CHARACTERISTIC OF CT SCAN IN MUCINOUS OVARIAN TUMOR
Retrospective Study in Dr. Soetomo General Academic Hospital Surabaya January 2020 – July 2023

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ABSTRACT

Background: Mucinous ovarian tumors present various diagnostic challenges, with a broad histopathological spectrum from benign, borderline to malignant. Underdiagnosis of Mucinous Ovarian Carcinoma causes under-treatment, thereby reducing survival. Overdiagnosis of Mucinous Borderline Ovarian Tumor results in unnecessary additional treatment, resulting in significant side effects. CT scan is a diagnostic imaging modality with high accuracy in assessing ovarian tumors. Knowing the preoperative CT scan image well is very important for diagnosis and patient management.

Objective: The purpose of this study is to identify the characteristics of preoperative CT scan features in mucinous ovarian tumors that correlate with histopathology results.

Methods and Materials: Descriptive study of 53 samples of mucinous type ovarian tumors consisting of 12 samples of Mucinous Ovarian Cystadenoma (MCA), 17 samples of Mucinous Borderline Ovarian Tumor (MBOT), and 24 samples of Mucinous Ovarian Carcinoma (MOC) which were histopathologically proven by surgery. Abdominal CT scan data without and with contrast were evaluated retrospectively.

Results: The dominant CT scan characteristics of MCA are multilocular cyst (91.7%) with a thin tumor wall (83.3%) and thin septa (83.3%), no solid component (91.6%), and no enhancement (66.6%), with diameter of 22.83±9.92 cm and cystic component density of 12.33±4.21 HU. The dominant CT scan characteristics of MBOT are multilocular solid cyst (64.7%) with thick walls (82.4%), thick septa (82.4%), and solid components (70.6%), which provide enhancement (52.9%) with mild (55.6%) and moderate (44.4%) enhancement pattern, with diameter of 28.03±6.31 cm and a cystic component density of 17.47±7.58 HU. The dominant CT scan characteristics of MOC are multilocular solid cyst (100%) with thick walls (100%), thick septa (100%), and solid components (100%) that provide enhancement (100%) with moderate (66.7%) and strong (33.3%) enhancement pattern, with diameter of 24.50±5.77 cm and cystic component density of 20.83±6.71 HU. Site/laterality, tumor diameter, and intramural calcification do not exhibit characteristic features in MCA, MBOT, and MOC.

Conclusion: CT scan features that can be used to assist in categorizing the preoperative diagnosis of mucinous ovarian tumors as benign, borderline, or malignant type include: morphology, tumor wall, septa, cystic lesion density, solid component, and enhancement pattern.

Keywords: CT Scan, Mucinous ovarian tumor, Mucinous Ovarian Cystadenoma, Mucinous Borderline Ovarian Tumor, Mucinous Ovarian Carcinoma

Introduction

The classification of ovarian tumors by the World Health Organisation includes epithelial tumor, sex-cord stromal tumor, germ cell tumor, soft tissue tumor, unclassified, and secondary metastatic tumors [1]. Mucinous ovarian tumor is classified as epithelial tumor according to histological categorization.

Mucinous ovarian tumors present various diagnostic challenges. These tumors have a broad histological spectrum, ranging from Mucinous Ovarian Cystadenoma (MCA), Mucinous Borderline Ovarian Tumour (MBOT) to Mucinous Ovarian Carcinoma (MOC), accounting for 80%, 16-17%, and 3-4% of Mucinous primary ovarian tumor, respectively [2].

MBOT has histopathological characteristics and clinical symptoms between benign ovarian tumors and ovarian cancer, therefore there is common misclassification of MBOT as MOC or MOC as MBOT histologically [3,4]. MBOT is predominantly detected during the early stages and primarily affects women in the reproductive age range, where maintaining fertility is crucial [5]. A critical concern of misdiagnosis of MOC as MBOT is its impact on survival. In cases where MOC is underdiagnosed as MBOT, the patient receives under-treatment, resulting in reduced survival. Conversely, when MBOT is overdiagnosed as MOC, patients receive unnecessary additional treatment, resulting in significant side effects [3]. Compared with malignant tumor, borderline tumor has a much better prognosis and because it is noninvasive, treatment may not be as radical as for malignant tumor. In malignant tumor, adjuvant chemotherapy is important to reduce the risk of recurrence. The ability to differentiate borderline tumors from malignant tumors before surgery greatly influences surgical treatment and allows better patient counseling [6].

