

DOI: <http://dx.doi.org/10.18203/2320-1770.ijrcog20196035>

Original Research Article

Diagnostic accuracy of ultrasonography with laparoscopy for assessment of benign adnexal masses

Vinita Sarbhaj, Medha Yadav*

Department of Obstetrics and Gynecology, Kasturba Hospital, Delhi University, Delhi, India

Received: 11 November 2019

Accepted: 03 December 2019

***Correspondence:**

Dr. Medha Yadav,

E-mail: medha18yadav@gmail.com

Copyright: © the author(s), publisher and licensee Medip Academy. This is an open-access article distributed under the terms of the Creative Commons Attribution Non-Commercial License, which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.

ABSTRACT

Background: Adnexal masses are one of the most common pathologies among women of all age groups. Objective of this study was to assess efficacy of ultrasonography in diagnosing adnexal pathology, rule out malignancy and its comparison with laparoscopy and pathology results.

Methods: A total 32 women with benign adnexal mass were evaluated by clinical examination, ultrasonography and laparoscopy. Findings of ultrasound were compared with laparoscopy and histopathology reports and diagnostic accuracy was calculated.

Results: Sensitivity of USG in diagnosing simple ovarian cyst is 20% and specificity is 88.9% while laparoscopy has sensitivity of 100% and specificity of 94.4%. USG versus laparoscopy has sensitivity of 50% versus 100% and specificity of 94.1% versus 100% in diagnosing endometrioma. Sensitivity of USG in diagnosing dermoid cyst is 66.7% and specificity is 95% while laparoscopy has both sensitivity and specificity of 100%. USG and laparoscopy, both have 100% sensitivity and specificity in diagnosing ectopic pregnancy, para-ovarian cyst and TO abscess. Benign serous cystadenoma is a histopathological diagnosis and is missed by both laparoscopy and ultrasonography.

Conclusions: Ultrasonography should be the primary imaging modality used to identify and characterize adnexal masses, as it is readily available, and noninvasive.

Keywords: Benign adnexal mass, Laparoscopy, Ovarian cyst, Ultrasound

INTRODUCTION

Adnexal masses are one of the most common pathologies among women of all age groups. They represent a spectrum of heterogeneous conditions with pathologies ranging from gynecologic and non-gynecologic sources and of benign, borderline or malignant origin. The differential diagnosis of adnexal masses includes ovarian cancer and patients are often offered additional investigations, such as tumor-marker tests, to clarify the nature of the tumor. However, the nature of adnexal tumors often remains uncertain despite several tests and, as a result, many patients undergo major surgery because of the fear of missing an ovarian cancer.¹

Ultrasound scan has been widely used as first line investigation for ovarian pathology screening with advantages like inexpensive and easily accessible but accuracy of ultrasonography is highly based on observer's experience and findings may vary from observer to observer.² Principal goals of ultrasound are to determine whether an adnexal lesion is "almost certainly benign" or whether the mass has "a reasonable chance of being malignant." Both trans-abdominal and trans-vaginal approaches can be employed.

The aim of this study was to assess efficacy of ultrasonography in diagnosing adnexal pathology, rule

out malignancy and its comparison with laparoscopy and pathology results.

METHODS

This study was conducted in Kasturba hospital from January 2018 to December 2018, 32 women, more than 18 years, with persistent adnexal mass suspected to be benign on clinical features, ultrasound or laparoscopy were included in the study. Exclusion criteria were masses arising from urinary tract and gastrointestinal tract, masses with suspicion of malignancy (complex large, solid, fixed, mass with thick septations (>2 mm), irregular borders, variable echogenicities, papillary projections, high volume, low vascular resistance and pulsatility on doppler ultrasound, ascites, matted bowel, family history of breast and ovarian cancer and CA125 >200 units/ml in premenopausal, and >35 units/ml in post-menopausal age group) and any contraindication of laparoscopy.

Preoperative evaluation included detailed history, examination, routine blood investigations for preanesthetic checkup and ultrasonography with Doppler study to check vascularity. All patients were taken up for laparoscopy. Specimen retrieved during was sent for histopathology and final diagnosis was correlated with ultrasonography. Data was coded and entered in SPSS latest version. The sensitivity, specificity, positive predictive value (PPV), and negative predictive value (NPV) was calculated by using a conventional two-by-two (2 x 2) table.

