

CT SCAN FEATURES OF OVARIAN NEOPLASM AT VARIOUS CA125 LEVELS A RETROSPECTIVE STUDY IN Dr. SOETOMO GENERAL ACADEMIC HOSPITAL SURABAYA JANUARY 2017 - JUNE 2020

D. Puspitasari^a, L. Mardiyana^b, B. Soeprijanto^c, H. Nugroho^d

mardiyanalies@yahoo.com

^a*Resident of Radiology Department, Faculty of Medicine Universitas Airlangga Surabaya, Indonesia*

^{b,c}*Staff of Radiology Department, Faculty of Medicine Universitas Airlangga;*

Staff of Dr. Soetomo General Academic Hospital, Surabaya, Indonesia

^d*Staff of Obstetrics and Gynecology Department, Faculty of Medicine Universitas Airlangga;*

Staff of Dr. Soetomo General Academic Hospital, Surabaya, Indonesia

Abstract

Background: Ovarian cancer is the third malignant tumor with the high mortality rate beside breast cancer and cervical cancer. CA 125 is one of the earliest tumor markers and often used by clinicians to diagnosed ovarian cancer. One of the criteria for malignant ovarian neoplasms diagnostic is the elevation of CA 125 levels, but CA 125 level milieu is not specifics indicated ovarian cancer. Contrast – enhanced CT scan of the abdomen and pelvis are the initial imaging modality that used to determined further diagnostic for developed treatment. In addition, preoperative discrimination between benign, borderline and malignant neoplasm in the pelvis was needed. **Objective:** The objective of this study was to evaluate CT scan feature of ovarian neoplasm at various CA 125 levels. **Methods:** Retrospective descriptive study in Dr. Soetomo General Academic Hospital January 2017 until June 2020, 91 patients of ovarian neoplasm with pathological confirmed enrolled in the study. Patient did abdominal CT scan and CA 125 serum examination before surgery. CT scan feature was evaluated in raw data. **Result:** From this study, age range was 22-75 years old, 38.46 % sample was at 51– 60 years, CA 125 level range 7.1 – 8749.5 U/ml. Benign ovarian neoplasm samples were 24. 2 % with CA 125 range 13.1-32.5 U/ml, CT scan feature were cystic (100 %), septated (90.1%), with solid component (72.7%). Borderline ovarian neoplasm sample were 3.3 % with CA 125 range 33.8-454.6 U/ml, CT scan feature were cystic (100 %), septated (100%), with solid component (100%). Malignant ovarian neoplasm samples were 72.5 % with CA 125 range 7.1 – 8749.5 U/ml, CT Scan feature were cystic (100 %), septated (98,4%), with solid component (96.9%), contrast enhancement (96.9 %), irregular walls (84,8 %). Of all, 49 samples were found ascites (85,7% were malignant), 39 samples were found peritoneal carcinomatosis (92 % was malignant ovarian neoplasm). **Conclusion:** There were no difference finding of the CT scan characteristics in benign and borderline ovarian neoplasm group with normal CA 125 levels and elevated CA 125 levels. The difference between malignant ovarian group, in elevation of CA 125 level showed ascites and peritoneal cacinomatosis more.

Keywords: Ovarian neoplasm, CA 125, CT Scan.

1. Introduction

Gynecological malignancies include cervical cancer, endometrial cancer and ovarian cancer. Ovarian cancer is the third malignant tumor with the high mortality rate beside breast cancer and cervical cancer (Dewi, 2017). CA 125 level is one of the earliest tumor markers and often used by clinicians to diagnosed ovarian cancer. One of the criteria for diagnosing malignant ovarian neoplasms by the elevated in CA 125 levels. Further more, the elevation of CA 125 levels can be caused by several causes; gynecological malignancy, other malignancy and non-malignancy condition (Dochez, et al, 2019). Contrast-enhanced CT scan of the abdomen and pelvis are the initial imaging modality that is used to determined further diagnostic for developed treatment. In addition, preoperative discrimination between benign, borderline and malignant neoplasm in the pelvis is essential for the selection of adequate therapy.

