COMPARATIVE STUDY OF USG B-MODE AND DOPPLER IN EVALUATION OF OVARIAN MASS LESIONS

Radiodiagnosis

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ABSTRACT

Background: Ovarian cancer is highly lethal due to delayed detection. Ovarian lesions display a myriad of findings on imaging. Knowledge of these is essential to make a diagnosis or list the differentials. USG remains the mainstay imaging modality in this war on cancer. **Aims & Objectives:** To assess the diagnostic accuracy of USG B-mode and doppler in characterisation of ovarian mass lesions. **Methods:** 103 women with ovarian lesions were evaluated with USG B-mode and doppler. The interpretation was compared with histopathology reports wherever possible. **Results:** With sensitivity and NPV of 81.82% and 84.62% of USG B-mode, it is a good primary imaging modality. By showing an increase in specificity to 94.23%, PPV to 89.29% and accuracy to 87.06%, the addition of doppler in the evaluation acts as a tool in confirmation of malignancy. **Conclusion:** With good diagnostic performance, USG proves to be a good primary imaging modality. Also, doppler evaluation forms a promising add-on that can be considered.

KEYWORDS

Ovarian, Ultrasonography [USG], Doppler

INTRODUCTION

Ovarian cancer represents one-fourth of all gynaecological malignancies and the third most common gynaecological malignancy. Though only eleventh most common cancer in women and only one-tenth as common as breast cancer, it's more lethal.^[1] The high mortality is due to delayed detection, late symptom onset and lack of proper screening.

The survival rate falls from 90% in stage I, 70% in stage II and 39% in stage III to 17% in stage IV. Only 15% of cases are detected when confined to the primary site.^[2] The earliest and accurate characterisation of ovarian lesions is thus warranted for better prognosis and decreased morbidity.

USG is an easily available and cost-effective dynamic imaging modality. It helps in lesion characterisation. With a skillful operator, USG can accurately characterise benign and malignant ovarian lesions, and the lesions requiring further workup.

MATERIALS & METHODS

103 patients with ovarian lesions were evaluated in the Department of Radiodiagnosis in M.G.M Medical College and M.Y Hospital, Indore from March 2019 to September 2020 after ethical and scientific committee clearance. Transabdominal and transvaginal USG was done. The lesion was evaluated in terms of its nature [cyst Vs solid], septae, echogenicity, solid portions, papillary projections, laterality, vascularity and ancillary features. Results were compared with the histopathological report. Statistical analysis was done. Cohen's kappa was applied.

RESULT

The age ranged from 18 to 80 years, with mean of 41.57 years [SD=13.8]. 32% were bilateral. 64.1% were cystic, 33% were mixed and 2.9% were solid. 61% of the lesions with cystic components were multilocular. Among the cystic and mixed lesions, thick septations, papillary projections and solid components were seen in 22%, 34% and 33% cases respectively. Solid lesions in our study were well-defined, heterogeneous, with foci of calcification, and 1 showing necrosis. The ancillary features - Ascites, omental deposits, lymphadenopathy, liver metastasis and pleural effusion were seen respectively in 21.3%, 6.8%, 4.9%, 2.9% and 4.8%. Vascularity was

seen in 71.8% cases, with central, septal and peripheral in 13.6%, 14.6% and 43.6% respectively. RI<0.5 was observed in 32.4% of the cases with vascularity. Considering intralesional solid component, papillary projections, thick septations and the noted ancillary features as features suggesting malignant nature, B-mode USG characterised 66% cases as benign and 34% as malignant. Adding intralesional low resistance blood flow as a malignant feature, 72.8% of cases were characterised as benign and 27.2% as malignant. Histopathological examination was done in 85 cases and 61% were benign and 39% were malignant. B-mode USG showed significant sensitivity [81.82%] and specificity [84.62%]. There was a notable increase of specificity [94.23%], PPV [89.29%] and accuracy [87.06%] when doppler findings were also considered in the characterisation.

DISCUSSION

USG continues to be the mainstay imaging modality in the evaluation of ovarian lesions. Considering the burden of ovarian cancer on women's health, early detection is important. With this background, we attempted to characterise the ovarian lesions with USG. The study population ranged from 18 to 80 years old, with a mean age of 41.57 years. More or less equal prevalence was noted in all age groups. Thus, it doesn't spare any age group.

The ovarian lesions we studied were predominantly purely cystic [64.1%], and the least was solid lesions [2.9%]. This is comparable to the studies by Guerra et al^[3] in 2008 and Khaled et al^[7] in 2014. Similar to the studies done by Umemoto et al^[4] in 2006 and Garg et al^[5] in 2017, the majority of the lesions in our study were unilateral [68%].

