e-ISSN: 0975-1556, p-ISSN:2820-2643

Available online on www.ijpcr.com

International Journal of Pharmaceutical and Clinical Research 2023; 15(12); 49-53

Original Research Article

Comparative Study of Ultrasonography (USG) and Computed Tomography (CT) in the Evaluation of Suspicious Ovarian Masses

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Received: 28-09-2023 / Revised: 27-10-2023 / Accepted: 25-11-2023

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Conflict of interest: Nil

Abstract:

Introduction: Ovarian tumours continue to be a major source of concern for Gynaecologists and radiologists. Ovarian Carcinoma is the second most prevalent type of gynaecological cancer. The purpose of this study was to compare ultrasound and computed tomography diagnostic modalities in the evaluation of suspicious ovarian masses.

Materials and Methods: The present study was conducted in Department of Radio- Diagnosis, Viswabharathi Medical College, Kurnool, Andhra Padesh, India. In the present study 50 females were enrolled having Suspicious Ovarian Masses. Computed tomography (CT) and USG characteristics of ovarian lesions were noted and recorded. The histopathological diagnosis was followed up and recorded. CT scan and Ultrasonography are excellent non-invasive modality to differentiate ovarian masses from benign and malignant lesions and both imaging techniques seem to be comparable in differentiation of malignant from benign ovarian tumors

Result: 50 patients were evaluated. USG had sensitivity of 87.6%, specificity 64.4%, positive predictive value (PPV) of 88.4% and negative predictive value (NPV) of 65.7% for benign tumors whereas for malignant tumors the sensitivity was 62.4, specificity 87.6, PPV 65.3% and NPV 85.3%. CT scan showed sensitivity of 98%, specificity of 96%, and PPV of 98% and NPV of 96% for benign tumours whereas for malignant tumors the sensitivity was 88.6, specificity 93.1%, PPV 78.6% and NPV 95.8%.

Conclusion: The evaluation of ovarian masses by Computed tomography scan was superior to the evaluation by Ultrasonography.

Keywords: Ultrasonography (USG), CT Scan, Ovarian Tumors, Sensitivity, Specificity.

Introduction

Adnexal lesions, particularly ovarian masses, are a common appearance in women of all ages and social classes. They frequently confuse both the Gynaecologist and the radiologist due to their broad spectrum of diagnostic variance. While benign ovarian tumours can be treated conservatively, severe neoplastic lesions frequently necessitate major surgical and oncological treatment. Ovarian cancer is a silent killer due to its late detection and dismal 5-year survival rate of 45%. It is the second most common gynaecological malignancy in India, trailing only cervical cancer, and has a global occurrence. [1,2] Ovarian cancer is a gynecological cancer that has a high mortality rate. Globally, an estimated 313,959 women were diagnosed with ovarian cancer in 2020, with the disease accounting for 207,252 reported fatalities. [3]

After the cervix and endometrial, the ovary is the third most prevalent location of primary malignancy in the female genital tract, accounting for 30% of all malignancies of the female genital tract. Ovaries are paired organs that measure 4 x 2.5 x 1.5 cm and are located one on each side of the uterus near to the lateral pelvic wall [4]. During the ovulatory cycle, the ovaries are susceptible to monthly endocrine and traumatic insults, making them a good target for tumour genesis. Primary and secondary ovarian carcinomas are common, with a wide range of histologic patterns seen in all age and ethnic groups [5]. Fifty percent of ovarian tumours are benign, 90% of

malignant tumours are epithelial, and the remaining 10% are metastasis-related [6]. However, the combined death risk of endometrial and cervical carcinoma is higher [7].

An ovarian cyst is a fluid-filled sac inside the ovary that is generally asymptomatic. It can cause lower abdomen or back pain, as well as pelvic inflammatory illness. However, the majority of ovarian cysts are not hazardous. [8] Ovarian cysts are classified as follicular, corpus luteum, dermoid, or cystodenomas. [9] Ultrasound and other laboratory examinations can be used to diagnose an ovarian cyst. [10,11] If necessary, patients might take drugs such as ibuprofen or paracetamol. Larger cysts may necessitate surgical intervention. [12,13]

Every month, most females of reproductive age can acquire a tiny cyst. In 8% of women, a larger cyst might create issues before menopause. [14] As a result, radiographic examination of ovarian masses is critical for early diagnosis and lesion definition, distinguishing benign from malignant masses, and choosing the therapeutic approach. Various diagnostic modalities, such as USG, CT, and now MRI, have come to the diagnostician's aid in resolving these quandaries. [15]