RESULTS

Age of patients ranged from 20-40 years with the mean of 28 years±standard deviation of 4.71 years and median of 28 years. Most common presenting complaint was pain abdomen (59.4%) followed by infertility (46.9%) and menstrual abnormality (28.1%), discharge P/V (15.6%) and lump in abdomen (6.3%). All patients had clinical and ultrasound evaluation before surgery.

Table 1: Pre-operative diagnosis by ultrasonography.

USG diagnosis	Number	%
Simple ovarian cyst	5	15.6
Endometrioma	5	15.6
Complex ovarian cyst	5	15.6
PID	5	15.6
Hydrosalpinx	4	12.5
Tubo-ovarian abscess	1	3.1
Dermoid cyst	3	9.4
Paraovarian cyst	2	6.3
Ectopic	1	3.1
Clear cyst / cystadenoma	1	3.1
NAD	5	15.6
Total	32	100.0

Pre-operative diagnosis was made based on history, clinical examination and ultrasound findings. Most common diagnosis made on USG were simple ovarian cyst in 5 (15.6%), endometriotic cyst in 5 (15.6%), complex ovarian cyst in 5 (15.6%) and PID in 5 cases (15.6%). Dermoid cyst was seen in 3 cases (9.4%). Paraovarian cyst was seen in 2 cases (6.3%). Ectopic pregnancy, clear cyst/ cystadenoma and TO abscess were seen in 1 case each (3.1%). No abnormality was detected in 5 cases on ultrasound. These 5 cases presented with infertility and mass were diagnosed subsequently on diagnostic laparoscopy (Table 1).

Table 2: Laparoscopic diagnosis in study subjects.

Laparoscopic diagnosis	Number	%
Endometrioma	11	34.4
Simple ovarian cyst	8	25
Hydrosalpinx	4	12.5
Tubo-ovarian abscess	1	3.1
Tubo-ovarian Mass	1	3.1
Dermoid cyst	3	9.4
Tubal ectopic	1	3.1
Paraovarian cyst	2	6.3
PCOS	1	3.1

Most common diagnosis made on laparoscopy was endometrioma in 11 women (34.4%) followed by simple ovarian cyst in 8 (25%), hydrosalpinx in 4 (12.5%), dermoid cyst in 3 (9.4%), paraovarian cyst in 2 (6.3%), tubo-ovarian abscess in 1 (3.1%), TO mass (3.1%), ectopic pregnancy in 1 (3.1%) and PCOS in 1 woman (3.1%) (Table 2).

Table 3: Histopathology of adnexal mass (n = 32).

Histo-pathological diagnosis	Number	%
Endometrioma	6	18.7
Simple ovarian cyst	5	15.6
Dermoid cyst	3	9.4
Benign serous cystadenoma	2	6.3
Koch's pathology	2	6.3
Fibro-connective tissue	1	3.1
Paraovarian cyst	2	6.3
Products of conception (ectopic preg)	1	3.1
Tubo ovarian abscess	1	3.1
Sample not sent	9	28.1
Total	32	100

Procedures performed during laparoscopy included cystectomy, ovariectomy, cyst aspiration, de-roofing and fulguration, cuff neo-salpingostomy, salpingectomy, salpingo-oophorectomy, and ovarian drilling. Sample could not be sent in 9 cases (28.1%). Out of these 9 cases 3 were hydrosalpinx where only drainage of hydrosalpinx and cuff salpingostomy was performed. One patient had PCOS and ovarian drilling was done in her. Two cases

were simple ovarian cyst, which seemed to be functional cyst on laparoscopy so only aspiration was done. Three cases were small endometriotic cyst in which de-roofing

with fulguration was done, as the cyst wall could not be separated due to dense adhesions with ovarian capsule.

Table 4: Diagnostic accuracy of USG for detection of different pathology.

	Sensitivity	Specificity	PPV	NPV
Simple ovarian cyst	20.0%	88.9%	33.3%	80.0%
Endometrioma	50.0%	94.1%	75.0%	84.2%
Dermoid	66.7%	95.0%	66.7%	95.0%
Ectopic pregnancy	100%	100%	100%	100%
Benign serous cystadenoma	0%	96.7%	0%	93.5%
Paraovarian cyst	100%	100%	100%	100%
TO Abscess	100%	100%	100%	100%
Koch's/TB	0%	100%	0%	91.3%

Table 5: Comparison of sensitivity and specificity of laparoscopy with USG.

