

Ultrasonographic Evaluation and Differentiation of Adnexal Masses with Histopathological Correlation

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Abstract

Background: Adnexal mass is common among women of reproductive age group. Diagnosis of these as benign and malignant are difficult and complex. Prompt identification and treatment is essential for an unruffled life. Pelvic ultrasonography remains the mainstay for this endeavor. Advent of Doppler in combination with greyscale ultrasonography has extended the imaging ability to characterize these lesions.

Aim: To evaluate efficacy of ultrasound in differentiating malignant from benign adnexal lesions.

Materials and Methods: A prospective study of ultrasound evaluation was done from October 2016 to March 2018 on 95 patients. The data was used for sonomorphological characterization with Sassone Scoring for probability of malignancy and benignity. The findings were merged with doppler vascularity index to obtain an overall sonological result. The efficacy of the combined results was evaluated by postoperative histopathological results.

Results: Sonomorphological evaluation detected 77% of malignant lesions. Addition of doppler identified all the malignant lesions when equated with histopathological diagnosis. One benign lesion was misdiagnosed as malignant. The PPV increased from [77.3 %] to [95.6%]

and diagnostic accuracy from [90.3 %] to [98.9 %]. Statistical analysis attributed P value of 0.05, hence considered to be significant.

Conclusion: The present study demonstrates increase in sensitivity, specificity, PPV and NPV in preoperative diagnosis and characterization of adnexal masses. A significant improvement of PPV and diagnostic accuracy was found on addition of doppler to greyscale ultrasound alone. Sassone scoring combined with vascular parameters can be strongly recommended to achieve better characterization and differentiation of benign and malignant adnexal masses.

Keywords: Adnexal mass, Ovarian cancer, Sonomorphological assessment of adnexal lesion.

Introduction

Adnexal Mass"-One Of The Common Conditions Seen In Women Of Reproductive Age Group Receives Utmost Importance As This Usually Raises Anxiety Because Of The Possibility Of Malignancy. Surgery Is Often Required Solely To Exclude The Possibility Of Malignancy And About 1/3Rd. Of Tumours Operated Upon For Suspected Ovarian Cancer Turn Out To Be Benign. Strangely The Ovarian Tumours, Which Appear Most Frequently, Are Usually Physiological In Origin, Produce Acute Symptoms And Receive The Most Radical Of All

Treatment. In Contrast, Malignant Tumours Of Ovary Are The Most Lethal Of All Gynaecological Tumours And Usually Remain Silent Until Late In Course Of Treatment. Thus, Adequate Characterization Of Adnexal Mass Is Important Both To Determine Which Patient Need Surgery And To Help Define The Type Of Surgery And Whether A Surgical Subspecialist Is Needed.

The Sonographic Features Of A Given Pelvic Mass Can Accurately Differentiate Malignant From Benign Masses Almost Eliminating Need Of Further Evaluation By Other Modalities. Colour And Pulsed Doppler Sonography Can Be Used In The Assessment Of Angiogenesis In Tumour Masses, Providing Shrewd Details With Regard To Histology And Metabolism, Thus Giving The Specialist Surgical Acumen Without Any Doubt. This Study Was Conducted With The Deliberate Intension Of Establishing The Diagnostic Value Of Ultrasound In Imaging Adnexal Lesions And To Reinforce These Conclusions With Postoperative Histopathological Diagnosis.

Materials and Methods

A prospective study was conducted in all women who were suspected or detected to have a pelvic mass clinically OR diagnosed with an adnexal lesion as serendipity during a screening program or part of abdominal examination in Siddhartha Medical College Hospital and Research centre, Tumkur. Both Outpatients and Inpatients were included between October 2016 to March 2018. The subjects for this study were 95 patients with 99 adnexal masses. Morphological indexing of the lesions were done with Sassone Score¹ based on characteristics like inner wall structure ,wall thickness ,septae ,echogenicity .A total score of more than 9 was considered into the group of high risk cases (likely malignant).Following this colour and pulsed doppler imaging was done (using WIPRO GE Volusion 730 Pro