2. Methods

This research is a descriptive type with a retrospective study design. This research at the Diagnostic Radiology department of the Integrated Diagnostic Center Dr. Soetomo General Academic Hospital Surabaya during January 2017 - June 2020. The sample collection in this study was carried out by consecutive sampling on all patients with pathologic result of ovarian neoplasm, who were subjected to contrast-enhanced CT scan of the abdomen and pelvis and CA 125 examination had been carried out at Dr. Soetomo General Academic Hospital Surabaya.

The inclusion criteria in this study were patients with ovarian neoplasm which classified in benign, borderline and malignant who underwent a CT scan and CA 125 levels examination in a span of not more than 40 days in Dr. Soetomo General Academic Hospital before surgery.

The research results are presented descriptively in tables and diagrams. The study was conducted after obtaining approval of an ethical test by the Medical Research Ethics Committee of Universitas Airlangga / Dr. Soetomo General Academic Hospital Surabaya.

3. Results

The total number of research samples were 91 peoples. The result showed that patients with ovarian neoplasm had the youngest age of 22 years and the oldest age of 75 years. Distribution in several group, showed the most ovarian neoplasm in the age group 51-60 years old 38.46% (35 people), 20.88% (19 people) in the age group 41-50 years old, and 15.38% (14 people) in the 61-70 years old.

The result of histopathological examination as the gold standard showed that the majority of samples with malignant ovarian neoplasm were 72.5% (66 people), benign ovarian neoplasm 24.2% (22 people), and borderline ovarian neoplasm 3.3% (3 people).

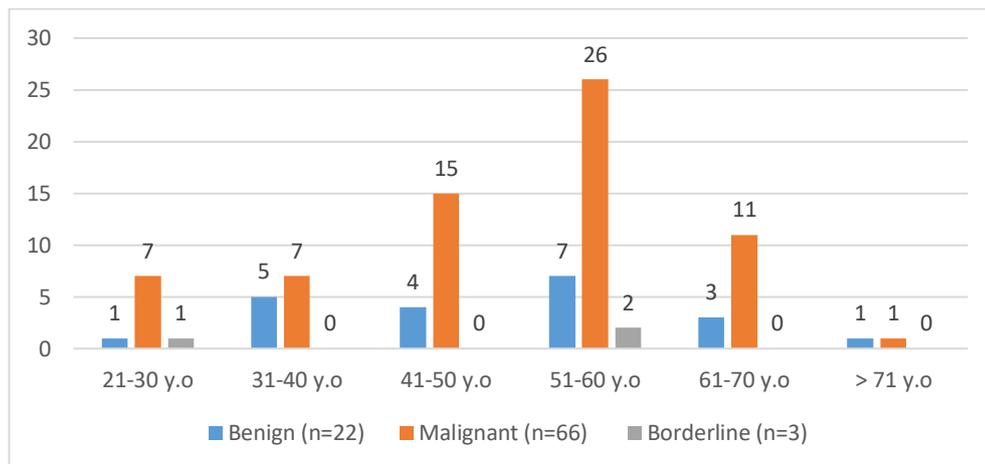


Figure 1. Distribution of ovarian neoplasm based on age

For the result of CA 125 serum examination of ovarian neoplasm showed the lowest serum CA 125 level was 7,1 U/ml and the highest level 8749.5 U/ml. It showed the majority of the sample 74.4% (68 people) had elevated serum levels of CA 125 (>35 U/ml) and 25.27% (23 people) had normal serum levels of CA 125.

From cross-tabulation result between pathologic and level CA 125, in the ovarian neoplasm group with normal CA 125 level, in the benign group pathologic result 55.5% with mucinous cystadenoma, in the borderline group 100% with mucinous borderline tumors, and 66.6% mucinous carcinoma in the malignant group. Whereas in the ovarian neoplasm group with increased CA 125 level, in the benign group pathologic result 46.1% with mature teratoma, in the borderline group 100% with serous borderline tumors, and 31.5% mucinous carcinoma in the malignant group (Table 1.)

The CT scan features observed the characteristic of mass included cystic, solid component, septa, wall, enhancement and secondary sign of ovarian malignancy including ascites, lymphadenopathy, pleural effusion, peritoneal carcinomatosis, and other feature like calcification, fatty component.