Abdominal CT scan is the initial imaging modality that is often used for diagnosis, determining subsequent treatment, and evaluating the response to therapy that has been given. CT scans can assess operable and non-operable ovarian tumors and provide cross-sectional images of internal organs, especially areas that are difficult to reach during laparotomy operations, providing detailed information on the extent of lesions and the presence of metastases [7,8]. In this case, the accuracy of CT scans is reported to be 93-96% [9]. The accuracy of CT scans in assessing the characteristics of ovarian carcinoma when compared with ultrasound is 94% vs 80% [7].

There are not many studies that specifically assess the CT characteristics of mucinous ovarian tumor. Most studies combined it with other epithelial ovarian tumors or even ovarian tumors in general. Based on this concept, the purpose of this study is to examine the characteristics of preoperative CT scans in mucinous ovarian tumors in correlation with the results of histopathology result post-surgery.

Methods and Materials

This research is a descriptive retrospective research conducted at the Diagnostic Radiology Department of Dr. Soetomo General Academic Hospital Surabaya from January 2020 to July 2023. The study's sample collection involved consecutively sampling all patients who were confirmed to have a mucinous ovarian tumor from the histopathology of the surgical tissue and who had undergone a preoperative abdominal CT scan with contrast at Dr. Soetomo General Academic Hospital Surabaya.

CT scan features observed include :

a. Site/laterality

The tumor site that has been confirmed by the results of the surgery

b. Morphology

This study used IOTA (International Ovarian Tumor Analysis) guidelines to classify tumor morphology. Examples are shown in figures 1 to 3.

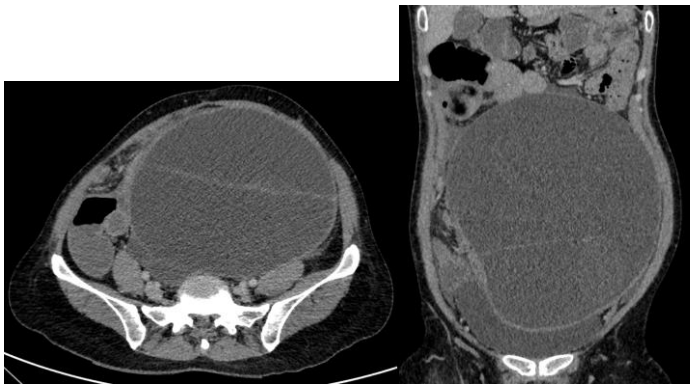

Figure 1. MCA with multilocular cyst morphology

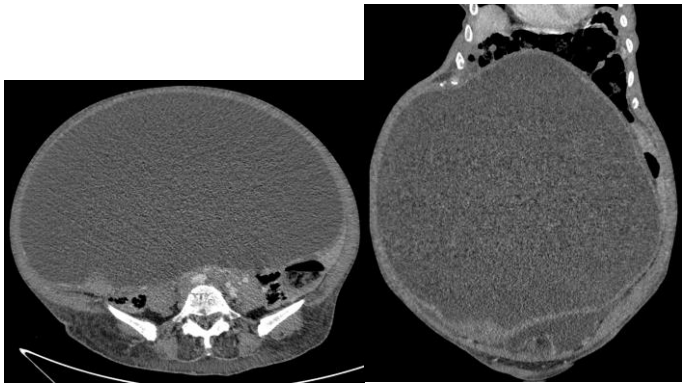

Figure 2. MBOT with unilocular solid cyst morphology

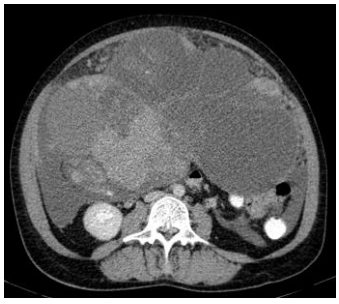

Figure 3. MOC with multilocular solid cyst morphology

c. Tumor diameter

Tumor diameter is measured based on the long axis (Figure 4).

