International Journal of Science and Research (IJSR)
ISSN (Online): 2319-7064
Index Copernicus Value (2015): 78.96 | Impact Factor (2015): 6.391

Accuracy of CT Imaging in Diagnosing Adnexal Neoplasms

Abdul Rehuman Methar Rihad

Department of Radio Diagnosis, K.S Hegde Medical Academy, Nitte University, Mangalore-575018, India

Abstract: ***Background**: Most adnexal neoplasms are benign, and each of the most common benign lesions has a typical sonographic appearance. At times adnexal neoplasms may be considered as indeterminate through ultrasound examination, either the organ of origin cannot be ascertained or the mass cannot be classified as benign or malignant with conviction. The most insidious and intractable disease in the adnexa is ovarian cancer. Computed Tomography (CT) Providing a systematic and wide coverage of the abdomen in the same session makes CT well suited for imaging and staging of gynecologic diseases. Hence, CT is the current imaging modality of choice in the preoperative evaluation of ovarian cancer. This study review an approach to CT in the diagnosis of ovarian neoplasms. **Methods**: This is an observational study, during January 2015 to October 2016, in the department of Radio diagnosis, Justice K. S. Hegde Hospital, Mangalore. The study were conducted in 46 cases who underwent contrast enhanced CT scan of abdomen and pelvis followed by histopathological examination of the specimen. **Results**: In the study, histopathology revealed 23 benign (50%) and 23 (50%) malignant cases. CT scan showed sensitivity of 65.2%, specificity of 82.6%, PPV of 83.3% and NPV of 90.5% with an accuracy of 73.9% in detecting ovarian neoplasms. **Conclusion**: Knowledge of certain radiologic findings that predominate for each type of tumor may help to distinguish benign from malignant tumors. CT imaging using parameters such as ill-defined margin, mixed components, ascites, heterogeneous enhancement pattern and presence of peritoneal deposits can give a high confidence in deriving the diagnosis of malignancy in suspected cases of ovarian neoplasms.*

Keywords: Adnexal neoplasms, Computed Tomography, Histopathology, Ovarian cancer

1. Introduction

Ovarian cancer is the seventh [1] most common cancer worldwide among women contributing 3.6% of all cancers (excl. non-melanoma skin cancer) diagnosed in 2012 and causing more deaths than any other gynecologic malignancy. Lifetime risk of cancer in hereditary patients is 40% to 50% with an earlier age of onset (10-15 years) than do other ovarian malignancy [2]. The most important prognostic factor is the stage of the lesion at the time of diagnosis [3]. Providing a systematic and wide coverage of the abdomen in the same session, makes CT well suited for imaging and staging of gynecologic diseases. Thin section CECT allows visualization of the ovaries even in postmenopausal women [4], [5]. The ability of CT to evaluate the liver, para-aortic region, omentum, and mesentery makes it useful for judging the gross extent of hematogenous, lymphatic, and peritoneal spread of ovarian cancer. Hence, CT is the current imaging modality of choice in the preoperative evaluation of ovarian cancer [4]–[8].

2. Methodology

2.1 Source of data

The study is a prospective observational study conducted in 46 cases between January 2015 to October 2016, in the department of Radio diagnosis, Justice K. S. Hegde Hospital, Mangalore.

2.2 Method of Study

All patients included in the study underwent CT scan of abdomen and pelvis (GE Brightspeed Select Elite 16 slice CT scanner with contrast) followed by histopathological examination of the specimen.

2.3 Inclusion Criteria

- Clinically suspected cases of adnexal neoplasms.
- Adnexal lesions found incidentally on ultrasound.

2.4 Exclusion Criteria

Patients with contraindication for CT. (Pregnancy, Renal failure).

2.5 Statistical Analysis

Diagnostic comparison using Sensitivity, Specificity, Positive predictive value (PPV), Negative predictive value (NPV) and accuracy were done [9].

3. Results

Among 46 patients in the study, calculation of frequency of age groups and patient age statistics were done. Table 1 and Table 2 show patient age demographic details.

Table 1: Frequency of age groups

Age group	*Frequency*	*Percent*
30 and below	5	10.9
31 - 50	28	60.9
Above 50	13	28.3
Total	46	100

Table 2: Patient age statistics

	Age
Minimum	19
Maximum	68
Mean	44.8913
Std. Deviation	12.22971

The histopathological analysis of specimens was tabulated in Table 3.