Table 1. Cross-tabulation result between pathologic and level CA 125

Group	Pathologic result	Normal CA	Elevated CA
		125 level (0- 35 U/ml) frequency	125 level (>35 U/ml) frequency
Benign (n=22)	Mature teratoma	2	6
	Seromucinous cystadenoma	1	1
	Mucinous cystadenoma	5	1
	Serous cystadenoma	0	3
	Unspecified	1	3
Borderline (n=3)	Mucinous borderline tumor	2	0
	Serous borderline tumor	0	1
Malignant (n=66)	Mucinous carcinoma	8	17
	Serous carcinoma	2	11
	Adult granulosa	2	3
	Endometrioid carcinoma	0	12
	Adeno carcinoma	0	2
	Sex Cord carcinoma	0	1
	Papillary serous	0	1
	Fibro-sarcoma	0	2
	Carsino-sarcoma	0	2
	Immature teratoma	0	1
	Clear cell carcinoma	0	2

Characteristic of CT Scan ovarian neoplasm features in this study more than 50 % of the samples were cystic (100 %), septic (95.6%), with solid component (90.1%), contrast enhancement (87.9 %), irregular walls (62.6 %), ascites (52.8%), other characteristics are peritoneal carcinomatosis (41.8%), calcification (29.7%).

Table 2. CT Scan Feature Benign Ovarian Neoplasm (n=22)

CT Scan Feature	Normal CA	Elevated CA	Total (n=22)
	125 level (0- 35 U/ml) (n=9)	125 level (>35 U/ml) (n=13)	
Cystic	9 (100%)	13 (100%)	22 (100%)
Solid component	6 (66.7%)	10 (76.9%)	16 (72.7%)
Septa	8 (88.8%)	12 (92.3%)	20 (90.1%)
Irregular wall	3 (33.3%)	4 (30,8%)	7 (31.8%)
Contrast enhancement	5 (55.5%)	10 (76.9%)	15 (68.2%)
Ascites	3 (33.3%)	3 (23.1%)	6 (27.3%)
Lymphadenopathy	0	1 (7.7%)	1 (4.5%)
Peritoneal carcinomatosis	1 (11.1%)	1 (7.7%)	2 (9.1%)
Pleural effusion	1 (11.1%)	2 (15.4%)	3 (13.6%)
Fatty component	1 (11.1%)	5 (38.4%)	6 (27.3%)
Calcification	2 (22.2%)	7 (53.8%)	9 (40.1%)

Table 3. CT Scan Feature Borderline Ovarian Neoplasm (n=3)

CT Scan Feature	Normal CA 125 level (0- 35 U/ml) (n=2)	Elevated CA 125 level (>35 U/ml) (n=1)	Total (n=3)
Cystic	2 (100%)	1 (100%)	3 (100%)
Solid component	2 (100%)	1 (100%)	3 (100%)
Septa	2 (100%)	1 (100%)	3 (100%)
Irregular wall	1 (50%)	1 (100%)	2 (66.7%)
Contrast enhancement	1 (50%)	0	1 (33.3%)
Ascites	1 (50%)	0	1 (33.3%)
Lymphadenopathy	1 (50%)	0	1 (33.3%)
Peritoneal carcinomatosis	1 (50%)	0	1 (33.3%)
Pleural effusion	0	0	0
Fatty component	0	0	0
Calcification	0	0	0

Table 4. CT Scan Feature Malignant Ovarian Neoplasm (n=66)

CT Scan Feature	Normal CA 125 level (0- 35 U/ml) (n=12)	Elevated CA 125 level (>35 U/ml) (n=54)	Total (n=66)
Cystic	12 (100%)	54 (100%)	66 (100%)
Solid component	12 (100%)	52 (96.3%)	64 (96.9%)
Septa	12 (100%)	53 (98.1%)	65 (98.4%)
Irregular wall	10 (83.3%)	46 (85.2%)	56 (84.8%)
Contrast enhancement	12 (100%)	52 (96.3%)	64 (96.9%)
Ascites	7 (58.3%)	35 (64.8%)	42 (63.6%)
Lymphadenopathy	3 (25%)	10 (18.5%)	13 (19.7%)
Peritoneal carcinomatosis	4 (33.3%)	32 (59.6%)	36 (54.5%)
Pleural effusion	1 (8.3%)	10 (18.5%)	11 (16.7%)
Fatty component	1 (8.3%)	4 (7.4%)	5 (7.6%)
Calcification	4 (33.3%)	14 (25.9%)	18 (27.3%)