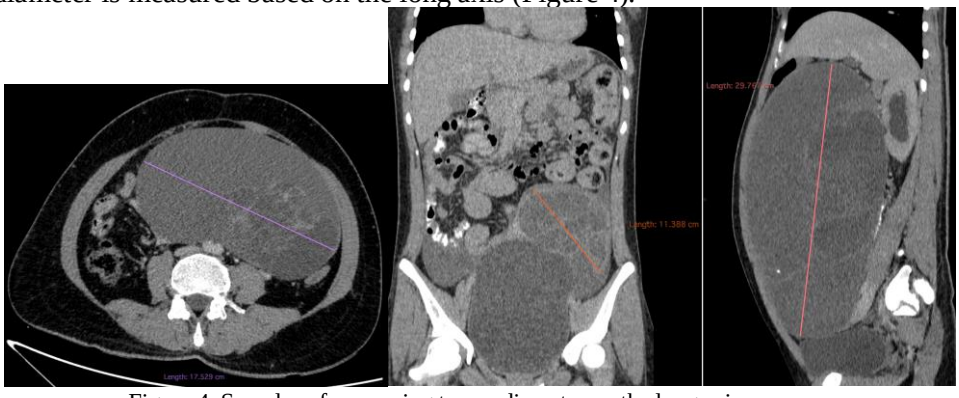

Figure 4. Samples of measuring tumor diameter on the long axis

d. Tumor wall

Tumor wall thickness is measured based on the thickest outer wall of the tumor in millimeter (mm). Then, it is categorized into the thin wall if < 3 mm and the thick wall if ≥ 3 mm (Figure 5).

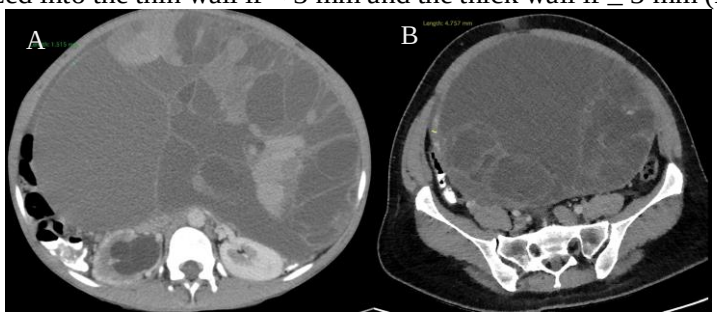

Figure 5. Samples of tumor wall measurements showed (A) thin wall and (B) thick wall

e. Septa

IOTA standards define septa as thin tissue strands that extend through the cyst cavity internally, connecting one surface to the opposite side. Evaluate the presence or absence of septa, if presence then they are measured based on the thickest septa in millimeter (mm). Thin wall are determined if <3 mm and thick wall if ≥3 mm (Figure 6).

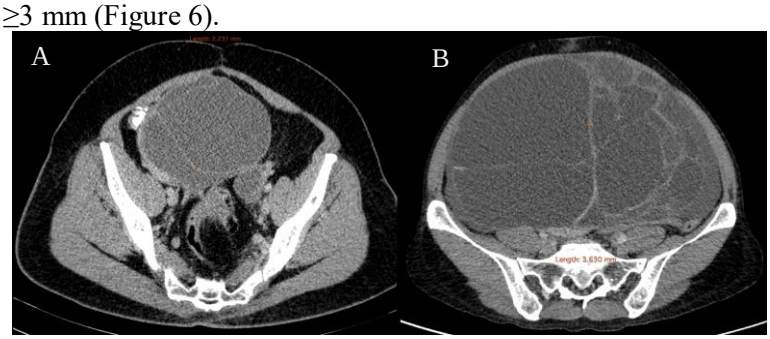

Figure 6. Samples of septa measurements showed (A) thin septa and (B) thick septa

f. Cystic lesion density

Density measurements were carried out on the largest locules with the largest ROI avoiding solid and wall components and septa in the non-contrast phase in the 2 projections (Figure 7).

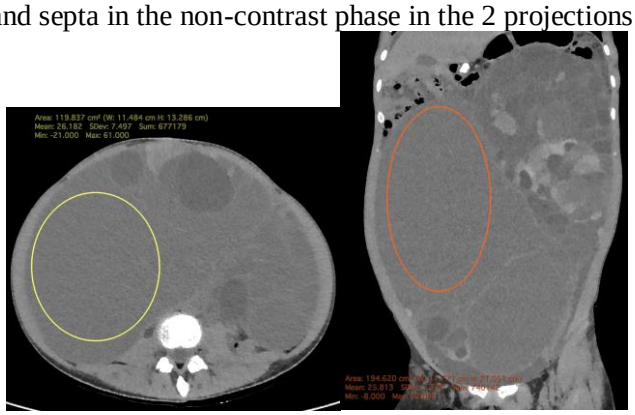

Figure 7. Sample of measuring the density of the cystic component in the largest locule with the largest ROI in 2 projections

g. Solid components

Evaluate the presence or absence of solid components. The solid component measurements were carried out at the greatest thickness (height) of the solid component of the tumor wall (Figure 8).