In patients with clinical signs that suggest ovarian mass, USG is usually the first line of investigation. The benefits of a USG for morphological characterization are its wide availability, low cost, and accuracy. However, a significant proportion of ovarian tumours may be classified as indeterminate on USG.[16] Cross-sectional imaging techniques are critical for such lesions. MRI can give precise anatomical localization and thorough lesion characterization, limiting the differential diagnosis greatly. However, in a nation like India, particularly in remote areas, availability and cost effectiveness are important barriers to MRI becoming the second line modality after USG for evaluating ovarian masses. CT, on the other hand, is widely available, relatively inexpensive, and provides a greater field of view, allowing for a more comprehensive inspection of the abdomen. [17,18]

The purpose of this study was to compare ultrasound and computed tomography diagnostic modalities in the evaluation of suspicious ovarian masses

Materials and Methods:

The current study was carried out in the Department of Radio- Diagnosis at Viswabharathi Medical College, Kurnool, Andhra Pradesh during the period of 2022 to 2023. The study protocol was approved by the Institutional ethics committee. Written and informed consent was taken from all the patients. The current study included 50 female patients with clinically suspected ovarian pathology.

Following was the inclusion and exclusion criteria for the present study.

Inclusion Criteria: Only those patients willing to participate in the study were included. Patients referred to the radiology department for ovarian lesions investigation, and found to have positive findings, were included in this study. All accidentally diagnosed cases of ovarian lesions were also be included in this study.

Exclusion Criteria: Patients presenting to radiology department & not willing for USG & CT examination & not willing for written consent were excluded from this study.

Before doing the CT scan, a detailed history of allergy and renal function tests were obtained, non-ionic contrast was employed in the study. Lesion location, size, papillary projections, wall features, capsular infiltrations, presence of solid portions & calcifications inside the mass, and presence of ascites were all noted using both an ultrasound and a CT scan. Lymph node enlargements, free fluid in the peritoneal cavity, and omental caking were considered as supporting evidence for cancer.

Trans-abdominal ultrasonography was performed utilising 3.5 and 5 Mhz curvilinear and linear transducers of Esaote MyLab X5 ultasound machine. Scanning is done in the transverse, oblique, and sagittal planes was performed, and the potential characterisation of ovarian tumours was assessed.

The CT scan of the pelvis was performed using the Toshiba 16 slice scanner. Pre and post intravenous contrast images, as well as oral contrast, were collected. Thin sections of 1 mm thickness were obtained in the area of interest.

Statistical analysis

The collected data was entered into a MS Excel and then exported to SPSS version 20. Percentages were computed as part of descriptive statistics.

Results:

Ultrasonography and CT scans were used to analyse 50 patients with clinically suspected ovarian disease in our investigation. The ultrasound findings were compared to the CT scan findings to establish the accuracy of the modality in diagnosing ovarian diseases.

The study included 50 females ranging in age from 0 to 80 years. The age group 41-50 years had the highest incidence, accounting for 18 (36%) of patients followed by age group of 31-40 years having 12 (24%) patients, 10 cases in patients with age group of 51-60 years, 4 cases in patients with age group of 61=70 years , 3 cases in elderly patients (> 70 years), 2 cases in patients with the age group of 21-30 years. Ovarian lesions were seen least frequently in paediatric 1 patient (0 to 20 years) as shown in **Table – 1**

Table 1: Age distribution of patients

Age (years)	N	%
< 21	1	2
21-30	2	4
31-40	12	24
41-50	18	36
51-60	10	20
61-70	4	8
>70	3	6

In this study, there were 39 benign (78%) and 11 (22%) malignant tumors which were diagnosed by histopathology as shown in Table 2

Table 2: Type of masses

Type of masses	N	%
Benign	39	78
Malignant	11	22

Mass abdomen was the most common presenting symptom and contributed to 44%. It is followed by pain abdomen of 28% and abdominal distension by 22%, others by pressure symptoms (4%), and loss of appetite (2%) as shown in Table 3

Table 3: Symptoms

Symptom	N	%
Mass Abdomen	22	44
Pain abdomen	14	28
Abdominal distension	11	22
Pressure symptoms	2	4
Loss of appetite	1	2

Most common benign tumour is mucinous cystadenoma with a percentage of (56.4%) followed by serous cystadenooma (25.6%), Dermoid (7.7%), Fibro Thecoma (5.1%), Fibroma (2.6%) & Granulose cell tumour (2.6%). Most common malignant tumour is papillary serous cystadeno carcinoma with a percentage of (36.3%). Followed by mucinous cystadeno carcinoma (18.2%), serous cystadeno carcinoma (18.2%), Borderline Malignant (Serous – 9.1%, Mucinous – 9.1%), & Dysgerminoma (4.1%).