4. Discussion

This research is a descriptive study with a retrospective research design that uses medical record data and raw data of CT scan examination at Diagnostic Centre Dr. Soetomo General Academic Hospital Surabaya, total number of research samples was 91 people. The result showed that patients with ovarian neoplasm had the youngest age of 22 years and the oldest age of 75 years. Distribution in several group, showed the most ovarian neoplasm in the age group 51-60 years old 38.46% (35 people). The subject divided in three group pathologic classification according to WHO classification (benign 24.2%, borderline 3.3% and malignant 72.5%) with normal and elevated CA 125 level.

4.1 Benign Ovarian Neoplasm

In the benign ovarian neoplasm group (22 sample), about 59.1 % sample (13 people) had increased CA 125 level with ranging from 42.4 U/ml-3468.2 U/ml (mean=475.6 U/ml),

and about 40.1 % sample (9 people) had normal CA 125 level ranging from 13.1 U/ml-32.5 U/ml (mean=21.4 U/ml). The distribution of data CA 125 level for benign ovarian neoplasm with increasing CA 125 unevenly, which is 11 people had an elevation of no more than 300 U/ml and 2 people had an elevated above 1000 U/ml.

From CT scan feature observation in benign ovarian neoplasm were cystic, septic, regular wall/well defined border, solid component with contrast enhancement. There was no difference finding of the CT scan characteristics in the benign ovarian neoplasm group which had normal CA 125 levels and those with elevated CA 125 levels, with a range of elevated levels not exceeding 1000 U/ml or accompanied with other disease.

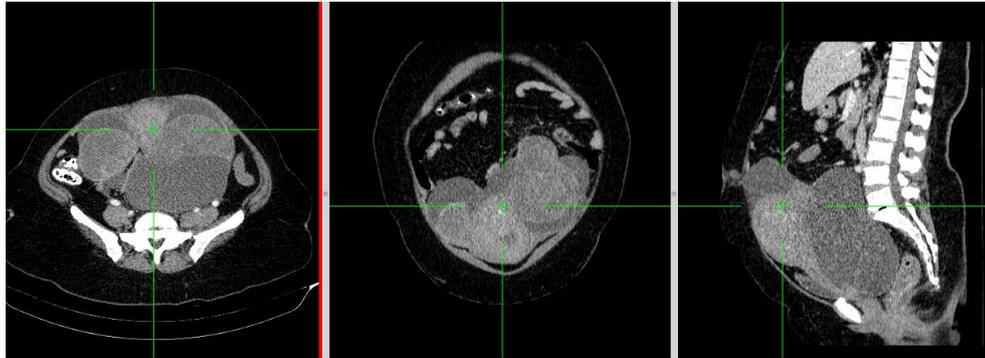


Figure 2. Mature cystic teratoma 52 y. o woman with CA 125 level 29.5 U/ml showed cystic, with solid component, septic, regular wall, and non-contrast enhanced.



Figure 3. Mature cystic teratoma and endometriosis 40 y. o woman with CA 125 level 1187 U/ml showed cystic, with solid component, septic, regular wall, contrast enhanced and calcification.

4.2 Borderline Ovarian Neoplasm

In the borderline ovarian neoplasm group (3 sample), about 66.7% sample (2 people) had normal CA 125 level (33.8 U/ml and 34.1 U/ml) and about 33.3 % sample (1 people) had increased CA 125 level (454.6 U/ml). From 2 samples borderline ovarian neoplasm with normal level CA 125 are mucinous borderline tumor, CT feature showed cystic with solid component (100%), septa (100%), enhancement (50%), ascites (50%), lymphadenopathy (50%) and peritoneal carcinomatosis (50%).



Figure 4. Mucinous borderline tumor, 38 y. o woman with CA125 34.1 U/ml. CT feature showed cystic, with solid component, septic, regular wall, contrast enhanced.

One sample with borderline ovarian neoplasm and elevated CA125 level (454.6 U/ml) was serous borderline tumor. CT scan finding were cystic with solid component, septa, regular wall without contrast enhancement.



