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Research Article

Role of Multidetector Computed Tomography in the Evaluation of Extent of Ovarian Carcinoma and To Correlate with Surgical Findings

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Abstract: Ovarian Carcinoma is the fifth most common malignancy of the female genital tract and second most common gynecological malignancy with highest morbidity and mortality in the female population. Multidetector computed tomography is the investigation of choice for the comprehensive evaluation of primary tumour pertaining to benignity and malignancy and the site of peritoneal metastasis and lymphadenopathy thereby planning further management of patients. The study was conducted in the Department of Radiology, Sree Balaji Medical College and Hospital, Chennai, from JULY 2016 – AUGUST 2019. A total of 114 patients with the primary diagnosis of ovarian mass lesions who were further evaluated by MDCT imaging and correlated with surgical findings. Preoperative CT can accurately predict the surgical outcome and hence has important role in deciding the management of ovarian cancer. The objective of this study was to evaluate the diagnostic accuracy of MDCT in assessing the extent of ovarian cancer and to correlate CT with surgical findings.

Keywords: Metastasis, Surgical findings, ovarian cancer.

INTRODUCTION

Ovarian Carcinoma is the fifth most common malignancy of the female genital tract (Roett, M. A., & Evans, P. 2009) and second most common gynecological malignancy with highest morbidity and mortality in the female population (Mironov, O. *et al.*, 2011). In most women with ovarian malignancy they remain clinically asymptomatic and progressed to advanced stages III and lV at the time of first diagnosis (van Nagell Jr, J. R. *et al.*, 1990; Vergote, I. *et al.*, 2010). This inference highlights the importance of early detection and improved characterization of ovarian masses for better planning and management. Clinical examination, bimanual pelvic examination and CA-125 levels have less sensitivity often below 50%, necessitating the utility of various imaging modalities like ultrasonography, computerized tomography, magnetic resonance imaging and in some cases laparoscopy (Guidozzi, F., & Sonnendecker, E. W. 1990; Kivinen, S. E. P. P. O. *et al.*, 1986).

Ultrasonography is the first line imaging technique to evaluate ovarian pathologies because it is relatively inexpensive, noninvasive, and widely available (Andolf, E., & Jörgensen, C. 1990; DiSantis, D. J. *et al.*,1993; Leibman, A. J. *et al.*, 1988). Transabdominal US, endovaginal US, or both should be performed for the evaluation of adnexal masses to identify early-stage ovarian carcinoma, especially in postmenopausal women. When conventional ultrasound reveals complex morphology unable to differentiate between benign and malignant lesions and the extent of disease in malignant cases, the other diagnostic tools can be used such as color Doppler and functional tumor vessel properties (Sarti, D. A. 1993; Kurtz, A. B. *et al.*, 1999; Kurjak, A. *et al.*, 1993; Emoto, M. *et al.*, 1997).

Multidetector computed tomography (MDCT) is the investigation of choice for the comprehensive evaluation of primary tumour pertaining to benignity, malignancy, site of peritoneal metastasis and lymphadenopathy, thereby planning further management of patients. Preoperative CT can accurately predict the surgical outcome and hence has important role in deciding the management of ovarian cancer (Nelson, B. E. *et al.*, 1993). Demonstration of GIT and urinary tract involvement helps to modify the

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surgical plan. Involvement of uterus, rectum, colon and small bowel by the tumor is well demonstrated. CT can also detect deposits on peritoneum, liver or bowel surfaces. All the patients with large deposits at root of mesentery, diaphragm and retro peritoneum are not resectable and can be spared of surgery. They may be put on neoadjuvant chemotherapy, as optimal debulking of the disease is unlikely to be achieved in these patients (Ascher, S.M. *et al.*, 2002; Urban, B. A., & Fishman, E. K. 1995).Three most common sites to have peritoneal deposits are right sub diaphragmatic space, greater omentum and pouch of douglas. The sensitivity of CT in this regard is moderate, conventional CT scanners can detect only up to 50% of peritoneal deposits that are 5mm or less in size. The helical and multi detector CT scanners have improved sensitivity in detection of small peritoneal deposits, especially in upper abdomen (Urban, B. A., & Fishman, E. K. 1995; Parrish, F. J. 2007). Detailed analysis of volumetric data of multiple detector computed tomography (MDCT) in multiple planes allows better detection of subtle lesions. With the advent of multidetector Computed Tomography (MDCT), it has become feasible to acquire several thin slices and image reconstruction in axial, coronal and sagittal planes contributing valuable information towards preoperative surgical and management planning (Parrish, F. J. 2007).

