

ROLE OF MRI IN SONOGRAPHICALLY INDETERMINATE ADNEXAL LESIONSRaseshkumar Rasiklal Vyas¹, Avichala Surendra Singh Taxak², Aparna Vijaysingh Dodia³, Palak Bhikharbhai Patel⁴¹Associate Professor, Department of Radiology, C.U. Shah Medical College and Hospital Surendranagar, Gujrat.²2nd Year Resident, Department of Radiology, C.U. Shah Medical College and Hospital Surendranagar, Gujrat.³3rd Year Resident, Department of Radiology, C.U. Shah Medical College and Hospital Surendranagar, Gujrat.⁴2nd Year Resident, Department of Radiology, C.U. Shah Medical College and Hospital Surendranagar, Gujrat.**ABSTRACT****BACKGROUND**

Adnexal lesion has been a common issue in all the age groups, more common in reproductive age groups. Diagnosis of adnexal mass is difficult and complex, for, it may be benign or malignant, and it's the risk of malignancy that propels for early, accurate and prompt diagnosis.

The aims of this study are as follows-

- To assess the ability of MRI in diagnosis of sonographically indeterminate adnexal lesions.
- To further characterize them in terms of content (solid, cystic, both solid-cystic), origin, tissue characterization (fat, blood, fibrous) and benign vs malignant potential.
- To elucidate the sonographic imaging features leading to indeterminate diagnoses.

MATERIALS AND METHODS

A prospective study, carried out from April 2016 to August 2016, under which 50 patients were selected, who were assessed Sonographically and diagnosed as indeterminate lesions using GE LOGIQ P5 machine, then, assessed by using SIEMENS MAGNETOM ESSENZA 1.5T MRI machine for characterization.

RESULTS

Determining the organ of origin is the essential first step in characterizing an adnexal mass, in our study, sonography performed below par in diagnosing the origin of the lesion. The second essential step of characterizing an adnexal lesion, is accurate tissue characterization, which was poor for sonography and excellent of MRI in our study. Thus, the study concludes, that MRI is an excellent modality for characterisation of adnexal lesions.

CONCLUSION

Adnexa is a complex structure, a significant proportion of adnexal masses detected by sonography are indeterminate. Sonography remains the initial imaging modality of choice in the assessment of the female pelvis, because it is readily available, inexpensive, safe and quick. Despite the high sensitivity of US, it is rarely specific. This study revealed that sonography performed poorly for determining the origin of the mass, which is the essential first step in characterizing an adnexal mass. MRI with its high contrast resolution & tissue characterization capabilities, helps in accurately resolving these uncertainties.

KEYWORDS

MRI, Comparative Studies, Adnexal Lesions, Female Pelvis.

HOW TO CITE THIS ARTICLE: Vyas RR, Taxak ASS, Dodia AV, et al. Role of MRI in sonographically indeterminate adnexal lesion. J. Evid. Based Med. Healthc. 2017; 4(26), 1523-1529. DOI: 10.18410/jebmh/2017/298

BACKGROUND

'Adnexa' in general refers to the accessory structures of an organ. In relevance to female pelvis, the term includes, the fallopian tubes and ovaries as well as associated vessels, ligaments, and connective tissue. Adnexal lesions are

common in all age groups, but more common in the reproductive age group.

Diagnosis of adnexal mass is difficult and complex, for, it may be benign or malignant, and it's the risk of malignancy that propels for early, accurate and prompt diagnosis. Ovarian cancer is the commonest cause of death from gynaecological malignancies and is the fifth commonest cause of cancer deaths in women.

A Sonographically indeterminate adnexal mass is the one that cannot be confidently placed into either the benign or malignant category, or the one for which the site of origin, remains to be established.

