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Research Article

Comparison of Ct PCI Score and Intraoperative PCI Score in Ovarian Cancer

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ABSTRACT
Background: Ovarian Cancer is the sixth most common cancer in the world2. Of all the gynecological malignancies, it is most lethal. Factors which can cause ovarian cancer are infertility, family history/genetic factors and previous hormone therapy. It has a poor prognosis because most of them are diagnosed in advanced stages. For ovarian cancer search for an ideal screening test has been going on. Transvaginal ultrasound, CA 125, and bimanual pelvic examination have been used in various screening studies to evaluate their role as screening tests but have not found much supportive evidence
Aim and Objectives: 1.Comparison of CT PCI score and intraoperative PCI score in ovarian cancer.2. To know the extent of peritoneal disease in patients of ovarian cancer in north Indian population.3. To know the sensitivity and specificity of CT PCI score
Methods: Study Design: Prospective study. **Sample Size:** 70
Results: Mean of Group CT PCI and Intraoperative PCI by unpaired t- test. Mean of group CT PCI were 9.3571with standard deviation of 6.64424 whereas mean of group Intraoperative PCI were 12.7857 with standard deviation of 10.73109. On descriptive analysis of CT PCI score the frequency percentage of LS 0 (no tumor) was 4.3%, LS 1 (upto 0.5 cm) was 0%, LS 2 (upto 5cm) was 28.6% and LS 3(> 5cm) was 67.1%. On descriptive analysis of Intraoperative PCIscore the frequency percentage of LS 0 (no tumor) was 7.1%, LS 1 (upto 0.5 cm) was 2.9%, LS 2 (upto 5cm) was 21.4% and LS 3(> 5cm) was 71.4%. histological type in ovarian cancer the frequency percentage of Papillary Adenocarcinoma was 14%, Adenocarcinoma was 8.5%, Serous Adenocarcinoma was 9.9%, Papillary Serous Carcinoma was 8.5% and majority of cases was found with Atypical Cells that is 59.1%.
Conclusions: found that there is some discrepancy in CT PCI scores and surgical PCI score in individual regions because of which some of metastatic nodules are missed in CT PCI but can be seen intraoperatively.

Keywords: Ovarian Cancer, CT PCI Score, Surgical PCI Score.

INTRODUCTION

The ovaries are the most mysterious and the least accessible of the female reproductive organs[1].Ovarian Cancer is the sixth most common cancer in the world[2]. Of all the gynecological malignancies, it is most lethal[1]. Factors which can cause ovarian cancer are infertility, family history/genetic factors (BRCA1, BRCA2 gene mutations or MSH2, MLH1, PMS1, and PMS2 gene mutations in Lynch II syndrome) and previous hormone therapy[1]. It has a poor prognosis because most of them are diagnosed in advanced stages[3]. For ovarian cancer search for an ideal screening test has been going on. Transvaginal ultrasound, CA-125, and bimanual pelvic examination have been used in various screening studies to evaluate their role as screening tests but have not found much supportive evidence[1].

The most common pathway for the spreading of Ovarian Cancer is peritoneal seeding. Most of the ovarian cancers are surface epithelial carcinomas, these tumor cells are able to slough off the ovary and enter the peritoneal circulation thereby seeding multiple site, thus resulting in Peritoneal Carcinomatosis '(PC)'[4]. From diaphragm till the pelvis tumor metastasis of variable sizes can occur anywhere. In staging and treating the ovarian cancer identifying these lesions are important. The extent of carcinomatosis represents one the most important prognostic factors for the patients[2,] therefore it is important to know the extent of peritoneal disease to help us counsel the patient regarding treatment and prognosis.

There are methods for evaluation of PC like Peritoneal Surface Disease Severity Score(PSDSS), Fagotti score, Eisenkop score, Aletti score, but the most commonly used score is the Peritoneal Cancer Index (PCI) score. 1996 Jacquet and Sugar baker described the PCI score[5].The PCI is the method of measuring the amount and site of metastatic tumor in the peritoneal cavity on Imaging or during surgery[1]. Regardless of tumor histologic origin, the PCI has been used to describe and explain the patients' tumor spread pattern, disease severity[6].The PCI is calculated as the sum of numerical lesion scores (LS score) assigned to 13 abdomino-pelvic regions[3].

