Al-Azhar International Medical Journal

Volume 5 | Issue 1 Article 46

2024
Section: General Surgery

Accuracy of Multi-detector Computed Tomography compared to laparoscopy In Ovarian Cancer Staging

Awad Mahmoud Awad
MD at Obstetrics and Gynecology, Faculty of Medicine, Al-Azhar University, Cairo, Egypt

Ahmed El-Sayed Mohammed Abd Elrahman
Professor of OncoSurgery, Faculty of Medicine, Al-Azhar University, Cairo, Egypt

Mohamed Hasan Mohamed El-Kasser
Assistant Professor of general Surgery, Faculty of Medicine, Al-Azhar University, Cairo, Egypt;

Mohammad Abol wafa Ahmad
Lecturer of Diagnostic and intervention Radiology, Faculty of Medicine, Al-Azhar University, Cairo, Egypt, drawadmahmoud@gmail.com

How to Cite This Article

Awad, Awad Mahmoud; Elrahman, Ahmed El-Sayed Mohammed Abd; El-Kasser, Mohamed Hasan Mohamed; and Ahmad, Mohammad Abol wafa (2024) "Accuracy of Multi-detector Computed Tomography compared to laparoscopy In Ovarian Cancer Staging," *Al-Azhar International Medical Journal*: Vol. 5: Iss. 1, Article 46.
DOI: https://doi.org/10.58675/2682-339X.2193

ORIGINAL ARTICLE

Accuracy of Multidetector Computed Tomography Compared to Laparoscopy in Ovarian Cancer Staging

Awad Mahmoud Awad [a,*], Ahmed El-Sayed Mohammed Abd Elrahman [b], Mohamed Hasan Mohamed El-Kasser [c], Mohammad Abol Wafa Ahmad [d]

[a] Department of Obstetrics and Gynecology, Egypt
[b] Department of OncoSurgery, Egypt
[c] Department of General Surgery, Egypt
[d] Department of Diagnostic and Intervention Radiology, Faculty of Medicine, Al-Azhar University, Cairo, Egypt

Abstract

Background: **When it comes to staging and monitoring ovarian cancer (OC), multidetector computed tomography (MDCT) of the abdomen is now the gold standard imaging scan. Most cases of OC that have metastasis to different locations in the body have done so via peritoneal metastases. To investigate whether or not the intraperitoneal cavity and retroperitoneal lymph nodes can be appropriately evaluated during laparoscopic staging of patients with OC, a prospective study was conducted.**

Aim and objectives: **The main aim of this research is to contrast the accuracy of MDCT compared to diagnostic laparoscopy in the staging of OC.**

Patients and methods: **This retrospective investigation was performed on 40 patients presented by OC. All patients' have undergone surgery in the Surgical Oncology Department of Al-Azhar University Hospitals. Each patient in the research underwent a thorough medical history and assessment, laboratory tests and a laparoscopy.**

Result: **There were 95 % cases serous, 2.5 % were mucinous, 2.5 % were endometrioid, 47.5 % were low grade, 52.5 % were high grade, 5 % were stage II, 45 % were stage IIIA, 30 % were stage IIIB, and 20 % stage IIIC.**

Conclusion: **Both MDCT and laparoscopy can be helpfull. Laparoscopy is an invaluable tool, when there is a high likelihood of inadequate cytoreduction because of the severity of the illness. Patients with OC may benefit from a more precise diagnostic tool, such as a multimarker approach comprising cancer antigen 125 (CA125), alpha-fetoprotein (AFP), and lactate dehydrogenase (LDH).**

Keywords: Diagnostic imaging, Laparoscopy, Multidetector computed tomography, Ovarian cancer

1. Introduction

About 70 % of ovarian cancer (OC) cases are diagnosed at an advanced stage, with peritoneal metastases (PMs) being the most prevalent route of dissemination and a recurrence rate in this group of patients above 50 %.[1]

When complete tumor shrinkage has occurred, the standard of care is cytoreductive surgery (CRS) after that hot intraperitoneal chemotherapy. Optimal debulking is attainable in only 30–85 % of instances with late-stage cancer, and therapy efficacy is highly reliant on the load and location of PMs.[2]

Ovarian tumors confined to one or both ovaries, with no signs of regional or systemic metastasis, are considered to be in the early stage of ovarian cancer (EOC).[3]

EOC patients often undergo extensive surgical staging followed by tailored postoperative chemotherapy.[4] For the initial staging of OC and evaluation of disease extent in suspected recurrence, multidetector computed tomography (MDCT) is the examination of choice at present. A new diagnostic option for possible OC recurrence is PET/CT.[5]

Salpingo-oophorectomy and hysterectomy, pelvic and paraaortic lymph node dissections, peritoneal

Accepted 19 August 2023.
Available online 7 June 2024

* Corresponding author at: Belbis, El Sharkia Governorate, Egypt.
E-mail address: drawadmahmoud@gmail.com (A.M. Awad).