The objective of this study was to evaluate the diagnostic accuracy of MDCT in assessing the extent of ovarian cancer and to correlate CT with surgical findings.

MATERIALS AND METHODS

This study was conducted in the Department of Radiology and Imaging, Sree Balaji Medical College And Hospital from July 2016 to September 2019. A total of 114 Patients with the primary diagnosis of ovarian mass lesions who were further evaluated by MDCT imaging and correlated with surgical findings.

All patients are selected on the basis of following inclusion criteria; 1) female patients having age from 20 to 80 yrs of age. 2) Clinically suspected for ovarian malignancy irrespective of the stage of disease. 3) Patients with signs and symptoms of weight loss, abdominal pain, abdominal or pelvic mass within six months of duration. (4) Patients referred for abdomen and pelvis MDCT after detection of ovarian mass by other modalities where further characterization of mass was required.

The exclusion criteria were (1) All patients who are not willing or unfit for surgery (2) Patients with contraindication to iodinated contrast media or radiation. The duration between surgery and CT scan examination ranged from 1 to 28 days (Mean 15 days)

A written informed consent was obtained from all patients and approved by the ethical committee. MDCT scan was performed using standard contrast protocols in Siemens 16 slice CT scanner and images were reviewed by two senior consultant radiologists. All patients were followed up with surgical and histopathological findings.

Findings used to diagnose malignancy were: diameter greater than 4 cm, cystic-solid mass, necrosis in a solid lesion, cystic lesion with thick, irregular walls or septa and/or with papillary projections. Presence of ascites, peritoneal deposits, peritoneal thickening, and lymphadenopathy were used to confirm malignancy. In addition, the presence of omental cake, peritoneal deposits, mesenteric deposits, and lymphadenopathy were also documented. (Figure 1- 8)

For the evaluation of the accuracy of MDCT in the detection of peritoneal metastases, peritoneal deposits and peritoneal thickening findings were separately noted in nine segments of the abdomen and pelvis. (Table – 2)

Benign lesions have diameters less than 4 cm and well defined margins, without evidence of local or distant spread. Cystic lesions are unilocular, and have thin walls with minimal septations, and the absence of papillary projection.

Statistical analysis was performed. The sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV), and diagnostic accuracy were calculated using standard statistical package . (Table – 1) Peritoneal metastases , peritoneal deposits , thickening and surgical findings each were separately documented in the nine segments of abdomen and pelvis. (Table – 2).

RESULTS

The Clinical Presentations of the 114 Patients Are As Follows;
Abdominal distension- 86 patients; abdominal mass-80 patients
Abdominal pain – 29 patients; vaginal bleeding-12 patients

Table 1: Comparison of CT with intra-operative findings in detection of peritoneal deposits (n=114)

Location of Peritoneal deposits			Number of patients (percentage)					
			CT			Surgery		
Right Hypochondrium	Epigastrium	Left Hypochondrium	54(48.4%)	27(25.7%)	28(22.3%)	69(58.5%)	30(28.3%)	42(34.8)
Right Lumbar	Umbilical	Left Lumbar	21(20.6%)	12(12.5%)	6(7.2%)	24(23.1%)	18(18.8%)	9(9.8%)
Right Iliac	Pelvis	Left Iliac	27(21.5%)	54(45.3%)	15(15.2%)	36(29.6%)	60(50.7%)	24(23.1%)

Table 2: Accuracy of CT in detection of disease at various sites when compared with surgical findings (n=114)

