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Original Research Article

Gross architecture of ovarian specimens from a southwest Nigerian tertiary healthcare facility

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ABSTRACT

Background: The aim of our study is to describe the gross morphology of ovarian specimens and to see if some entities can be distinguished based on their gross morphology.
Methods: We did a cross-sectional study of all ovarian specimen received by the department of morbid anatomy and forensic medicine of Obafemi Awolowo university teaching hospitals complex (OAUTHC), Ile-Ife, Nigeria from January 1, 2018, to December 31, 2022 (Five-year period). OAUTHC is situated in the southwestern part of Nigeria.
Results: We examined 225 right ovarian specimens. Non- neoplastic lesions were the most common lesions of the right ovary accounting for 52 cases followed by malignant tumour accounting for 25 cases. We examined 233 specimens of the left ovary of which 133 were normal. Eighteen (72%) of malignant tumors of the left ovary had cystic cut surfaces. The spectrum of lesions of both ovaries has different average widest diameters with significant overlap in their distribution. Metastatic carcinoma is seen to involve both ovaries and found to mainly have a solid cut surface. We found that the average widest diameter of a normal left ovary is 3.6 cm while that of a normal right ovary is 4.9 cm.
Conclusions: The ovarian lesions have different widest diameters and are usually larger than that of a normal ovary. Benign ovarian tumours are generally larger than their malignant counterparts but cannot be distinguished based on size alone. Metastatic carcinoma involved both ovaries and had a predominantly solid-cut surface. The normal left ovaries were smaller than the normal right ovaries.

Keywords: Ovarian neoplasms, Ovarian cysts, Endometriosis, Follicular cyst

INTRODUCTION

Examination of the gross morphology of the ovarian specimen in the histopathology laboratory is very important in arriving at a final diagnosis. A careful assessment of the appearance of the ovary, particularly of the cut surface, can help in distinguishing the various disease entities that affect the ovary.

The size of the ovary is about 3-5 cm long, 2-3 cm wide, and 1-2 cm thick.[1,2] The cut surface commonly shows a cortex and a medulla. Corporal albicantes, or corpus luteum, are some of the structures that can be identified on the cut surface of the ovary even before microscopy. Cystic structures normally less than 2.5 cm in widest diameter can also be seen in a normal ovary.

However, ovaries with diseases can have quite distinct architectures that can point to groups of disease entities. In many tumorous conditions of the ovary, there is a marked increase in the size of the ovary that is often much larger than the normal ovary. This is because the ovary resides in the pelvis and often grows to a large size before it is palpable or causes pressure symptoms. Many ovarian tumours are occultic and are at advanced sizes before they are detected.[3] This is particularly unfortunate in cases of

malignant lesions, most of which would have spread widely before being detected.

The cut surface of abnormal ovaries can be solid, cystic, or a combination of solid and cystic structures. It is well known that large ovaries with a predominantly solid surface have a much higher chance of being malignant. Many malignant ovarian tumours can have a combination of solid and cystic-cut surfaces. The combination of the size of the ovary and the nature of its cut surface can be useful in identifying many ovarian diseases.

Our study's objectives are to characterise the gross morphology of ovarian specimens to establish a baseline of data, determine whether morphological traits can be used to distinguish between abnormal and normal ovaries, and determine whether groups of entities can be identified based on their gross morphology.

METHODS

We did a cross-sectional study of all ovarian specimens received by the department of morbid anatomy and forensic medicine at the OAUTHC, Ile-Ife, Nigeria, from January 1, 2018, to December 31, 2022 (a five-year period). The OAUTHC is situated in the southwestern part of Nigeria. We got authorization for the study from our local ethics and research committee. We extracted information on the biodata of the patients, the size of the ovary, and the nature of the cut surface of the ovary from departmental records. We evaluated each case to confirm the diagnosis seen in the records. We cut and stained the tissue blocks in each case with haematoxylin and eosin.