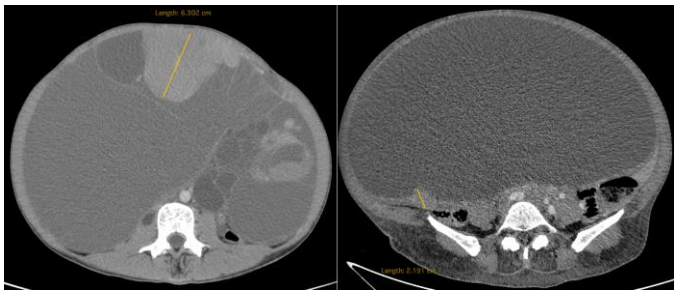

Figure 8. Measuring the thickness of the solid component

h. Intramural calcification

Intramural calcification in this study was assessed in the non-contrast phase, evaluated in the tumor wall and septa (Figure 9).

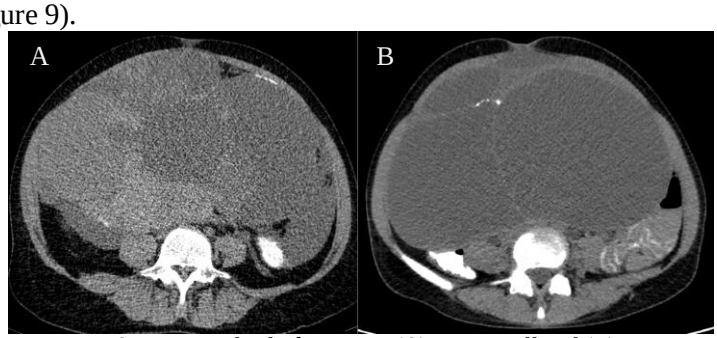

Figure 9. Intramural calcification in (A) tumor wall and (B) septa

i. Enhancement pattern

The presence or absence of enhancement was measured from the density of the solid components of the tumor or walls or septa in the non-contrast and venous phases. Enhancement was obtained if there was an increase of ≥ 20 HU. The enhancement pattern is obtained by comparing in the venous phase the density of the solid component or tumor wall or septa with the density of the uterine myometrium, then categorized into three patterns: mild (less than), moderate (equal), and strong (more than).

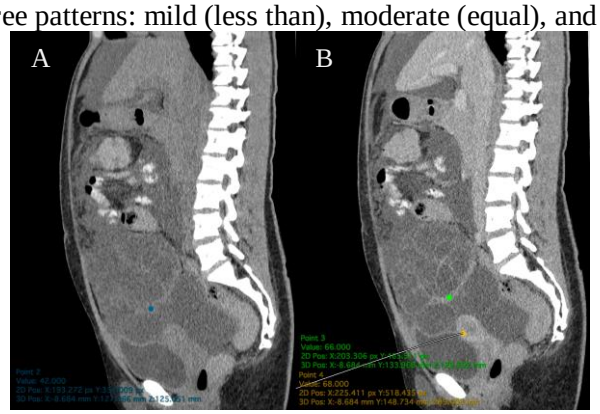

Figure 10. Enhancement measurements in the (A) non-contrast and (B) venous phases showed a moderate enhancement pattern

The research findings are provided descriptively in tables. The study was carried out following permission of an ethical test by the Medical Research Ethics Committee of Universitas Airlangga / Dr. Soetomo General Academic Hospital Surabaya.

Result

In this study, there were 53 research subjects, consisting of 12 samples (22.6%) of Mucinous Ovarian Cystadenoma (MCA), 17 samples (32.1%) of Mucinous Borderline Ovarian Tumor (MBOT),

and 24 samples (45.3%) of Mucinous Ovarian Carcinoma (MOC) which were histopathologically proven by surgery.