https://doi.org/10.58675/2682-339X.2193

washings, omentectomy, and peritoneal biopsies are some of the operations that may have to be performed during an exploratory laparotomy during surgical staging for OC, as recommended by FIGO.[6]

The risks associated with its use, such as tumor rupture or spillage, instrumental heat damage, difficulties in tumor extraction, port-site metastases, etc., have prevented widespread adoption of the technique. Compared to laparotomy, certain meta-analyses have found that laparoscopic surgery had a reduced complication rate, a similar recurrence rate shorter and postoperative hospital stays.[7]

2. Patients and methods

This research involved 40 cases presented by OC. All patients have undergone surgery in the Surgical Oncology Department of Al-Azhar University Hospitals.

Inclusion criteria: cases were involved if informed consent was obtained and they voluntarily participated in the study, the patients who were radiologically suspected of having OC and cases with high levels of tumor marker of OC.

Exclusion criteria: patients below 15 years and above 80 years, patients who had distant metastases on CT scan and patients unfit for pneumoperitoneum.

2.1. Methods

Personal information was collected from each participant in the study, including their name, age, occupation, and residence. Every patient had a specially prepared form filled out with their data, and they were kept on file. Interventional history, hospital diagnosis, admission date, medical and surgical background, hemodynamics (heart rate and noninvasive blood pressure), and respiratory profile (respiratory rate and oxygen saturation).

Careful clinical examination: represented by blood pressure, temperature, respiratory rate, heart rate, pallor, jaundice, cyanosis, and lymph node enlargement.

2.2. Investigations

The percentage of hemoglobin in each patient's blood and the number of red blood cells, white blood cells, platelets, serum creatinine, blood urea, and urine samples were measured. Prothrombin time (PT) and international normalized ratio (INR) serum gamma-glutamyl transferase; serum aspartate and alanine aminotransferases (AST and ALT). Total lipids, serum total cholesterol, serum high-density lipoprotein (HDL) cholesterol, serum triglycerides, serum phospholipids, low-density lipoprotein, very low-density lipoprotein, HDL, total cholesterol/HDL cholesterol ratio. Tests for fibrinogen, platelets, clotting time (INR), and activated partial thromboplastin time (APTT) are also performed. We also tested for viral markers (HBsAg, HCV Ab, CEA, CA 19.9, alpha-fetoprotein (AFP), and cancer antigen 125 (CA125)).

Imaging: represented by CT chest to exclude metastasis, and as a part of the patient general evaluation, CT abdomen and pelvis with intravenous contrast and lower and upper gastrointestinal tract endoscopy and biopsy, then histopathological assessment if indicated.

2.3. Imaging techniques

All CT scans were taken via a 64-channel MDCT scanner or a 16-channel MDCT. Before the trial, patients had to fast for 6 h and take 500–750 ml of diluted oral compared by mouth. This was done between 30 and 45 min beforehand. All patients were given 140 ml of intravenous contrast material using the mechanical injector at a rate of 2.3 ml/s. While lying on their back, patients have had CT scans that start at the diaphragm and end at the pelvic floor.

2.4. Image interpretation

Two radiologists with 6 and 8 years of expertise in cancer imaging, respectively, evaluated all CT scans prospectively. Each reader used their own reconstruction and picture interpretation console, adjusting the width, pan, and level of their window to examine the images independently. Each reader followed a consistent reporting form for each abdominopelvic area to ensure an accurate link between peritoneal deposit extent at CT and operation.

Peritoneal carcinomatosis index (PCI) was evaluated using sugar baker's methodology. Using two transverse planes (one at the level of the anterior superior iliac spine and the other at the midpoint of the coastal edge) and two sagittal planes (at the level of the midclavicular line), we sectioned the abdomen into nine separate areas. Separate evaluations of the small intestine's upper and lower ileum and upper and lower jejunum were conducted.

To quantify CT PCI, the largest tumor implant in the evaluated area was selected, and lesion size score between 0 and 3 were assigned: 0 for no tumor, 1 for tumors up to 5 cm in size, 2 for tumors between 0.5 and 5 cm in size, and 3 for tumors larger than 5 cm or with confluent disease or matting to

pelvic structures. The PCI was measured by adding up the lesion size scores for each of the 13 abdominal and pelvic regions. A perfect score would be 39 (13 × 3). K statistics were used to determine the level of agreement between the two radiologists.

2.5. Laparoscopy

Clinical diagnosis was established after exhaustive testing, using radiology where available, and patients were then evaluated for diagnostic laparoscopy. The potential for a laparotomy and the necessity for a final operation were discussed with each patient, as were the risks and advantages of the procedure.

A 10 mm telescope was inserted through the supra umbilical port after a pneumoperitoneum was created utilizing the Veress needle or blind trocar insertion procedure, and a 5 mm port was inserted in the upper or lower abdomen to facilitate manipulation or biopsy of intraabdominal disease.