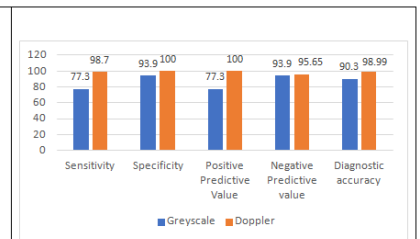
OR WIPRO GE Volusion S6 5-7.5 Mhz TVS and 1-5 Mhz TAS Probe) Optimisation of the parameters were done for the calculation of impedance indices. Flow results were recorded, fine branching vessels and peripheral flow were characterised as normal flow in the absence of aliasing. On Spectral doppler ,lowest RI ,PI and maximum PSV of the vessels within the lesions were used for the analysis. Doppler values of RI=0.40;PI=1.0 and PSV max of 15 cm/sec was considered suggestive of malignancy².The results were followed up with histopathological results.

Statistical Analysis

Validation of the study was done by tabulation of the observations from radiological and histopathological inferences and was subjected to statistical analysis. We used Fischer exact test for this. A P value of <0.05 was considered statistically significant. Morphological sassone scoring¹ had a suspicion of 17/99(17.17 %) cases of malignancy ,whereas vascularity index² showed 23/99 of cases to be malignant. The PPV increased from [77.3 %] to [95.6%] and diagnostic accuracy increased from [90.3 %] to [98 %]. One case was identified falsely as malignant. The overall study revealed a sensitivity of 98 % , specificity of 100 % , PPV 100 % , NPV 95.6 % and diagnostic accuracy of 98.99 %.

Greyscale and Vascularity	Grey scale	Doppler
Sensitivity	77.3	95.6
Specificity	93.9	97.4
Positive predictive value	77.3	95.6
Negative predictive value	93.9	97.4
Diagnostic Accuracy	90.3	98

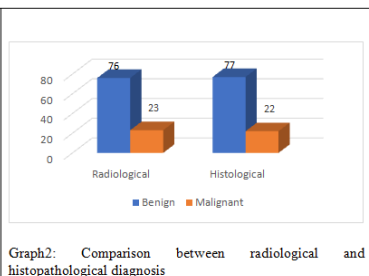
Table1: Comparison of Greyscale with Colour doppler



Graph1: Comparison of greyscale with Colour doppler

Radiological	Histopathological		p value
	Benign	Malignant	
Benign	76 (98.7)	-	<0.05
Malignant	1 (1.3)	22 (100.0)	
Total	77 (100.0)	22 (100.0)	

Table2: Comparison between radiological and histopathological diagnosis



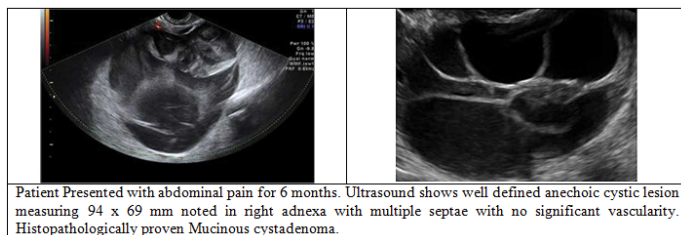
Discussion

For a connoisseur, be a gynaecologist or a subspecialist, who use radiological opinion as a scaffolding for his decisions, should receive an unmitigated result so that he doesn't confuse himself in the cross roads of variabilities in adnexal lesions .

A legitimate reporting pattern requires an in-depth evaluation of these variabilities, which takes into account both greyscale and spectral doppler parameters to give an absolute result which almost equate with the histopathological analysis. Of the total 99 cases included in the study, 77 (77.7 %) cases on histopathology were found to be benign and 22 (22.3 %) of cases were malignant. All features assessed in this study, including Greyscale characteristics and vascularity indices were significantly helpful in discriminating between benign and malignant adnexal masses. Though most of the malignant cases were found in sizes more than 5cm, there was much overlap between the benign lesions. Statistical significance could not be made out .Hence size of the lesion could not be considered into the diagnostic criteria. Sassone A M et al^[1],Brown DL et al^[7] and Yourk P et al ^[8] also reported no significant association of size of the mass with malignancy in their respective studies.

Majority of the cases were cystic, constituting 62.2 % of cases and rest were mixed. Almost all the benign cases had thin walls(<3 mm) and malignant ones had thick walls(>3 mm). Thus, wall thickness had significance in present study as one of the predictors for the analysis.