Sonography is the initial imaging study of choice in the evaluation of women with suspected adnexal masses because of its widespread availability, relatively low cost, and high sensitivity in the detection of masses.^{1,2,3} However,

*Financial or Other, Competing Interest: None.
Submission 02-03-2017, Peer Review 08-03-2017,
Acceptance 22-03-2017, Published 28-03-2017.*

Corresponding Author:

*Dr. Raseshkumar Rasiklal Vyas,
No. 3, Devkutir, Bunglows-1,
Iscon Ambli Road, Ambli,
Ahmedabad, Gujrat-380058.*

*E-mail: dr_rasesh_rad@yahoo.com
DOI: 10.18410/jebmh/2017/298*



sonography is limited by its decreased specificity for the diagnosis of benignity, which can vary from 60% to 95% and result in as many as 20% of adnexal masses being classified as indeterminate.^{1,4}

Imaging of the indeterminate adnexal mass is now the most common indication for MRI. Not only is it helpful for problem solving in regards to the indeterminate adnexal mass, but it also provides an effective platform for treatment planning. This is extremely useful particularly in cases of younger women, in whom exposure to ionizing radiation should be kept to a minimum.

MATERIALS AND METHODS

A prospective study, carried out from April 2016 to August 2016, under which 50 patients were selected, who were assessed Sonographically and diagnosed as indeterminate lesions using GE LOGIQ P5 machine, then, assessed by using SIEMENS MAGNETOM ESSENZA 1.5T MRI machine for characterization.

As it was pre-decided to take 50 patients, we were able to obtain these many cases in the given time period.

Sonography was done using curvilinear transducer (4-8 MHz) and transvaginal probe (8-12 MHz) in Gray scale imaging and colour doppler settings.

The Routine MRI Sequences Applied were- coronal T2-weighted half-Fourier single-shot fast spin echo; axial T1-weighted spin echo; sagittal T2-weighted fast spin echo; axial T2-weighted fast spin echo and chemically selective fat suppression.

Inclusion Criteria

- Female patients of all age groups with lower abdominal or pelvic pain.
- All patients with clinical suspicion of adnexal pathology.

Exclusion Criteria

- Patients with uterine pathologies have been excluded from the study.

- Those patients who had contraindications for MRI investigation.
- (Patients with metallic fragments, clips or devices in brain, eye & spinal canal, cardiac pacemakers, insulin pumps, neurostimulators & cochlear implants.)
- Patients who had a history of claustrophobia.

RESULTS

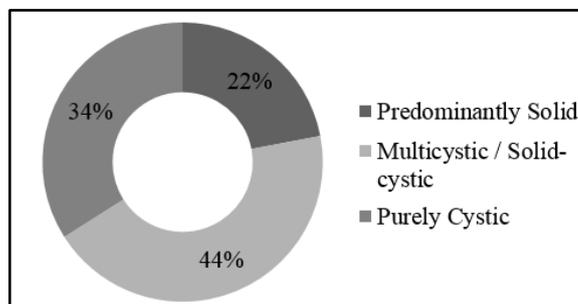


Table I. Percentage Distribution on the Basis of Tissue Content

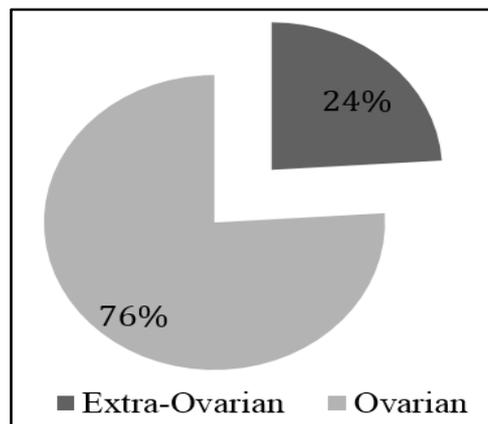


Table II. Percentage Distribution of the Lesion on the Basis of Origin Confirmed by MRI

	Frequency Seen in Total Cases	Frequency Seen in Benign Cases	Frequency Seen in Malignant Cases
Septations/echoes	26/50	20/44	6/6
Papillary Excrescences	12/50	8/44	6/6
Solid Component	34/50	28/44	6/6

Table III. Organ of Origin of Adnexal Masses on US and Comparison with MRI

Origin	On USG	On MRI
Ovarian	18/50	38/50
Tubal	6/50	8/50
Extra-ovarian	0/50	4/50
Indeterminate	26/50	0/50

