Diagnostic accuracy of ultrasonography with color doppler imaging techniques in adnexal masses and correlation with histopathological analysis

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Abstract

Introduction: Adnexal mass is common in all age groups but very common among women of reproductive age. An adnexal mass may be benign or malignant. It is the risk of malignancy that propels us for early, accurate and prompt diagnosis to lessen the mortality and morbidity. Ultrasonography is considered the primary imaging modality for confirmation of the ovarian origin of mass and characterization of nature of mass as benign or malignant. Color Doppler and CT scan may also be more informative. Histopathological diagnosis is definitive. we did study on total of fifty (50) patients who had complain of mass lesion/lesions in adnexal region, pelvic pain, unexplained weight loss, ascites, lump abdomen, abdominal distension. They underwent ultrasound, color doppler examination.USG and color doppler findings are confirmed by histopathological diagnosis. we studied the accuracy, sensitivity and specificity of USG and COLOR DOPPLER in the diagnosis of adenexal masses.
Keywords: Adnexal, benign, malignant, Ultrasonography, Color Doppler, accuracy, sensitivity, specificity.

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INTRODUCTION

Adnexal mass is common in all age groups but very common among women of reproductive age. An adnexal mass may be benign or malignant. It is the risk of malignancy that propels us for early, accurate and prompt diagnosis to lessen the mortality and morbidity. Imaging by ultrasonography helps to locate its origin [ovarian, uterine, cervix or bowel loops] the mass size, consistency, internal architecture by scoring system which will grade the malignant tumors. With the development of sonography including Doppler study it is possible to make early and more specific pre and intraoperative evaluation of adnexal mass and to develop individual strategies of adnexal mass and avoid unnecessary interventions. Ultrasonography is considered the primary imaging modality for confirmation of the ovarian origin of mass and characterization of nature of mass as benign or malignant.[1] It correlates morphologic images with gross macroscopic pathologic features of ovarian masses. However, when morphologic features alone are applied to the prediction of ovarian malignancy, there is tendency to over diagnose malignant tumors because of a substantial overlap between malignant and benign masses. Therefore, addition of color Doppler imaging with pulsed Doppler spectral analysis improves the characterization of ovarian masses by means of quantitative blood flow measurements obtained from tumor vessels and so increases sensitivity and specificity of characterization of ovarian masses.[2]. When a mass is detected on sonography it should be characterized by location, size, external contour and internal consistency. The vast majority of ovarian masses are functional in nature. The size of mass

is important as the mass of < 5 cm is usually benign whereas larger masses have a higher incidence of malignancy. Complex masses may be either benign or malignant and should further be assessed for wall-contour, irregular borders, thick irregular septations, papillary projections and echogenic solid nodules all of which favour malignancy. Color and spectral Doppler may also be of value-vascularity may be demonstrated within septae or nodules, high resistance flow strongly suggests benign disease. Although Ascites may associated with benign disease but it is much more frequently seen with the malignancy. Color Doppler has been proposed in differentiating benign from malignant neoplasms, based on the fact that malignant neoplasms usually have a low resistance index. A resistive index of less than 0.4 and a pulsatility index of less than 1.0 are considered suspicious of malignancy. However, due to overlap of these findings in benign and malignant neoplasms, the clinical utility of Doppler imaging is limited.[3].

Table 1: Ovarian neoplasms classification of ovarian neoplasm: [4]

Sr. No.	Type	Examples
I	Surface Epithelial Stromal Tumours	Serous cystadenoma (carcinoma) Mucinous cystadenoma (carcinoma) Endometrioid carcinoma Clear cell carcinoma. Transitional cell tumor (Brenner)
II	Germ cell tumors	Teratoma- mature, immature, monodermal, mixed Dermoid Dysgerminoma Yolk-sac tumor Embryonal Carcinoma, Choriocarcinoma.
III	Sex cord-stromal tumor	Granulosa cell tumor Sertoli- leydig cell tumor Thecoma and fibroma Gynandroblastoma Unclassified
IV	Metastatic tumors	Genital primary- uterus Extragenital primary- stomach, Colon, breast, lymphomas.

