

## ORIGINAL ARTICLE

### COMPARATIVE ROLE OF MRI & USG IN EVALUATING FEMALE PELVIC PATHOLOGIES AND ITS CORRELATION WITH OPERATIVE / HISTOPATHOLOGY FINDINGS

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#### ABSTRACT:

**Introduction:** Since magnetic resonance imaging (MRI) offers high contrast resolution, provides good tissue characterization, and is capable of multiplanar imaging capabilities, it is becoming a useful tool for the evaluation of female pelvic pathology. Since MRI is more expensive and potentially less readily available than ultrasound, it is important to know when patients should undergo MRI.

**Aim & objective:** To study MRI & ultrasound appearance of various pathologies of female pelvis, to assess which modality is more accurate in a particular pathology and to assess the sensitivity & specificity of MRI & ultrasound in various Pelvic pathologies.

**Methodology:** 50 female patients were randomly selected who reported with clinical positive symptoms and findings of pelvic pathologies. Equipments which were used to assess the pathologies were ESAOTE my lab 40 with is color doppler and GE (1.5T) for MRI Machine. Descriptive statistical analysis was carried out in the study. **Results:** MRI and USG provide valuable adjunct in pre and post-operative evaluation. This study comprised of 50 cases, with maximum patients in the age group of 31 to 40, followed by 41 to 50 and then 21 to 30 years. The commonest complaint being Bleeding PV, followed by pain abdomen, post menopausal bleeding and others. USG was able to diagnose 60% of the congenital defects in comparison to MRI (100%). USG was able to diagnose 42% with adnexal lesions, 26% with uterine lesions and 100% with cervical cancers (only with the quantification of the lesion), but the specificity was 100% with USG. On MRI, maximum group were adnexal lesions followed by uterine lesions followed by cervical cancer and then others. **Conclusion:** Since magnetic resonance imaging (MRI) offers high contrast resolution, provides good tissue characterization, and is capable of multiplanar imaging capabilities, it is becoming a useful tool for the evaluation of female pelvic pathology. It is more accurate and specific than USG. Since it is more expensive than the USG and need more expertise, it is important to know when patients should undergo MRI.

Key words: MRI, Pelvic pathologies, USG.

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#### INTRODUCTION:

The indications for Magnetic Resonance Imaging (MRI) of the female pelvis have expanded considerably over the past decade, The impetus behind these expanding indications is multifactorial. First, there has been widespread dissemination of MRI hardware and software techniques that allow the routine acquisition of images with high spatial or temporal resolution, Second, the advent of minimally invasive therapies in the management of gynaecologic disorders has created a need for increased accuracy in the preoperative evaluation of these patients, Finally, in this era of cost containment, several studies have shown that the appropriate use of MR imaging in the diagnostic algorithm minimizes cost.<sup>1</sup>

Some of the indications for MRI evaluation of the female genital tract are: infertility, Congenital anomalies<sup>2,3</sup> Ovarian and cervical lesions, Pelvic inflammatory Disease etc.

MRI of the adult female pelvis is a well-established tool in the evaluation of pelvic pathology and is often used as a supplement to sonography. The need for diagnostic surgical intervention has largely been eclipsed with the advent of magnetic resonance imaging, which has become the imaging modality of choice for characterisation of congenital Mullerian anomalies .MRI allows a precise delineation or uterus didelphys and unilateral blind vagina, a congenital abnormality, clearly demonstrating the transverse vaginal septum with hematometrocolpos and uterus didelphys<sup>4</sup>.

MRI of the pelvis can characterize a wide variety of ovarian lesions. For women with possible adnexal pathology, MRI is useful for lesion characterization. In some lesions such as mature teratoma (dermoid), endometrioma, and ovarian fibroma, specific benign diagnoses can be established by MR examination and surgery can, in select Cases, be modified or avoided.

MRI is gaining momentum for staging gynaecologic malignancies. Ovarian cancer is the second most common pelvic tumour and the leading cause of death from gynaecologic malignancy. In patients With ovarian cancer, MRI determination of disease extent helps treatment planning either as a surgical roadmap or to identify non resectable patients. MRI staging is adjunct to clinical and surgical staging in women with cervical or endometrial cancer, respectively<sup>5,6</sup>.