	Ultrasonography		Laparoscopy	
	Sensitivity	Specificity	Sensitivity	Specificity
Simple ovarian cyst	20%	88.9%	100%	94.4%
Endometrioma	50%	94.1%	100%	88.2%
Dermoid cyst	66.7%	95%	100%	100%
Ectopic pregnancy	100%	100%	100%	100%
Benign serous cystadenoma	0%	96.7%	0%	100%
Paraovarian cyst	100%	100%	100%	100%
TO abscess	100%	100%	100%	100%
Koch's pathology/ Genital TB	0%	100%	0%	100%

On histopathology examination, endometrioma was seen in 6 cases (18.7%). Simple ovarian cyst was seen in 5 cases (15.6%). Dermoid cyst was seen in 3 cases (9.4%). Benign serous cystadenoma was seen in 2 cases (6.3%). Koch's pathology was noted in 2 cases (6.3%). Paraovarian cyst was noted in 2 cases (6.3%). In 1 case, (3.1%) sample showed fibro-connective tissue only. Products of conception suggestive of ectopic and tubo-ovarian abscess were noted in 1 case each. Sample could not be sent in 9 cases (28.1%). Out of these 9 cases 3 were hydrosalpinx where only drainage of hydrosalpinx and cuff salpingostomy was performed. One patient had PCOS and ovarian drilling was done in her. Two cases were simple ovarian cyst, which seemed to be functional cyst on laparoscopy so only aspiration was done. Three cases were endometriotic cyst in which de-roofing with fulguration was done, as the cyst wall couldn't be separated due to dense adhesions with ovarian capsule (Table 3).

Sensitivity of USG in diagnosing simple ovarian cyst was 20% with a PPV of 33.9% and specificity of 88.9% with NPV of 80%. USG has low sensitivity in diagnosing endometrioma of 50% and high specificity of 94.1% with PPV of 75% and NPV of 84.2%. Sensitivity of USG in diagnosing Dermoids cyst was 66.7% with a PPV of

66.7% and specificity of 95% with a NPV of 95%. USG has 100% sensitivity and specificity in diagnosing ectopic pregnancy, para-ovarian cyst and TO abscess. For diagnosing Koch's pathology USG has 0% sensitivity and 100% specificity with a NPV of 91.3%. For diagnosing benign serous cystadenoma USG has 0% sensitivity and 96.7% specificity with a NPV of 93.5% (Table 4).

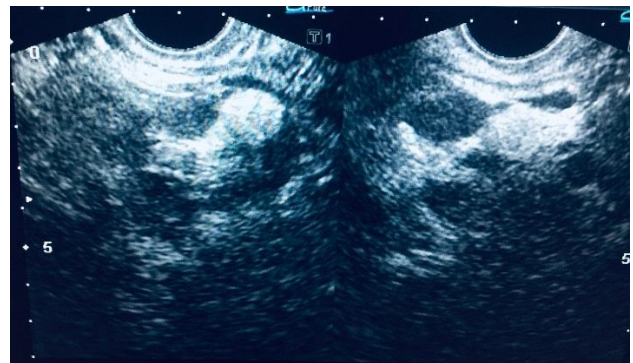


Figure 1: Dermoid cyst appearance on trans-vaginal sonography.

Sensitivity of USG in diagnosing simple ovarian cyst is 20% and specificity is 88.9% with a PPV of 33.3% and

NPV of 80%, while laparoscopy has sensitivity of 100% and specificity of 94.4%. Endometrioma was diagnosed in 6 cases on histopathology. Only 3 patients were diagnosed preoperatively as endometrioma on ultrasonography. While one each were labelled as simple ovarian cyst and complex ovarian cyst and in one patient no abnormality was diagnosed. Laparoscopy has 100% sensitivity in diagnosing endometrioma while USG has sensitivity of only 50%. But specificity of USG (94.1%) in diagnosing endometriomas is higher than that of laparoscopy (88.2%) (Table 5).

Dermoid cyst was diagnosed in 3 patients on histopathology (Figure 1). Out of these 2 were diagnosed as dermoid cyst and in 1 subject no abnormality was diagnosed on ultrasonography. Laparoscopy has both sensitivity and specificity of 100% while USG has sensitivity of 66.7% and specificity of 95% in diagnosing dermoid cyst (Table 5).

In diagnosing paraovarian cysts, hydrosalpinx, Koch's / genital TB, TO abscess and ectopic pregnancy both USG and laparoscopy have same sensitivity (100%) and specificity (100%).

Benign serous cystadenoma is a histopathological diagnosis and is missed by both laparoscopy and ultrasonography.