Table 4: Benign and Malignant tumors

Tumors	N	%
Benign		
Mucinous cystadenoma	22	56.4
Seous Cystadenoma	10	25.6
Dermoid	3	7.7
Fibro Thecoma	2	5.1
Fibroma	1	2.6
Granulose cell tumor	1	2.6
Malignant		
Papillary serous cystadeno carcinoma	4	36.3
Mucinous Cystadeno carcinoma	2	18,2
Serous cystadeno carcinoma	2	18.2
Borderline Malignant Serous Mucinous	 1 1	 9.1 9.1
Dysgerminoma	1	9.1

CT was found to have 98% sensitivity, 96% specificity in the differentiation of benign and malignant ovarian masses, while PPV and NPV were 98% and 96%, respectively. The sensitivity of USG was 87.6%, specificity was 64.4% and PPV and NPV were 88.4% and 65.7 % respectively as shown in Table 5

Table 5: Test performance characteristics of US and CT scan

	Ultrasound		Computed Tomography	
	Benign	Malignant	Benign	Malignant
Sensitivity	87.6	62.4	98	88.6
Specificity	64.4	87.6	96	93.1
Positive Predictive value	88.4	65.3	98	78.6
Negative Predictive value	65.7	85.3	96	95.84

Discussion:

Ovarian tumours pose the most clinical challenge of any gynaecological cancer, and ovarian carcinoma is the second most frequent gynaecological cancer in terms of incidence. Because the majority of them present at a late stage, clinical diagnosis is challenging, and because benign ovarian tumours outweigh malignant ones, determining a level of suspicion for malignancy is crucial and is mostly based on imaging modalities. The evaluation of a level of suspicion for cancer in an ovarian tumour is the most important phase in its therapy because the decision to undertake radical or conservative surgery is dependent on an accurate pre-operative diagnosis. [19]

Clinical evaluation of site (unilateral or bilateral), fixity, consistency, presence of nodules in Douglas pouch, and presence of ascites raises the suspicion of malignancy to some extent, but when combined with other tools such as tumour markers and two-dimensional ultrasounds, the sensitivity for malignancy rises. [19,20] CT has been utilised mostly in patients with ovarian malignancies among women with ovarian diseases, either to estimate disease extent before to surgery or as a substitute for second look laparotomy. CT scans are favoured for detecting peritoneal implants, lymphadenopathy, and the extent of the disease. However, studies have failed to show that CT is significantly superior to other modalities in ovarian cancer characterisation. [21,22,23] Furthermore, ultrasonography is more accurate in detecting simple ovarian cysts. Dr. Hari Kishore Rai et al. [24] in their study observed that Computed tomography is superior diagnostic imaging modality than USG prior to treatment which improved detection and characterization of tumour due to better diagnostic accuracy and consequently reduction of invasive procedure which lead to significant reduction of mortality and morbidity from tumour. Onyeka et al. [25] found that the sensitivity of CT scan for all ovarian cancer detection was higher than that of the US (83% vs. 67%), but that the US was more specific.

In our research, CT was reported to have 98% sensitivity and 96% specificity in distinguishing benign and malignant ovarian masses, with PPV and NPV of 98% and 96%, respectively. USG had a sensitivity of 87.6%, a specificity of 64.4%, and a PPV and NPV of 88.4% and 65.7%, respectively. The outcomes of this investigation are consistent with the findings of Ahmed A et al. [26] Verit FF et al [27] discovered that in comparing the diagnostic accuracy of different modalities in the detection of ovarian tumours in premenopausal women, USG was 83% sensitive and 92% specific, whereas CT was 91% sensitive and 96% specific.

Conclusion:

This study concludes that computed tomography is a superior diagnostic imaging modality than USG prior to treatment, which improved tumour detection and characterization due to improved diagnostic accuracy and, as a result, reduced invasive procedures, resulting in a significant reduction in tumour mortality and morbidity.