S. NO	Site of disease	No. of patients (n=114)		Sensitivity (%)	Specificity (%)	PPV (%)	NPV (%)	Accuracy (%)
		CT	Surgery					
1	Ascites	69(61.5%)	69(60.5%)	100	100	100	100	100
2	Pl effusion /nodules	24 (20.1%)	-	-	-	-	-	-
3	Diaphragm	54(49.4%)	66(58.9%)	79.3	92.8	91.4	71.0	83.21
4	Liver surface	45 (39.5%)	66 (57.9%)	68.6	94.8	92.3	62.2	75.31
5	GB fossa	6 (5.3%)	12 (10.5%)	24.0	94.8	48	85.9	85.57
6	Spleen	18 (15.8%)	15 (13.2%)	58	88.9	50	91.8	86.84
7	Stomach/ pancreas/ l sac	6 (5.3%)	18 (15.8%)	18.7	94.7	50	84.3	83.33
8	Small bowel/ colon	33 (28.9%)	48 (42.1%)	58.3	91.9	81.8	73.1	76.31
9	Omentum Supracolic	42 (36.8%)	60 (52.6%)	63	92.4	92.9	72.8	86.84
10	Omentum Infracolic	60 (52.6%)	72 (63.2%)	78.2	91.9	95	71.2	84.21
11	Kidneys/ hydronephrosis	15 (13.2%)	9 (7.9%)	68.7	90.2	40.0	95.9	89.18
12	Mesentery	45 (39.5%)	60 (52.6%)	68	92.1	93.3	71.7	81.08
13	RPLN	6 (5.3%)	9 (7.9%)	31.3	91.1	50	93.4	92.10
14	UB	57 (50%)	69(60.5%)	76.3	91.9	94.7	71.2	83.78
15	Rectum/ sigmoid	54 (47.4%)	66 (57.9%)	75.3	91.8	94.4	74.1	84.21
16	Pelvic wall	9 (7.9%)	15 (13.2%)	38	91.9	66.7	90.2	89.18
17	Presacral	9 (7.9%)	15 (7.9%)	64.7	92.1	66.7	95.1	94.73
18	Pelvic LNs	9 (7.9%)	15 (13.2%)	19	90.9	33.3	89.6	84.21
19	Uterus	63(55.3%)	66(57.9%)	82.4	83.5	90.5	81.4	86.84