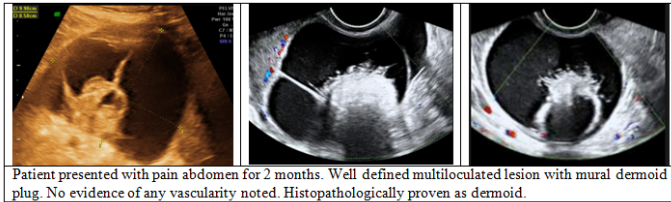
Sonomorphology has higher specificity in differentiating malignant from benign ovarian neoplasms - if dermoids, inflammatory masses and endometriomas are excluded by recognizing their specific sonographic characteristics^[1]. Morphologic assessment by three dimensional sonography yielded additional information, especially small papillary projections (<3mm), thick septae, and the relationship of the mass to surrounding structures.Papillary protrusions and abnormalities of the inner wall structure were the most reliable findings associated with ovarian carcinoma ^[1].



According to Folkman et al ;^[9] Metabolically active, dividing cancer cells produce angiogenesis factor that stimulates new blood vessel formation .These new tumour vessels are morphologically abnormal as they lack intimal smooth muscles , which are necessary for increasing peripheral vascular resistance^[9].Colour doppler imaging enables detection of the angiogenesis in malignant lesions and peripheral vascularity in Benign lesions. Morphologically, malignant tumour vessels are abnormal as they lack intimal smooth muscles in their walls and shows an irregular course with arteriovenous shunting. The presence of interface vessels helped in identifying the uterine origin of a well-defined solid juxta-uterine mass with prominent peripheral and central vascularisation and the mass was correctly identified as a subserous myoma^[10]

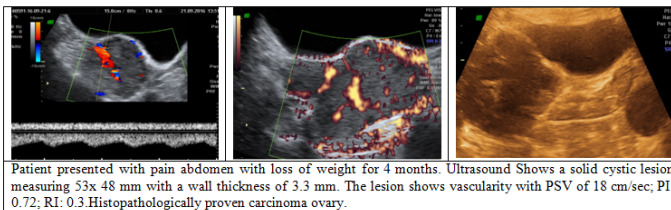
Benign cystic teratomas were the commonest benign ovarian neoplasms. These were high scoring lesions having characteristic imaging features- "Tip-of-the-

iceberg" sign^[11]; mobile hyper echoic fat balls^[12]; halo-like peripheral hypo echogenicity in solid appearing dermoids^[13] and a dermoid plug^[5]. The presence of solid components though generally indicative of malignancy, was also observed in benign neoplasms^[14]. The absence of flow on colour Doppler in echogenic portions of mucinous tumours helped to confirm the presence of mucin pockets/haemorrhage^[15].

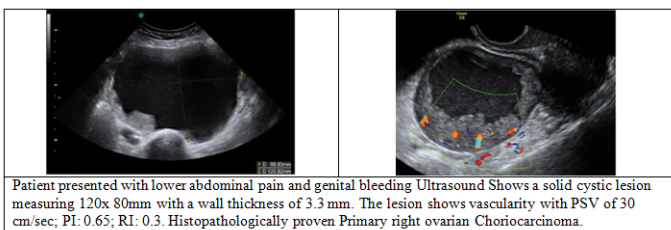


Patient presented with pain abdomen for 2 months. Well defined multiloculated lesion with mural dermoid plug. No evidence of any vascularity noted. Histopathologically proven as dermoid.

Present study demonstrated vascularity in all the histopathologically proven malignant lesions with characteristic spectral values. The lesions had almost equal prevalence of vascularity in wall and septae. Taory.K.et al.;^[16] in their study also encountered almost equal distribution of the tumour vascularity in cystic ovarian neoplasms in wall and septae.



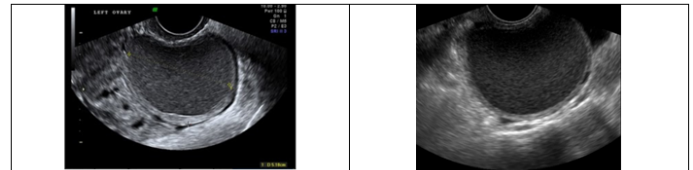
Patient presented with pain abdomen with loss of weight for 4 months. Ultrasound Shows a solid cystic lesion measuring 53x 48 mm with a wall thickness of 3.3 mm. The lesion shows vascularity with PSV of 18 cm/sec; PI: 0.72; RI: 0.3. Histopathologically proven carcinoma ovary.



