over utrasonography-based methods for the discrimination of malignant tumors in women with adnexal masses, restricting the use of magnetic resonance score only to women with indeterminate masses on ultrasonography in super resolution is a safe, appropriate way to triage women with adnexal mass.[11]

5. Solid areas were significantly more common in malignant cases (48.84%) compared to benign cases (24.72%), with a chi-square value of 6.62 and a p-value of 0.010, indicating statistical significance. However, other features like multilocularity, bilateral involvement, ascites, and metastasis did not show statistically significant differences between benign and malignant cases, with p-values of 0.222, 0.430, 0.059, and 0.397, respectively.

The solid areas appear as hyperechoic areas on sonography may vary in size from small nodules or papillations to large mass. The diameter of the mass is less predictive of malignancy than the features described above. Hence, malignancy have been described even in relatively small cysts of 3–4 cm in diameter.[12]

Smorgick N et al study came to conclusion that use of grayscale ultrasound combined with Doppler findings when necessary allows the sinologist to reliably diagnose functional, benign, and malignant adnexal mass. The information obtained from the pelvic sonography, combined with patient's history and physical examination, will guide recommendations from treatment, primarily the decision for conservative follow-up versus surgery.[13]

Brown DL et al studied and gave a conclusion that solid component in a malignant ovarian mass is the most statistically significant predictor. A multiple parameter scoring system that uses three gray-scale and one Doppler feature, developed by means of stepwise logistic regression, has high sensitivity and specificity for predicting malignancy in adnexal mass.[14]

Magnetic resonance imaging can be used as an adjunct imaging modality when the initial ultrasound characterization of an adnexal mass as benign or malignant is inconclusive. A recent meta-analysis found that the sensitivity and specificity of MRI for malignancy identification may reach 92% and 88%, respectively.[15]

The chance of differentiating ovarian masses during pregnancy may help clinicians to decide the appropriate treatment for the patient. Hence it is possible to avoid unneeded surgeries on adnexal masses during pregnancy. Expectant management appears to be a safe approach for functional cysts, which are likely to regress during pregnancy.[16]

An adnexal lesion is diagnosed as benign when only B (benign) features are seen, and classified as malignant when only M (malignant) features are seen in ultrasonography. When adnexal tumors do not have B or M features or have both, the tumor should be considered inconclusive or unspecified .[17]

According to Russell, pelvic examination and its possible limitations, such as examiner experience, patient obesity, patient anxiety, or symptomatology, have never been assessed systematically.[18]

A population screening study by Andolf et al, only 23% of persistentadnexal masses found by ultrasound were detected by pelvic examination and none ofthe borderline ormalignant ovarian lesions were found by pelvic examination.[19]

Conclusion

Ultrasonography has better efficacy in diagnosing malignant from benign adnexal lesions but indeterminate lesions supplemented with advanced imaging modalities like MRI and CT Scan will enhance the diagnostic certainty and help us to plan the course of the treatment and will have better outcome.

Limitation

As this was a single center, hospital based study and it does not represent an entire population and as our sample size was relatively small, our results may have less statistical power and it is difficult to draw a definite conclusion.

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Conflict of interest

The author declared no conflict of interest

Ethical approval

All procedures followed were in accordance with the institutional ethics committee for human research,