Table IV. US features in Multicystic/Solid Cystic Masses

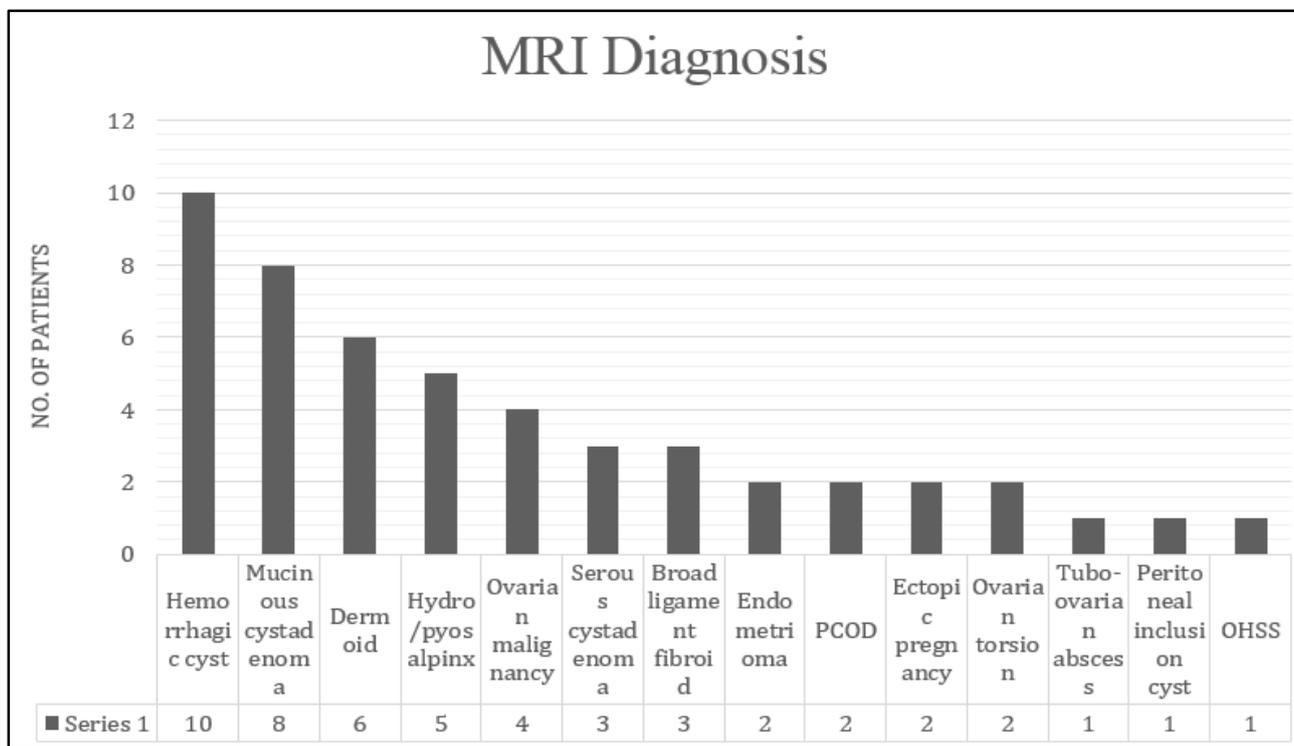


Table V. Data Distribution on the Basis of Nature of Disease on MRI Final Diagnosis (Confirmed by MRI)