The peritoneal cavity was carefully examined, and biopsies were collected as needed. After that, a complete staging was done, and laparoscopy was used for therapy wherever possible. If the patient's condition did not call for medical attention, none was given.

From the moment of the first trocar incision through the end of the staging process, the operating time is expressed in minutes. A patient's convalescence time began on the day of operation and ended on the day of release or death. Wound sepsis (infection at the surgical site), respiratory distress, and other postoperative and intraoperative complications were measured. Any deaths that occurred were documented.

The standard of care was laparotomy. All patients were treated with routine abdominal midline laparotomy and thorough surgical staging as recommended by guidelines. It was sought that all deposits be removed, and further operation was performed [small bowel resection (1.2 %), diaphragm stripping (2.2 %), and abdominopelvic peritonectomy (32.9 %)] only if optimum cytoreduction with no or 1 cm gross residual tumor was not achieved (bilateral salpingo-oophorectomy, total abdominal hysterectomy, total omentectomy, appendectomy). Gross residual tumor larger than 1 cm was indicative of poor cytoreduction. If feasible, lymph nodes in the pelvis and around the aorta were removed from each patient.

Stages of OC: The International Federation of Gynecological Oncologists (FIGO) staging system is widely applied.

Stage I contains: ovarian and fallopian tube tumors that make stage I (T1-N0-M0) cancer. These components make up stage IA (T1a-N0-M0): lack of malignant cells in ascites or peritoneal washings; tumor contained within one ovary (capsule intact) or fallopian tube; absence of tumor on the exterior surface of the ovary or fallopian tube. The following constitutes IB stage (T1b-N0-M0): no evidence of cancerous cells in the ascites or peritoneal washings; tumor contained within both ovaries (capsules intact); tumor not visible from the outside of the ovaries or fallopian tubes. Tumors confined to one or both ovaries or fallopian tubes and meet any of the following criteria are classified as stage IC. Surgical leak occurs at stage IC1 (T1C1—N0-M0). A capsule burst prior to surgery, or tumor on the surface of the ovary or fallopian tube, defines stage IC2 (T1C2—N0-M0). Ascites or peritoneal washings include cancer cells, marking stage IC3 (T1C3—N0-M0).

Stage II contains primary peritoneal cancer or tumor extension into the pelvis (below the pelvic brim) characterizes stage II (T2-N0-M0) disease. Extension and/or implants on the uterus, ovaries, and/or fallopian tubes characterize stage IIA (T2a-N0-M0) disease. The cancer has spread to other intraperitoneal tissues in the pelvis (stage IIB; T2b, N0, M0).

Stage III contains: when a tumor has progressed to both ovaries or both fallopian tubes, or when the primary peritoneal cancer has metastasized to the retroperitoneal lymph nodes (T1/T2-N1/M0), the condition is said to be stage III. The elements of stage IIIA are as follows:

Stage IIIA1 (T1/2-N1-M0) has only retroperitoneal lymph nodes that test positive (cytologically or histologically). It is designated stage IIIA1 (i) when the maximum dimension of the metastasis is up to 10 mm. The maximal diameter of the metastasis is greater than 10 mm (stage IIIA1 (ii)). It is considered to be stage IIIA2 (T3a2-N0/N1-M0) when there is microscopic extrapelvic (above the pelvic brim) peritoneal involvement together with or without positive retroperitoneal lymph nodes. In stage IIIB (T3b-N0/N1-M0), there may be macroscopic PMs outside the pelvis, with a maximum size of up to 2 cm; retroperitoneal lymph node metastasis may or may not be present. Stage IIIC (T3c-N0/N1-M0) is defined as the presence of macroscopically detectable PM beyond the pelvis with a maximal size of greater than 2 cm, with or without metastases to the retroperitoneal lymph nodes. There is no parenchymal damage in the liver or spleen at the stage IIIC level, but the tumor has spread to the organs' capsules.

Stage IV contains: excluding PMs, the following conditions constitute stage IV (any T-any N-M1) metastatic disease. IVB: parenchymal metastases and extraabdominal organ metastases (that involves inguinal lymph nodes and lymph nodes outside the abdominal cavity) are present, while stage IVA is defined by a pleural effusion with positive cytology.

2.6. Administrative considerations

Official permission was received from the ethical committee of the Department of Surgical Oncology at Al-Azhar University Hospitals. The request for official permission was submitted to the Institutional Research. Approval from the ethics committee of the Faculty of Medicine (Institutional Research Board).

2.7. Ethical consideration

The procedures of the study did not have any negative effects on the participants or the service that was provided, informed consent was obtained from all of the participants after they were informed about the goals, process, and applicable objectives of the study. Participants had no negative side effects from research procedures, and sensitive personal information was securely stored. Participants were not required to pay any additional fees, and the investigators were responsible for covering any and all costs associated with this aspect of the study.