Patient presented with lower abdominal pain and genital bleeding Ultrasound Shows a solid cystic lesion measuring 120x 80mm with a wall thickness of 3.3 mm. The lesion shows vascularity with PSV of 30 cm/sec; PI: 0.65; RI: 0.3. Histopathologically proven Primary right ovarian Choriocarcinoma.

Endometriomas show diverse appearances on ultrasonography- ranging from anechoic cystic lesions to echogenic cysts to masses containing multiple septations and solid tissue^[21]. Both ovarian and extraovarian endometriomas were seen in this study .Cysts with diffuse

low level internal echoes , multilocularity and hyper echoic wall foci which have been described as pathognomonic features of endometriomas by Patel et al^[6].



Patient presented with pain during menstruation. Well defined unilocular lesion with ground glass opacity measuring 50 x 48 mm. No evidence of any vascularity noted. Histopathologically proven endometrioma.

Of the benign lesions which showed vascularity on Doppler, three of the benign lesions had papillary projections/wall irregularities ,demonstrating vascularity within, whereas majority of the benign cases(86.6%) showed peripheral vascularity. All malignant lesions demonstrated papillary projections / irregularities with vascularity on doppler. Hassen K et al.^[17] reported that there is absence of colour flow in all papillary projections of benign ovarian masses while all papillary projections in the malignant ovarian masses demonstrated flow and Buy JN et al.^[18] demonstrated vascularity in all solid portions in the malignant adnexal masses in their study.

Our Study Revealed That All Malignant Lesions Fell Into Category Of $RI \leq 0.4$; $PI \leq 1.0$ And $PSV \geq 15$ Cm/Sec. Most Of The Previous Studies Also Had Significant Lower RI,PI And Higher PSV In Malignant Lesions. These Findings Were Consistent With Our Study. On Radiological Analysis One (Benign Mucinous Cyst Adenoma)Out Of 77 Cases Of Benign Lesions, Was Misdiagnosed As Malignant On The Basis Of Vascular Indices. It Showed Thick Septae With Papillary Projection, Wall Thickness Of > 3 mm And Appeared Hypoechoic On Grey Scale Imaging. A Resultant Sassone Score Of 10 Was Given. On Spectral Analysis It Showed A Peak Systolic Velocity Of 18 Cm/Sec, PI Of 0.9 And

RI Of 0.3, Which Made Us Categorize The Lesion Into Malignant One, But Turned Out To Be Benign On Histopathology. Benign Mucinous Tumors Are Still Difficult To Differentiate From Malignant Mucinous Lesions With Considerable Overlap Of Resistive Indices [19].

On Grey Scale And Doppler Evaluation, 76 (98.7%) Out Of 77 Histopathologically Confirmed Benign Adnexal Masses Were Correctly Diagnosed. Buy JN Et Al [18], Alcazar JL Et Al [4], Jain KA [19] Also Misdiagnosed Similar Lesions In Their Series As Malignant On Gray Scale US.

The Grey Scale Sensitivity And Negative Predictive Value Was At Par With Studies Conducted By Sassone Et Al [1]; Anuradha Et Al [3] And Specificity And Positive Predictive Value Was Correlating With Studies Conducted By Anuradha Et Al [3].

Study Showed An Overall Sensitivity (98.7%), Specificity (100%), PPV (100%), NPV (94.7%) And Diagnostic Accuracy (98.9%).

Tumour Doppler Assessment Has Some Controversial Reviews As These Lesions Imbricate In Their Values To A Certain Extend. However, We Could Establish And Assimilate Significant Ranges Of These Spectral Values Which Showed Higher Sensitivity, Specificity, Positive Predictive Value And Diagnostic Accuracy.

Conclusion

Identification Of The Ovarian Lesions And Extraovarian Adnexal Lesions Should Help Avoid Additional Or Unnecessary Imaging. Identifying Features That Strongly Suggest Malignancy Will Result In Timely Management Rather Than A Delay Caused By Additional Follow-Up Imaging. Finally, Proper Reporting And Management Recommendations Serve To Alleviate Anxiety And

Misinterpretation On The Part Of The Patient And Physician. [20]

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