We included all cases with biodata and available histopathology reports. We excluded cases with missing biodata and tissue. We studied 303 ovarian specimens, of which only 255 met the inclusion criteria. We measured the widest diameter of each ovary in cases of bilateral oophorectomy or one of the ovaries in cases of unilateral oophorectomy. We described the cut surface of normal ovaries as normal, while we classified the cut surface of ovaries with lesions as solid or cystic. The cut surface is described as cystic if the widest diameter of the cyst is greater than 2.5 cm and the cavitary structure is lined by epithelial or follicular cells.

We extracted data and compiled it in Microsoft excel. We analysed data using Microsoft excel and SPSS version 20.

RESULTS

Most of the ovarian specimens were from patients in 40- to 50-year-old age group, which accounted for 113 cases. This was followed by 50-60 year old age group, which accounted for 62 cases. Frequencies of ovarian specimens received from other age groups shown in Figure 1.

We examined 225 right ovarian specimens. More than half of the ovaries were normal (127). Non-neoplastic lesions were the most common lesions of the right ovary, accounting for 52 cases, followed by malignant tumours, accounting for 25 cases. We found all the benign tumours of the right ovary to be cystic and most of the cut surface of the malignant lesions to be solid (56%). Most of the non-neoplastic lesions were found to be cystic. There was a significant association between the cut surface of the ovary and the nature of the lesion ($p<0.001$). Other details are shown in Table 1. We found all the cases of teratoma of the right ovary to be cystic. Only one out of six cases of endometrioid carcinoma of the right ovary were found to be cystic. All the cases of right ovarian endometriosis were solid. Seven out of eight cases of metastatic carcinomas are solid. All the right ovaries removed because of torsion were cystic. All the cases of serous adenocarcinoma and serous cystadenoma were cystic. The cut surfaces of other lesions are shown in Table 2.

We examined 233 specimens of the left ovary, of which 133 were normal. Twenty (87%) out of 23 cases of benign tumours of the left ovary were cystic. Eighteen (72%) malignant tumours of the left ovary had cystic-cut surfaces. A cystic cut surface was seen in 50 (98%) of non-neoplastic lesions. These and other details of the cut surface of the left ovary are shown in Tables 3 and 4.

Figures 2 and 3 show how the widest diameter of the ovaries varies in various diseases that involve the right and left ovaries. Figure 2 shows a boxplot that depicts the distribution of the widest diameter of the right ovaries among the various classes of specimens. Most of the lesions have widest diameters that are much larger than those of the normal right ovary. The borderline tumours were generally larger than the benign and malignant tumours. The non-neoplastic lesions have a widest diameter slightly larger than that of the normal ovary, with significant overlap in the distribution.

Figure 3 shows the boxplot of the distribution of the widest diameter of the left ovarian specimens. The average widest diameter of the benign lesions was the highest, followed by that of the malignant tumours. The widest diameter of the non-neoplastic lesions was like that of normal ovary. We found that the average widest diameter of a normal left ovary is 3.6 cm, while that of normal right ovary is 4.9 cm.

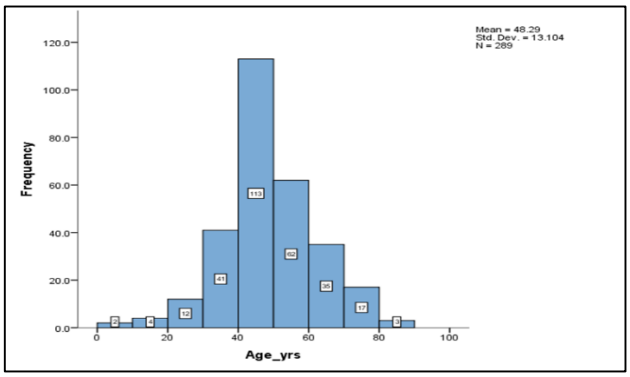

Figure 1: Histogram of age distribution of cases.