2.8. Data management and statistical analysis

The Statistical Package for the Social Sciences (SPSS) (IBM Corp., Armonk, NY, USA), version 20 was utilized for all phases of the data analysis procedure, including data entry, processing, and statistical analysis. We used of Kruskal–Wallis, Wilcoxon's, χ^2, logistic regression analysis, and Spearman's correlation tests to determine whether or not something was significant. The data were given, and appropriate analysis was performed according to the kind of data (parametric or nonparametric) that was acquired for each variable. *P* values with a margin of error of less than 0.05 % were considered statistically significant. *P* value is the level of significance; *P* value more than 0.05 is nonsignificant, *P* value of 0.05 is significant, and *P* value less than 0.01 is highly significant.

3. Result

Table 1 showed that the mean age was 50 ± 4.9 ranged between 30 and 55, the mean BMI was

Table 1. Demographic data of patients in our study.

Age	
Mean ± SD	50 ± 4.9
Minimum–maximum	30–55
BMI (kg/m^2)	
Mean ± SD	27 ± 2.9
Minimum–maximum	25–29.8
Residence [*n* (%)]	
Urban	22 (55)
Rural	18 (45)

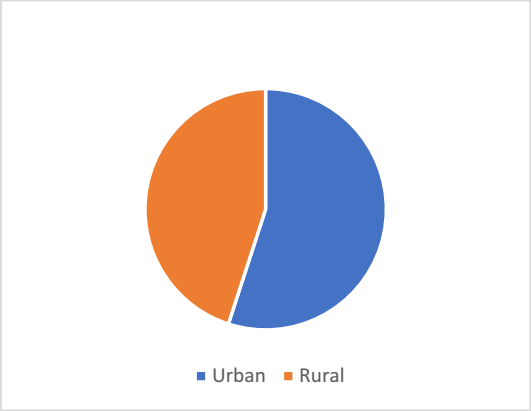

Fig. 1. Residence among studied cases.

Table 2. Complete blood picture of patients in our study.

Red blood cells (× 10^6/mm^3)	
Mean ± SD	4.6 ± 0.40
Minimum–maximum	3.8–5
Hematocrit (%)	
Mean ± SD	40.5 ± 3.2
Minimum–maximum	37–45
Haemoglobin (g/100 ml)	
Mean ± SD	13.1 ± 1.1
Minimum–maximum	12–14
Leucocytes (/mm^3)	
Mean ± SD	7550 ± 240
Minimum–maximum	7000–7700
Platelets (/mm^3)	
Mean ± SD	258 176 ± 5414
Minimum–maximum	20 000–30 000

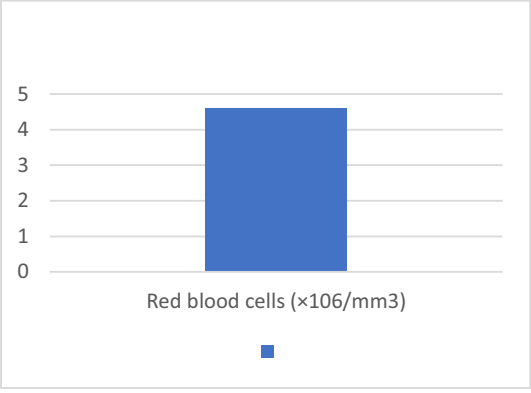

Fig. 2. Red blood cells (× 10^6/mm^3).

Table 3. Liver function tests and renal function tests of patients in our study.

Aspartate aminotransferase (U/l)	
Mean ± SD	40.20 ± 10.57
Minimum–maximum	22–80
Alanine aminotransferase (U/l)	
Mean ± SD	41.20 ± 9.56
Minimum–maximum	26.0–65.0
Urea (mg/dl)	
Mean ± SD	33.50 ± 3.47
Minimum–maximum	28.0–45.0
Creatinine (mg/dl)	
Mean ± SD	1.08 ± 0.10
Minimum–maximum	0.90–1.24

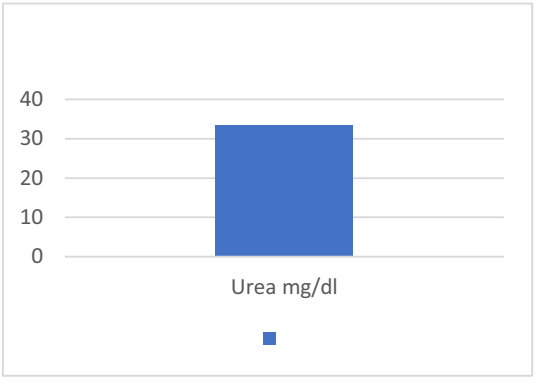

Fig. 3. Urea (mg/dl).

Table 4. CA125, LDH, and AFP of patients in our study.

