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Ultrasound Study of Ovarian Masses

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Abstract: ***Background: After the breast and uterine cancers the third most commonly encountered variety is the carcinoma of the ovaries. The diagnosis often ends up late and the prognosis is poor. This study sincerely puts in an effort to evaluate the ovarian cancer patterns encountered in the USG. The fellow practising radiologists would make a point to check and do the same if possible. Methods: This study was done in the Department of Radiology, at Fathima Institute of Medical Sciences, Kadapa, Andhra Pradesh, This study was done from 2014 to 2016. Detailed personal history was taken. A total of thirty cases were studied and the results that were obtained were tabulated. All the statistical analysis was done using the latest SPSS software (2015). California. Results: Based on ultra sound features, thirteen cases of benign tumours were cystic, one case was bilocular, three cases were multilocular, No cases of complex or solid masses were recorded in benign tumours in the study. Among the malignant tumours, two cases were cystic, one case was bilocular, four cases were multilocular, four cases were complex and two cases were solid in nature. Nine cases of cystic tumours showed wall thickness less than five mm and four cases of cystic masses showed wall thickness more than five mm. Conclusion: The following study successfully shows the importance of USG in diagnosing the ovarian mass in its early stages. None of the patients were below fifty years so it makes absolute sense to at least check the malignancy as a routine in patients who has crossed menarche.***

Keywords: Ovarian malignancy, Menarche, USG, Cystic, Reproductive Organ

1. Introduction

Ovary is the female reproductive organ which is almond shaped, corrugated and pearly grey in colour. Each ovary measures around thirty five mm in length, twenty five mm in width and eighteen mm in thickness. The ovary is attached to the back of broad ligament by mesovarium. Lateral relation of ovary is the fossa below bifurcation of common iliac artery and ureter. Medially ovary is related to fimbria of fallopian tube. Ovary is attached to the cornu of uterus via the ovarian ligament.

Ovary before puberty is smaller and located near the brim of pelvis. Post - menopausal ovaries are shrunken and atrophied and measure around twenty mm in length, ten mm in width and fifteen mm in thickness. In postmenopausal women any ovary which appears larger than the above mentioned values ultrasonically is of great concern.

Ovary is the third most common site for gynaecological malignancies. The prognosis is usually poor. Ovary is complex in embryology, histology, steroidogenesis and has a potential for malignancy. Ovarian growths can occur at any age. [1]

The risk factors for ovarian cancers are, smoking, family history and exposure to HRT. Usually the symptoms are vague and non-specific [2]. Early menarche, late menopause and nulliparity are associated with increased risk of malignant ovarian tumours.

FIGO staging of ovarian cancer is world - wide followed as follows. [3]

Ovarian malignancies spread via direct spread, lymphatic spread and blood spread. Directly it can spread to other pelvic and intra - abdominal organs, omentum and under surface of diaphragm. Lymphatic spread can occur to the inguinal lymph nodes, para aortic lymph nodes, mediastinal lymph nodes and cervical lymph nodes. Via blood it can spread to liver, lungs and sometimes to the bone and brain.

Ultrasound can be the primary investigation which can be employed for diagnosing any ovarian mass. If the tumour is abdominal, a Trans abdominal transducer is used. A trans vaginal ultrasound gives a clearer picture in most cases.

A benign cyst can be unilateral, unilocular or multilocular with a thin wall and septae of less than five mm in case of multilocular cyst. The cavity is non-echogenic. In ninety five percent of cases, the above mentioned findings with normal CA-125 levels below 35 U/ml indicate benign nature of the tumour.

In about fifty percent of stage 1 epithelial ovarian malignant tumours, a raised level of CA-125 can be seen.

A solid tumour is almost always suggestive of malignancy, except in cases of fibroma and Brenners tumour. If ultrasound reveals that a tumour is bilateral (sometimes unilateral) or a solid tumour associated with ascitis, thick tumour wall with echogenic areas within the tumour, septum more than five mm in thickness with papillary projections from its walls indicate that the tumour is malignant in nature. The presence of ascitis in ultrasound strongly indicates the nature of the tumour to be malignant. A menopausal ovary measuring more than 2 cm in length, 1.5cm in width and 1 cm in thickness and volume of about 8 ml indicates an ovarian growth to be present.