Most cases are in the 30-to-60-year age group.

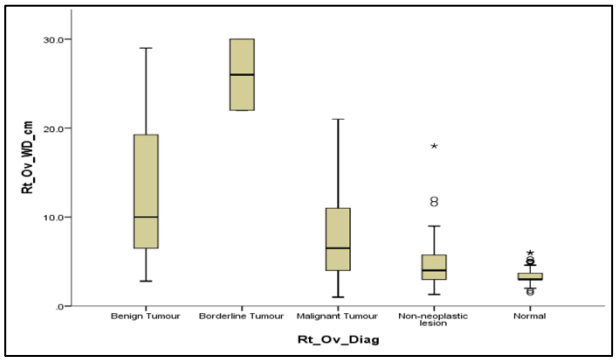

Figure 2: Boxplot of the widest diameter of the various classes of right ovarian specimens.

The box plot shows a different distribution of the widest diameter of the various right ovarian specimens.

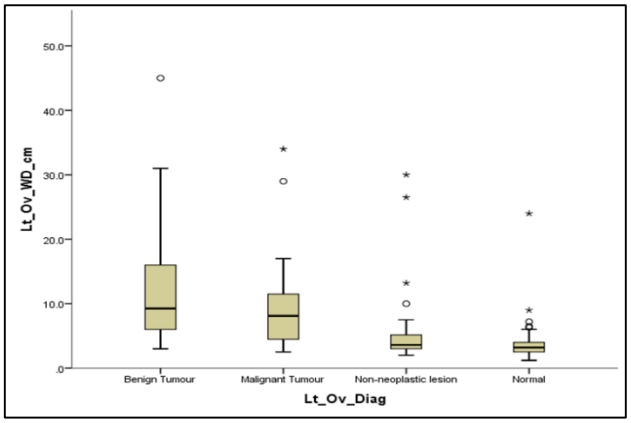

Figure 3: Boxplot of the widest diameter of the various classes of left ovarian specimens.

The boxplot shows a different distribution of the widest diameter of the various left ovarian specimen.

Table 1: The cut surface appearance of the categories of lesions seen in the right ovary.

Variables	Cystic	Normal	Solid	Total
Benign tumour	19	0	0	19
Borderline tumour	2	0	0	2
Malignant tumour	11	0	14	25
Non-neoplastic lesion	41	0	11	52
Normal	0	127	0	127
Total, n (%)	73 (32.4)	127 (56.4)	25 (11.1)	225 (100)

Table 2: The cut surface appearance and age characteristics of the various right ovarian specimens.

Diagnosis	Cystic	Normal	Solid	Total	Average diameter (cm)	Mean age (In years)	Median age (In years)	Minimum age (In years)	Maximum age (In years)
Benign simple cyst	4	0	0	4	4.0	55.0	52.0	49	67
Benign teratoma	11	0	0	11	3.0	41.7	45.5	17	55
Borderline mucinous tumour	2	0	0	2	8.4	53.5	53.5	47	60
Brenner tumour and metastatic mucinous carcinoma	0	0	1	1		39.0	39.0	39	39
Corpus luteum cyst	10	0	0	10	7.0	45.3	45.0	33	67
Corpus luteum haemorrhagicum	9	0	8	17	5.0	41.1	42.5	32	50
Endometrioid adenocarcinoma	1	0	5	6	3.6	58.7	63.0	34	75
Endometriosis	0	0	3	3	3.5	59.0	65.0	37	75
Fibrothecoma	1	0	0	1	10.0	61.0	61.0	61	61
Follicular cyst	14	0	0	14	7.0	43.8	45.0	30	55
Granulosa cell tumour	2	0	0	2	9.1	42.5	42.5	36	49
Inflammation	3	0	0	3	3.9	42.3	45.0	23	59
Metastatic carcinoma	1	0	7	8	2.5	56.5	52.5	40	83
Mucinous adenocarcinoma	1	0	1	2	1.3	76.0	76.0	76	76
Mucinous cystadenoma	3	0	0	3		50.0	43.0	37	70
Normal	0	127	0	127	2.9	51.8	50.0	21	82
Ovarian torsion	2	0	0	2	5.0	27.0	27.0	17	37
Serous adenocarcinoma	5	0	0	5	5.0	55.0	53.0	43	69
Serous cystadenoma	4	0	0	4	4.2	47.3	51.5	28	58
Total	73	127	25	225		48.3	48.0	5	85