	Benign	Malignant
On USG	31	19
On MRI	44	6

Table 6. Data distribution on the basis of nature of disease on USG v/s MRI

Clinical Profile and Imaging

Benign Pathologies-

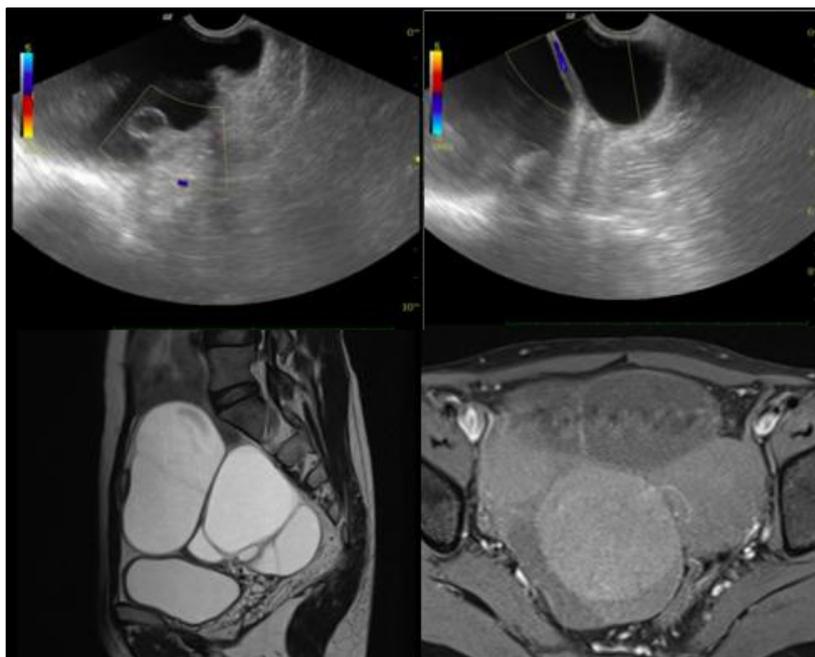


Figure 1. A 32 year female had complaints of diffuse abdominal pain and loss of appetite. USG Shows e/o well defined Multilocular Cystic Lesion with low level internal echoes and internal septations showing internal vascularity, seen in the right adnexa, possibility of Cystic Ovarian neoplasm could not be ruled out. MRI elicits, e/o well defined multilocular lesion in the right adnexa, which is hypointense on T1WI with fat suppression and hyperintense on T2W images, with internal septations. Diagnosed as Mucinous Cystadenoma Ovary