Cross tabulation of CT imaging features and its correlation with histopathology were listed in Table 4.

Fishers exact test/Chi square test (Table 5) was used to compare the sensitivity of CT scan in detecting the ovarian cancer with level of significance (p value) if <0.05 and highly significance if <0.01.

4. Discussion

The youngest patient was 19 years and the most elderly patient was 68 years with a mean age ± standard deviation of 44.9±12.2 years. Majority of patients were in third to fifth decades of age and only 5 patients were in the less than 30 years group.

In the observed subjects, there were 23 benign (50%) and 23 (50%) malignant cases which were diagnosed on histopathology.

The morphological characteristics associated with strong likelihood of malignancy in present study were the presence of ill-defined margin(65.2%), mixed components(65.2%), heterogeneous enhancement on contrast administration (67.4%), ascites (80.4%) and peritoneal deposits (82.6%); where ascites and peritoneal deposits showed a highly significant correlation towards ovarian malignancy. Lymphadenopathy assessed with CT imaging showed an accuracy of 60.9%.

Table 3: Histopathological findings in 46 patients

Nature	*Type*	*Histopathology*	*Frequency*
Benign	Epithelial	Serous cyst adenoma	5
	Epithelial	Mucinous cyst adenoma	4
	Epithelial	Mucinous tumor	1
	Germ cell	Cystic teratoma	5
Malignant	Epithelial	Serous cyst adenocarcinoma	7
	Epithelial	Serous adenocarcinoma	4
	Epithelial	Mucinous adenocarcinoma	2
	Epithelial	Poorly differentiated adenocarcinoma	6
	Germ cell	Immature teratoma	1
	Germ cell	Mixed germ cell tumor (dysgerminoma, embryonal carcinoma)	1
	Metastatic	Krukenberg tumor - primary from breast	1
	Metastatic	Severe dysplasia with colonic malignancy	1
Others		Acute on chronic salpingo oporitis	1
		Hemorrhagic cyst	1
		Endometriotic cyst	4
		Mesenteric cyst	1
		Negative for malignancy	1
Total			46

Fatima Mubarak et al. states that MDCT is an excellent noninvasive modality to differentiate adnexal masses from benign and malignant causes. The presence of ascites, peritoneal metastases, and lymphadenopathy was also used to confirm malignancy [10].

In present study, CT scan showed sensitivity of 65.2% with positive predictive value of 83.3%, specificity of 82.6% with egative predictive value of 90.5% and an *accuracy of 73.9%.*

The sensitivity and specificity were compared to other studies in literature and is given in Table 6.

Table 4: Diagnostic performance of CT and histopathology in evaluation of ovarian neoplasms

Detection	*Sensitivity %*	*Specificity %*	*PPV %*	*NPV %*	*Accuracy %*
Bi vs unilateral	60.7	52.2	56	57.1	56.5
Size(cm) : (>=7 vs <7)	69.6	21.7	47.1	41.7	45.7
Margin : ill-defined vs well defined	47.8	82.6	73.3	61.3	65.2
Tissue content : mixed vs solid	82.6	47.8	61.3	73.3	65.2
Enhancement: hetero vs homogeneous	87	47.8	62.5	78.6	67.4
Septation : (+ vs -)	78.3	21.7	50	50	50
Calcification : (- vs +)	13	65.2	27.3	42.9	39.1
Ascites : (+ vs -)	91.3	69.6	75	88.9	80.4
Lymphadenopathy: (+ vs -)	52.2	69.6	63.2	59.3	60.9
Peritoneal implants: (+ vs -)	69.6	95.7	94.1	75.9	82.6
Overall	65.2	82.6	83.3	90.5	73.9

Table 5: shows the 'p' value cross tabulation

CT Consideration in Ovarian cancer	*'p' value*	*Fishers exact test/Chi square test*
Uni/bilateral CT * Histopathology	.721	Not considered
Size(cm) CT * Histopathology	.721	Not considered
Margin CT * Histopathology	.022	Significant for malignancy
Tissue content CT* Histopathology	.022	Significant for malignancy
homo/heterogeneous CT* Histopathology	.010	Significant for malignancy
Septation CT * Histopathology	.639	Not considered
Calcification CT * Histopathology	.083	Not considered
Ascitis CT * Histopathology	.000	Highly significant for malignancy
Lymphadenopathy CT * Histopathology	.115	Not considered
Peritoneal implants CT * Histopathology	.000	Highly significant for malignancy