Table 1. Distribution of mucinous ovarian tumor patients based on age

		Mucinous Ovarian Tumor Frequency (percentage)		
		MCA (n=12)	**MBOT (n=17)**	**MOC (n=24)**
Age (year)	Range	15-67	18-63	14-67
	Mean ± standart deviation (SD)	39.3±19.7	45.8±12.8	46 ±14.7
Based on decades	11-20 years old	4 (33.3%)	1 (5.9%)	1 (4.2%)
	21-30 years old	1 (8.3%)	2 (11.7%)	2 (8.3%)
	31-40 years old	0%	1 (5.9%)	6 (25%)
	41-50 years old	2 (16.8%)	5 (29.4%)	6 (25%)
	51-60 years old	4 (33.3%)	7 (41.2%)	4 (16.7%)
	61-70 years old	1 (8.3%)	1 (5.9%)	5 (20.8%)

Table 2. Characteristics CT Scan of Mucinous Ovarian Tumor

		Mucinous Ovarian Tumor Frequency (percentage)		
		MCA (n=12)	**MBOT (n=17)**	**MOC (n=24)**
Site/ laterality	Unilateral	12 (100%)	17 (100%)	24 (100%)
	Right	4 (33.3%)	5 (29.4%)	11 (45.8%)
	Left	8 (66.7%)	12 (70.6%)	13 (54.2%)
	Bilateral	0	0	0
Morphology	Unilocular cyst	0	0	0
	Unilocular solid-cyst	0	1 (5.9%)	0
	Multilocular cyst	11 (91.7%)	5 (29.4%)	0
	Multilocular solid-cyst	1 (8.3%)	11 (64.7%)	24 (100%)
	Solid mass	0	0	0
Tumor diameter	Range	11.3-39 cm	16.2-38 cm	12,1-33.8 cm
	Mean ±SD	22.83±9.92 cm	28.03±6.31 cm	24.50±5.77 cm
	11-20 cm	5 (41.7%)	3 (17.6%)	7 (29.1%)
	21-30 cm	4 (33.3%)	8 (47.1%)	13 (54.2%)
	31-40 cm	3 (25%)	6 (35.3%)	4 (16.7%)
Tumor wall	Thin (< 3mm)	10 (83.3%)	3 (17.6%)	0
	Thick (≥ 3 mm)	2 (16.7%)	14 (82.4%)	24 (100%)
Septa	Absence	0	1 (5.9%)	0
	Presence	12 (100%)	16 (94.1%)	24 (100%)
	Thin (< 3mm)	10 (83.3%)	2 (11,7%)	0
	Thick (≥ 3 mm)	2 (16.7%)	14 (82.4%)	24 (100%)
Density of cystic component	Range	6-20 HU	5-28 HU	3-29 HU
	Mean±SD	12,33±4,21 HU	17,47±7,58 HU	20,83±6,71 HU

	< 11 HU	4 (33.3%)	3 (17.6%)	2 (8.3%)
	11-20 HU	8 (66.7%)	7 (41.2%)	8 (33.3%)
	21-30 HU	0	7 (41,2%)	14 (58,4%)
Solid component	Absence	11 (91.6%)	5 (29.4%)	0
	Presence	1 (8.7%)	12 (70.6%)	24 (100%)
	Range	3.3 cm	1.1-7.1 cm	1.3-13.4 cm
	Mean ±SD	3.3±0 cm	3.82±1.91 cm	4.62±3.11 cm
Intramural calcification	Absence	3 (25%)	7 (41.2%)	12 (50.0%)
	Presence	9 (75%)	10 (58.8%)	12 (50.0%)
Enhancement pattern	Absence	8 (66,6%)	8 (47.1%)	0
	Presence	4 (33.4%)	9 (52.9%)	24 (100%)
	Mild	4 (33.4%)	5 (29.4%)	0
	Moderate	0	4 (23.5%)	16 (66.7%)
	Strong	0	0	8 (33.3%)

The dominant CT scan characteristics of MCA are multilocular cyst (91.7%) with a thin tumor wall (83.3%) and thin septa (83.3%), no solid component (91.6%), and no enhancement (66.6%), with diameter of 22.83±9.92 cm and cystic component density of 12.33±4.21 HU. The dominant CT scan characteristics of MBOT are multilocular solid cyst (64.7%) with thick walls (82.4%), thick septa (82.4%), and solid components (70.6%), which provide enhancement (52.9%) with mild (55.6%) and moderate (44.4%) enhancement pattern, with diameter of 28.03±6.31 cm and a cystic component density of 17.47±7.58 HU. The dominant CT scan characteristics of MOC are multilocular solid cyst (100%) with thick walls (100%), thick septa (100%), and solid components (100%) that provide enhancement (100%) with moderate (66.7%) and strong (33.3%) enhancement pattern, with diameter of 24.50±5.77 cm and cystic component density of 20.83±6.71 HU. Site/laterality, tumor diameter and intramural calcification do not provide a typical appearance in MCA, MBOT, and MOC.

