Original Research Article

A comparative study of ultrasonography and magnetic resonance imaging features in the detection and characterization of adnexal mass lesions with histopathological examination as a gold standard

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Abstract
Background & Methods: The aim of the study is to compare study of ultrasonography and magnetic resonance imaging features in the detection and characterization of adnexal mass lesions with histopathological examination as a gold standard. The Department of Obstetrics and Gynaecology at our institution is the first place where female patients who appear with lower abdomen pain and menstrual irregularities are assessed initially. Following that, the Department of Radiodiagnosis is contacted in order to administer additional radiological evaluations to these individuals. Eighty-five patients were referred for evaluation using ultrasonography and magnetic resonance imaging (MRI) in this investigation.
Results: The USG diagnostic performance demonstrated a sensitivity of 85.45%, specificity of 80.00%, and accuracy of 83.53%. The MRI results showed a sensitivity of 96.36%, specificity of 86.67%, and accuracy of 92.94%. The most common MRI diagnoses were serous cystadenocarcinoma (22.4%) and serous cystadenoma (17.6%), which matched the HPE findings. The MRI accurately identified 67.1% of lesions as benign and 32.9% as malignant, while the histopathological examination (HPE) confirmed 62.4% as benign and 37.6% as malignant. The comparison between USG and HPE revealed that USG accurately detected 47 benign and 24 malignant lesions, but there were 8 instances where it misidentified benign lesion as malignant and 6 instances where it misidentified malignant lesion as benign. Based on the comparison between MRI and HPE, it was found that MRI successfully identified 53 benign and 26 malignant lesions, but there were 2 instances where it misidentified benign lesion as malignant and 4 instances where it misidentified malignant lesion as benign.
Conclusion: The high degree of concordance that exists between magnetic resonance imaging (MRI) and histopathological examination (HPE) demonstrates the reliability of MRI as a diagnostic tool, particularly in difficult circumstances when the results of ultrasonography (USG) are unclear. A further factor that contributes significantly to the accurate comprehension of adnexal masses is the detection of significant imaging characteristics, such as enhancement and lymphadenopathy on magnetic resonance imaging

(MRI). Given these findings, it is of the utmost importance to incorporate magnetic resonance imaging (MRI) as an integral component of the diagnostic procedure for adnexal masses.

Keywords: ultrasonography, adnexal, lesions & histopathological.
Study Design: Prospective comparative study.

1. INTRODUCTION

In the realm of gynaecology, adnexal masses are something that are found rather regularly. A substantial contributor to female morbidity, lesions of adnexal origin can also result in mortality, despite the fact that they are less common than other types of lesions. Consequently, they frequently require gynaecologic surgery to be performed. [1]
Lesions of the adnexa are most commonly seen in women who are of reproductive age; however, they can also manifest themselves in people of any age. In addition to the ovary, the fallopian tube, and the broad ligament, adnexa is composed of the blood vessels and nerve structures that are related to these tissues. Ovarian tumours are responsible for two thirds of these cases reported. As a result of the late identification of ovarian cancer and the limited efficiency of the treatments that are now available, ovarian malignancies are notorious for having a high death rate among gynaecological cancers. [1]
The presence of ovarian cancer is a significant factor in the overall death rate associated with gynaecologic tumours. It is quite rare to discover ovarian neoplasm in its early stages, which frequently leads to a diagnosis that is more far along in its progression. There are major complications associated with the treatment of an ovarian cancer that has progressed to its later stages [2]. In recent years, there has been an increase in the number of diagnoses of ovarian cancer. It is estimated that 3.6% of all cancer cases are caused by ovarian cancer, which has a death rate of around 4.3% [3].
There is a wide variety of adnexal lesions, some of which are benign and others of which are malignant. It is important to keep in mind, however, that benign lesions are significantly more prevalent than malignant ones. When it comes to analysing adnexal lesions, there are a lot of different elements to take into consideration, which can make it difficult for radiologists to deliver a correct diagnosis using just one imaging approach. Through imaging, it is possible to determine whether or not the mass poses a hazard to the patient, which helps patients avoid having to endure surgery that is not necessary and alleviates their fears. In contrast to the widespread belief, it is of the utmost importance to discover malignant masses at an early stage in order to guarantee that the patient receives treatment as soon as possible.[4]
Identifying the difference between benign and malignant adnexal lesions is one of the key concerns of radiologists. This allows them to guide patients towards the treatment strategy that is most appropriate for them. There are many instances in which it is not possible to tell whether a clinically diagnosed adnexal lesion is benign or malignant until surgical exploration and histological testing have been performed [5]. 7.8% of patients who are premenopausal have ovarian masses, while just 2.5% of women who have gone through menopause have ovarian masses [6-7].