**METHODOLOGY:**

The objectives of this prospective study were to compare the findings of MRI & ultrasound in various pathologies of female pelvis and to evaluate the accuracy of the imaging technique for particular pathology.

50 female patients were randomly selected irrespective of age and socioeconomic status who reported with clinical positive symptoms and findings of pelvic pathologies. Equipments which were used to assess the pathologies were ESAOTE my lab 40 which is color doppler and GE (1.5T) for MRI Machine A clinical history was taken for each patient regarding symptoms relevant to the pelvic problem and Clinical Examination details were collected from the current case file and past medical records. MRI Imaging was performed in supine position with an empty bladder after fasting of atleast 4 hrs to limit the bowel motion. Body coil allowing better coverage had been used. T1WI images were used to depict the anatomy, tissue characterization, nature of fluid collections. T2WI images to identify uterine and vaginal zonal anatomy and to depict intrauterine pathology. GRE sequences were used for staging malignancies. Axial and Sagittal planes were used for evaluation of uterus. Both T1 and T2 spin echo sequences to identify and evaluate the ovaries. Both transverse and coronal planes were used for identification of ovaries and confirming that a mass originates in the adnexa rather than uterus. Fat suppressed sequences were helpful in suspected cases of Dermoids. Gadolinium enhanced T1WI were used in some of the cases.

Descriptive statistical analysis was carried out in the study. Results on continuous measurements are presented on Mean +/- SD (Min. – Max.) and results on categorical

measurements are presented in Number (%). Significance is assessed at 5% level of significance. Chi square test / Fisher Exact test has been used to find the significance of association of USG diagnosis with MRI diagnosis, Diagnostic statistics such as sensitivity, specificity, PPV, NPV and Accuracy has been used to find the correlation of USG diagnosis with MRI diagnosis. The Statistical software namely SPSS 15.0, Stata 8.0, MedCalc 9.0.1 and Systat 11.0 were used for the analysis of the data and Microsoft word and Excel have been used to generate graphs, tables etc.

**RESULTS:**

A Correlation clinical radiological study consisting of 50 female patients is undertaken to study the correlation of findings of USG diagnosis with MRI diagnosis. The maximum numbers of patients were in the age group 31-40 years. Among the 50 patients, the maximum patients presented with menorrhagia. The maximum cases in USG and MRI diagnosis were those of benign adnexal lesions. There were 30 cases (60%) of USG which correlated with the diagnosis of MRI while the others were not entirely correct or either doubtful. (Table 1 and Graph 1)

Correlation of USG and MRI diagnosis was also done by dimension wise observation and it was found that USG was able to diagnose 1 (2%) case of congenital defect while MRI diagnosed both the cases (4%) of congenital defects with ease. Similarly USG diagnosed 21 benign adnexal lesions(42%) while MRI diagnosed 24 adnexal lesions(48%).USG was able to diagnose carcinoma cervix as well as ovary grossly but MRI was able to delineate the lesion and help with the staging of which was not possible with USG.USG was able to diagnose 1 (2%) case of endometrial carcinoma while MRI diagnosed 2 cases (4%) of the endometrial carcinoma. Of the cases with benign uterine lesions 13 (26%) were diagnosed by USG while MRI diagnosed 14 (28%) cases..There were 7 doubtful cases (14%) of diagnosis by USG while MRI had one as doubtful diagnosis. (Table 2 and Graph 2)

USG was able to diagnose 50% Of congenital defects in comparison to MRI, 92.8% with benign uterine lesions, 87.5% with benign adnexal lesions and 100% with ovarian as well as cervical carcinomas(only quantification of lesion)and 50% with endometrial carcinomas but the specificity was 100% with USG .among the carcinoma cervix cases USG was able to diagnose the growth in cervix but was not able to tell the extent clearly which we were able to diagnose clearly on MRI. (Graph 3)