CT scan, PET CT, MRI and Ultrasonography are tested in different studies but CT scan is most commonly used due to its availability and accuracy. Although ultrasound can be used for diagnosis, it is not the imaging modality used to stage ovarian cancer. [7].CT can identify tumour implants larger than 1 cm, but its sensitivity decreases to 25% when detecting implant that are 1cm or smaller. These modalities have been compared with Surgical PCI score which is considered as the gold standard to determine peritoneal disease.

In malignant ovarian tumor,80 to 90% are epithelial ovarian cancers and nonepithelial cancers constitute 10 to 20%. Epithelial cancers are the most common type of ovarian tumor, of this papillary serous cystadenoma and cystadenocarcinoma is the most common variety and constitutes 50%.Seventy percent of the epithelial lesions are serous type, mucinous 20%, endometrioid 2%,clear cell, Brenner and undifferentiated tumor constitutes less than 1%.Most of the ovarian tumors are malignant in extremes of age,10% before puberty and after menopause it is about 50%.

Since the ovarian cancer is a silent disease, most of the patients are asymptomatic in early stage of the disease. The symptoms are not specific and are vague in nature like loss of appetite, weight loss, abdominal discomfort, abdominal distension, urinary and bowel symptoms. Sometimes they may present as postmenopausal bleeding and irregular menses.

Aim and Objectives

Aim: Comparison of CT PCI score and intraoperative PCI score in ovarian cancer.

Objectives: 1.To know the extent of peritoneal disease in patients of ovarian cancer in north Indian population.2.To know the sensitivity and specificity of CT PCI score.

MATERIAL AND METHODS

Study Design: Prospective study

Study Centre: Department of OBGY Rohilkhand Medical College and Hospital Bareilly**.**

Study Population: All patients of FIGO stage 1,2 and 3 ovarian cancers admitted in Department of OBGY Rohilkhand Medical College And Hospital Bareilly during study period such cases were included in the study,

Sampling Method: Convenient sampling

Period of Study: 10 November 2022 to 11 November 2023

Sample Size: 70

Inclusion Criteria

- All patients of FIGO stage 1,2 and 3 ovarian cancers coming to our hospital.
- Patients with ECOG Performance Score of 0-3.

Exclusion Criteria

- Stage 4 ovarian cancers.
- Patients not fit for surgery, ECOG 4 or more.

Approval for the Study

Written approval from Institutional Ethics committee was obtained beforehand. Written approval of OBGY and other related department was obtained. After obtaining informed verbal consent from All patients of FIGO stage 1,2 and 3 ovarian cancers such cases were included in the study.

Study Procedure

Study subjects were enrolled after obtaining clearance from ethics committee. All the subjects were explained in detail about study procedure in language she understands.

Informed written consent was obtained from study participants. Predesigned and pretested study proforma was used as a tool for data collection. In this study CT PCI of all patients was compared with INTRAOPERATIVE PCI for statistical significance, using Sugar baker's score.

Sugar Baker's Score

The entire abdomen and intestines are divided into 13 spaces. 9 Two transverse planes and two transverse planes divide the abdomen into 9 zones. The superior transverse plane is located at the lowest aspect of the lateral knee margin and the inferior transverse plane is located at the level of the anterior superior

iliac spine. The sagittal planes divide belly into three equal parts. Lines defining nine zones are numbered clockwise with 0 at the navel Regions 9-12 divide the small bowel. In each of the 13 regions the maximum visible lesion size is measured and assigned to a lesion size score between LS=0 to LS= 3. LS=0 means no combined tumor visible, LS=1 means acombined tumor lesion size below0.5 cm, LS=2 means a combinedtumor lesion size between0.5 cmand5 cm, and LS=3 means acombined tumor lesion size larger than 5, cm or describe confluent tumor. LS 5 scores in individual regions are added to the PCI score of, which can give a minimum score of 0 and a maximum score of 39

Data Analysis

All the data collected was entered in excel spreadsheet and analyzed using SPSS version 21 software. Chi square test was used to study associations. P<0.05 was considered as significant.