A colour flow Doppler can further add information about neo vascularisation. CT/MRI can help in recognizing the spread of the tumour and helps in planning the modality of treatment. Fine needle aspiration cytology can give a hint about the nature of the tumour. Tissue markers like CA-125 and NB/70k can be used to follow up certain tumours. [1]

Transvaginal ultrasound with high frequency (5-7 MHz) probes can be recommended for initial assessment of adnexal masses. Transabdominal ultrasound is of value in the detection of ascites and peritoneal carcinoma, but in assessment of pelvic masses it is of minimal use. Ultrasound can accurately identify the morphology of an ovarian mass, measure tumour size [4] and it can be as accurate as CT/MR for diagnosis of ovarian cancer with a sensitivity of 86-95% and a specificity of 68-90%. A mass is considered complex if it has some solid content inside, thick irregular septa and associated ascites. [5] [6] [7] [8].

This study sincerely puts in an effort to evaluate the ovarian cancer patterns that are commonly encountered in the USG. The study is intended to be helpful for the budding radiologists and the whole of practising radiological fraternity to understand the most commonly encounter patterns and thus prevent the agonising outcome.

2. Aims and Objectives

To study the ovarian masses using ultrasonography.

3. Materials and Methods

This study was done in the Department of Radiology, this study was done from 2014 to 2016.

Detailed history was taken. The patients were asked about the personal history in detail.

The patients were readied for the USG.

A total of thirty cases were studied and the results that were obtained were tabulated.

Incidence, age group to which they belong, CA – 125 study and the ultrasonographic features were studied and noted in detail.

The patients were then sent for biopsy and the specimen was sent to the Department of Pathology for the detailed histo-pathological review.

Only Histo – pathologically confirmed cases the details of the USG were reviewed again and the features were noted.

Inclusion Criteria

- Only when the ovarian mass was seen in the USG the case was taken up for the study.

Exclusion Criteria

- A case in which the serological CA 125 level confirmation was not done was not taken up for the study.
- Microscopic tumors in which the mass was not evident on the studies were not taken up for the study.

All the statistical analysis was done using the latest SPSS software (2015). California.

4. Results

Table 1: Showing incidence of ovarian tumors in age groups

Age	*Frequency*	*Percentage*
< 50 years	0	0
50 – 60 years	09	30.1%
60– 70 years	14	46.6%
>70 years	07	23.3%
Total	30	100%

Table 2: Showing associated findings

Findings	*Frequency*
CA – 125 >35 u/l	13
CA – 125 < 35 u/l	17
Ascitis	9

Table 3: Showing type of tumour based on ultra - sonographic features

	Cystic	Bilocular	Multilocular	Complex	Solid	Not Found
Benign	9	1	3	0	0	4
Malignant	2	1	4	4	2	NIL