DISCUSSION

Imaging by ultrasonography helps to locate its origin [ovarian, uterine or bowel] the mass size, consistency, internal architecture by scoring system, which will grade the malignant tumor. Advantages of ultrasound include availability, cost effectiveness, patient tolerability, RMI scoring and doppler study.

Ultrasonography missed the ovarian pathology in 5 out of 32 cases in our study, which were endometrioma (3), dermoid (1) and hydrosalpinx (1). They were all of size less than 3 cm and were diagnosed only on laparoscopy. Hence USG has poor sensitivity in detecting masses of size ≤ 3 cm. Hydrosalpinx, dermoid cysts, paraovarian cysts, ectopic pregnancy, and TO abscess are the preoperative ultrasound diagnosis which correlated correctly on laparoscopy and histopathology. The most commonly missed or wrongly diagnosed was endometriosis.

Kroon et al, concluded in their study that transvaginal sonography lacks sufficient accuracy in the differentiation of the various non-malignant ovarian cysts. This low diagnostic accuracy is likely to be due to the heterogeneity of the sonographic characteristics of these cysts. Whenever further treatment depends on the histopathological diagnosis, one has to bear in mind that Transvaginal ultrasound will misdiagnose one-third of ovarian masses. Especially in the case of failed medical treatment or expectant management according to the

sonohistological diagnosis and in women in whom assisted reproduction is considered, diagnostic laparoscopy with histopathological examination by cystectomy is still warranted.³

A multicenter study by Valentin L et al, reported that 90% of extra uterine masses were classified in a proper way by the ultra-sonographer as benign or malignant, but 10% were unclassifiable by their ultrasound findings.⁴ According to Yezbek et al, the expertise of the ultra-sonographer influences the likelihood of an accurate diagnosis. Expert ultrasonography operators, who use the pattern-recognition method, do not normally miss epithelial ovarian cancers. However, the diagnosis of borderline ovarian tumors is more difficult and false negative findings are more common. This problem, however, is offset by the high specificity achieved, by expert ultrasonography operators, which helps to avoid unnecessary interventions in patients with benign adnexal pathology.²

Laparoscopy was found to have better diagnostic accuracy than USG by Theodoridis et al, which is in accordance with our study. They documented that TVS identified correctly 30 cases of simple cysts (94%), 3 para-ovarian cysts (75%), 29 endometriomas (78%), 5 serous cystadenomas (63%), 3 mucinous cystadenomas (75%), and 12 Dermoid cysts (80%). Which is similar to diagnosis by laparoscopy, as it correctly diagnosed 30 cases of simple cysts (94%), 4 para-ovarian cysts (100%), 37 endometriomas (100%), 6 serous cystadenomas (75%), 3 mucinous cystadenomas (75%), and 15 dermoid cysts (100%).⁵

A strong correlation was observed, between the ultrasound finding and pathological result for adnexal mass, by Ples L et al, ($p < 0.001$). Pre-operative diagnosis was made using clinical signs and symptoms and ultrasound images. The ultrasound findings were ovarian endometriosis (23.9%) of cases, left ovarian cyst (22.5%), right ovarian tumors (18.3%) and left ovarian tumors (8.5%). On histopathology examination ovarian endometriosis was found in 32.4% cases, ovarian functional cyst in 15.5%, salpingitis in 12.5%, ovarian myoma in 7%, papillary serous ovarian cyst in 4.2%, ovarian teratoma cyst in 9.9%, ovarian carcinoma in 1.4% and borderline serous tumor in 1.4%.⁶

Bhagde AD, evaluated 50 women presenting with an adnexal mass and found out that the most common site of origin of adnexal masses is the ovary and common histopathological diagnosis included mucinous cyst adenoma (20%), benign and mature cystic teratoma (16% and 6%) and serous cyst adenoma (10%). They concluded that ultrasonography is a useful non-invasive tool which is useful in diagnosing most cases of functional ovarian cysts, benign ovarian neoplasm and ovarian malignancy; but the histopathological examination of tissue obtained from laparoscopy/laparotomy is the gold standard for diagnosis

of adnexal mass. They documented sensitivity of 89-100%, specificity of 73-83%, PPV of 37-46% and NPV of 96-100% for ultrasonography.⁷

Laparoscopy set the diagnosis correctly in all the cases of dermoid cysts, paraovarian cyst, hemorrhagic cyst, hydrosalpinx and para-ovarian cysts in the study by Agarwal K et al. Laparoscopy was less accurate in the description of the nature of simple serous and mucinous cystadenomas, and endometriotic cyst, although the lower sensitivity laparoscopy exhibits in these cases is mostly unimportant, because it does not alter the conservative surgical approach that consists of ovarian cystectomy in such cases.⁸