Table 2: Staging of Ovarian Carcinoma:[5]

Stage		Description
I	IA	Tumour confined to ovaries Limited to one ovary, no ascites, no tumour on external surface: capsule intact.
	IB	Limited to both ovaries, no tumour on external surface: capsule intact. Stage IA or IB.
	IC	Tumour on surface of one or both ovaries; or with capsule ruptured; or with ascites present containing malignant cells or with positive peritoneal washings.
II	IIA	Tumour in one or both ovaries with pelvic extension Extension to uterus and/or fallopian tubes. Extension to other pelvic structures.
	IIB	Stage II A or IIB.
	IIC	Tumour on surface of one or both ovaries; or with capsule ruptured; or with ascites present containing malignant cells or with positive peritoneal washings
III	IIIA	Tumour involving one or both ovaries with peritoneal implants outside the pelvis and/or positive retroperitoneal or inguinal lymph nodes. Tumour grossly limited to true pelvis with negative nodes but histologically confirmed microscopic seeding of abdominal peritoneal surfaces.
	IIIB	Tumor involving one or both ovaries with histologically confirmed implants of abdominal peritoneal surfaces with not exceeding 2cm in diameter.Nodes is negative.
	IIIC	Abdominal implants greater than 2cms in diameter and/or positive retroperitoneal or inguinal lymph nodes.
IV		Tumour involving one or both ovaries with distance metastasis.

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MATERIAL AND METHODS

Study Design

This study was done in Mahatma Gandhi Medical College and Hospital, Jaipur, Rajasthan from October 2012 to November 2014. A total of fifty (50) patients having mass lesion/lesions in adnexal region will be taken up for the study, all the patient who present with pelvic pain, unexplained weight loss, ascites, lump abdomen, abdominal distension underwent ultrasound, color doppler examination

Ultrasound Examination

Ultrasound examination is done in patient with full bladder, in supine position by real time scanning technique using 3-5 MHz linear or sector transducer (Toshiba Nemio 5501X). Detailed ultrasound examination of b/l ovaries fallopian tubes is done. The number size and echotexture of lesion will be delineated.

Color Doppler Examination

All the patients were evaluated by Color Doppler ultrasonography using a Toshiba Nemio 5501X machine with pulsed Doppler system and equipped with a color velocity imaging system for color blood flow codification. After characterizing masses by their morphology, color velocity imaging gate was activated to identify blood flow. The resistance index was calculated in each case. The lowest resistive index detected at any point in the mass was considered for analysis. The masses which were completely avascular with no blood flow were considered as benign. The Doppler findings were considered suggestive of malignancy when: Resistive index (RI) < 0.4513

Fine Needle Aspiration Cytology/Biopsy

Equipment used for FNAC was as follows: A 20 or 22 Gauge (Outer diameter 0.7 mm) spinal type needle with removable stylet and beveled tip was used in the study. The patient was asked to suspend respiration. After ensuring the needle tip in the lesion, Stylet was removed and syringe was attached to it. Continuous maximum suction was applied while needle oscillated up and down. Usually up to 3 passes were made to ensure adequate material for cytologic evaluation. The Suction was released after withdrawing the needle. Aspirated material was smeared thoroughly over the glass slides and fixed immediately. The slides were stained primarily with Giemsa stain, special stains were used whenever necessary.

Cytologic Aspects

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RESULTS

The study was conducted in the department of radio diagnoswas from October 2012 to November 2014 in Mahatma Gandhi institute of medical sciences, Jaipur, Rajasthan. Total 50 patients were included in thwas study. All the patients underwent sonography, and FNAC/HPE FNAC was done under US guidance which was diagnostic of the lesions and was the gold standard

- In our study, the maximum percentage of patients were in the age range of III and IV decade (56%). Mean age of patient distribution in our study was 38.56 and S.D. was 11.93.

- Most of the patient were in pre menopausal age group 31 (62%) out of them (24/31) 77.41% were benign whether 19 (38%) patients were in post menopausal age group among them (13/19), 68.42% were malignant.

- The most common clinical feature with which the patients presented was pain abdomen (70%), followed by Lump abdomen (34%). Whether 8% patients present with urinary frequency or pressure symptom.

- There were 41 patients present with U/L mass, out of them (29/41) 70% were benign whether 9 patients present with B/L mass out of them (8/9) 88% were malignant.

- Mass >5 cm in post menopausal age group (11/15) 73% were malignant and mass >5 cm in pre menopausal age group (20/25) 80% were benign.

- Hypoechoic lesion on USG examination were 19 (38%) out of them (17/19) 89% were benign. Hyper echoic Lesions were 9(18%) among them (7/9) 77% were malignant. Lesion with mixed echo texture were22 (44%) among them (11/22) 50% were benign and (11/19) 50% were malignant.

- Lesion which were purely cystic were 17 (34%) out of them (16/17) 94% were benign and the lesion with mixed internal conswastency (with solid component and _+calcification) were 33, out of them (19/33) 57% were malignant.

- Lesion with absent or < 3mm septal thickness were 35 (70%) in number, out of them (28/35) 80% were benign and the lesion with septal

thickness >3 mm were 15 (30%) in number among them (13/15) 86% were malignant.

- Lesions with irregular innerwall were 14 (28%) in number, out of them (13/14) 92% were malignant and the lesion with regular innerwall were 36(72%) in number among them (29/36) 80% were benign.