**Table 1:** Correlation of USG and MRI Diagnosis

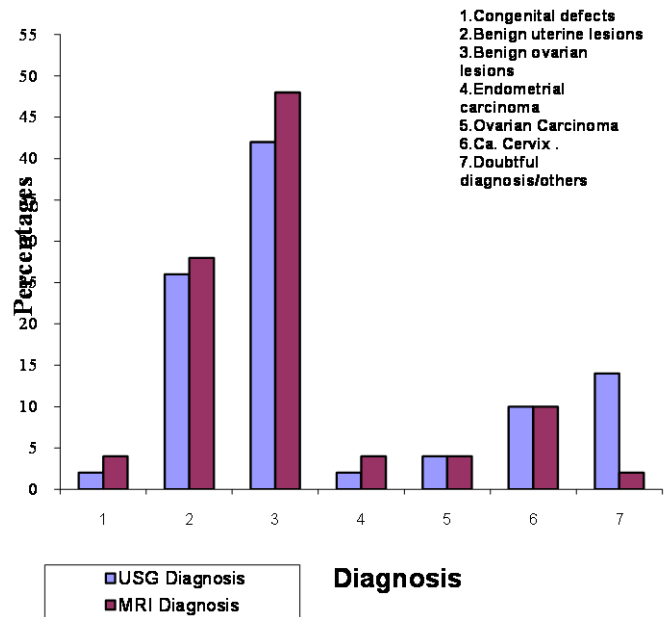
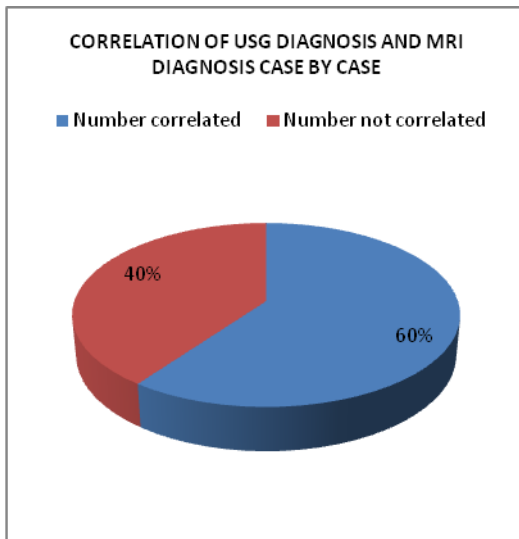
Correlation	Number (n=50)	%	95% CI
Number correlated	30	60	43.3 – 76.6%
Number not correlated	20	40	28.9 – 51.0%

**TABLE 2:** Correlation Of USG & MRI Diagnosis on Dimension Wise Observation

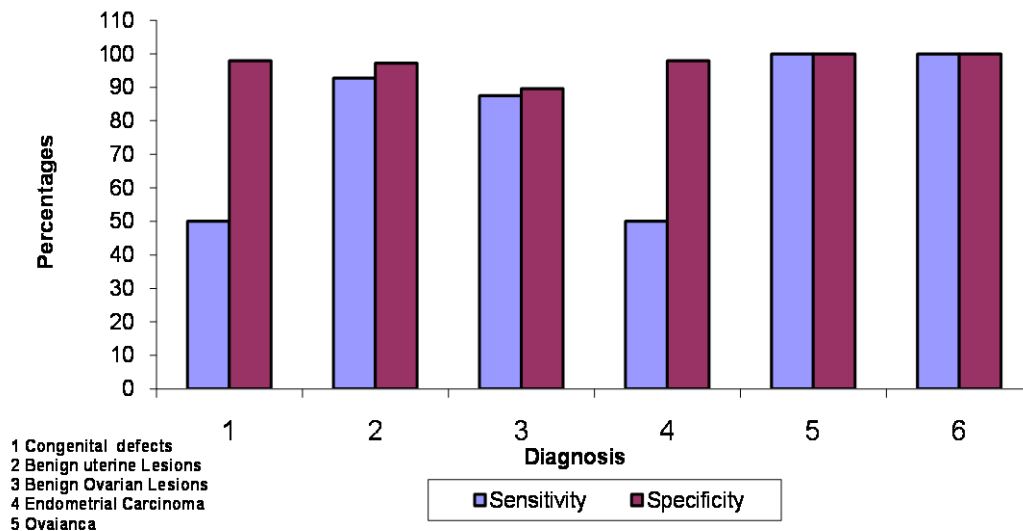
DIAGNOSIS	USG DIAGNOSIS		MRI DIAGNOSIS	
	NO	%	No	%
Congenital lesions defects	1	2	2	4
Benign uterine lesions	13	26	14	28
Benign adnexal lesions	21	42	24	48
Endometrial carcinoma	1	2	2	4
Ovarian malignancy	2	4	2	4
Carcinoma Cervix	5	10	5	10
Doubtful diagnosis/others	7	14	1	2