Discussion

The most distribution of mucinous primary ovarian tumor in this research is MOC at 45.3%, this is different compared to WHO data globally, where MCA is around 80%, MBOT 15% and MOC 5% [10]. The results of this research obtained more MOC samples compared to MBOT and MCA, the same as data from the Anatomical Pathology Laboratory in Surabaya [11] and Semarang [12]. Differences in characteristics based on the histopathological diagnosis in this study sample can be caused by socioeconomic status, which is closely related to access to health services, patient awareness of ovarian cancer symptoms, and timely response to symptoms. In Brewster et al's study, weaker social status was associated with more advanced disease [13]. It is also known that according to the latest histopathological, molecular and genetic studies, mucinous type ovarian tumors include type I, where this type has indolent behavior and is part of a continuous morphology and molecular tumor starting from a benign cystadenoma/adenofibroma tumor, then developing into atypical/borderline proliferative and ultimately invasive tumors [14]. Therefore, delays in patients coming to health facilities can also have an impact. Apart from that, the location of this research is also at a tertiary referral center. Ovarian cancer was also ranked third among the total new cancer cases in Indonesian women in 2020 based on Globocan data with 14,896 new cases.

Mucinous ovarian tumors have a wide age range, they can occur in young to elderly women and even children. According to Herrington, MCA is most often diagnosed in the reproductive age group, while MBOT and MOC average 45 years [10]. This is consistent with this research. Research by Okugawa et.al

involving 162 MCA samples, 58 MBOT samples and 30 MOC samples obtained mean and standard deviation results that were slightly older than this study, namely MCA 43.9±17.2 years, MBOT 45.9±18.3 years, and MOC 52.0± 12.9 years, but from the results of the analysis there was no significant difference between MBOT and MOC ages [15].

The study of Matsuo et.al with multivariate analysis showing that older age (≥61 years) is an independent characteristic that is more associated with MOC compared with MBOT, where age 61 years is a useful cut-off to differentiate MOC from MBOT [13]. In accordance with this study, 5 out of 7 samples (71.4%) of samples aged >61 years were MOC.

In this study, the CT scan characteristics of mucinous ovarian tumors were evaluated :

a. Site/laterality

The location of all samples (100%) in this study was unilateral. This data is in accordance with the study of Herrington, as many as 95% of mucinous ovarian tumors are unilateral [10], and Cömert et.al's study with 75 MBOT samples showed that 93.3% of samples were unilateral [16]. Unilaterality is one of the characteristics of primary mucinous ovarian tumors which is one of the characteristics to differentiate them from metastatic tumors. Metastatic tumors are usually found more often in bilateral ovaries [2,16,17]. Khunamornpong et.al's study of 74 cases of mucinous adenocarcinoma found 95% bilateral metastases [18]. Jung et.al's study compared primary and metastatic mucinous adenocarcinoma, it was found that 94.7% of primaries were unilateral [19].

The results of this study consisted of 20 samples located in the right ovary (37.7%) and 33 samples located in the left ovary (62.2%), wherein all groups, both MCA, MBOT, and MOC were mostly on the left side. Sel, et.al obtained the same results in samples of unilateral epithelial ovarian cancer, generally found to be more on the left side (61.5%), no research explains the cause [19]. Univariate and multivariate analysis studies by Yamada et.al on ovarian cancer in general with 131 samples consisting of 58 bilateral samples and 73 unilateral samples (54.8% right samples and 45.2% left samples) did not show any significant differences in overall survival (OS, P=0.218) and progression-free survival (PFS, P=0.604) in right vs left unilateral, but there was a difference in unilateral vs bilateral where OS and PS in unilateral were longer [21]. However, in a study with a larger sample by Zhang et.al on 1483 samples of unilateral MOC, there was no significant difference in incidence between the right (50.8%) and left (49.2%) sites [22].