CA125 (U/ml)	
Mean ± SD	184.5 ± 210.12
Minimum–maximum	10–780
LDH (U/l)	
Mean ± SD	333.8 ± 50.4
Minimum–maximum	225.0–420.0
AFP (ng/ml)	
Mean ± SD	5.70 ± 4.0
Minimum–maximum	1.70–22.50

AFP, alpha-fetoprotein; CA125, cancer antigen 125; LDH, A lactate dehydrogenase.

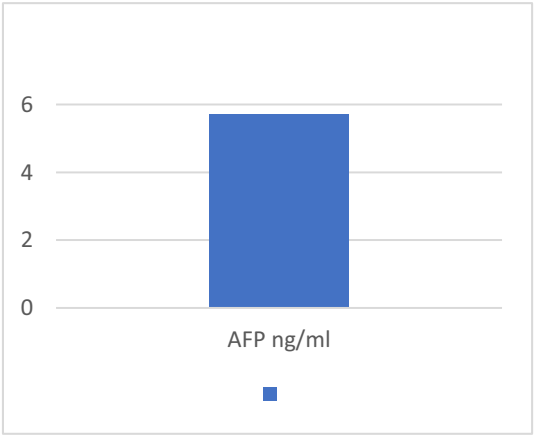

Fig. 4. AFP (ng/ml). AFP, alpha-fetoprotein.

Table 5. Coagulation profile of patients in our study.

PT (s)	
Mean ± SD	14.5 ± 1.1
Minimum–maximum	11.5–20
APTT (s)	
Mean ± SD	37.8 ± 3.4
Minimum–maximum	12.50–50
INR	
Mean ± SD	1.20 ± 0.25
Minimum–maximum	0.82–1.64

APTT, activated partial thromboplastin time; INR, international normalized ratio; PT, prothrombin time.

27 ± 2.9 ranged between 25 and 29.8, 55 % were urban, and 45 % were rural (Fig. 1).

Table 2 showed that the mean red blood cells ($\times 10^6/mm^3$) was 4.6 ± 0.40 ranged between 3.8 and 5, the mean hematocrit (%) was 40.5 ± 3.2 ranged between 37 and 45, the mean hemoglobin (g/100 ml) was 13.1 ± 1.1 ranged between 12 and 14, the mean leucocytes ($/mm^3$) was 7550 ± 240 ranged between 7000 and 7700, and the mean platelets was 258 176 ± 5414, ranged 20 000–30 000 (Fig. 2).

Table 3 showed that the mean AST (U/l) was 40.20 ± 10.57 ranged between 22 and 80, the mean

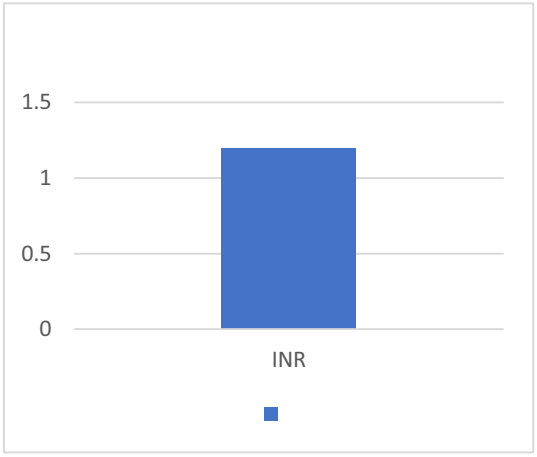

Fig. 5. International normalized ratio.

Table 6. Tumor-related characteristics of patients in our study.

Histology [*n* (%)]	
Serous	38 (95)
Mucinous	1 (2.5)
Endometrioid	1 (2.5)
Grade [*n* (%)]	
Low grade	19 (47.5)
High grade	21 (52.5)
FIGO stage [*n* (%)]	
II	2 (5)
IIIA	18 (45)
IIIB	12 (30)
IIIC	8 (20)

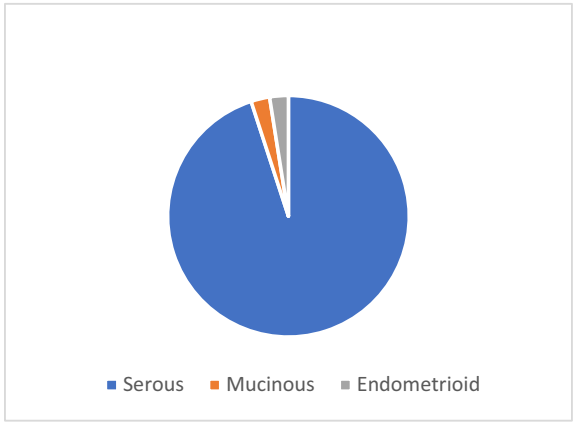

Fig. 6. Histology of studied cases.

ALT (U/l) was 41.20 ± 9.56 ranged between 26.0 and 65.0, the mean urea (mg/dl) was 33.50 ± 3.47 ranged between 28.0 and 45.0, the mean creatinine (mg/dl) was 1.08 ± 0.10 ranged between 0.90 and 1.24 (Fig. 3).

