

Spectrum of Adnexal Pathologies: Comparative Evaluation of Ultrasound and 3T - Magnetic Resonance Imaging

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Abstract: *Background: Adnexal lesions present a significant diagnostic challenge in gynaecological practice. This study aims to investigate the correlation between ultrasound and 3T - Magnetic Resonance Imaging (MRI) findings in the evaluation of adnexal lesions. The findings were further confirmed by histopathological evaluation.*

Keywords: Adnexal lesions, Ultrasound, Magnetic Resonance Imaging, Diagnostic imaging, Gynaecological pathologies

1. Introduction

Adnexal pathologies, which encompass a wide range of pathological conditions affecting the ovaries, fallopian tubes, and surrounding structures, pose a significant diagnostic challenge in gynaecological practice. These pathologies can vary in their aetiology, severity, and potential for malignancy, necessitating accurate and timely diagnosis for appropriate management. Imaging modalities, such as ultrasound and magnetic resonance imaging (MRI), play a crucial role in the evaluation and characterization of adnexal pathologies, guiding clinical decision - making and treatment planning.

Ultrasound, a widely available and cost - effective imaging technique, has long been the primary modality for the initial assessment of adnexal pathologies. It's ability to provide real - time, high - resolution images and its non - invasive nature make it an invaluable tool in the evaluation of pelvic pathologies. However, ultrasound has limitations, particularly in the characterization of complex adnexal masses and the assessment of their extent and involvement of surrounding structures.

Magnetic resonance imaging (MRI) has emerged as a powerful complementary imaging modality for the evaluation of adnexal pathologies. MRI offers superior soft tissue contrast and multiplanar imaging capabilities, enabling detailed anatomical delineation and tissue characterization. Additionally, MRI can provide valuable functional information through advanced techniques such as diffusion - weighted imaging (DWI) and contrast - enhanced imaging, which can aid in the differentiation of benign and malignant pathologies.

Despite the strengths of each modality, the correlation between ultrasound and MRI findings in the assessment of adnexal pathologies remains an area of ongoing investigation. This study aims to investigate the correlation between ultrasound and MRI findings in the evaluation of adnexal pathologies. By analysing a cohort of patients with adnexal pathologies who underwent both ultrasound and MRI examinations, the study will assess the concordance and discrepancies between the two imaging modalities in terms of

lesion detection, characterization, and staging. The findings of this research may have significant implications for optimizing diagnostic algorithms, refining imaging protocols, and improving the overall management of patients with adnexal pathologies.

2. Methods

This prospective, observational study was conducted at D Y Patil University School of Medicine, Nerul, Navi Mumbai. A total of 12 women with suspected adnexal lesions underwent both ultrasound and MRI examinations within a two - week interval. Two independent radiologists, blinded to clinical information and the results of the other imaging modality, reviewed and interpreted the images separately. The findings from both modalities were compared and correlated for each participant.

They assessed the presence, location, size, and characteristics of any adnexal pathologies, as well as their potential involvement of surrounding structures. The radiologists provided a presumptive diagnosis based on the imaging findings, using established diagnostic criteria and scoring systems.

The findings from the ultrasound and MRI examinations were compared and correlated for each participant. Discrepancies between the two imaging modalities were identified and categorized based on the type of lesion, lesion characteristics, and diagnostic concordance. In cases where discrepancies arise, a third radiologist with expertise in gynaecological imaging reviewed the cases and provides a consensus opinion.

Further, the findings were assessed for histopathological evaluation for confirmed diagnosis.

3. Results

The study included 12 patients, with the majority (66.6%) between 21 - 40 years old. There was a high degree of concordance between ultrasound and MRI diagnoses for most

cases, including mucinous cystadenoma, hydrosalpinx, dermoid cyst, and serous cystadenoma. MRI provided additional information or refined the diagnosis in several cases, such as characterizing an "adnexal cyst" on ultrasound as a serous cystadenoma. In one case, MRI definitively diagnosed a left adnexal neoplasm, which was initially suggested as a "tubo - ovarian mass" on ultrasound. Later, it was confirmed and diagnosed as serous carcinoma of fallopian tube on histopathology.