References:

1. 1.Parkin DM, Bray F, Ferlay J, Pisani P. Global cancer statistics, 2002. CA: a Cancer Journal for Clinicians. 2005; 55(2):74-108.
2. Nand KA. Consolidated report of population-based cancer registeries. Indian Counc Med Res. 2001;1:212.
3. Sung H, Ferlay J, Siegel RL, Laversanne M, Soerjomataram I, Jemal A, Bray F. Global cancer statistics 2020: GLOBOCAN estimates of incidence and mortality worldwide for 36 cancers in 185 countries. CA: a cancer journal for clinicians. 2021 May;71(3):209-49.
4. Gupta. N, Bisht. D. Retrospective and prospective study of ovarian tumors and tumor like lesions. Indian journal of Pathol Microbiol., 2007; 50(30): 525- 527.
5. Prabhakar BR, Kalyani M. Ovarian tumors-prevalence in Punjab. Indian J. Pathol. Microbiol., 1989; 32(4): 276-281.
6. Young RH, Scully RE. Differential diagnosis of ovarian tumors based primarily on their pattern and cell type. Semin Diagn Pathol., 2001; 18(3): 161 – 235.
7. Jagadeeshwari N, Reddy R.S., Rao K.S. Incidence of ovarian tumors. J. Obstet. Gynec.India, 1971; 21: 727 -732.
8. Jeong YY, Outwater EK, Kang HK. Imaging evaluation of ovarian masses. Radiographics. 2000; 20(1):1445- 1470.
9. Aziz Z, Sana S, Saeed S, Akram M. Institution based tumor registry from Punjab: five-year data based analysis. J Pak Med Assoc. 2003; 53(2):350-353.
10. Tanwani AK. Prevalence and patterns of ovarian lesions. Ann Pak Inst Med Sci. 2005; 1(4):211-214.

11. Nam E, Kim Y, Kim J, et al. Kim. Diagnosis and staging of ovarian cancer: comparative values of PET/CT, Doppler US, CT, and MRI correlated with histopathologic analysis. J Clin Oncol. 2008; 26(15S):5567.
12. Kinkel K, Lu Y, Mehdizade A, Pelte MF, Hricak H. Indeterminate ovarian mass at ultrasound: incremental value of second imaging test for characterization-meta analysis and Bayesian analysis. Radiology. 2005; 236(2): 85-94.
13. Tsili AC, Tsampoulas C, Charisiadi A, et al. Adnexalmasses: accuracy of detection and differentiation with multidetector computed tomography. Gynecol Oncol. 2008; 110 (4):22-31.
14. Ovarian cysts. Office on Women's Health. November 19, 2014.
15. Joshi M, Ganesan K, Munshi HN, Ganesan S, Lawande A. Ultrasound of adnexal masses. In Seminars in Ultrasound, CT and MRI. WB Saunders. 2008; 29(2):72-97.
16. Funt SA, Hann LE. Detection and characterization of adnexal masses. Radiologic Clinics of North America. 2002; 40(3):591-608.
17. Devine C, Szklaruk J, Tamm EP. Magnetic resonance imaging in the characterization of pelvic masses. In Seminars in Ultrasound, CT and MRI. WB Saunders. 2005; 26(3):172-204.
18. Bennett GL, Slywotzky CM, Giovanniello G. Gynecologic causes of acute pelvic pain: spectrum of CT findings. Radiographics. 2002; 22 (4):785-801.
19. Averette H.E. and Nguyen H.N. The role of prophylactic oophorectomy in cancer prevention. Gynecologic Oncology. 2001; 55 (3):38-41.
20. Ponder B.A.Y., Barlow and Lela S.B. Preoperative and intraoperative evaluation in ovarian malignancy. Obstet. Gynecol.2002; 48: 321-5.
21. Liu J., Xu Y. and Wang J.Ultrasonography, computed tomography and magnetic resonance imaging for diagnosis of ovarian carcinoma. Eur. J.Radiol. 2007; 62 : 328-334.
22. Funt S.A. and Hann L.E.: Detection and characterization of adnexal masses. Radiologic Clin. North Am. 2002; 40:591-608.
23. Loyer M., Whitman J., and Fenstermacher J.M.: Imaging of ovarian carcinoma. Int. J. Gynecol. Cancer.1999; 9: 351-61.
24. Dr. Hari Kishore Rai, Dr. Swami Vivekanand. Assessment of suspicious ovarian masses by comparative study of USG and CT techniques. IJMBS.2020;4(7):141-145
25. Onyeka BA, Attalla A, Deemer H. Comparative diagnostic values of greyn scale USS versus CT scan in primary management of gynaecological pelvic mass with emphasis on ovarian detection and staging. J Obstet. Gynaecol. 2001; 21(6):516-9.
26. 26.Ahmed A, Zamir S, Saghir NJ. Characterization of adnexal masses on Tran's abdominal ultrasonography and CT scan. Ann Pak Inst Med Sci. 2013; 9(1):48-51.
27. Verit FF, Pehlivan M. Transvagınal ultrasound and computed tomography combıned wıth ca–125 determınatıons in preoperatıve evaluatıon of ovarıan masses in premenopausal women. Harran Üniversitesi Tıp Fakültesi Dergisi. 2007; 4(2):50-54.