Table 4 showed that the mean CA125 (U/ml) was 184.5 ± 210.12 ranged between 10 and 780, the mean LDH (U/l) was 333.8 ± 50.4 ranged between 225.0 and 420.0, the mean AFP (ng/ml) was 5.70 ± 4.0 ranged between 1.70 and 22.50 (Fig. 4).

Table 5 showed that the mean PT (s) was 14.5 ± 1.1 ranged between 11.5 and 20, the mean APTT (s) was 37.8 ± 3.4 ranged between 12.50 and 50, the mean INR was 1.20 ± 0.25 ranged between 0.82 and 1.64 (Fig. 5).

Table 6 showed that there were 95 % cases serous, 2.5 % were mucinous, 2.5 % were endometrioid. 47.5 % were low grade and 52.5 % were high grade. Five percent were stage II, 45 % were IIIA, 30 % were IIIB, and 20 % IIIC (Fig. 6).

Table 7 shows that as regards MDCT, sensitivity was 98 %, specificity was 90 %, and accuracy was 95.0 % (Fig. 7).

Table 8 shows that regarding laparoscopy, sensitivity was 82 %, specificity was 91 %, and accuracy was 88.0 % (Fig. 8).

Table 7. Sensitivities, specificities, and accuracies of multidetector computed tomography in ovarian cancer staging.

	Sensitivity	Specificity	Accuracy
Multidetector computed tomography	98 %	90 %	95.0 %

Table 8. Sensitivities, specificities, and accuracies of laparoscopy in ovarian cancer staging.

	Sensitivity	Specificity	Accuracy
Laparoscopy	82 %	91 %	88.0 %

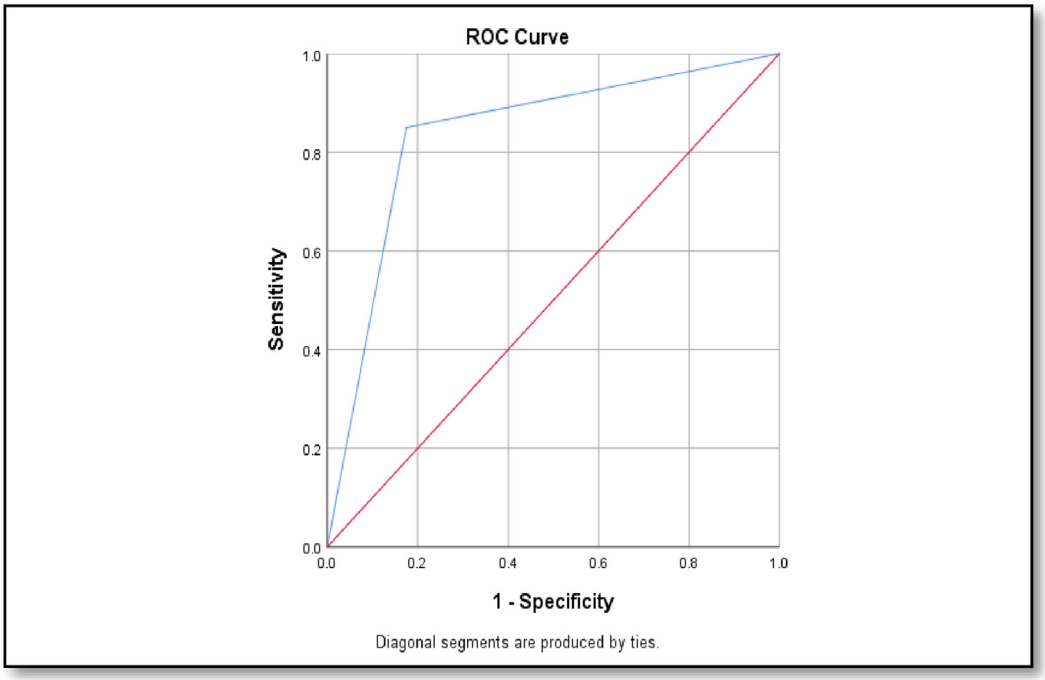

Fig. 7. ROC curve of multidetector computed tomography in ovarian cancer staging. ROC, receiver operating characteristic.