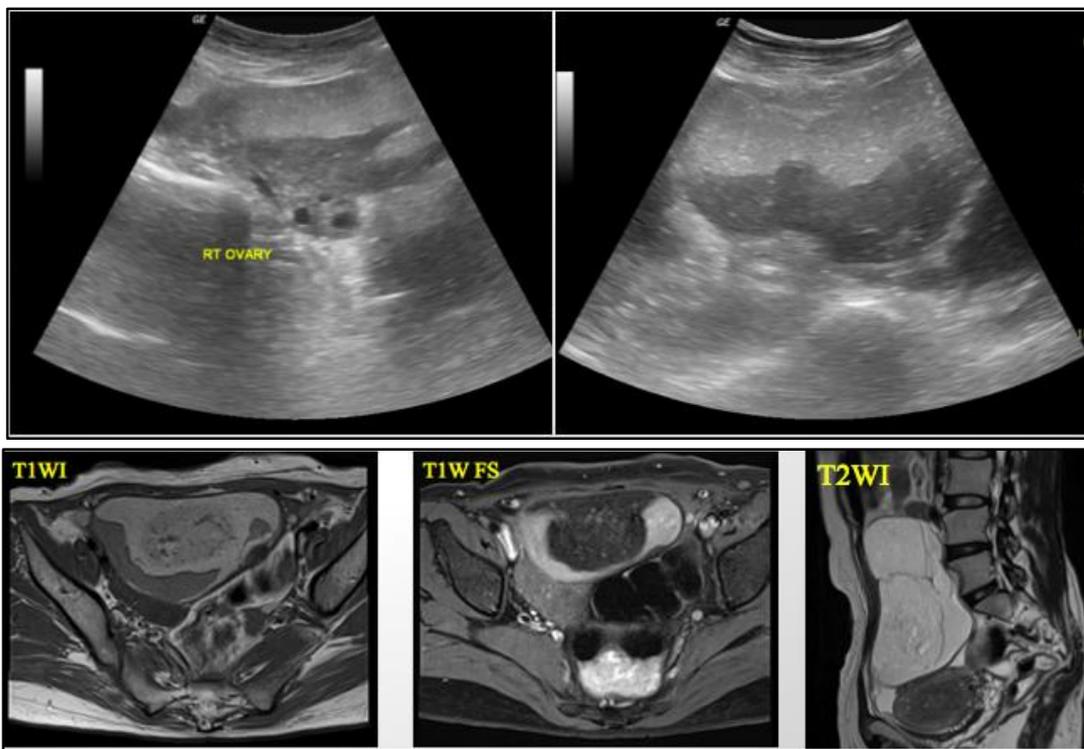


Figure 2. A 27 year old patient presented with vague abdominal pain and vomiting. USG shows heterogeneously hyperechoic lesion, layering over the hypoechoic free fluid in right adnexa. MRI shows, the lesion to be hyperintense on both T1W and T2W images, which gets suppressed on T1W Fat saturated images, along with the presence of surrounding hyperintense free fluid. - Ruptured Dermoid Ovarian Cyst

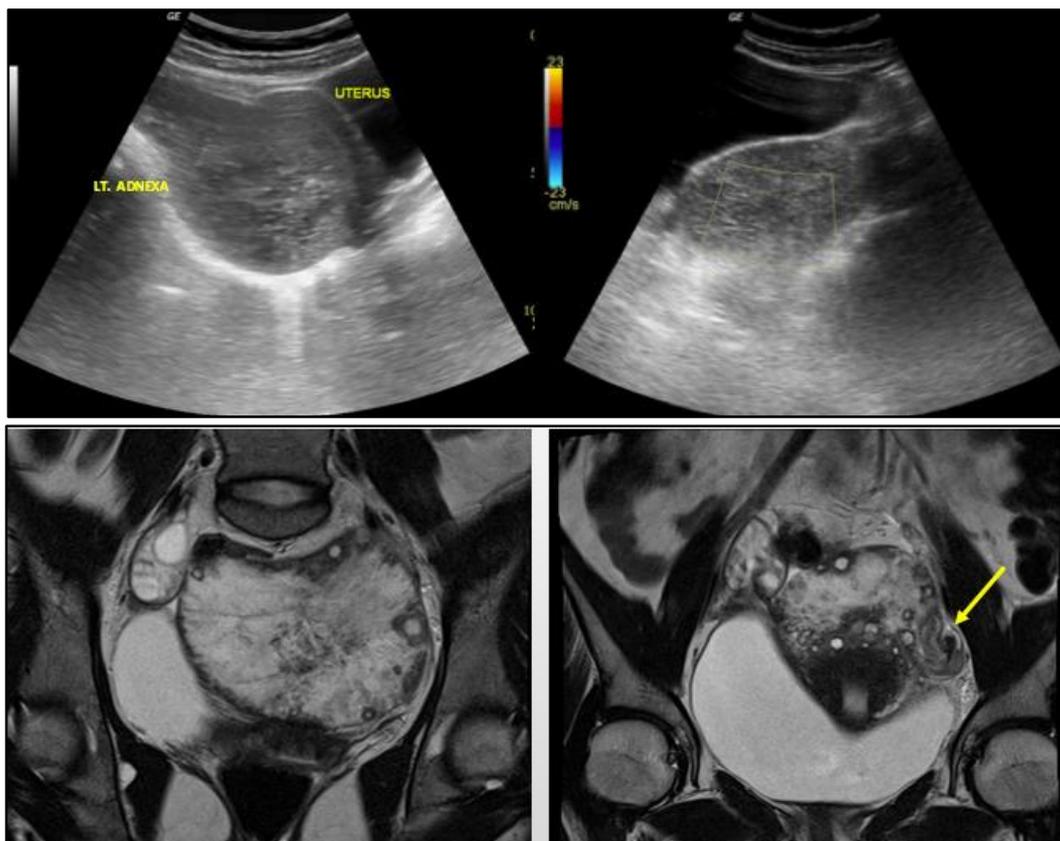


Figure 3. A 18 year old patient presented with acute abdomen since 2 hours followed by nausea and vomiting. Trans-abdominal sonography shows well defined predominantly hypoechoic lesion in the left adnexa, compressing the uterus, left ovary not seen separately. Normal Right ovary. Possibility of Benign lesion (fibroid) couldn't be ruled out. MRI demonstrates, an enlarged left ovary, with hypointense stroma on T2W images with multiple peripherally displaced follicles. Also e/o hypointense twisted vascular pedicle (arrow) seen. Right ovary appears normal. - Ovarian Torsion