The study included 12 patients with adnexal lesions, with ages ranging from 21 to 60 years. The majority of patients (66.6%) were between 21 - 40 years old, indicating a higher prevalence

of adnexal pathologies in reproductive - age women. We found most adnexal pathologies were right sided (66.7%)

Table 1: Age and laterality distribution of the patients

Variable		Frequency (%)
Age in years	21 - 30	4 (33.3%)
	31 - 40	4 (33.3%)
	41 - 50	2 (16.7%)
	51 - 60	2 (16.7%)
Laterality	Right	8 (66.7%)
	Left	4 (33.3%)
Total		12 (100%)

Table 2: USG and MRI diagnosis

S. No	Age	MRD	Diagnosis on Ultrasonography	Diagnosis on MR	HPE	Frequency (%)
1	39	3590833	Right PCOD Left ovary multilobulated lesion.	Right PCOD Mucinous cystadenoma of left ovary	Right PCOD Mucinous cystadenoma of left ovary	1 (8.3%)
2	33	3862155	Right sided hydrosalpinx	Right sided hydrosalpinx	Right fallopian tube dilated and filled with serous fluid	1 (8.3%)
3	42	3809320	Right dermoid cyst	Right dermoid cyst	Mature cystic teratoma	1 (8.3%)
4	48	3781441	Left ovarian cystic lesion	Left ovarian serous cystadenoma	Left ovary - - serous cystadenoma	1 (8.3%)
5	29	3779043	Left ovarian endometriotic cyst	Left ovarian endometriotic / haemorrhagic cyst	Cystic Fluid with haemorrhagic component	1 (8.3%)
6	21	3776931	Right adnexal cyst	Serous cystadenoma in right adnexa	Serous cystadenoma - - right adnexa	1 (8.3%)
7	59	3769247	Right adnexal tubo - ovarian mass	Right sided tubo - ovarian mass with haemorrhagic component	Scanty fragmented endometrial glands	1 (8.3%)
8	36	3836464	Right ovarian cyst	Right sided complex para - ovarian cyst	Fluid filled cyst with ciliated lining	1 (8.3%)
9	38	3760367	Broad ligament fibroid in right adnexa	Right side Broad Ligament fibroid	Leiomyoma with focal cystic hydropic degeneration	1 (8.3%)
10	55	3731087	Large adnexal tubo - ovarian mass	Left adnexal neoplastic aetiology	Serous carcinoma of fallopian tube	1 (8.3%)
11	22	3758153	Right ovarian simple cyst	Right ovarian simple cyst	cystic fluid reveals macrophages against proteinaceous background	1 (8.3%)
12	27	3837305	Right adnexal cystic lesion.	Right sided peritoneal inclusion cyst	cystic fluid space lined by bland mesothelial cells	1 (8.3%)
Total						12 (100%)

The results demonstrate a diverse spectrum of adnexal pathologies, including both benign and malignant lesions. There was a high degree of concordance between ultrasound and MRI diagnoses for most cases (9/12 cases). For instance, hydrosalpinx, broad ligament fibroid, endometriotic cyst, dermoid cyst (mature cystic teratoma) and simple ovarian cyst were consistently diagnosed by both modalities.

However, there were some cases where MRI provided additional information or refined the diagnosis. For example, an "adnexal cyst" on ultrasound was characterized as a serous cystadenoma on MRI.