Table 3: The cut surface appearance of the categories of lesions seen in the left ovary.

Variables	Cystic	Normal	Solid	Total
Benign tumour	21	0	3	24
Malignant tumour	18	0	7	25
Non-neoplastic lesion	50	0	1	51
Normal	0	133	0	133
Total, n (%)	89 (38.2)	133 (57.1)	11 (4.7)	233 (100)

Table 4: The cut surface appearance and age characteristics of the various left ovarian specimens.

Diagnosis	Cystic	Normal	Solid	Total	Average diameter (cm)	Mean age (In years)	Median age (In years)	Minimum age (In years)	Maximum age (In years)
Benign Brenner tumour	2	0	0	2	6.0	42.00	42.00	39	45
Benign simple cyst	8	0	0	8	21.6	45.50	44.00	17	67
Benign teratoma	11	0	0	11	9.5	42.45	36.00	5	75
Benign teratoma and Brenner	1	0	0	1	6.0	34.00	34.00	34	34
Benign teratoma with metastasis	1	0	0	1	11.0	60.00	60.00	60	60
Benign teratoma with mucinous cystadenoma	1	0	0	1	31.0	49.00	49.00	49	49
Corpus luteum cyst	19	0	0	19	5.2	41.95	46.00	5	51
Corpus luteum haemorrhagicum	5	0	1	6	3.3	44.17	46.00	33	50
Endometrioid adenocarcinoma	1	0	1	2	11.0	55.50	55.50	47	64
Endometriosis	2	0	0	2	8.0	38.00	38.00	27	49
Fibrothecoma	1	0	3	4	8.6	52.00	54.50	36	63
Follicular cyst	14	0	0	14	3.9	45.36	46.00	27	55
Granulosa cell tumour	3	0	1	4	21.9	59.50	61.00	40	76
Inflammation	2	0	0	2	6.8	39.00	39.00	38	40
Leiomyoma	2	0	0	2	11.3	28.50	28.50	19	38
Metastatic carcinoma	3	0	3	6	6.1	59.17	55.00	42	83
Metastatic GIST	1	0	0	1	17.0	54.00	54.00	54	54
Mucinous adenocarcinoma	1	0	0	1	5.0	76.00	76.00	76	76
Mucinous cystadenoma	2	0	0	2	36.8	47.00	47.00	39	55
Normal	0	133	0	133	3.6	51.02	49.00	22	82
Serous adenocarcinoma	7	0	2	9	6.3	52.78	53.00	35	69
Serous cystadenoma	1	0	0	1	28.5	59.00	59.00	59	59
Thyroid carcinoma with benign teratoma	1	0	0	1	-	65.00	65.00	65	65
Total	89	133	11	233		48.29	48.00	5	85

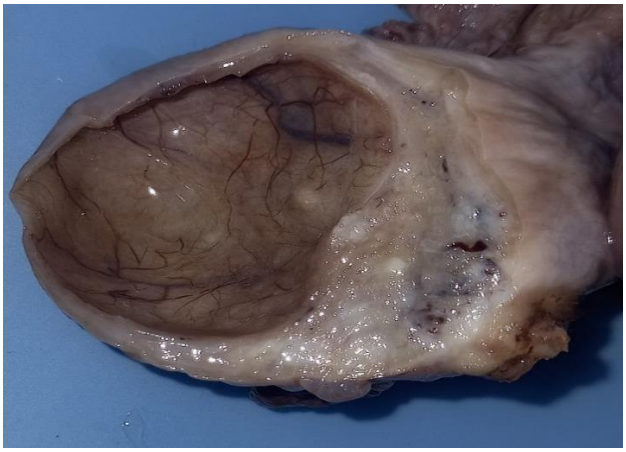

Figure 4: Cut surface of a left ovarian follicular cyst.

