International Journal of Radiology and Diagnostic Imaging

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Efficacy of MRI and USG in the evaluation of adnexal mass lesions and correlation with histopathological examination

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Abstract
Surgeries to adnexal mass lesions in the gynaecology practice is common. Ultrasonography (USG) and magnetic resonance imaging (MRI) are best in the characterization of adnexal mass lesions. MRI is superior modality than USG in the evaluation of indeterminate adnexal lesions. This study was aimed to assess the efficacy of USG and MRI in the evaluation of adnexal mass lesions and its comparison with histopathological examination. A total 60 female cases between age group 15-75 years with lower abdominal pain and menstrual irregularities were recruited. All the cases were undergone to trans-abdominal ultrasonography and MRI to evaluate adnexal lesions for content, nodularity, thickness of septum, thickness of wall, vascularity of lesion and ascites. In USG findings, 25% cases had malignant lesions and 75% cases had benign lesions. MRI reports showed that 28.33% had malignant lesions and 71.67% had benign lesions. Histopathological examination (HPE) of Post-operative specimen stated that 18.33% had malignant lesions and 81.67% had benign lesions. USG had 64.4% sensitivity, 100% specificity and 81.49% diagnostic accuracy. However, MRI had 92.65% sensitivity, 100% specificity and 96.4% diagnostic accuracy. MRI had high sensitivity, accuracy value than USG. MRI is dominant in diagnosis and characterization of adnexal mass lesion than ultrasonography.

Keywords: Transabdominal ultrasonography, magnetic resonance imaging (MRI), histopathological examination (HPE), adnexal mass lesions, diagnostic accuracy

Introduction
Characterization of clinically diagnosed adnexal mass lesions is difficult until histopathological examination and surgical exploration are done [1]. To decide the need of surgery, to define and planning of the surgical procedure, lesion characterization is must [2]. Globally, 5-10% women were undergoing surgeries for adnexal masses, among them 25% or less are malignant rest 50-75% are benign. Exploratory laparotomies was the only choice to diagnosis of adnexal lesion before, now surgical laparoscopy has been implemented to manage lesions [3]. Diagnosis of adnexal lesions based on radiological findings have become revolution, which helped to cease the unwanted surgeries [4].
Ultrasonography (USG) is a preliminary choice in the diagnosis of adnexal masses because it is cost effective and easily available. Around 90% of adnexal mass lesion can be adequately diagnosed and characterized by USG alone -. However, MRI is superior diagnostic modality in the characterization of indeterminate adnexal masses diagnosed by USG [6, 7]. With the reference of above controvertible statement the present study was designed to assess the efficacy of USG and MRI in the evaluation of adnexal mass lesions and its comparison with histopathological examination.

Materials and Methods
The present prospective controlled study was conducted in the Department of Radiology, MNR Medical College and Hospital during March 2018 to September 2019. A total 60 female cases between age group 15-75 years with lower abdominal pain and menstrual irregularities were recruited. Cases with complex adnexal lesions and simple adnexal cyst more than 5cm were included, cases with ectopic pregnancy, simple adnexal cyst less than 5cm, having ovarian torsion were excluded. Informed consent was obtained from all the cases and study protocol was approved by the institutional ethics committee.

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All the cases were undergone to trans-abdominal ultrasonography to evaluate adnexal lesions for content, nodularity, thickness of septum, thickness of wall, vascularity of lesion and ascites. After ultrasonography all the study participants were subjected to MRI to evaluate lesion size, lesion content, thickness of septum, thickness of wall, nodularity, details of ascites, early arterial phase enhancement. Cases were evaluated by using MRI in different sequences like T1axial, T2 sagittal & coronal, T1 contrast axial & coronal and STIR coronal planes. The data was collected into Microsoft Office Excel 2010. The processes of exporting the coded data from excel to SPSS version 20.0 was employed.