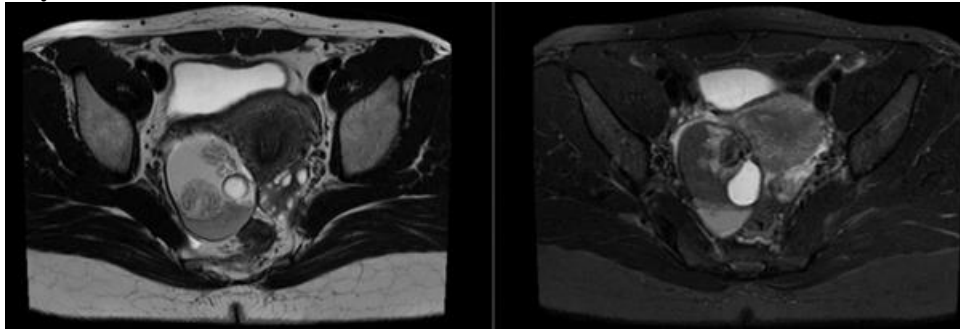
Notably, in three cases, a "multilobulated cystic lesion" suggested by ultrasound was definitively diagnosed as "mucinous cystadenoma of left ovary" by MRI. Another case of "right adnexal cystic lesion" suggested by ultrasound was definitively diagnosed as "right sided peritoneal inclusion cyst" by MRI and "left adnexal tubo - ovarian mass"

suggested by ultrasound was definitively diagnosed as "left adnexal neoplastic aetiology" by MRI, highlighting the superior tissue characterization capabilities of MRI.

The three cases showing discordance between ultrasound and MRI includes, "right adnexal cyst" suggested on ultrasound, diagnosed as "serous cystadenoma" on MRI. Another case of "right adnexal tubo - ovarian mass" suggested on ultrasound, diagnosed as "right sided tubo - ovarian mass with haemorrhagic component" on MRI, showed scanty fragmented endometrial glands on histopathological examination and "right ovarian cyst" suggested on ultrasound, diagnosed as "right paraovarian cyst" on MRI.

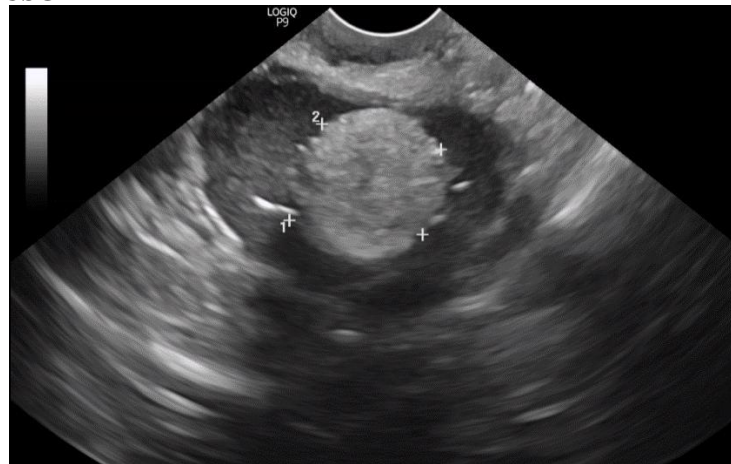
4. Images

Image 1: Dermoid cyst on MRI



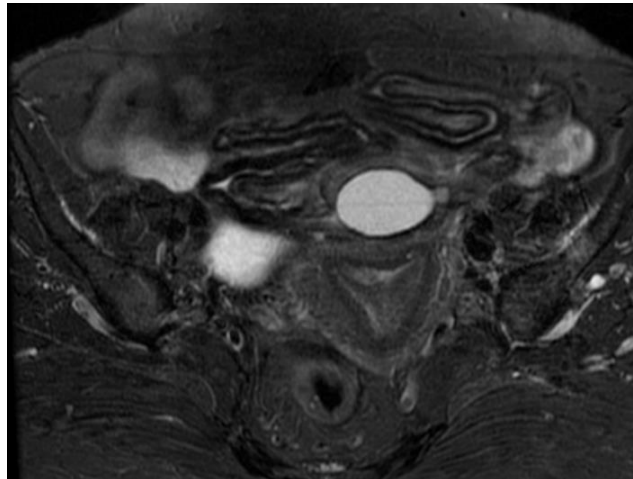
MRI revealed the presence of a unilocular, heterogeneous, sharply - defined mass originating from the right adnexa. A fluid - fluid level and a heterogeneous floating solid part were detected within the lesion.