Figure 5. Serous borderline tumor, 60 y. o woman with CA125 454.6 U/ml

4.3 Malignant Ovarian Neoplasm

In the malignant ovarian neoplasm group (66 sample), about 81.8 % sample (54 people) had increased CA 125 level with ranging from 42.7 U/ml-8220.1 U/ml (mean=1095.6 U/ml), and about 18.2% sample (12 people) had normal CA 125 level ranging from 7.1 U/ml-32.6 U/ml (mean=20.18 U/ml).

CT scan characteristic of malignant ovarian neoplasm with normal level CA125 (18.2% sample) in this study more than 50 % of the samples were cystic (100 %), septic (100%), with solid component (100%), contrast enhancement (100 %), irregular walls (83.3 %), ascites (58.3%). However CT scan characteristic of malignant ovarian neoplasm with elevated level CA125 (81.8% sample) in this study more than 50 % of the samples were cystic (100%), septic (98.1%), solid component with contrast enhancement (96.3 %), irregular walls (85.2 %), ascites (64.8 %) and peritoneal carcinomatosis (59.6%). Of all, 49 samples were found ascites (85,7% were malignant), 39 samples were found peritoneal carcinomatosis (92 % was malignant ovarian neoplasm).

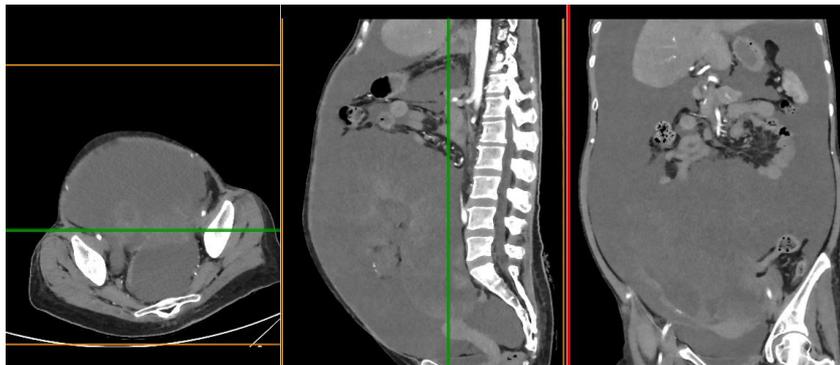


Figure 6. Serous carcinoma ovary, 24 y. o woman with CA 125 level 32.2 U/ml. CT scan feature showed cystic, with solid component, septic, irregular wall, contrast enhanced and ascites.

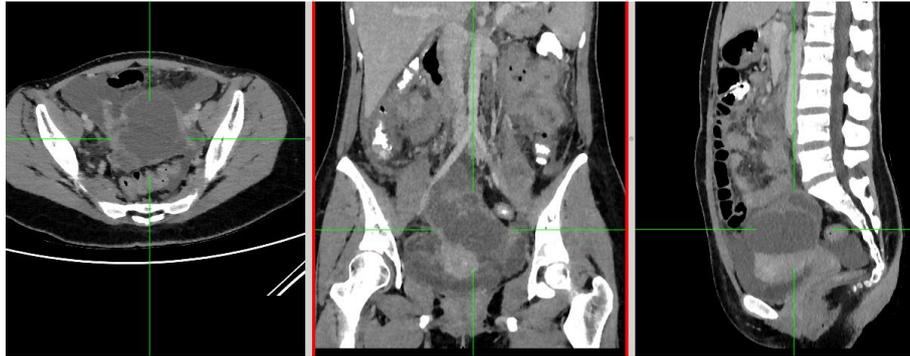


Figure 7. Endometrioid carcinoma, 60 y. o woman with CA 125 level 8749.5 U/ml. CT scan feature showed cystic, with solid component, septic, irregular wall, contrast enhanced, ascites, peritoneal carcinomatosis.

This study has not explain yet whether CT scan feature of mass was not different between malignant ovarian neoplasm group with normal level of CA125 and malignant ovarian neoplasm with elevated CA 125 level, except peritoneal carcinomatosis. From this study 39 people showed peritoneal carcinomatosis which is had elevated CA 125 level in 84.6% sample (33 people). It can be concluded that peritoneal carcinomatosis was a form of neoplasm aggressiveness supported by high serum CA 125 levels. However in benign ovarian neoplasm group that had peritoneal carcinomatosis confirm pathologically, there was co-incidence with cervical carcinoma.