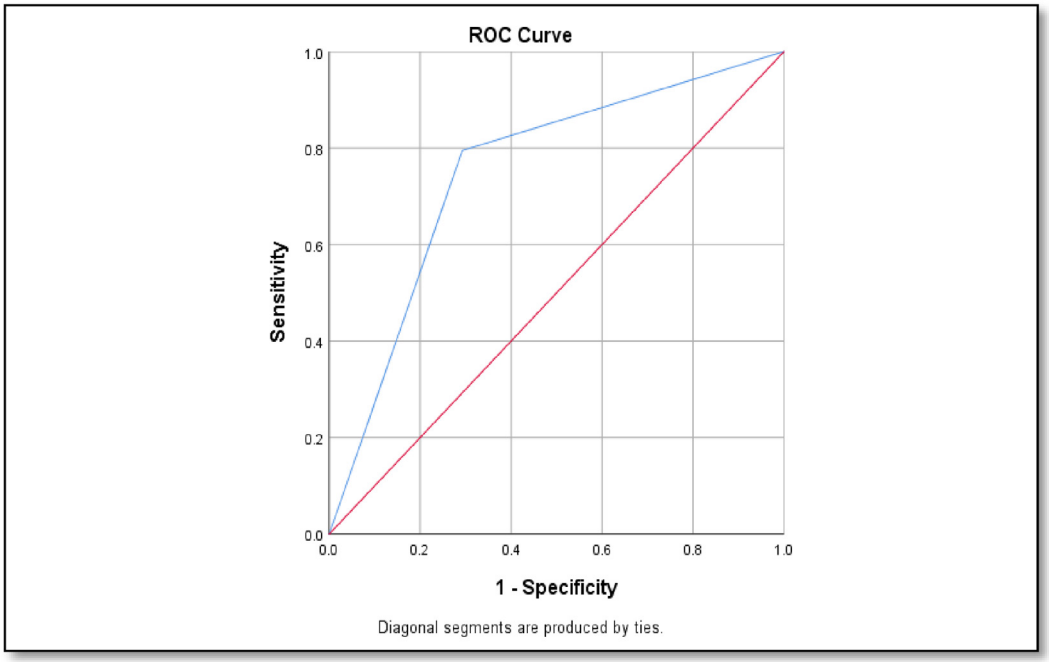

Fig. 8. ROC curve of laparoscopy in ovarian cancer staging. ROC, receiver operating characteristic.

4. Discussion

Following dissemination to the peritoneal cavity, epithelial OC is one of the most often diagnosed forms of cancer in the ovary. Although peritoneal carcinomatosis in OC almost always stays limited to the peritoneal cavity, it is nevertheless regarded to be a candidate for CRS.[8]

Our results showed that the mean age was 50 ± 4.9 ranged between 30 and 55, the mean BMI was 27 ± 2.9 ranged between 25 and 29.8, 55 % were urban, and 45 % were rural.

Our results agreement with Ahmed *et al.*[9] who found that 85 patients with OC who had CRS were enrolled, with a median patient age of 55 (range, 27–82).

Our results agree with Chandrasekhar *et al.*[10] who found that the average age of cases at presentation was 48.3 years old (range, 26–70 years). Most cases, which accounted for 22 (or 57.9 %), were in their sixth and seventh decades of life. Our results agrees with Maccio *et al.*[11] who found that 12.1 ± 1.1 g/100 ml was the average hemoglobin level for women with OC hemoglobin levels in 91 patients with epithelial OC, and 95 controls, arranged by stage. OC patients had significantly less hemoglobin than the controls ($P < 0.001$). Hemoglobin levels were significantly reduced in cases with stages III and IV cancer compared to those with stages I and II ($P < 0.001$).

Our results showed that the mean AST (U/l) was 40.20 ± 10.57 ranged between 22 and 80, the mean ALT (U/l) was 41.20 ± 9.56 ranged between 26.0 and 65.0, the mean urea (mg/dl) was 33.50 ± 3.47 ranged between 28.0 and 45.0, the mean creatinine (mg/dl) was 1.08 ± 0.10 ranged between 0.90 and 1.24.

Our results agreement with Lafleur *et al.*[12] who found that patients with OC had a blood creatinine level of 0.84 ± 0.40 mg/dI on average. Twenty-two (4.50 %) patients had a blood creatinine level of 1.2 mg/dl or greater, which is linked with a low likelihood of survival. Our results agree with Bastani *et al.*[13] who discovered that CA125, AFP, and LDH levels were analyzed in preoperative blood samples from 110 women (24 healthy controls, 66 ovarian benign tumors, and 20 OC). The median CA125 level was 621.3 IU/ml, the median AFP level was 3.4 IU/ml, and the median LDH level was 480 IU/l in OC patients. In contrast to control groups, blood levels of CA125 and LDH were shown to be higher in patients with EOC.

According to 14's findings, 33 cases with stage III or stage IV OC participated in the trial. Seventeen of these cases had received neoadjuvant chemotherapy, and another 16 had received chemotherapy following having undergone maximally effective debulking surgery. Serum CA-125 levels, coagulation assays, regular biochemistry tests, and other clinicopathologic variables were compared with healthy participants before therapy. All of the coagulation tests, such as the PT, the APTT, the INR, fibrinogen, and platelet, demonstrated a statistically

significant difference among the cases and the control participants ($P \leqslant 0.001$).