2. MATERIAL AND METHODS

The study performed prospectively at the Department of Radiodiagnosis at Gajra Raja Medical College, Gwalior to describe the features of adnexal masses in female patients based

on USG and MRI and confirming on HPE. 85 patients with clinical suspicion of adnexal mass who referred to the Department of Radiodiagnosis, G.R.M.C. Gwalior for diagnosis and evaluation will be subjected to MRI.

An examination using ultrasonic technology is the first step in the evaluation procedure. Patients are subjected to transabdominal sonography, which is performed on an Esaote scanner with a curvilinear probe. The ultrasound examination focuses on a number of characteristics of adnexal lesions, such as the existence of ascites, the presence of content, the presence of nodularity, the thickness of the wall, the thickness of the septum, and the vascularity of the lesion.

INCLUSION CRITERIA
• Clinically suspected cases of adnexal mass lesions.
• Adnexal mass lesions observed on ultrasound.
• Adnexal mass lesions observed on MRI.

EXCLUSION CRITERIA
• Patients not giving consent.
• Contraindication to MRI study like patients with pacemaker, metallic implants, aneurysmal clips.
• Claustrophobia or anxiety disorder aggravated by MRI.
• Cases lacking both clinical and imaging findings are excluded.
• Ectopic pregnancy

3. RESULT

The age distribution of the participants in the study shows that the majority (50.6%) were between 41 and 60 years old. Participants aged 21 to 40 years made up 34.1% of the study population, while those aged 20 years or younger constituted 7.1%. Only 8.23% of the participants were older than 60 years. This age breakdown highlights that the findings are predominantly applicable to middle-aged adults, with fewer data points from the younger and older age groups.

Table 1: Age group Distribution

Age group	Frequency	Percent
≤ 20	6	7.1%
21-40	29	34.1%
41-60	43	50.6%
>60	7	8.23%
Total	85	100.0%

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Table 2: Nature of lesion on USG

	Frequency	Percent
Solid	4	4.7%
Solid Cystic	20	23.5%
Cystic	61	71.8%
Total	85	100.0%

In the study, the majority of adnexal mass lesions were cystic, accounting for 71.8% of the cases. Solid cystic lesions were observed in 23.5% of the participants, while purely solid lesions were relatively rare, comprising only 4.7% of the cases. This suggests that cystic characteristics are the most common presentation in adnexal masses.

Table 3: Diagnosis of lesion based on MRI

	Frequency	Percent
Endometrioma	5	5.9%
Corpus Luteal Cyst	2	2.3%
Teratoma	5	5.9%
Broad Uterine Fibroid	1	1.2%
Malignant Solid Cystic Tumour	5	5.9%
Benign Solid Tumour	2	2.3%
Metastasis	1	1.2%
Follicular Cyst	3	3.5%
Haemorrhagic Cyst	5	5.9%
Mucinous Cystadenocarcinoma	2	2.3%
Mucinous Cystadenoma	10	11.8%
Hydrosalpinx	3	3.5%
Para Ovarian Cyst	3	3.5%
Serous Cystadenocarcinoma	19	22.4%
Serous Cystadenoma	15	17.7%
Tubo-ovarian Abscess	3	3.5%
Broad Ligament Hematoma	1	1.2%
Total	85	100.0 %

In the study diagnosing adnexal lesions based on magnetic resonance imaging (MRI) findings, a total of 85 participants were evaluated. The most frequently diagnosed lesions were serous cystadenocarcinoma, found in 22.4% of cases, and serous cystadenoma, found in 17.6% of cases. Mucinous cystadenoma was diagnosed in 11.8% of participants. Endometrioma, teratoma, malignant solid cystic tumour, and haemorrhagic cyst each accounted for 5.9% of cases. Other diagnoses included follicular cyst, hydrosalpinx, para ovarian cyst, and tuboovarian abscess, each present in 3.5% of participants. Less common findings were corpus luteal cyst, benign solid tumour, broad uterine fibroid, mucinous cystadenocarcinoma, broad ligament hematoma, and metastasis, each constituting 1.2% to 2.3% of cases. This distribution highlights that serous-type cystadenomas and carcinomas were the most prevalent adnexal masses detected by MRI.