Table 6: Comparison of studies on CT for detection of ovarian malignancy

Study	*Sensitivity*	*Specificity*
Kurtz et al. [11]	90%	88%
Kinkel et al. [12]	81%	87%
Liu J et al. [13]	85%	86%
Firoozabadi et al.[14]	79%	92%
Moideen N et al. [15]	95%	46%
Present study	*65.50%*	*82.60%*

5. Conclusion

CT imaging using parameters such as ill-defined margin, mixed components, ascites, heterogeneous enhancement pattern and presence of peritoneal deposits can give a high confidence in deriving the diagnosis of malignancy in suspected cases of ovarian neoplasms.

References

[1] http://globocan.iarc.fr/old/pie_pop.asp?selection=224900&title=World&sex=2&type=0&window=1&join=1&submit=%C2%A0Execute%C2%A0
[2] Lynch HT, Watson P, Lynch JF, et al. Hereditary ovarian cancer:heterogeneity in age at onset. Cancer 1993;71:573-581.
[3] Ozols RF, Schwartz PE, Eifel PJ: Ovarian cancer, fallopian tube carcinoma, and peritoneal carcinoma. In De Vita VT Jr, Hellman S, Rosenberg SA (eds): Cancer: Principles and Practice of Oncology, 6th ed. Philadelphia, Lippincott Williams & Wilkins,2001, pp 1597-1632.
[4] John R. Haaga… (et al.) – 5th ed. (2009) CT and MR imaging of the whole body pages: 2075– 2123.
[5] Joseph K. T. Lee, Stuart s. Sagel.- 4th ed. Computed body tomography with MRI correlation 2006 pages:1375,1392,1397.
[6] American college of radiology ACR appropriateness criteria: staging and follow-up of ovarian cancer 2012.
[7] Kawamoto S, Urban BA, Fishman EK CT of epithelial ovarian tumors Radio graphics. 1999 Oct;19 Spec No:S85-102; quiz S263-4.
[8] Text book of radiology and imaging, 7e volume 2 by David Sutton MD, FRCP, DMRD, FCan, AR(Hon.) reprinted in 2013 pages: 1091-92, 1078-84.
[9] https://onlinecourses.science.psu.edu/stat507/node/71stat507epidemiological research methods-sensitivity, specificity, positive predictive value, negative predictive value.
[10] Mubarak F, Alam MS, Akhtar W, Hafeez S, Nizamuddin N. Role of multidetector computed tomography (MDCT) in patients with ovarian masses. Int J Women's Health. 2011;3(1):123-6.
[11] Kurtz AB, Tsimikas JV, Tempany CMC, Hamper UM, Arger PH, Bree RL, et al. Diagnosis and staging of ovarian cancer: comparative values of Doppler and conventional US, CT, and MR imaging correlated with surgery and histopathologic analysis: report of the radiology diagnostic oncology group. Radiology. 1999;212(1):19-27.
[12] Kinkel K, Lu Y, Mehdizade A, Pelte MF, Hricak H. Indeterminate ovarian mass at US: incremental value of second imaging test for characterization - meta-analysis and Bayesian analysis. Radiology. 2005;236:85-94.
[13] Liu J, Xu Y, Wang J. Ultrasonography, computed tomography and magnetic resonance imaging for diagnosis of ovarian carcinoma. Eur J Radiol. 2007;62(3):328-34.
[14] Firoozabadi RD, Zarchi MK, Mansurian HR, Moghadam BR, Teimoori S, Naseri A. Evaluation of diagnostic value of CT scan, physical examination and ultrasound based on pathological findings in patients with pelvic masses. Asian Pac J Cancer Prevent. 2011;12(7):1745-7.
[15] Moideen N, Hebbar SS, Rai L, Guruvare S, Adiga P. Comparison of CA-125, conventional ultrasound and CT imaging in diagnosis and staging of ovarian cancer correlated with surgico- pathological findings. Int J Reprod Contracept Obstet Gynecol 2014;3:924-30.

Author Profile

Abdul Rehuman Methar Rihad received M.B.B.S. degree from Dali University, China in 2012. He now pursuing postgraduation course in M.D radio-diagnosis in K.S Hegde Medical Academy, Nitte University, Mangalore-575018, India.