Results

Table 1: Details of descriptive data of study participants

Parameter	Mean±SD
Age	36.88 ± 10.46
Menopause period	
Pre menopause	42 (70%)
Post menopause	18 (30%)
Symptoms	
Pain	46 (76.67%)
Lump	18 (30%)
Abnormal bleeding	15 (25%)
Irregular periods	14 (23.3%)
Laterality of disease	
Unilateral	80%
Bilateral	20%
Thickness USG	2.78 ± 1.02
Thickness MRI	3.18 ± 1.14

Table 2: Details of ultrasonography, MRI Findings in study participants

Parameter	Ultrasonography		MRI	
	Frequency	Percentage	Frequency	Percentage
Details of septum				
Present	38	63.3%	38	63.33%
Absent	22	36.67%	22	36.67%
Thickness of septal wall				
>3mm	09	15%	12	20%
<3mm	28	46.67%	17	28.33%
Nodule				
Present	08	13.3%	11	18.33%
Absent	52	86.67%	49	81.67%
Nature of the lesion				
Cystic	47	78.33%	46	76.67%
Solid-cystic	13	21.67%	14	23.33%
Details of ascites				
Present	05	8.33%	06	10%
Absent	55	91.67%	54	90%
Details of vascularity				
Central vascularity	11	18.33%	-	-
Peripheral vascularity	15	25%	-	-
Septal vascularity	08	13.3%	-	-
No vascularity	26	43.3%	-	-
Enhancement				
Present	-	-	16	26.67%
Absent	-	-	44	73.33%
Omental deposits				
Present	-	-	07	11.67%
Absent	-	-	53	88.33%
Lymphadenopathy				
Present	-	-	05	8.33%
Absent	-	-	55	91.67%
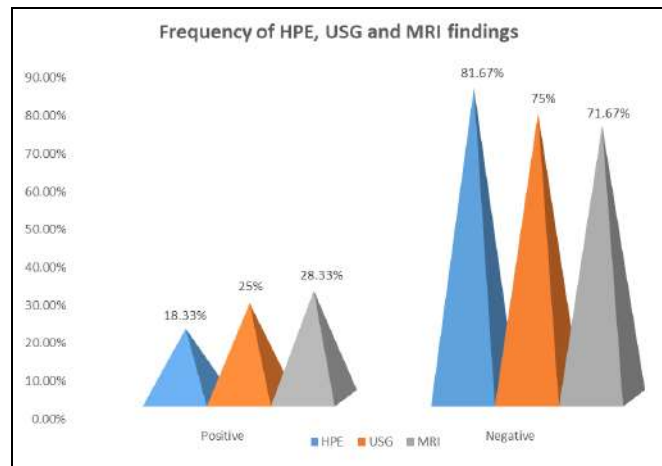
Fig 1: Frequency of HPE, USG and MRI findings among study participants

Table 3: Frequency of HPE, USG and MRI findings

Variables	HPE vs USG	HPE vs MRI
Sensitivity	64.4%	92.65%
Specificity	100%	100%
Positive predictive value	100%	100%
Negative predictive value	84.2%	97.6%
Accuracy	81.49%	96.4%

Discussion
Ultrasonography (USG) is the primary preference in the identification and characterization of adnexal lesions [8, 9]. Studies suggested that USG give 90% accurate diagnostic characterization adnexal masses [10]. MRI is an alternate a diagnostic tool for lesion evaluation after ultrasonography [11]. This study was designed to assess the efficacy of USG and MRI in the evaluation of adnexal mass lesions and its comparison with histopathological examination. The mean age of study participants was 36.88 years. Majority cases had unilateral lesions (80%) and 20% cases had bilateral lesions. These bilateral lesions were confirmed as malignant on histopathological examination. Septal thickness of lesion was 2.78mm by USG, whereas by MRI it was 3.18mm. Study by Shiva Shankar MP et al., observed that majority cases in between age group 21-40 years (32%) followed by 1-20 years (28%) with mean age 32 years. In view of laterality, 12% cases had lesions on bilateral side, 43% cases had right side and 45% cases had left side lesions [11]. Study by Aruna et al., observed mean age 30 years and Al-Shukri et al., found 29 years [12, 13]. Study by Adusumilli et al found mean age 46 years in their study which was much higher than the present study [14].