The picture shows the cut surface of a cystic left ovary measuring 4.5×3.5×2.6 cm. The cut surface shows greyish-white solid tissue and a cyst measuring 2.8 cm in widest diameter. It contained a serous fluid.

DISCUSSION

Examination of the cut surface of ovarian specimens has been helpful in making the diagnosis of ovarian lesions. It can be very difficult to distinguish benign tumours from malignant ones. However, examination of the gross specimen can favour either a malignant or benign lesion. In our study, we demonstrated that the distribution of ovarian widest diameter varies between the various classes of ovarian specimens. The widest diameter of the benign tumours tends to be greater than that of the malignant

tumours. This may be connected to the fact that many benign tumours are slow-growing and cause little or no symptoms. This makes them continue growing for a long time before detection, either because of pressure symptoms or other effects. Many of them are left undetected and may be noticed after death, at autopsy. Malignant tumours of the ovary can be occultic and tend to evade detection until the very late stages.[4-6] Although it is not detected early, it probably does not grow for periods as long as that of benign tumours, as it is much more likely to be detected when it presents with symptoms in the late stages. The boxplot in Figure 2 showed significant overlap in the distribution of the diameter of both benign and malignant ovarian tumors. Hence, the diameter of the ovary cannot be used exclusively in distinguishing these lesions in gross examination. Other gross morphological characteristics must be considered in addition to size.

The average widest diameter of non-neoplastic ovarian lesions is much smaller than that of benign and malignant tumours. This is expected as the non-neoplastic lesions, which include corpus luteum cysts, endometriosis, follicular cysts, and inflammatory lesions, are not predominantly proliferative in nature. Most of these non-neoplastic lesions involve hyperplasia of the parenchyma or infiltration of the ovary by inflammatory cells and fluid.

We noticed that an ovary with the widest diameter of less than 6 cm is very likely to be non-tumorous.

The average diameter of the normal ovary is quite like that of the non-neoplastic lesions of the ovary but much smaller than that of the benign and malignant tumours of the ovary. This indicates that in most cases, if the ovary is of normal size, it's extremely unlikely that there will be any tumour in the ovary. It is very important to note that ovaries can have a normal size and still contain a malignant tumour. We saw a case of serous papillary adenocarcinoma in a normal-sized ovary that metastasized to many lymph nodes, including an axillary lymph node.

Some studies have shown borderline ovarian tumours to be larger than malignant ones.[7] Although we found borderline tumours to have the highest average widest diameter in the right ovary, we cannot make a conclusive statement on this as we only saw two cases. A larger study with many borderline tumours is needed to make a conclusive statement. We expect the average diameter of the borderline tumours to be somewhere between that of benign and malignant tumours. It is possible that we could only identify a few borderline tumours because most cases of ovarian masses present at the hospital late. Any borderline lesion is more likely to have transformed before detection.

All the benign ovarian tumours seen in our study were cystic. This is like the findings made by other authors.[8] We defined a cystic ovary as an ovary with a cavitary lesion greater than 2.5 cm, lined by epithelial cells, and with minimal or very thin solid tissue. Therefore, any cystic ovary with an ovarian diameter greater than 6cm is very likely to be neoplastic in nature. It will be difficult to distinguish malignant lesions from benign lesions based on this, as there is significant overlap between the two classes of tumours.