Image 2: Dermoid cyst on USG



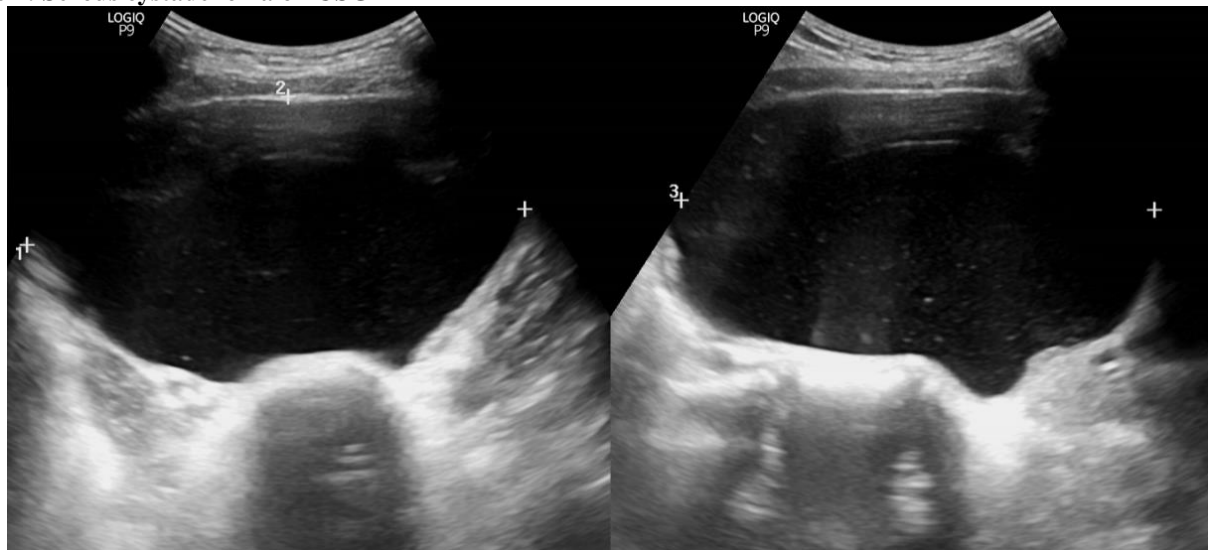
Mature cystic teratoma with a Rokitansky nodule (dermoid plug)

Image 3: Serous cystadenoma on MRI



Left ovarian cystic lesion with fluid component hyperintense on T2/STIR and hypointense on T1. Enhancement of the cyst wall without the solid component is noted.

Image 4: Serous cystadenoma on USG



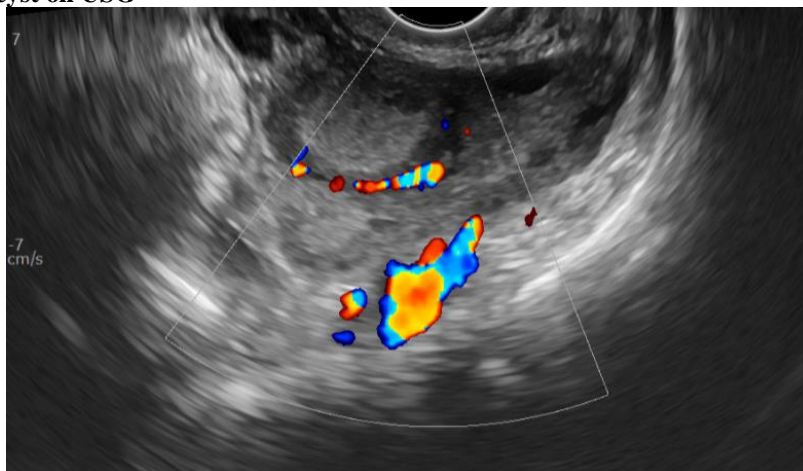
A unilocular cystic lesion, located in the midline. There are no evident solid components, papillary projections or internal septations. The right ovary is identified, separate to the mass. Left ovary not visualized.