Features like intralesional solid component, papillary projections, thick septations, ancillary features and intralesional low resistance vascularity point towards the malignant nature of the lesion. Among cystic and mixed lesions, thick septations, papillary projections and solid components were found in 22%, 34% and 33% cases respectively. This was comparable with the observation made by Khalaf et al^[6] in 2018, where thick septations, papillary projections and solid components were observed respectively in 20%, 32.7% and 36.6% of their cases. The solid lesions in our study were well-defined, heterogeneous with foci of calcifications and 1 showing necrosis. This was comparable with the study done by Khaled et al^[7] in 2014, where 2 out of 20 cases were solid well-defined lesions, with cystic

degeneration in 1.

The ancillary features raising suspicion of malignant nature were noted to be ascites, omental deposits, lymphadenopathy, liver metastasis and pleural effusion, and were found respectively in 21.3%, 6.8%, 4.9%, 2.9% and 4.8% of our cases. This was comparable with the studies done by Guerra et al^[3] in 2008, who observed peritoneal nodules in 8.9% and lymphadenopathy in 4% of their cases. Also, Manali et al^[8] in 2014 observed ascites to be the most frequently noted ancillary finding in this setting.

On angiogenesis, the newly formed blood vessels show low impedance flow. Thus, low RI could be used as a predictor of ovarian malignancy. RI<0.5 was observed in 32.4% of the cases in our study. Similarly, Sehgal et al^[9] observed a low resistance flow pattern in 21% of their cases.

On final interpretation, using B-mode morphology, 66% of the cases were characterised as benign and 34% as malignant. On adding doppler findings, 72.8% were characterised as benign and 27.2% as malignant. This was comparable with the studies done by Garg et al^[5] in 2017 and Khalaf et al^[6] in 2018.

85 out of 103 lesions were histopathologically evaluated, 8 resolved eventually and 10 were lost during follow-up. Among the histologically evaluated lesions, 61% were benign and 39% were malignant. Goyal et al^[10] in 2016 observed a similar result of 60% benign and 40% malignant ovarian lesions. Histopathological evaluation revealed 26 mucinous cystadenomas, 16 serous cystadenomas, 4 hemorrhagic cysts, 2 endometriomas, 4 teratoma, 10 serous cystadenocarcinomas and 23 mucinous cystadenocarcinomas. Similar to the studies done by Li et al^[11] in 2011 and Khaled et al^[7] in 2014, the majority of the benign ovarian lesions in our study were epithelial cystadenomas [80%]. Mucinous cystadenocarcinomas comprise the majority [70%] of the malignant ovarian lesions. Similarly, Nasr et al^[12] observed 71% of the malignant lesions to be mucinous cystadenocarcinomas.

Figure 1: USG findings in A: Fat echogenic content in right ovarian lesion suggestive of teratoma; B: Unilocular right ovarian cystic lesion with ground glass echoes suggestive of endometrioma; C: Multilocular abdominopelvic solid cystic lesion from right ovary with varying echogenicity between locules and central vascularity with RI = 0.44, suggestive of mucinous cystadenocarcinoma

By detection of fat content, teratomas were accurately detected on USG, similar to the study by Guerra et al^[3] in 2008. 1 case was falsely characterised as hemorrhagic cyst, while it turned out to be an endometrioma. The accuracy in the characterisation of serous and mucinous lesions as malignant was respectively noted to be 92% and 84% respectively.

Table 1: Statistical analysis of USG evaluation of ovarian lesions

	USG [B-mode]	USG [B-mode + Doppler]
Sensitivity [%]	81.82	75.76
Specificity [%]	84.62	94.23
PPV [%]	77.14	89.29
NPV [%]	88.00	85.96
Accuracy [%]	83.53	87.06

B-mode USG had significant sensitivity and NPV. On addition of doppler evaluation, there was a notable increase in specificity, PPV and accuracy, however, sensitivity and NPV were reduced. USG [B-mode] had 83.52% agreement with histopathological examination with cohen's kappa 0.657, [substantial agreement], while USG [B-mode+ Doppler] observed 87.05% agreement and cohen's kappa of 0.719

[substantial agreement]. This was in concordance with the study by Goyal et al^[11] in 2016. Hence, by the addition of doppler evaluation, the imaging modality becomes more efficient in true identification of those without the ovarian malignancy.

The area under ROC [Receiver Operating Characteristic] curve was 0.832 for USG B-mode evaluation and became 0.850 when doppler was added, stating better performance when doppler is added

Graph 2: ROC curve

CONCLUSION

The crucial factor in ovarian malignancy is detection time. With early detection alone, it is possible to significantly improve the survival rate. With a sensitivity and specificity of 81.82% and 84.62% respectively, USG is a good primary imaging modality. It is non-invasive, has low cost and is a widely available dynamic imaging modality. On considering doppler findings along with B-mode morphology, specificity improved to 94.23%, and this is a promising add-on that can be utilised, without any additional cost.

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