RESULT AND OBSERVATIONS

Table-1 Mean of PCI Scores among Study Groups

Group	N	Mean	S.D	p-value
CT PCI	**70**	9.3571	6.64424	
Intraoperative PCI	**70**	12.7857	10.73109	**0.001****

The above table shows Mean of Group CT PCI and Intraoperative PCI by unpaired t- test. Mean of group CT PCI were 9.3571with standard deviation of 6.64424 whereas mean of group Intraoperative PCI were 12.7857 with standard deviation of 10.73109. There was statistical significant difference seen with p=0.001.

Table-2 Mean and Frequency of CT PCI Score among Study Group

PCI Score	Frequency	Percent	Mean	t-value	Mean Difference	S.D
LS0	3	4.3	4.3			
LS 1	00	00	00			
LS 2	20	28.6	28.6			0.82658
LS 3	47	67.1	67.1	30.381	2.5871	
Total	70	100.0	100.0			

The above table shows Mean of CT PCI Score among Study Group using unpaired t- test where t-value=30.381 and Mean Difference was found 2.5871. On descriptive analysis of CT PCI score the frequency percentage of LS 0 (no tumor) was 4.3%, LS 1 (upto 0.5 cm) was 0%, LS 2 (upto 5cm) was 28.6% and LS 3(> 5cm) was 67.1%.

Table-3 Mean and Frequency of Intraoperative PCI Score among Study Group

PCI Score	Frequency	Percent	Mean	t-value	Mean Difference	S.D
LS0	5	7.1%	7.0			
LS 1	02	2.9%	2.4			
LS 2	15	21.4%	20.6			**0.86381**
LS 3	48	71.4%	70	26.028	2.5143	
Total	70	100.0	100.0			

The above table shows Mean of Intraoperative PCIScore among Study Group using unpaired t- test where t-value=26.028 and Mean Difference was found 2.5143.On descriptive analysis of Intraoperative PCIscore the frequency percentage of LS 0 (no tumor) was 7.1%, LS 1 (upto 0.5 cm) was 2.9%, LS 2 (upto 5cm) was 21.4% and LS 3(> 5cm) was 71.4%.

Table-4 Mean, Frequency of Histological Type among Study Groups

Histological Type	Frequency	Percent	p-value
Atypical Cells Present	41	59.1%	
Papillary Adenocarcinoma	10	14.00%	

Adenocarcinoma	06	8.5%	0.001**
Serous Adenocarcinoma	07	9.9%	
Papillary Serous Carcinoma	06	8.5%	
Total	70	100.0	

The above table shows Mean of histological type ofovarian canceramong Study Group using Pearson chi square- test where p-value=**0.001.** There was statistical significant difference seen with p-value less than 0.05.On descriptive analysis of histological typein ovarian cancerthe frequency percentage of Papillary Adenocarcinoma was 14%, Adenocarcinoma was 8.5%, Serous Adenocarcinoma was 9.9%, Papillary Serous Carcinoma was 8.5% and majority of cases was found with Atypical Cells that is 59.1%.