**Graph 2:** Correlation of USG & MRI Diagnosis on Dimension Wise Observation

**Graph 1:** Correlation of USG and MRI Diagnosis



**Graph 3:** Correlation of USG diagnosis with MRI diagnosis



## DISCUSSION:

Space occupying lesions in the pelvis are very common over a wide age range. Many conditions may give rise to a pelvic mass and it is frequently difficult to arrive at an accurate diagnosis. MRI and USG provide valuable adjunct in pre and post-operative evaluation. In this study of 50 cases, MRI was performed on a 0.35T machine and the sequences taken were Sagittal T1, T2, Axial T1, T2 and Coronal T1, T2 and Fat suppressed T2WI sequences. This study comprised of 50 cases, with maximum patients in the age group of 31 to 40, followed by 41 to 50 and then 21 to 30 years. The range was between 16 to 75 years. The mean was 41 years which was similar to a study conducted by Lisa Bame Schwartz et al<sup>7</sup>, where patients ranged between 17 to 83 years (mean, 41 years; median, 38 years). Most patients were of reproductive age. The commonest complaint being Bleeding PV (38%), followed by pain abdomen(28%), post menopausal bleeding (16%) and others (18%). In a study by Lisa Bame Schwartz et al<sup>7</sup>, the commonest presenting complaint was bleeding PV (73%). Another study by Janio Szklaruk et al<sup>8</sup> also showed that the commonest presenting complaint was bleeding PV. USG was able to diagnose 60% of the Congenital defects in comparison to MRI (100%), where this was similar to a study by R.K.Zurawin et al<sup>9</sup>, where they were able to diagnose only 50% by USG while on MRI it was 100%. Among the cases where tissue diagnosis was available, Ca. cervix (n=5) cases were the maximum with Squamous cell carcinomas (n=4) 8%, which was similar to a study by Janio Szklaruk et al<sup>8</sup> where they had a maximum of Squamous cell carcinomas – 90%, followed by Adenocarcinoma (n=4) 8%. A study by Wright TC et al<sup>10</sup> where they quoted 10 to 15% range. In our study, uterine fibroids, only (n=4→8%) was diagnosed with USG while 6 (12%) were diagnosed by MRI. This was similar to studies by Haricak et al, Hamlin et al and Dudiak et al<sup>11-13</sup> where MR imaging to be more accurate than US. On USG there were 7(14%) patients where the diagnosis was doubtful, which was similar to a study by Lisa Bame Schwartz et al<sup>7</sup> where they had a doubtful diagnosis in 26%. In the present study, MRI had one doubtful diagnosis (2%). Since magnetic resonance imaging (MRI) offers high contrast resolution, provides good tissue characterization, and is capable of multiplanar imaging capabilities, it is becoming a useful tool for the evaluation of female pelvic pathology. Since MRI is more expensive and potentially less readily available than ultrasound, it is important to know when patients should undergo MRI.<sup>14</sup> Ultrasound is the imaging modality of choice for the female pelvis. It is widely available, has broad acceptance by patients as a "familiar test," and is relatively inexpensive. High resolution imaging of transvaginal ultrasound provides high diagnostic accuracy for pelvic pathology. However, there are some shortcomings with this modality, such as the limited field of view, obscuration of pelvic organs by the

presence of bowel gas, inherent limitations dependent on patient size, and its dependence on the skill and experience of the operator.<sup>15</sup>