In this study, 76.67% cases were suffered with pain, 30% cases were with lump, 25% cases were with abnormal bleeding and 23.3% cases were suffered with irregular cycles of menstruation. Study by Shiva Shankar MP et al., found that 76% cases were suffered with pain, 26% with lump, 24% with abnormal bleeding and 21% cases with irregular periods [11]. Study by Guzel et al., and Al-Shukri et al., observed common complaint was abdominal pain in 77.5% and 98% cases respectively [13, 15].

USG findings in this study stated that thickness of septal wall was <3mm in 46.67% cases, whereas 15% cases had >3mm thickness. Nodules was absent in 86.67% cases and nodules was seen in 13.3% cases. Majority lesions were cystic in nature (78.33%) than solid cystic (21.67%). Ascites was seen in 91.67% cases. Central, septal and peripheral vascularity was seen in 18.3%, 13.3% and 25% respectively

(Table 2). MRI findings of this study stated that septal wall thickness was <3mm in 28.33% cases, whereas 20% cases had >3mm thickness. Nodules was absent in 81.67% cases and nodules was seen in 18.33% cases. Majority lesions were cystic in nature (76.67%) than solid cystic (23.33%). Ascites was seen in 90% cases. Omental deposits was seen in 88.33% cases and lymphadenopathy in 8.33% cases (Table 2). Study by Aruna et al., observed that on USG, 50% lesion were cystic, 18% were solid and 32% were complex lesions. Whereas on MRI, 56% were cystic, 18% were solid and 26% were complex lesions [12]. Study by Prabha et al., found that majority lesions on USG were solid (66%) followed by complex lesions (42%) and cystic lesions (0%). Whereas MRI found cystic, solid and complex lesions in 27%, 37% and 31% respectively [16].

In this study, on USG there were 25% cases of malignant ovarian lesion and 75% cases had benign lesions. MRI reports showed that 28.33% cases had malignant ovarian lesions and 71.67% cases had benign lesions. Histopathological examination of Post-operative specimen stated that 18.33% cases had malignant ovarian lesions and 81.67% cases had benign ovarian lesions (Figure 1). Shiva Shankar MP et al., in his study found 50 lesion, among that 16 lesion confirmed as malignant by MRI, 19 lesions as malignant by USG and 14 lesions confirmed as malignant by histopathological examination [11].

The comparison of findings of USG with HPE has 64.4% sensitivity, 100% specificity, 100% Positive predictive value, 84.2% Negative predictive value and 81.49% diagnostic accuracy. In comparison of MRI findings with HPE has 92.65% sensitivity, 100% specificity, 100% Positive predictive value, 97.6% Negative predictive value and 96.4% diagnostic accuracy. Study by Shiva Shankar MP et al., observed sensitivity and specificity of ultrasound was 92.5% and 93.3% respectively, whereas MRI has sensitivity and specificity of 97.1% and 100% respectively. MRI has more sensitivity and specificity value than USG [11]. Study by Aruna et al., found that the sensitivity and specificity for USG was 80% and 95% respectively. MRI had sensitivity of 100% and specificity of 97.7% [12]. Study by Madan R et al., on adnexal lesion by gray scale USG had sensitivity of 92.5% and specificity of 55.3%. The values of this study was similar to the findings of Hriack H et al and Scoutt LM et al. [17-19]. Study by Sohib et al., found accuracy of MRI in lesion detection has sensitivity of 95% and specificity of 88% [20].

Conclusion

In USG, there were 25% cases of malignant ovarian lesion and 75% cases had benign lesions. MRI reports showed that 28.33% cases had malignant ovarian lesions and 71.67% cases had benign lesions. Histopathological examination of Post-operative specimen stated that 18.33% cases had malignant ovarian lesions and 81.67% cases had benign ovarian lesions. The comparison of findings of USG with HPE has 64.4% sensitivity, 100% specificity, 100% Positive predictive value, 84.2% Negative predictive value and 81.49% diagnostic accuracy. In comparison of MRI findings with HPE has 92.65% sensitivity, 100% specificity, 100% Positive predictive value, 97.6% Negative predictive value and 96.4% diagnostic accuracy. The results concludes that MRI had high sensitivity, accuracy value than USG. MRI is dominant in diagnosis and characterization of adnexal mass lesion than ultrasonography.

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