Table 4: Frequency of benign and malignant lesions on MRI

	Frequency	Percent
Benign	57	67.1 %
Malignant	28	32.9 %

In the study using ultrasonography (USG) for the diagnosis of adnexal lesions, % of the lesions were identified as benign, amounting to 57 cases. Malignant lesions were identified in 32.9 % of the cases, which corresponds to 28 cases. This indicates that the majority of adnexal lesions detected by MRI were benign.

Table 5: The cross-tabulation of HPE and MRI findings

		HPE		Total
		Benign	Malignant	
MRI	Benign	53	4	57
	Malignant	2	26	28
	Total	55	30	85

The cross-tabulation of histopathological examination (HPE) and magnetic resonance imaging (MRI) findings in the study for the diagnosis of adnexal lesions revealed the following: Out of the total 85 cases, 53 lesions identified as benign on MRI were confirmed as benign on HPE. However, 4 cases initially classified as benign on MRI were found to be malignant on HPE. Conversely, 2 lesions identified as malignant on MRI were determined to be benign on HPE. Importantly, 26 cases classified as malignant on MRI were confirmed as malignant on HPE. This indicates that MRI demonstrated high accuracy in identifying both benign and malignant lesions, with a very low rate of misclassification.

4. DISCUSSION

There is a wide range of variations in the adnexa of the uterus, from benign cysts to potentially malignant tumours. Timely and precise identification and understanding of these masses are crucial for effective clinical care and favourable patient results. Ultrasonography (USG) and Magnetic Resonance Imaging (MRI) are commonly used imaging techniques to evaluate adnexal masses without the need for invasive procedures[8]. Ultrasound (USG) is a widely used imaging technique due to its widespread availability, cost-effectiveness, and ability to provide real-time imaging. The MRI technique provides excellent soft tissue contrast and the ability to capture images from various angles, offering valuable information for analysing complex adnexal masses. This study aims to assess the correlation between histopathological examination (HPE), ultrasonographic findings, and MRI evaluations to achieve an early and conclusive diagnosis of adnexal masses[9].

This study has the potential to significantly enhance diagnostic accuracy in the evaluation of adnexal masses, resulting in improved patient outcomes. By conducting a comprehensive analysis of the efficacy of USG and MRI in comparison to the gold standard of HPE, this study seeks to provide valuable insights into the advantages and disadvantages of each imaging technique[10]. Accurate and prompt diagnosis of adnexal masses is crucial in differentiating between benign and malignant growths, offering valuable insights for effective clinical treatment, and potentially reducing the need for invasive procedures. This study aims to contribute to the existing literature by providing current data and unique perspectives that

can influence clinical practice guidelines and decision-making in the field of gynaecological oncology.

The study included participants with a wide range of ages, from 18 to 64 years old, with an average age of 41.7 years. This aligns with findings from multiple recent studies. For instance, a study conducted by Prasad et al. (2020) revealed that the average age of participants in a comparable group was 38.2 years. The effectiveness of ultrasound and magnetic resonance imaging (MRI) in detecting adnexal masses was investigated by this cohort. According to a recent study, the researchers discovered that the participants had an average age of 43.5 years[11]. A comparison was made between the utilisation of ultrasound (USG) and magnetic resonance imaging (MRI) techniques. The findings are consistent with the usual age distribution observed in studies on adnexal masses, indicating that they are frequently detected in women who are in their middle age.

5. CONCLUSION

The high degree of concordance that exists between magnetic resonance imaging (MRI) and histopathological examination (HPE) demonstrates the reliability of MRI as a diagnostic tool, particularly in difficult circumstances when the results of ultrasonography (USG) are unclear. A further factor that contributes significantly to the accurate comprehension of adnexal masses is the detection of significant imaging characteristics, such as enhancement and lymphadenopathy on magnetic resonance imaging (MRI). Given these findings, it is of the utmost importance to incorporate magnetic resonance imaging (MRI) as an integral component of the diagnostic procedure for adnexal masses.

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