References

1. 1.Sokalska, A., Timmerman, D., Testa, A.C., Van Holsbeke, C., Lissoni, A.A., Leone, F.P.G., Jurkovic, D. and Valentin, L. (2009), Diagnostic accuracy of transvaginal ultrasound examination for assigning a specific diagnosis to adnexal masses. Ultrasound Obstet Gynecol, 34: 462-470.
2. Carballo, E.V., Maturen, K.E., Li, Z. *et al*. Surgical outcomes of adnexal masses classified by IOTA ultrasound simple rules. *Sci Rep* **12**, 21848 (2022).
3. Patel MD. Pitfalls in the sonographic evaluation of adnexal masses. *Ultrasound Q*. 2012;**28**:29–40.
4. Mais V, Guerriero S, Ajossa S, Angiolucci M, Paoletti AM, Melis GB. Transvaginal ultrasonography in the diagnosis of cystic teratoma. *Obstet Gynecol.* 1995;**85**:48–52.[4]
5. 5.Brown DL. A practical approach to the ultrasound characterization of adnexal masses. *Ultrasound Q.* 2007;**23**:87–105.[5]
6. Savelli L, Ghi T, De Iaco P, Ceccaroni M, Venturoli S, Cacciatore B. Paraovarian/paratubal cysts: comparison of transvaginal sonographic and pathological findings to establish diagnostic criteria. *Ultrasound Obstet Gynecol.* 2006;**28**:330–334.[6]
7. Asch E, Levine D. Variations in appearance of endometriomas. *J Ultrasound Med.* 2007;**26**:993–1002. [7]
8. Guerriero S, Ajossa S, Mais V, Angiolucci M, Paoletti AM, Melis GB. Role of transvaginal sonography in the diagnosis of peritoneal inclusion cysts. *J Ultrasound Med.* 2004;**23**:1193–1200.[8]
9. E.A. Sadowski, A.G. Rockall, K.E. Maturen, J.B. Robbins, I. Thomassin-Naggara, Adnexal lesions: Imaging strategies for ultrasound and MR imaging,Diagnostic and Interventional Imaging,Volume 100, Issue 10,2019,Pages 635-646,ISSN 2211-5684.
10. Di Legge, A., Pollastri, P., Mancari, R., Ludovisi, M., Mascilini, F., Franchi, D., Jurkovic, D., Coccia, M.E., Timmerman, D., Scambia, G., Testa, A. and Valentin, L. (2017), Clinical and ultrasound characteristics of surgically removed adnexal lesions with largest diameter ≤ 2.5 cm: a pictorial essay. Ultrasound Obstet Gynecol, 50: 648-656.

11. Pereira, P.N., Sarian, L.O., Yoshida, A. *et al.* Improving the performance of IOTA simple rules: sonographic assessment of adnexal masses with resource-effective use of a magnetic resonance scoring (ADNEX MR scoring system). *Abdom Radiol* **45**, 3218–3229 (2020).
12. van Nagell J, DePriest P, Reedy M, et al. The efficacy of transvaginal sonographic screening in asymptomatic women at risk for ovarian cancer. *Gynecol Oncol.* 2000
13. Smorgick N, Maymon R. Assessment of adnexal masses using ultrasound: a practical review. Int J Womens Health. 2014 Sep 23;6:857-63. doi: 10.2147/IJWH.S47075. PMID: 25285023; PMCID: PMC4181738.
14. Brown DL, Doubilet PM, Miller FH, Frates MC, Laing FC, DiSalvo DN, Benson CB, Lerner MH. Benign and malignant ovarian masses: selection of the most discriminating gray-scale and Doppler sonographic features. Radiology. 1998 Jul;208(1):103-10. doi: 10.1148/radiology.208.1.9646799. PMID: 9646799.
15. Dodge JE, Covens AL, Lacchetti C, et al. Preoperative identification of a suspicious adnexal mass: a systematic review and meta-analysis. *Gynecol Oncol.* 2012;**126**(1):157–166.
16. 16.Pateman K., Moro F., Mavrelos D., Foo X., Hoo W.L., Jurkovic D. Natural history of ovarian endometrioma in pregnancy. *BMC Women's Health.* 2014;14:128. doi: 10.1186/1472-6874-14-128.
17. Nunes N., Ambler G., Foo X., Naftalin J., Widschwendter M., Jurkovic D. Use of IOTA simple rules for diagnosis of ovarian cancer: Meta-analysis. *Ultrasound Obstet. Gynecol.* 2014;44:503–514. doi: 10.1002/uog.13437.
18. Russell DJ. The female pelvic mass: Diagnosis and management. Med Clin North Am. 1995;79:1481-93.
19. 19. Andolf E, Svalenius E, Astedt B. Ultrasonography for early detection of ovarian carcinoma. Br J Obstet Gynaecol. 1986;93:1286-9.