b. Morphology

This study uses IOTA (International Ovarian Tumor Analysis) guidelines in classifying tumor morphology. According to IOTA, each type of tumour morphological classification carries a specific risk of malignancy. These risks are as follows: unilocular cyst 0.6%, unilocular solid cyst 33%, multilocular cyst 10%, multilocular solid cyst 41%, and solid mass 62%. The findings of this study correspond with the malignancy risk in IOTA, with 91.7% of the multilocular cyst samples exhibiting MCA, whereas only 8.3% of the samples are characterized as multilocular solid cysts. The majority of samples in MBOT consisted of 64.7% multilocular solid cysts, followed by 29.4% multilocular cysts, with only one sample (5.9%) being unilocular cysts. The study revealed that all cases in the MOC group exhibited multilocular solid cysts. Based on the research by Pascual et.al on 387 mucinous ovarian tumors, it was seen that MCA predominantly consisted of multilocular cysts, MBOT generally comprised of multilocular cysts and multilocular solid cysts, and MOC mainly consisted of multilocular solid cysts [23].

c. Tumor diameter

According to Herrington, MCA varies in size with an average of 10 cm, MBOT averages around 20 cm and in some cases can even reach 50 cm, while MOC measures >10 cm [10]. In this study, the diameter range was 11.3 - 39 cm, with the average result and standard deviation of MBOT 28.03 ± 6.31 cm, greater than MOC 24.5 ± 5.57 cm and the smallest was obtained at MCA 22.83 ± 9.92 cm. This is consistent with a multivariate research by Moon et.al on 141 ovarian tumor samples in general consisting of 97 borderline samples and 73 malignant samples, with the result that the borderline tumor size was larger than the malignant tumor [24].

Meanwhile, in Okugawa's study of 162 MCA patients, 58 MBOT patients and 30 MOC patients obtained mean results and standard deviations sequentially from smallest to largest for MCA 15.4±7.1 cm, MBOT 19.6±6.6 cm, and MOC 21.0±8.0 cm [15]. Pascual et.al's study using ultrasound on 365 patients with mucinous type ovarian tumors also obtained a mean diameter sequentially from smallest to largest at MCA 7.3 cm, MBOT 9.9 cm and MOC 11.5 cm [23].

d. Tumor wall

Indications of malignant epithelial tumors typically involve walls with a thickness above 3 mm [25,26]. The findings of this study revealed that all MOC specimens exhibited walls of significant thickness, while 82.4% of MBOT specimens also displayed thick walls. In contrast, 83.3% of MCA specimens were seen to have walls of thinness. Consistent with this research, Ghossain et.al's study yielded similar findings, with 90% of the MCA exhibiting thin walls [27].

e. Septa

Indications of malignant epithelial tumors typically involve the presence of septa that are thicker than 3 mm [25,26]. The findings of this study revealed that all MOC specimens exhibited thick walls, while 82.4% of MBOT specimens had thick walls, and 83.3% of MCA specimens had thin walls. Only one sample lacked septa, namely MBOT with unilocular solid cyst shape. Consistent with this research, Ghossain et.al's study yielded similar findings, with narrow septa observed in 90% of MCA cases [27]. The result of this study was the average measurements and standard deviations of the septa, arranged from smallest to largest, were as follows: MCA 2.66±0.61 mm, MBOT 3.90±1.10 mm, and MOC 4.68±1.36 mm. According to this study, deSouza et.al discovered that the septa in borderline tumors had a thickness of 3.3±1.5 mm, which was thinner than the septa in malignant tumors, which had a thickness of 5.1±2.3 mm [6].

f. Cystic lesion density

Ovarian malignancies typically develop as cystic masses, with the cyst fluid produced by cancer cells playing a role in the active restructuring of the extracellular matrix in the ovaries. Mucinous tumor, which is a type of epithelial ovarian tumors, secrete significant quantities of mucous substances and create mucin lakes within the stroma [28]. The density of the cystic component in this study showed that the average and standard deviation for each type of mucinous ovarian tumor increased from MCA 12.33±4.21 HU, MBOT 17.47±7.58 HU, and MOC 20.83±6.71 HU.