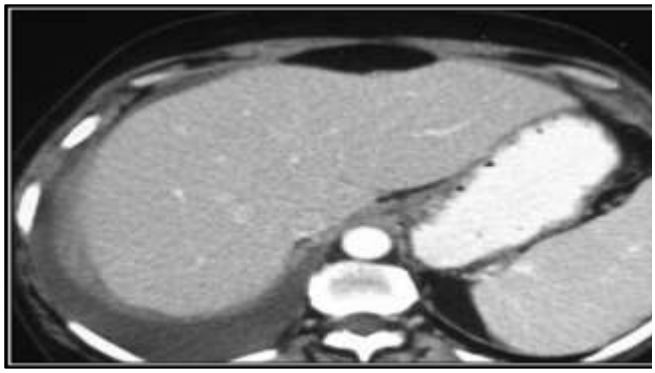

Figure 1: subdiaphragmatic depostis

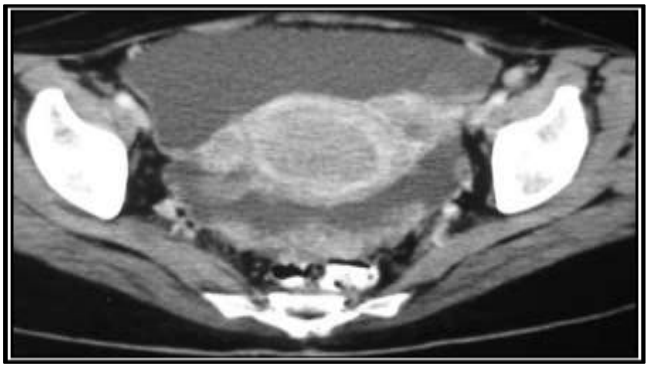

Figure 3 : Peritoneal deposits in pouch of Douglas

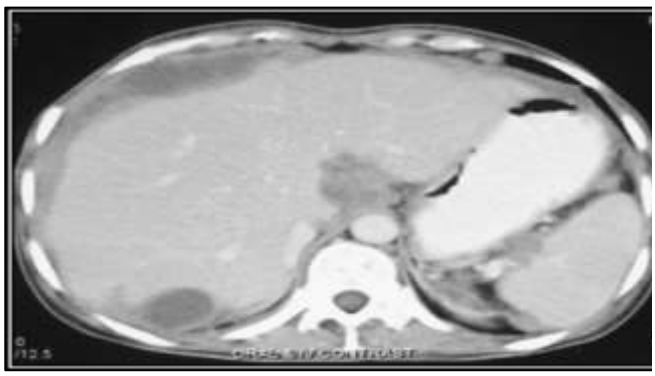

Figure 2: Multiple upper abdominal peritoneal deposits

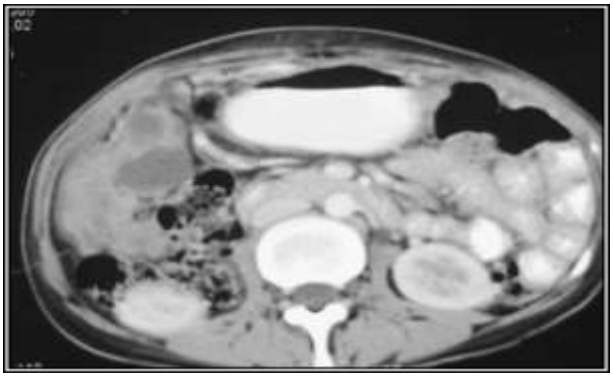

Figure 4: Colonic Deposits

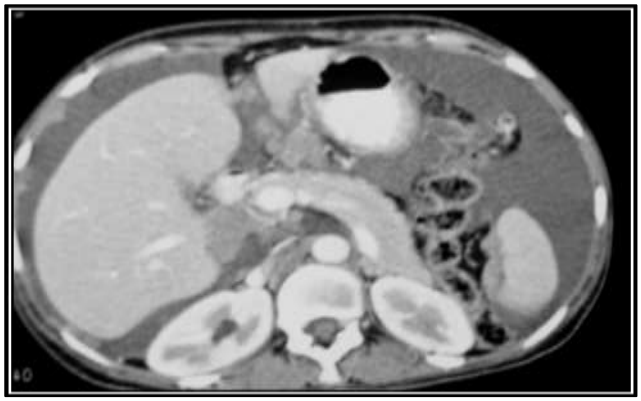

Figure 5: Peritoneal Deposits

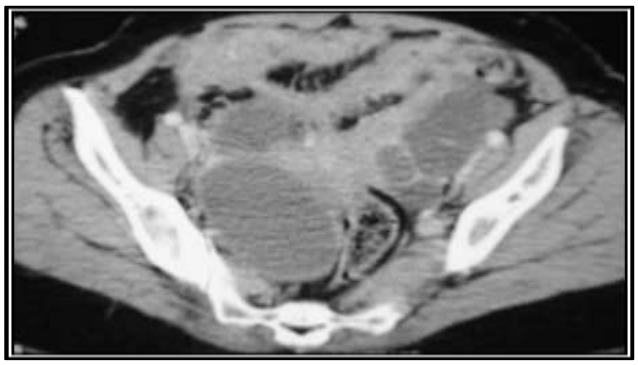

Figure 6: Small Bowel Deposits

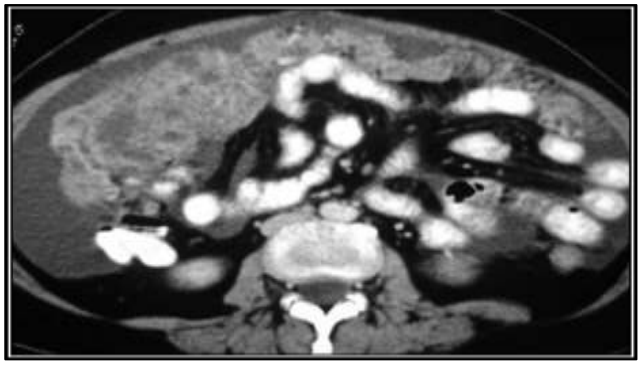

Figure 7: Omental Deposits

DISCUSSION

Inspite of the development of effective surgical and chemotherapeutic approaches, ovarian carcinoma remains a leading cause of death from gynecologic malignancy. Most of the patients with ovarian malignancy patients present with stage III and IV disease. Most of the patients with suspected ovarian malignancies have delayed presentation with non-specific complaints like abdominal pain, abdominal mass, abdominal distension and at times with vaginal bleeding. In the above situation it is imperative to evaluate the nature of the ovarian masses with all diagnostic methods starting with clinical examination, pelvic examinations, laboratory exam for CA-125, and imaging modalities.