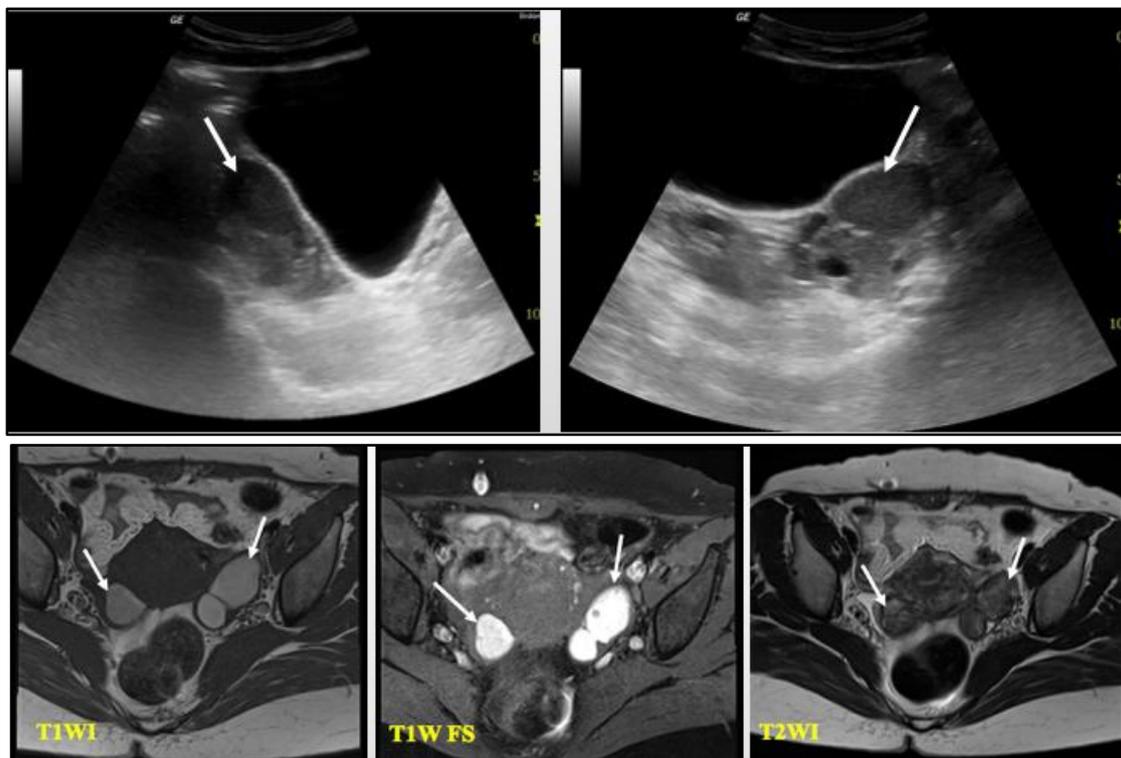


Figure 6. A 23 year old patient presented with complaints of oligomenorrhoea and chronic lower abdominal pain. On Trans-abdominal sonography, evidence of well defined heterogeneously hyperechoic lesion (arrow), seen in both adnexa, possibility of Dermoid/ endometrioma/haemorrhagic cyst could be considered. However, axial T2WI shows the lesion to be hypointense (shading), surrounded by follicles, however, on corresponding T1WI, it appears hyperintense, which doesn't suppress on T1 fat suppression images, suggesting presence of blood. - Endometrioma