Our results agree with Ahmed *et al.*[9] who found that there were 81 (95.3 %) cases serous, two (2.4 %) were mucinous, two (2.4 %) were endometrioid. Thirty-eight (44.7 %) were low grade and 47 (55.3 %) were high grade. Five (5.9 %) were stage II, 39 (45.9 %) were IIIA, 25 (29.4 %) were IIIB, and 16 (18.8 %) IIIC.

Similarly, our results agreement with Jehovah and Armstrong,[14] who found that EOC constitutes greater than 90 % of primary OC and may be subdivided into serous, mucinous, endometrioid, transitional cell (Brenner tumors), clear cell, mixed, and undifferentiated types according on morphologic criteria. Most OC have a papillary serous histology (75 %).

Our results agreement with Zeff,[15] who found that sensitivity 71 %, specificity 73 %, positive predictive value 69 %, and negative predictive value 92 %, regarding CT.

Our results agree with Ahmed *et al.*[9] who determined that the sensitivity and specificity of laparoscopy were 94.9 and 98.3 %, respectively; the positive predictive value and negative predictive value were 97.9 and 96.8 %, respectively; the accuracy was 93.8 and 95.7 %; and the negative predictive value was 72.2 and 88.8 %. While laparoscopy has a higher percentage of success in diagnosing pelvic conditions than CT, both procedures properly display ovarian carcinomatosis in 88.2 and 90.6 % of patients, respectively. In total, 68 individuals (or 80 %) had their cytoreduction optimized.

4.1. Conclusion

MDCT and laparoscopy appear to be effective diagnostic methods for OC. In cases with a high risk of suboptimal cytoreduction due to disease extent, laparoscopy is a valuable diagnostic and therapeutic instrument. A multimarker approach consisting of CA125, AFP, and LDH that could provide a more accurate diagnostic tool for OC patients.

Conflicts of interest

There are no conflicts of interest.

References

1. Van Calster B, Deroose CM. PET/CT in the staging of patients with a pelvic mass suspicious for ovarian cancer. *Gynecol Oncol*. 2018;131:694–700.
2. Tempany CM, Zou KH, Silverman SG, et al. Staging of advanced ovarian cancer: comparison of imaging modalities-report from the Radiological Diagnostic Oncology Group. *Radiology*. 2004;215:761–767.
3. Denny L, Quinn M. FIGO cancer report 2015. *Int J Gynaecol Obstet*. 2015;131(Suppl 2):S75.
4. Querleu D, LeBlanc E. Laparoscopic infrarenal paraaortic lymph node dissection for restaging of carcinoma of the ovary or fallopian tube. *Cancer*. 1994;73:1467–1471.
5. Kang SK, Reinhold C, Atri M, et al. ACR appropriateness criteria (®) staging and follow-up of ovarian cancer. *J Am Coll Radiol*. 2018;15:S198–S207.
6. Benedet JL, Bender H, Jones H, et al. FIGO staging classifications and clinical practice guidelines in the management of gynecologic cancers. FIGO Committee on Gynecologic Oncology. *Int J Gynaecol Obstet*. 2000;70:209–262.
7. Ataseven B, Grimm C, Harter P, et al. Prognostic impact of port-site metastasis after diagnostic laparoscopy for epithelial ovarian cancer. *Ann Surg Oncol*. 2016;23(Suppl 5):834–840.
8. Aletti Giovanni D, Peiretti M. Quality control in ovarian cancer surgery. *Best Pract Res Clin Obstet Gynaecol*. 2017;41:96107.
9. Ahmed SA, Abou-Taleb H, Yehia A, et al. The accuracy of multi-detector computed tomography and laparoscopy in the prediction of peritoneal carcinomatosis index score in primary ovarian cancer. *Acad Radiol*. 2019;26:1650–1658.
10. Chandrasekhar SH, Thulkar S, Srivastava DN, et al. Preoperative evaluation of peritoneal deposits using multidetector computed tomography in ovarian cancer. *Br J Radiol*. 2011;84:38–43.
11. Maccio A, Madeddu C, Massa D, et al. Hemoglobin levels correlate with interleukin-6 levels in patients with advanced untreated epithelial ovarian cancer: role of inflammation in cancer-related anemia. *Blood*. 2005;106:362–367.
12. Lafleur J, Hefler-Frischmuth K, Grimm C, et al. Prognostic value of serum creatinine levels in patients with epithelial ovarian cancer. *Anticancer Res*. 2018;38:5127–5130.
13. Bastani A, Asghary A, Heidari MH, et al. Evaluation of the sensitivity and specificity of serum level of prostasin, CA125, LDH, AFP, and hCG+ β in epithelial ovarian cancer patients. *Eur J Gynaecol Oncol*. 2017;38:418–424.
14. Jehovah D, Armstrong DK. Recent progress in the diagnosis and treatment of ovarian cancer. *CA Cancer J Clin*. 2011;61:183–203.
15. Zeff N. Role of laparoscopy in initial tumour staging in advanced epithelial ovarian cancer: a systematic review. *Pleura Peritoneum*. 2018;3:1.