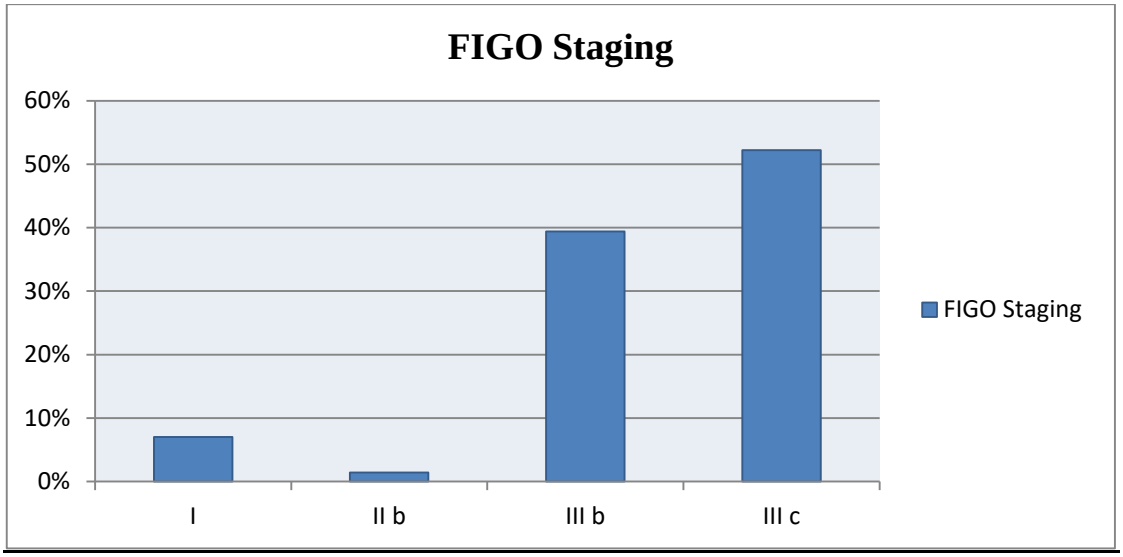


Figure 1: Distribution of Ovarian Cancer with FIGO Staging in Study Group

Table-5: Comparison of Accuracy of CT-PCI and Intraoperative PCI in Study Group in Different Abdominal Regions

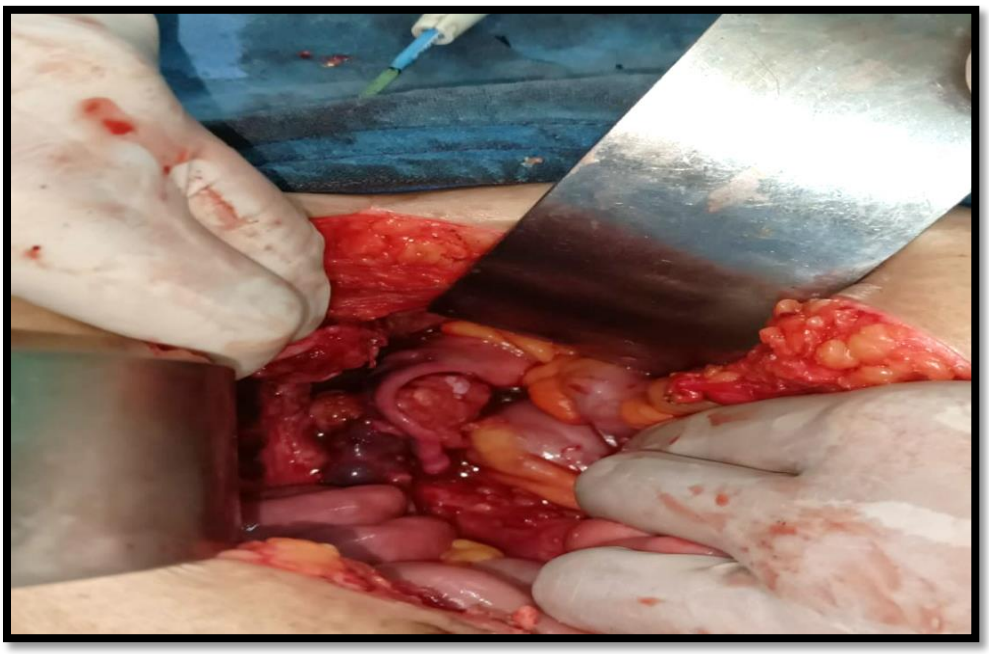
REGION IN ABDOMEN	CT -PCI MEAN	INTRAOPERATIVE PCI MEAN	P VALUE
0	0.9	1.3	0.001
1	0.9	1.3	0.001
2	1	1.1	0.004
3	0.9	1.1	0.005
4	1	1.1	0.001
5	0.9	1	0.002
6	0.9	1.1	0.002
7	0.5	0.8	0.005
8	0.4	0.8	0.001
9	0.5	0.8	0.001
10	0.51	0.86	0.06
11	0.56	0.89	0.001
12	0.51	0.79	0.001

Looking at each region of the abdominal cavity, the p value for the upper regions (1–3) was found statistically significant, and similar observations was seen for the lower regions (5–7), and for the small bowel regions (9–12) except for CT 10 and OT 10. Taking all patients together, the surgical and CT PCI differed significantly on the paired *t* test analysis ($p = 0.001$).