Although tumor markers like CA-125, AFP, and HCG are indicative of ovarian cancer and germ cell tumors respectively, imaging modalities are required for careful analysis of the components of the masses and evidence of malignant spread which are useful for further management (Ascher, S.M. *et al.*, 2002; Urban, B. A., & Fishman, E. K. 1995).

Computed tomography is the better imaging modality for the identification of internal structures of the ovarian masses regarding their shape, size, density and texture . Even the absence of any abnormality in CT still provides the relevant data. MDCT with multiplanar reformation and fast acquisition provides better characterization of adnexa and a detailed evaluation of abdomen to differentiate adnexal masses from benign and malignant causes. The CT findings used to diagnose malignancy were: diameter greater than 4 cm, cystic-solid mass, necrosis in a solid lesion, cystic lesion with thick, irregular walls or septa, and/or with papillary projections. The presence of ascites, peritoneal metastases, and lymphadenopathy was also used to confirm malignancy as well as the staging. This helps in the planning of the treatment, eliminating unnecessary surgery and expenses (Tsili, A. C. *et al.*, 2008).

There is no uniformity in the assessment of surgical resectability. Each institution will be having its own criteria depending upon the patient's clinical conditions, local surgical and oncological expertise. The optimal management is broadly accepted as optimal cyto-reductive surgery, which may need to be supplemented by chemotherapy.

However a systematic review of the MDCT staging contributes significantly to decision-making and identifies resectable and non-resectable sites of disease. MDCT plays a critically important role in identifying lesions >2 cm at the root of the mesentery, gastro-splenic ligament, lesser sac, porta hepatis, falciform ligament, para-cardiac nodes and lung parenchyma, and also in detecting high retroperitoneal lymphadenopathy, presacral extraperitoneal disease, and pelvic sidewall invasion in order to predict the resectability. The use of a CT scoring system emphasizing multiple potential disease locations appears to improve accuracy.

A detailed presentation of these findings not only provides the surgeons a clear road map for surgery but allows the pre-operative input of other oncosurgeons who may be required to achieve complete or near complete resection of disease.

The values of sensitivity and specificity of MDCT in differentiation of ovarian masses are comparable to those reported in literature (Kinkel, K. *et al.*, 2005; Tsili, A. C. *et al.*, 2008; Gatreh-Samani, F. *et al.*, 2011) (Kinkel *et al.*, 2005; Tsili *et al.*, 2008; Gatreh-Samani *et al.*, 2011). A sensitivity and specificity of 81% and 87% has been reported by

Kinkel *et al.,* (2005) in their Meta-analysis. Similarly Tsili *et al.,* have reported that MDCT can categorize adnexal masses into benign and malignant with a sensitivity and specificity of up to 90.5% and 93.7% respectively. In our study, two separate radiologists recorded the MDCT findings. Overall in case of first reader, MDCT was found to have 92% sensitivity and 86.68% specificity, while the second reader reported a sensitivity and specificity 94.6%, 90% respectively. The difference between the results of two radiologists was not statistically significant. Excellent agreement was found between the findings reported by the two readers and the surgical findings. Also, in our study all patients underwent biopsy (Gold-standard), thus minimizing verification bias and reporting accurate sensitivity rate.

CONCLUSION

In conclusion, based on our study we can conclude that MDCT is a reliable imaging modality in diagnosis of ovarian masses as well as its staging accurately and with insignificant interobserver variability, leading to timely decision for the treatment of this debilitating disease. CT scanning has proven useful in monitoring the course of women with epithelial ovarian carcinoma. In this study, common sites of sub optimally resected tumor were proposed and the ability of CT scan to identify these inoperable lesions was investigated. This study has sincerely attempted to reduce the uncertainty as to which patient should be initially subjected to neoadjuvant chemotherapy and which patients can be directly taken up for primary debulking surgery.

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