Image 5: Endometrial cyst on MRI



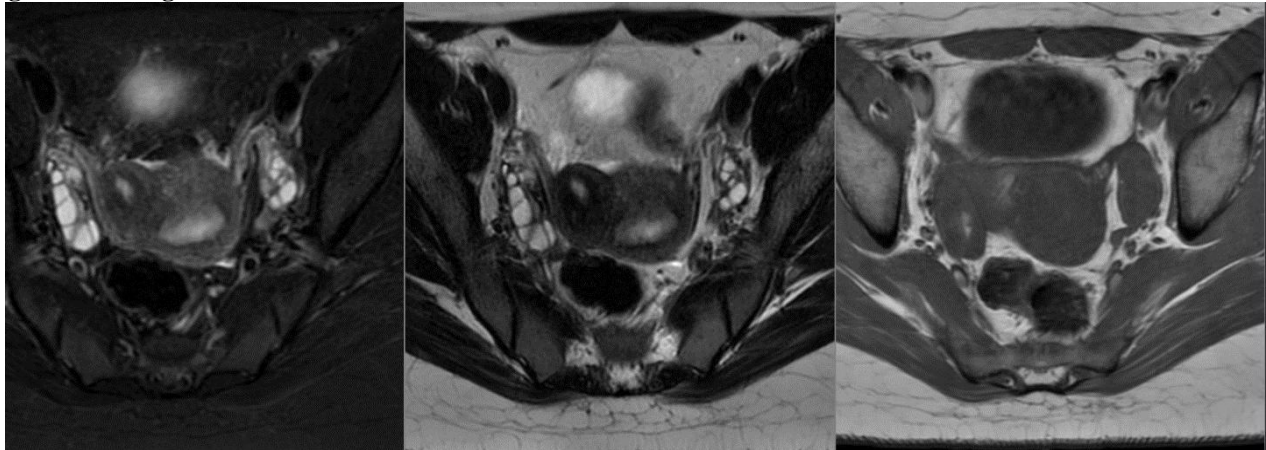
Left adnexal cyst with fluid - fluid level giving T2 shading appearance.

Image 6: Endometrial cyst on USG



Left ovarian well - defined cyst showing internal low - level echoes, with no vascularity.

Image 7: Broad ligament fibroid on MRI



T1 and T2 hypointense lesion noted in the right adnexa to project into the pouch of Douglas. However, the uterus is not well visualized separately. The right ovary is seen separately from the lesion. There is presence of a central T2 and STIR hyperintense cystic area within. These features indicate broad ligament fibroid with cystic degeneration. No features of torsion.

A well - defined, hypochoic or heterogeneous adnexal mass with few cystic areas within.