Table-6 Distribution of Accuracy of CT-PCI in Different Abdominal Regions

CT-PCI versus surgical PCI (*n* = 70)				
Region	Same	Less	More	All patients
0	42	10	4	59.1%
1	38	13	5	53.52%
2	54	12	7	76.05%
3	44	15	3	61.97%
4	45	11	5	63.38%
5	41	14	6	57.74%
6	48	16	5	67.70%
7	42	14	6	59.15%
8	62	17	6	87.32%
9	59	11	7	83.09%
10	48	11	4	67.70%
11	52	12	7	73.23%
12	48	15	5	67.70%

Looking at each region of the abdominal cavity, the accuracy ranged from 60 to 80%. It was 50–70% for the upper regions (1–3), 55–65% for the lower regions (5–7), and 60–80% for the small bowel regions (9–12). The highest accuracy was seen in region 8 and the lowest in region 2. Taking all patients together, the surgical and CT PCI differed significantly on the paired *t* test analysis ($p = 0.001$).



intraoperative picture during exploratory laparotomy

DISCUSSION

CT scan, PET CT, MRI and Ultrasonography are tested in different studies but CT scan is most commonly used due to its availability and accuracy. Although ultrasound can be used for diagnosis, it is not the imaging modality used to stage ovarian cancer. [7].CT can identify tumour implants larger than 1 cm, but its sensitivity decreases to 25% when detecting implant that are 1cm or smaller. These modalities have been compared with Surgical PCI score which is considered as the gold standard to determine peritoneal disease.

Jincy rajan et al[8] in 2018 did the study to determine the accuracy of ct preoperative characterization and staging of ovarian cancer using the peritoneal and found that the best accessed area was number 8 that is the right flank with the correlations coefficient of 0.835 while te correlation coefficient was seen in 2 of the areas namely right upper and lower jejunum ie. Area number 1 and 10.

But in my study Looking at each region of the abdominal cavity, the accuracy ranged from 60 to 80%. It was 50–70% for the upper regions (1–3), 55–65% for the lower regions (5–7), and 60–80% for the small bowel regions (9–12). The highest accuracy was seen in region 8 and the lowest in region 2. Taking all patients together, the surgical and CT PCI differed significantly on the paired *t* test analysis ($p = 0.001$).

In year 2022 D. fischerova [9]conducted a prospective study on preoperative staging of advancved ovarian cancer on 67 patients in plaque. And found that the best modality to assign correct FIGO stage was WB-DWI/MRI (65.7%, 44/67), followed by ultrasound (61.2%, 41/67) and CT (59.7% (10/67). Altogether, FIGO stage IV was detected in 10.4% (7/67) and represented by involvement of pleura (3), and infiltrated celiac (2), inguinal (1), axillary (1) and mediastinal lymph nodes (2). In all except 2 cases of mediastinal lymph nodes the stage IV was confirmed by sampling of suspicious lymph nodes. As it is mentioned in the previous paragraph, the last 2 patients with mediastinal lymph nodes on CT and/or WB-DWI/MRI were lacking biopsy, hence they were followed-up using imaging during adjuvant treatment to confirm evidence on metastatic disease.

In our study FIGO Staging among Study Group using unpaired t- test where t-value=2.077 and Mean was found 5.199 with standard deviation of 1.333. On descriptive analysis Stage I was seen in 7% of cases, Stage IIb in 1.4% cases, Stage IIIb and IIIc in 28% and 36% cases respectively.