5. Conclusion

Characteristic of CT scan ovarian neoplasm features in this study more than 50% of the samples were cystic (100 %), septic (95.6%), with solid component (90.1%), contrast enhancement (87.9 %), irregular walls (62.6 %), ascites (52.8%), other characteristics are peritoneal carcinomatosis (41.8%), calcification (29.7%). There was no difference finding of the CT scan characteristics in the benign and borderline ovarian neoplasm group which had normal CA 125 levels and those with elevated CA 125 levels, There is a difference in CT scan findings in malignant ovarian neoplasm with normal CA 125 levels and elevated CA 125 levels. In malignant ovarian neoplasm with elevated CA125 showed more secondary sign feature ascites and peritoneal carcinomatosis.

6. Acknowledgment

I would like to dedicate my gratitude to all lecturers of Radiology Department, Faculty of Medicine Universitas Airlangga, my family, and all of friends for their support.

7. Conflicts of interest

The author declares that there is no conflicts of interest.

References

- CambruZZi, E., Lima, R., Teixeira, S., ; Pêgas, K.,(2014).The relationship between serum levels of CA 125 and the degree of differentiation in ovarian neoplasms. *J Bras Patol Med Lab*, v. 50, n. 1, p. 20-25, fevereiro 2014
- DEWI, M. (2017). Sebaran Kanker di Indonesia, Riset Kesehatan Dasar 2007. *Indonesian Journal of Cancer*, 11(1), 1–8. <https://doi.org/10.33371/ijoc.v11i1.494>
- Dochez, V., Caillon, H., Vaucel, E., Dimet, J., Winer, N., & Ducarme, G. (2019). Biomarkers and algorithms for diagnosis of ovarian cancer: CA125, HE4, RMI and ROMA, a review. *Journal of Ovarian Research*, 12(1), 1–9. <https://doi.org/10.1186/s13048-019-0503-7>
- Han, L. Y., Karavasilis, V., Hagen, T. van, Nicum, S., Thomas, K., Harrison, M., ... Kaye, S. B. (2010). Doubling time of serum CA125 is an independent prognostic factor for survival in patients with ovarian cancer relapsing after first-line chemotherapy. *European Journal of Cancer*, 46(8), 1359–1364. doi:10.1016/j.ejca.2010.02.012

- Helfrida Situmeang, Lies Mardiyana, B. Soeprijanto, CT Scan Features of Non Epithelial Ovarian Cancer A Retrospective Study In Radiodiagnostic Departement of Dr. Soetomo General Hospital Surabaya at January 2016 July 2019, International Journal of Research Publication (Volume: 59, Issue: 1), <http://ijrp.org/paper-detail/1389>
- Jeong, Y.-Y., Outwater, E. K., & Kang, H. K. (2000). Imaging Evaluation of Ovarian Masses. *Radio Graphics*, 20(5), 1445 – 1470. doi.org/10.1148/radiographics.20.5.g00se101445.
- Milojkovic, M., Hrgovic, Z., Hrgovic, I., Jonat, W., Maass, N., & Buković, D. (2004).
- Momenimovahed, Z., Tiznobaik, A., Taheri, S., & Salehiniya, H. (2019). Ovarian cancer in the world: Epidemiology and risk factors. *International Journal of Women's Health*, 11, 287–299. <https://doi.org/10.2147/IJWH.S197604>
- Mubarak, F., Alam, M. S., Akhtar, W., Hafeez, S., & Nizamuddin, N. (2011). Role of multidetector computed tomography (MDCT) in patients with ovarian masses. *International Journal of Women's Health*, 3(1), 123–126. <https://doi.org/10.2147/IJWH.S15501>
- Ranjan, R., Katiyar, S., Kumar, A., & Mishra, J. (2015). Benign Pelvic Masses Associated with Raised CA 125 Level: Radiological Pathological Correlation. 3(6), 1–5. <https://doi.org/10.17354/ijss/2015/386>
- Scholler, N., Urban, N., & Gene, C. a. (2010). CA125 in Ovarian Cancer Nathalie. *Biomarkers in Medicine*, 1(4), 513–523. <https://doi.org/10.2217/17520363.1.4.513.CA125>