Image 9: Mucinous cystadenoma on MRI

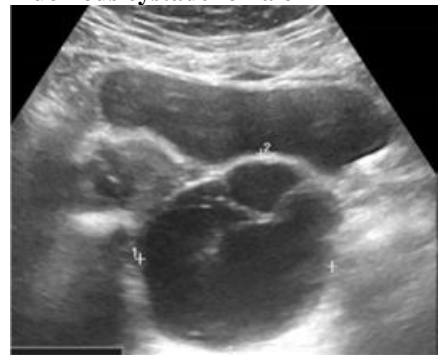
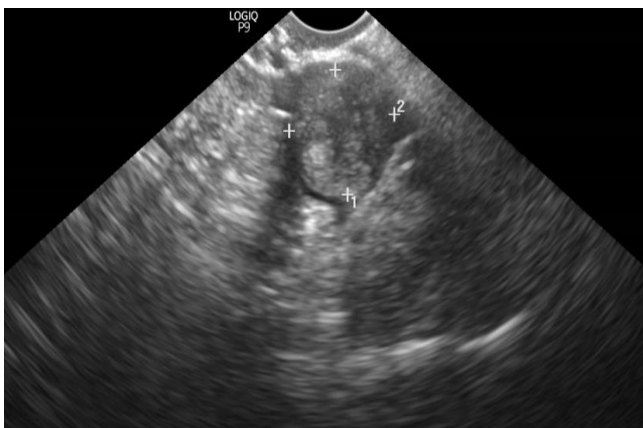
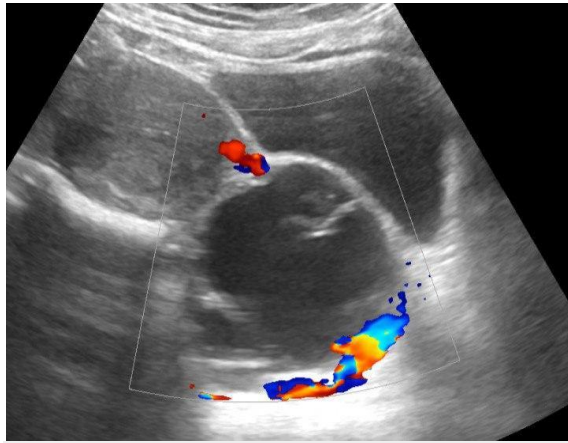


Image 8: Broad ligament fibroid on USG



Left adnexal multilocular cystic lesion, hypointense on T1 and hyperintense on T2 and STIR, enhancement of the septa on post contrast study yet no solid component.

Image 10: Mucinous cystadenoma on USG

Left adnexal large multiloculated cystic mass with no internal vascularity.

5. Discussion

Our results show a high concordance between ultrasound and MRI for many adnexal lesions. This is consistent with the findings of Sohaib et al., who reported that ultrasound and MRI have comparable accuracy in diagnosing common adnexal masses. However, our study also demonstrates instances where MRI provided more specific diagnoses, especially for complex lesions. This aligns with the work of Thomassin - Naggara et al., who developed an MRI scoring system for adnexal masses, emphasizing MRI's superior tissue characterization abilities.

In our study, MRI provided more detailed characterization of complex lesions, such as the case of "adnexal neoplastic aetiology" on ultrasound being diagnosed as "serous carcinoma of fallopian tube" on MRI. This supports the findings of Valentini et al., who demonstrated MRI's superiority in characterizing complex adnexal masses and differentiating between benign and malignant lesions.

Our results show instances where MRI provided additional information beyond the ultrasound findings. For example, characterizing an "adnexal cyst" on ultrasound as a serous cystadenoma on MRI. This aligns with the work of Lalwani et al., who reported that MRI can provide crucial additional information in cases of indeterminate adnexal masses on ultrasound.

The age distribution in our study, with a majority of patients between 21 - 40 years, is consistent with the epidemiological data presented by Forstner et al., who reported a higher incidence of adnexal masses in women of reproductive age.

While our study provides valuable insights, the small sample size (n=12) limits the generalizability of the results. Future studies with larger cohorts are needed to validate these findings.

6. Conclusion

In conclusion, our study reinforces the complementary roles of ultrasound and MRI in evaluating adnexal lesions. There was a high concordance between ultrasound and MRI for

many adnexal lesions (9/12 cases). While ultrasound remains an excellent first - line imaging modality, MRI provides valuable additional information, particularly for complex lesions and in cases where malignancy is suspected.

While ultrasound remains an excellent first - line imaging modality for adnexal lesions, MRI provides valuable additional information, particularly for complex lesions and in cases where malignancy is suspected. The complementary use of both modalities can improve the accuracy of diagnosis and characterization of adnexal pathologies, potentially impacting patient management and outcomes.

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