The prospective study was done in 1999 by Twickler D et al [10]on 244 patients in texas and found that the Women with suspected adnexal masses and known outcomes were classified into malignant and nonmalignant groups. In the nonmalignant group, there were 85 patients with benign neoplasms. 69 patients with simple functional cysts, 25 patients with masses secondary to pelvic inflammatory disease, 13 patients with endometriomas, and 7 patients with no ovarian mass by sonography and clinical follow-up. Less frequent adnexal masses included 8 cases of nondefined ovarian cystic disease, a para-ovarian cyst, a paratubal cyst, a benign fibrovascular ampullary mass, an ampullary ectopic mass, an ovarian lymphocele, a peritoneal cyst, and benign mesonephric cysts. In the malignant group (n = 30 patients), 11 tumors were bilateral, whereas bilateral masses were identified in 38 women in the non-malignant group (n = 214 patients). For the purpose of this study, only the larger mass was evaluated in the case of suspected bilateral masses.

In our study p-value came 0.001 that was statistical significant. On descriptive analysis of histological type in ovarian cancer the frequency percentage of Papillary Adenocarcinoma was 14%, Adenocarcinoma was 8.5%, Serous Adenocarcinoma was 9.9%, Papillary Serous Carcinoma was 8.5% and majority of cases was found with Atypical Cells that is 59.1%.

CONCLUSION

Found that there is some discrepancy in CT PCI scores and surgical PCI score in individual regions because of which some of metastatic nodules are missed in CT PCI but can be seen intraoperatively. Which can change the plan of management. Studies like this may help the radiologist to focus on those areas which were probably missed during CT scoring but were found intraoperatively.

REFERENCESS

1. Patni R. Screening for ovarian cancer: An update. Journal of Mid-life Health. 2019 Jan;10(1):3.
2. Sagrario LG, Jose EH, Celia LR, Eugenia PM, Cristobal MC, Jesus ZT. Peritoneal Cancer Indexes in Ovarian Carcinomatosis: Correlation Between CT and Intraoperative Results and Survival. International Journal of Clinical Oncology and Cancer Research. 2017 Aug 1;2(4):75.
3. Meleis MH, El-Agwany AM. Peritoneal carcinomatosis index in advanced ovarian malignancy either by multislice CT verus laparotomy: a comparative study. Indian Journal of Gynecologic Oncology. 2015 Dec;13(1):1-8.
4. Pannu HK, Bristow RE, Montz FJ, Fishman EK. Multidetector CT of peritoneal carcinomatosis from ovarian cancer. Radiographics. 2003 May;23(3):687-701.
5. El-Agwany AS. Laparoscopy and computed tomography imaging in advanced ovarian tumors: a roadmap for prediction of optimal cytoreductive surgery. Gynecology and minimally invasive therapy. 2018 Apr;7(2):66.
6. Shin W, Park SY, Lim MC. Peritoneal cancer index in ovarian cancer. Journal of gynecologic oncology. 2019 Jan 1;30(1).

7. Javadi S, Ganeshan DM, Qayyum A, Iyer RB, Bhosale P. Ovarian cancer, the revised FIGO staging system, and the role of imaging. American Journal of Roentgenology. 2016 Jun;206(6):1351-60.
8. Rajan J, Kuriakose S, Rajendran VR, Sumangaladevi D. Radiological and surgical correlation of disease burden in advanced ovarian cancer using peritoneal carcinomatosis index. Indian Journal of Gynecologic Oncology. 2018 Mar;16(1):1-7.
9. Fischerova D, Pinto P, Burgetova A, Masek M, Slama J, Kocian R, Frühauf F, Zikan M, Dusek L, Dundr P, Cibula D. Preoperative staging of ovarian cancer: comparison between ultrasound, CT and whole-body diffusion-weighted MRI (ISAAC study). Ultrasound in Obstetrics & Gynecology. 2022 Feb;59(2):248-62.
10. Twickler DM, Forte TB, Santos-Ramos R, McIntire D, Harris P, Miller DS. The Ovarian Tumor Index predicts risk for malignancy. Cancer: Interdisciplinary International Journal of the American Cancer Society. 1999 Dec 1;86(11):2280-90.