Yogini KD et al, conducted a study on laparoscopic approach to adnexal mass in 96 adolescents. They concluded that ultrasound is a gold standard in preoperative evaluation to ascertain the benign nature of adnexal mass and laparoscopic approach is effective and safe for managing adolescent adnexal masses.⁹ Yadav P, in a review of adnexal masses in postmenopausal women stated that tumor markers, high frequency trans-vaginal ultrasound with doppler studies remain the least expensive modalities and the diagnostic accuracy and interpretation reliability are based on subjective assessment and experience of ultrasonographer.¹⁰

Wakhloo A, observed the sensitivity of pre-operative tools i.e. physical examination and ultrasound in diagnosing ovarian cyst as 75%, 86.9% in endometriosis, 100% in ectopic pregnancy and 25% in TO mass. They concluded that appropriate patients for laparoscopic approach could be selected, if proper pre-operative evaluation was done.¹¹

CONCLUSION

Without doubt laparoscopy is a superior diagnostic modality over USG for diagnosis but it should be used both as a diagnostic and a therapeutic procedure in adnexal masses and ultrasonography (USG) should be the primary imaging modality used to identify and characterize adnexal masses, as it is readily available, and non-invasive.

Funding: No funding sources

Conflict of interest: None declared

Ethical approval: The study was approved by the Institutional Ethics Committee

REFERENCES

1. Nezhat F, Nezhat C, Welander CE, Benigno B. Four ovarian cancers diagnosed during laparoscopic

- management of 1011 women with adnexal masses. *Am J Obstet Gynecol.* 1992;167:790-6.
2. Yazbek J, Raju S, Nagi J, Holland T, Hillaby K, Jurkovi D. Effect of quality of gynaecological ultrasonography on management of patients with suspected ovarian cancer: a randomised controlled trial. *The Lancet Oncol.* 2008;9(2):124-31.
3. De Kroon CD, van der Sandt HA, van Houwelingen JC, Jansen FW. Sonographic assessment of non-malignant ovarian cysts: does sonohistology exist? *Hum Reprod.* 2004;19:2138-43.
4. Valentin L, Ameye L, Jurkovic D, Metzger U, Lécuru F, Van Huffel S, et al. Which extrauterine pelvic masses are difficult to correctly classify as benign or malignant on the basis of ultrasound findings and is there a way of making a correct diagnosis? *Ultrasound Obstet Gynecol.* 2006;27(4):438-44.
5. Theodoridis TD, Zepiridis L, Mikos T, Grimbizis GF, Dinas K, Athanasiadis A, et al. Comparison of diagnostic accuracy of transvaginal ultrasound with laparoscopy in the management of patients with adnexal masses. *Arch Gynecol Obstet.* 2009;280(5):767-73.
6. Pleş L, Sima RM, Burnei A, Albu DF, Bujor MA, Conci S, et al. The experience of our clinic in laparoscopy for adnexal masses and the correlation between ultrasound findings and pathological results. *Rom J Morphol Embryol.* 2016;57(4):1337-41.
7. Bhagde AD, Jani SK, Patel MS, Shah SR. An analytical study of 50 women presenting with an adnexal mass. *Int J Reprod Contracept Obstet Gynecol.* 2016;6(1):262.
8. Aggarwal K. Laparoscopic evaluation and management of benign adnexal masses. *J Med Sci Clin Res.* 2017;5(6):23024-30.
9. Yogini KD, Balasubramaniam D, Palanivelu C, Kakollu A. Laparoscopic approach to adnexal mass in adolescents: a retrospective analysis. *J Datta Meghe Inst Med Sci Univ.* 2017;12(1):55-60.
10. Yadav P, Gupta M, Agarwal M, Garg R, Verma U, Gupta S. Role of imaging in dilemma of adnexal masses in postmenopausal women. *J South Asian Feder Menopause Soc.* 2017;5(1):45-50.
11. Wakhloo A, Sharma S, Singh G. Role of laparoscopy in the diagnosis and management of benign adnexal masses. *Int J Res Med Sci.* 2019;7:255-9.

Cite this article as: Sarbhai V, Yadav M. Diagnostic accuracy of ultrasonography with laparoscopy for assessment of benign adnexal masses. *Int J Reprod Contracept Obstet Gynecol* 2020;9:283-7.