In accordance with this study, the research by Lupean et.al obtained results in the non-contrast phase, the average (and range) fluid density in MCA was 7.05 HU (5.88-8.22 HU) lower than MOC 11.21 HU (6.97-15.45 HU) [29].

g. Solid component

The presence of solid component can be found in all types of mucinous tumors due to the varying fibrous stroma content [17]. The results of this research showed that only 1 sample (8.7%) of MCA had a solid component with a thickness of 3.3 cm. Most of the MBOT had a solid component (70.6%) with a mean of 3.81±1.91 cm. 100% MOC has a solid component with an average of 4.62±3.11 cm.

In accordance with this research, a multivariate analysis study by Moon et.al on ovarian tumors in general with 97 borderline samples and 73 malignant samples, showed that the solid component in borderline tumors was rarer and smaller than in malignant tumors, whereas in borderline average 2.1 cm (range 1-2.6 cm) and malignant average 3.7 cm (range 2.3-5.2 cm) [24].

h. Intramural calcification

In this study, 58.4% of the samples had intramural calcifications, which were present in all types of histopathology, including MCA 75%, MBOT 58.8% and MOC 50.0%. Okada's study of 44 cases of mucinous ovarian tumors resulted in 34.1% of samples with intramural calcification in 8 benign, 3 borderline, and 4 malignant, whereas after confirmation of the histopathological results, 56.8% of the samples had calcification in all histopathological types with details of 13 benign, 5 borderline and 7 malignant [30].

Russell and Farnsworth stated that mucinous tumors may contain large deposits of dystrophic calcification. Russell also reported that these calcifications were relatively common in areas of acellular

connective tissue, were not associated with an epithelial component, and were very different from typical psammoma bodies [30].

Only a few reports provide radiological or pathological evidence of calcification in mucinous ovarian tumors. Okada stated in his research that the presence of intramural calcification in the mucinous can be a good indicator [30].

A separate study involving 122 cases of ovarian cancer with calcification found that, when considering the stage of the cancer, a multivariate analysis revealed that calcification was associated with a worse prognosis. Nevertheless, the study revealed that the serous samples accounted for the majority including 60% of the total, mucinous samples only made up 6% of the total, while the remaining samples consisted of other types of ovarian tumors [31].

i. Enhancement pattern

The pattern of enhancement in this study was found in the MOC with strong and moderate patterns, MBOT with moderate and mild patterns, while MCA was in the mild pattern and no enhancement.

In accordance with this research, Han et.al's study involving 60 samples of epithelial ovarian tumors (26 borderline and 34 malignant) obtained significantly lower enhancement results for borderline tumors compared to malignant tumors in both the venous and arterial phases ($p < 0.05$), where enlargement reflects the blood supply of the tumor, which is positively correlated with its invasiveness [32]. A study by Moon, et.al with 29 samples of borderline ovarian tumors and 63 samples of malignant ovarian tumors, the results showed mild enhancement in borderline (82.8%) and malignant (65.1%), moderate enhancement in borderline (13.8%) and malignant (31.8%), 2 samples strong enhancement in malignant [24].

There is a limitation to this study, namely the small number of samples. This research can be a preliminary to conducting further research with a larger number of samples regarding the characteristics of CT scans in mucinous ovarian tumor, so that scoring of each characteristic can be carried out.

Conclusion

Understanding the characteristics of CT scans in mucinous ovarian tumor can help improve preoperative diagnostics. CT scan features that can be used to assist in categorizing the preoperative diagnosis of mucinous ovarian tumors as benign, borderline, or malignant type include: morphology, tumor wall, septa, cystic lesion density, solid component, and enhancement pattern. Site/laterality, tumor diameter and intramural calcification do not provide a typical appearance in MCA, MBOT, and MOC. Knowing the preoperative CT scan image well is very important for diagnosis and patient management.

Acknowledgment

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Ethical clearance

This study was approved by ethics committee of Dr. Soetomo General Academic Hospital Surabaya, Indonesia (Ref.No : 1492/LOE/301.4.2/X/2023).

Conflict of Interest

None.

Source of funding

None.

Abbreviations

MCA	: Mucinous Ovarian Cystadenoma	SD	: Standart deviation
MBOT	: Mucinous Borderline Ovarian Tumor	cm	: centimeter
MOC	: Mucinous Ovarian Carcinoma	mm	: millimeter
IOTA	:International Ovarian Tumor Analysis	HU	: Hounsfield Unit

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