- Ascites was present in 22 (44%) patient, out of them (17/22) 77% were malignant and the patient with absent ascites were 28 (56%) in number, out of them (25/28) 89% were benign.

- There were 19 (38%) patients with absent flow and all were benign. 9 (18%) patients have only peripheral flow out of them 8/9 (88%) were benign. 10 (20%) patients have only internal flow among them 9/10 (90%) were malignant. Patients with peripheral and internal flow were 12 (24%) in number out of them 10/12 (83.3%) were malignant.

- In 19 patients flow was absent so R.I. can't be calculated.

- There were 10 (20%) patients with increased R.I. out of them 8/10 (80%) were benign and 21 (42%) patients with decreased R.I. out of them 19/21 (90.48%) were malignant.

- Hwastopatologic dwastribution of total 50 adnexal masses include in our study was 30 (60%) benign and 20 (40%) were malignant. Benign cases include serous cyst adenoma 10(20%), mucinous cyst adenoma 3(6%), benign cystic teretoma 5 (10%), simple cyst 9 (18%), par ovarian cyst 1 (2%), ovarian abscess 1 (2%) and chocolate cyst (endometrioma) 1(2%). Malignant cases include mucinous cystadenocarcinoma 8 (16%), serous cystadenocarcinoma 6 (12%), clear cell carcinoma 2 (4%), granulosa cell tumour 1(2%), sex cord tumour 1 (2%), krukenberg tumour (metastatwas from carcinoma breast) 1 (2%), metastatic papillary carcinoma 1 (2%). In our study 30 (60%) tumour were surface epithelial tumour.
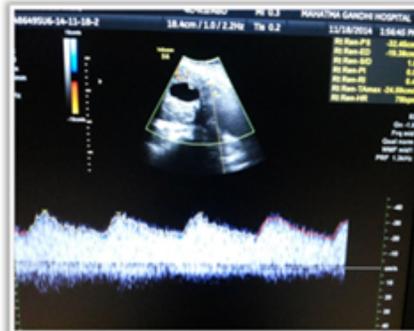

Figure 1: Granulosa cell tumour
Figure 2: Bilateral krukenberg tumer
Figure 3: Right ovarian mucinous cystadenoma
Figure 4: Benign cystic teretoma

DISCUSSION

Histopatologic distribution of adnexal masses include in our study was 30 (60%) benign and 20 (40%) were

malignant. Benign cases include serous cyst adenoma 11(22%), mucinous cyst adenoma 3 (6%), benign cystic teretoma 4 (8%), simple cyst 9 (18%), par ovarian cyst 1 (2%), ovarian abscess 1 (2%) and chocklet cyst 1(2%). Malignant cases include mucinous cystadenocarcinoma 8 (16%), serous cystadenocarcinoma 6 (12%), clear cell carcinoma 2 (4%), granulosa cell tumour 1(2%), sex cord tumour 1 (2%), krukenberg tumour 1 (2%), metastatic papillary carcinoma 1 (2%). In our study 30 (60%) tumour were surface epithelial tumer,which was similar to previous study done by Kurman R J. e*t al* 1994. In the current study it is found that masses that were purely cystic 17 (34%) were tend to benign16/17 (94%). And the masses which was mixed internal consistency with and without calcification were 33 (66%), among them 19 (19/33)57% were malignant. Thus the presence of solid component favour the diagnosis of malignancy. Similar results were found in the study of Brown *et al* 2010, He concluded that USG demonstration of a solid component in a cystic mass is the most important predictor of malignancy, conversely malignancy is very unlikely in the absence of a solid component. Solid component can be seen in benign as well as borderline tumours On colour Doppler examaination there were19 (38%) patients with absent flow and all were benign. 9 (18%) patients have only peripheral flow out of them 8/9 (88%) were benign. 10 (20%) patients have only internal flow among them 9/10 (90%) were malignant. Patients with peripheral and internal flow are 12 (24%) in number out of them 10/12

(83.3%) were malignant. Similar result found in previous study of Shazia *et al*., JL Alcazar *et al*

CONCLUSION

In the current study USG, USG + Color Doppler, has sensitivity respectively 76.6%, 86.6%, to diagnose benign and malignant adnexal masses. In our study the imaging features of malignancy were: presence of masses bilaterally, size >5cm, hyper echoic mass, partly cystic - solid mass, with solid components cystic or solid –cystic lesions with thick and irregular walls or septa of thickness >3mm and /or with papillary projection. The presence of associated findings such as ascites, peritoneal metastasis and lymphadenopathy indicate malignant mass. On colour Doppler examination presence of blood flow in the mass with decreased RI indicate malignancy.

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