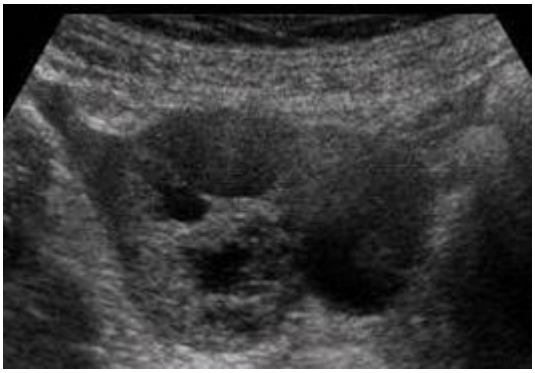

Image 1: Showing the multi-cystic swellings of the ovary

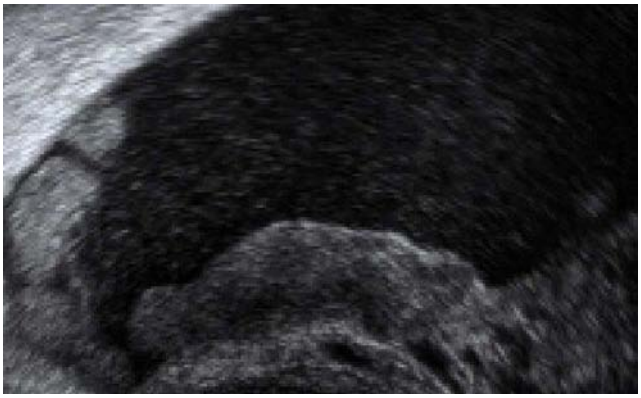

Image 2: Pouch of Douglas

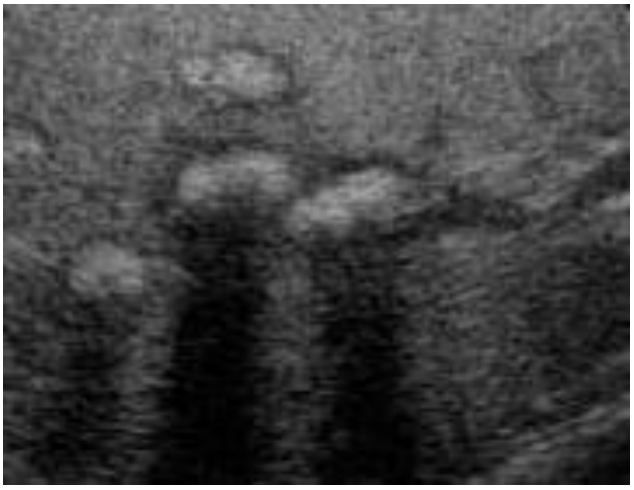

Image 3: Metastasis

Table 4: Showing wall thickness of cystic masses

Wall thickness	*Frequency*
<5 mm	9
>5 mm	4

Table 5: Enhancement into the medulla or the peritoneum (Pouch of Douglas)

Age * Enhancement Crosstabulation

			Enhancement heterogenous	Total
Age	50 and below	Count	6	6
		% within Age	100.0%	100.0%
		% within Enhancement	20.0%	20.0%
	51 - 60	Count	12	12
		% within Age	100.0%	100.0%
		% within Enhancement	40.0%	40.0%
	61 - 70	Count	7	7
		% within Age	100.0%	100.0%
		% within Enhancement	23.3%	23.3%
	Above 70	Count	5	5
		% within Age	100.0%	100.0%
		% within Enhancement	16.7%	16.7%
Total		Count	30	30
		% within Age	100.0%	100.0%
		% within Enhancement	100.0%	100.0%

Table 6: Lymph node enhancement

Age * Lymph nodes Crosstabulation

			Lymph nodes		
			Nil	Present	Total
Age	50 and below	Count	0	6	6
		% within Age	.0%	100.0%	100.0%
		% within Lymph nodes	.0%	20.7%	20.0%
	51 - 60	Count	0	12	12
		% within Age	.0%	100.0%	100.0%
		% within Lymph nodes	.0%	41.4%	40.0%
	61 - 70	Count	1	6	7
		% within Age	14.3%	85.7%	100.0%
		% within Lymph nodes	100.0%	20.7%	23.3%
	Above 70	Count	0	5	5
		% within Age	.0%	100.0%	100.0%
		% within Lymph nodes	.0%	17.2%	16.7%
Total		Count	1	29	30
		% within Age	3.3%	96.7%	100.0%
		% within Lymph nodes	100.0%	100.0%	100.0%

Table 7: Local Viscera extension

Age * adjacent viscera extension Crosstabulation

			adjacent viscera extension		
			nil	Present	Total
Age	50 and below	Count	4	2	6
		% within Age	66.7%	33.3%	100.0%
		% within adjacent viscera extension	26.7%	13.3%	20.0%
	51 - 60	Count	5	7	12
		% within Age	41.7%	58.3%	100.0%
		% within adjacent viscera extension	33.3%	46.7%	40.0%
	61 - 70	Count	4	3	7
		% within Age	57.1%	42.9%	100.0%
		% within adjacent viscera extension	26.7%	20.0%	23.3%
	Above 70	Count	2	3	5
		% within Age	40.0%	60.0%	100.0%
		% within adjacent viscera extension	13.3%	20.0%	16.7%
Total		Count	15	15	30
		% within Age	50.0%	50.0%	100.0%
		% within adjacent viscera extension	100.0%	100.0%	100.0%

Table 8: Metastasis

Age * Metastasis Crosstabulation

			Metastasis		
			Nil	Present	Total
Age	50 and below	Count	6	0	6
		% within Age	100.0%	.0%	100.0%
		% within Metastasis	31.6%	.0%	20.0%
	51 - 60	Count	8	4	12
		% within Age	66.7%	33.3%	100.0%
		% within Metastasis	42.1%	36.4%	40.0%
	61 - 70	Count	2	5	7
		% within Age	28.6%	71.4%	100.0%
		% within Metastasis	10.5%	45.5%	23.3%
	Above 70	Count	3	2	5
		% within Age	60.0%	40.0%	100.0%
		% within Metastasis	15.8%	18.2%	16.7%
Total		Count	19	11	30
		% within Age	63.3%	36.7%	100.0%
		% within Metastasis	100.0%	100.0%	100.0%

Image 4: The statistics of sensitivity and Specificity for the USG when evaluated with histology

	Disease				
Test	**Present**	**n**	**Absent**	**n**	**Total**
Positive	True Positive	a= 30	False Positive	c= 00	a + c = **30**
Negative	False Negative	b= 4	True Negative	d= 00	b + d = **4**
Total		a + b = **34**		c + d = **0**	