More than half of the malignant tumours are totally solid. Compared with other categories of ovarian lesions studied, it is seen that malignant tumours have the highest proportion of solid lesions. It is well established that ovarian masses with predominantly solid-cut surfaces are malignant. As frozen section diagnosis of ovarian lesions can sometimes be very challenging, it might be advisable to examine the cut surface of the ovary after excision at surgery and use the findings to decide whether more extensive surgery or further intraoperative evaluation will be needed. This is particularly useful if an imaging study is not available or is inconclusive. A significantly enlarged ovary with a solid-cut surface should be strongly suspected to be malignant.

We noticed that all the cases of endometriosis on the left ovary were cystic, while those on the right side were solid. The average age for the right-sided endometriosis was 59 years, which was much more than 38 years for the left-sided cases. It is possible that right-sided endometriosis is more commonly discovered after menopause. However, a larger study is required before a definite conclusion can be drawn.

Metastatic carcinoma is seen to involve both ovaries and is found to mainly have a solid-cut surface. However, three out of six cases involving the left ovaries and one out of eight cases involving the right ovaries are seen as cystic. It is important to note that cystic structures can also be seen in metastatic ovarian disease and are not just restricted to primary ovarian tumours.

The primary mucinous tumours of the ovaries were found to be predominantly cystic. This conforms to general reports that also state that the ovary can attain a massive size.[9-12] The only case of mucinous cystadenocarcinoma affected both the right and left ovaries. Our findings corroborate reports in the literature that mucinous adenocarcinomas, although less likely to be bilateral than their serous counterparts, can present with involvement of both ovaries.[13] Finding a purely cystic mucinous neoplasm does not rule out malignancy, as seen in the case of mucinous adenocarcinoma involving the left ovary. Pathologists must endeavour to thoroughly examine multiple sections of cystic mucinous neoplasms to look for evidence of malignancy.[13]

There have been rare reports of GIST metastasizing to the ovary.[14-17] From our study, we found a case of metastasis of GIST to the left ovary. This was in a 54-year-old woman. It is not unusual for GIST in its primary site to have a cystic cut surface; hence, the cystic nature of the ovarian lesion is not unexpected. It is important to thoroughly evaluate spindle cell tumours of the ovary to

ascertain their nature, as it is possible to misdiagnose GIST as leiomyoma. Immunohistochemistry using c-kit, DOG-1, CD34, Desmin, h-caldesmon, and SMA will be very useful in making this distinction.

There have been reports of leiomyoma involving the ovary.[18-20] It is important to note that all the cases of leiomyoma of the ovary we identified were in the left ovary. From our experience, it is important to thoroughly study the clinical and imaging findings together with adequate histologic sections before you can draw a conclusion about ovarian leiomyoma. This is necessary because uterine leiomyomas, which are more common, could be wrongly labelled as ovarian.

Serous cystadenocarcinomas involving either of the ovaries are predominantly cystic. Although the presence of mucin on the cut surface of the ovary can help identify mucinous tumours of the ovary, it might be a bit challenging to distinguish benign mucinous lesions from malignant ones. This is because malignant mucinous tumours can be extensively cystic with minimal solid areas. Mucinous tumours can also have mild atypia. It is important to extensively sample many areas of the ovaries before drawing a conclusion.

We observed that the normal left ovaries were smaller than the right ovaries. We have no explanation why this is the case. Pathologists need to take note of this fact when interpreting size changes in the ovary. The finding of a bigger right ovary does not necessarily indicate the presence of a lesion in that ovary.

CONCLUSION

The widest diameter of the benign tumours tends to be greater than that of the malignant tumours. The average widest diameter of non-neoplastic ovarian lesions is much smaller than that of benign and malignant tumours. Metastatic carcinoma is seen to involve both ovaries and is found to mainly have a solid-cut surface. The primary mucinous tumours of the ovaries were found to be predominantly cystic. The normal left ovaries were smaller than the normal right ovaries.

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