Malignant Pathology

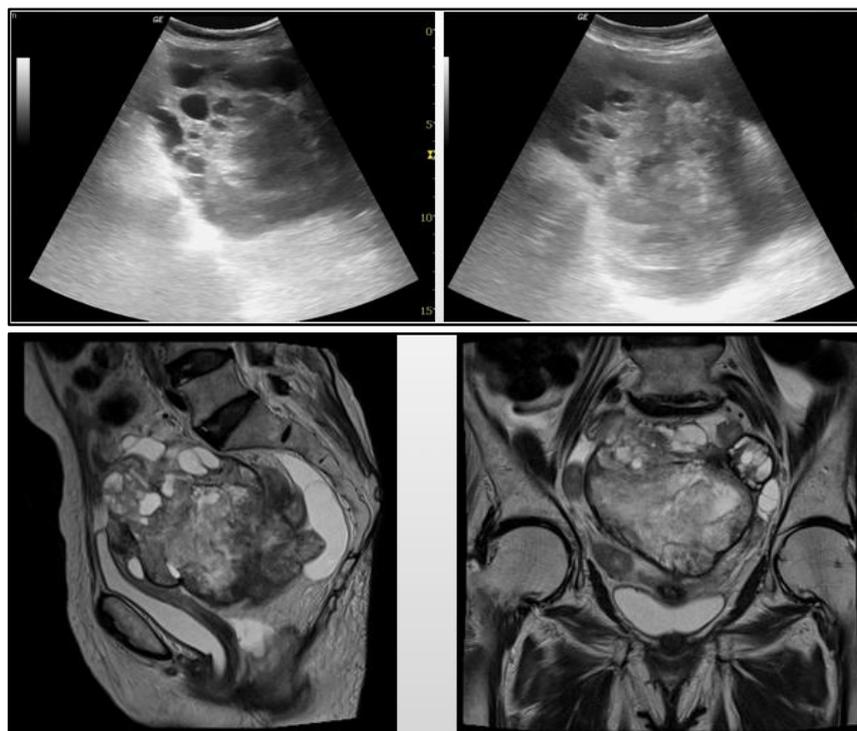


Figure 5. A 55 year old patient came with complaints of palpable lump in pelvis along with loss of weight and appetite since 5 months. USG shows e/o ill-defined solid cystic lesion noted in both adnexa with internal vascularity. B/l ovaries not seen separately. Possibility of Malignant lesion was considered, however, origin couldn't be traced. MRI T2WI show e/o ill-defined heterogeneously hyperintense lesion in b/l adnexa, along with loss of fat plane between the lesion and rectum. Both ovaries not seen separately. - B/L Ovarian Malignancy

DISCUSSION

Adnexal lesion has been a common issue in all the age groups, more common in reproductive age groups. Out of which 5-10% of women undergo surgery for suspicious adnexal masses, less than 15% of which prove to be malignant.⁵ Outwater and Dunton.⁶ stated that unnecessary or inappropriate surgery was performed in 50-67% of benign cases because of suspicious sonography findings. In our study, 13 out of 50 patients were diagnosed as possible malignant aetiologies, which turned out to be benign on further MRI characterization. This suggested that sonography has a poor specificity in diagnosing benign conditions (Table VI). However, with MRI we could accurately characterise these benign conditions and differentiate from malignant ones.^{7,2} Thus, unnecessary or inappropriate surgery and follow up imaging can be avoided in such cases.

Determining the organ of origin is the essential first step in characterizing an adnexal mass, in our study, sonography performed poorly in diagnosing the origin of the lesion (Table III). The second essential step of characterizing an adnexal lesion, is accurate tissue characterization, which was poor for sonography and excellent of MRI in our study. In our study, predominantly (44%) found feature seen in the lesions was solid-cystic nature (Table I).

Benign masses more often than not appeared complex on sonography, thereby mimicking a malignancy. For example, in our study two dermoid cysts, one endometrioma, one tubo-ovarian abscess and one ovarian torsion (Figure III) were incorrectly categorized as solid ovarian neoplasms on sonography. So, MRI was particularly useful in determining the character of these lesions. High signal intensity on T1W & low signal intensity ("T2 shading") on T2W images is highly specific for endometrioma.^{1,8} (Figure IV). Dermoid (Figure II) is typically hyperintense signal on both T1W and T2W images with characteristic low signal intensity on fat suppressed images.^{9,10} Features highly indicative of malignancy includes, irregular & thick septations of more than 3 mm, solid component and papillary excrescences (Table III). So, complementary use of MRI is most beneficial in complex adnexal masses with equivocal malignant feature.^{8,11,12}

Sensitivity and Specificity of USG in Determining the Benignity of the Lesion

Out of 50 patients, 44 were benign and 6 were malignant lesions.