Test

Results

Statistic	Formula	Value	95% CI
Sensitivity	$\frac{a}{a+b}$	88.24%	72.55% to 96.70%
Specificity	$\frac{d}{c+d}$		
Positive Likelihood Ratio	$\frac{Sensitivity}{100 - Specificity}$	0.88	
Negative Likelihood Ratio	$\frac{100 - Sensitivity}{Specificity}$		
Disease prevalence	$\frac{a+b}{a+b+c+d}$	100.00% (*)	89.72% to 100.00%
Positive Predictive Value	$\frac{a}{a+c}$	100.00% (*)	88.43% to 100.00%
Negative Predictive Value	$\frac{d}{b+d}$	0.00 % (*)	0.00% to 60.24%

5. Discussion

WHO has classified ovarian tumours as following:-

- Epithelial tumours
- Serous tumours
- Mucinous tumours
- Endometroid tumours
- Clear cell tumours
- Brenner tumours
- Mixed epithelial tumours
- Undifferentiated carcinoma
- Unclassified epithelial tumours
- Sex cord stromal tumours
- Granulosa cell tumours, theca cell tumours
- Androblastomas
- Gynandroblastomas
- Unclassified
- Lipid cell tumours
- Germ cell tumours
- Dysgerminoma
- Endodermal sinus tumour
- Polyembryoma
- Choriocarcinoma
- Teratoma
- Mixed tumour
- Gonadoblastoma
- Soft tissue tumours
- Unclassified tumours
- Metastatic tumours

Serous cystadenomas are the most common benign epithelial tumour. It is bilateral in 10% of cases and usually unilocular.

Mucinous cystadenoma is the second most common benign epithelial tumour. It is a large unilateral multilocular cyst.

Brenner tumour is more common after forty years. It is usually less than 2 cm in size.

Sex cord stromal tumours represent 4% of benign ovarian tumours. They can occur at any age including children and post menopause. They are hormone secreting.

Germ cell tumour shows differentiation along the embryonic pathway. They can be divided into three categories.

- Mature (Benign)- eg. Dermoid cyst
- Immature (Malignant)- eg. Solid teratoma
- Monodermal (Highly specialized)- eg. Stuma ovarii
- 80-85 % of all malignant ovarian tumours are epithelial tumours. Of the epithelial tumours, serosa type accounts for 50%, endometroid accounts for 10%, mucinous type accounts for 10%, clear cell type accounts for 5% and undifferentiated accounts for 10-15%.

Germ cell tumours account for 2-3% of all ovarian malignancies. It is usually seen in younger women.

In the present study, maximum number of cases i. e 46.6 percent were seen in age group sixty to seventy years which amounted to fourteen cases, followed by age group less to fifty to sixty years which showed 30.1 percent of cases which amounted to nine cases. Seven cases were seen in age group more than eighty years which amounted to 23.3 percent. No cases were recorded in age group of less than sixty years which met the study parameters.

Thirteen cases studied showed the levels of CA – 125 more than 35 u/l which indicated malignancy. Seventeen cases showed CA – 125 levels less than 35 u/l which indicated benign nature. Abdominal ascites was seen in nine cases.

Based on ultra sound features, thirteen cases of benign tumours were cystic, one case was bilocular, three cases were multilocular, No cases of complex or solid masses were recorded in benign tumours in the study.

Four of the USG scans did not find out any evidence of the benign tumor. But the subjects were found to have USG scans did not find out any evidence of the benign tumor. But the subjects were found to have carcinoma of the ovary by histopathological study.

Among the malignant tumours, two cases were cystic, one case was bilocular, four cases were multilocular, four cases were complex and two cases were solid in nature.

Nine cases of cystic tumours showed wall thickness less than five mm and four cases of cystic masses showed wall thickness more than five mm.

The findings of this study based on ultra sound features was similar to the study done by Osmers R et al.[9] PLCO (USA) had reported two hundred twelve cases out of thirty four thousand patients who underwent screening[10]. UKC-TOCS had reported thirty four cases when the screening number of patients that were included were close to fifty thousand.[11]

According to a study conducted by Surendra Kumar Saini et al[12] the parity of the women had a major function. It was reported that nulliparous women are more susceptible to the disease. In our study the same was found. The study conducted by us is in agreement with the other study.

6. Conclusion

In the present study it is established that,

- The disease is more common in the elderly females. None of the patients were below fifty years.
- The disease commonly effects the nulliparous women more.
- The USG studies have to be confirmed by Histopathological studies.
- False negativity is not high but also at the same time is not impossible.
- CA 125 can be added as a compliment in screening.
- The most commonly found patterns in the USG in the descending order of frequency are multilocular, bilobed, solid and so on.

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