Out of 44 benign lesions, 31 were true positives (TP) and 2 were false negative (FN).

Out of 6 malignant lesions, 13 were false positive (FP) and 6 were true negative (TN).

So, Sensitivity would be $[TP/(TP+FN)]*100 = [31/(31+2)]*100 = 93.93\%$

Specificity $[TN/(FP+TN)]*100 = [6/(13+6)]*100 = 31.57\%$.

However, because of the small sample size, selective patient recruitment, as only the patients with adnexal masses who were referred to us were recruited, and the

overlap of categories for a mass to be indeterminate on sonography, a statistical analysis could not be performed.

The main aim of our study was to evaluate the ability of MRI to characterize and provide additional useful information in cases of indeterminate sonographic findings. Thus, the study concludes, that MRI is an excellent modality for characterisation of adnexal lesions.

CONCLUSION

This study revealed that sonography performed poorly for determining the origin of the mass, which is the essential first step in characterizing an adnexal mass. MRI with its high contrast resolution & tissue characterization capabilities, helps in accurately resolving these uncertainties.

Most indeterminate masses result from common benign conditions; so, unnecessary or inappropriate surgery can be avoided in such cases. For a few of such masses, which are malignant, instead of a 'wait and watch' strategy of repeat ultrasound, MR imaging results in a more timely diagnosis.^{1,13}

REFERENCES

- [1] Forstner R, Thomassin-Naggara I, Cunha TM, et al. ESUR recommendations for MR imaging of the sonographically indeterminate adnexal mass: an update. *Eur Radiol* 2016. DOI 10.1007/s00330-016-4600-3.
- [2] Spencer J, Ghattamaneni S. MR imaging of the sonographically indeterminate adnexal mass. *Radiology* 2010;256(3):677-694.
- [3] Adusumilli S, Hussain HK, Caoili EM. MRI of sonographically indeterminate adnexal masses. *Am J Roentgenol* 2006;187(3):732-740.
- [4] Imaoka I, Wada A, Kaji Y, et al. Developing an MR imaging strategy for diagnosis of ovarian masses. *Radiographics* 2006;26(5):1431-1448.
- [5] Sohaib SA, Mills TD, Sahdev A, et al. The role of magnetic resonance imaging and ultrasound in patients with adnexal masses. *Clinical Radiology* 2005;60(3):340-348.
- [6] Saini A, Dina R, McIndoe A, et al. Characterizations of adnexal masses with MRI. *AJR* 2005;184(3):1004-1009.
- [7] Funt SA, Hann LE. Detection and characterization of adnexal masses. *Radiol Clin North Am* 2002;40(3):591-608.
- [8] Jung SE, Lee JM, Rha SE, et al. CT and MR imaging of ovarian tumors with emphasis on differential diagnosis. *Radiographics* 2002;22(6):1305-1325.
- [9] Hricak H, Chen M, Coakley FV, et al. Complex adnexal masses: detection and characterization with MR imaging-multivariate analysis. *Radiology* 2000;214(1):39-46.
- [10] Outwater EK, Dunton CJ. Imaging of the ovary and adnexa: clinical issues and applications of MR imaging. *Radiology* 1995;194(1):1-18.

- [11] Scoutt LM, McCarthy SM, Lange R, et al. MR evaluation of clinically suspected adnexal masses. *J Comput Assist Tomogr* 1994;18(4):609-618.
- [12] Hricak H. Current trends in MR imaging of the female pelvis. *Radiographics* 1993;13(4):913-919.
- [13] DiSantis DJ, Scatarige JC, Kemp G, et al. A prospective evaluation of transvaginal sonography for detection of ovarian disease. *AJR* 1993;161(1):91-94.