## CONCLUSION:

MRI offers improved tissue contrast, and direct multiplanar imaging, has better accuracy, sensitivity and specificity in evaluation of female genital tract in comparison with USG. MRI is a better modality for detecting, characterization of various diseases, staging patients with carcinomas where accurate diagnosis will make an impact on their surgical and medical management planning in comparison with USG. MRI is a costlier modality and needs expertise in interpretation. USG remains the cost effective primary imaging modality for the evaluation of a clinically suspected pelvic lesion.

## REFERENCES:

1. Reinhold, Caroline, Magnetic Resonance Imaging in Gynecologic Disease. Topics in Magnetic Resonance Imaging. Magnetic Resonance Imaging in Gynecologic Disease. Aug. 2003; 14(4):267.
2. McLeary, Michael S, Kjellin, Ingrid B, Kirk, Shannon, R.Magnetic Resonance Imaging of the Pediatric Female pelvis: A Pictorial Essay, Journal of Women's Imaging. Feb 2001; 3(1):38-44.
3. Troiano, Robert N. Magnetic Resonance Imaging of Mullerian Duct Anomalies of the Uterus. Topics in Magnetic Resonance Imaging. Magnetic Resonance Imaging in Gynecologic Disease. Aug 2003; 14(4):269-279.
4. Lo Casto, Antonio, Rossello, Mario, Salerno, Sergio, De Maria, Marcello. MR Imaging of Uterus Didelphys Transverse Vaginal Septum Causing Hematometocolpos and Renal Agenesis. Journal of Women's Imaging. May 2002; 4(2):86-88.
5. Pretorius, E. Scott, Outwater, Eric K, Hunt, Jennifer L., Siegelman. Evan S. Magnetic Resonance Imaging of the Ovary. Topics in Magnetic Resonance Imaging, April 2001; 12(2):131-146.
6. Ascher, Susan M. Takahama, Junko. Jha, Reena C. Staging of Gynecologic malignancies. Topics in Magnetic Resonance Imaging, April 2001; 12(2) 105-129.
7. Lisa Bame Schwartz, Ellen panageas, Robert Lange, John Rizzo, Florence Comite, Shirley Mc Carthy. Female Pelvis: Impact of MR Imaging on Treatment Decisions and Net Cost Analysis', Radiology, 1994:192:55-60.
8. Janio Szklaruk, Eric P. Tamm, Haesun Choi, and Vithya Varavithya, MR Imaging of Common and Uncommon Large Pelvic Masses Radiographics 2003; 23:403-424.
9. R.K. Zurawin, J.E. Dietrich., M.J. J Heard and C.L. Edwards. Didelphic uterus and obstructed hemigagina with renal agenesis: Case report and review of the literature. Journal of Pediatric and Adolescent Gynecology. April 2004; 17(2):137-141.
10. Wright TC, Ferenczy A, Kurman RJ, Carcinoma and other tumors of the cervix. In Kurman (ed) Blausterin's pathology of the female genital tract 4<sup>th</sup> edition, New York, Springer-Verlag 1994: 279-326.

11. Haricak H, Tscholakoff D, Heinrichs L, et al. Uterine leiomyomas: correlation of MR, histopathologic findings, and symptoms, *Radiology*; 1986; 158:385-391.
12. Halmin JD, Pettersson H, Fitzsimmons J, Morgan LS. MR imaging of uterine Leiomyomas and their complications. *J Comput Assist Tomogr* 1985; 9:902-907.
13. Dudiak CM, Turner DA, Patel K, Archie JT, Silver B, Norusis M. Uterine leiomyomas in the infertile patient: Preoperative localization with MR imaging versus US and hysterosalpingography. *Radiology* 1988; 167:62
14. ACR Practice Guideline for the Performance of Magnetic Resonance Imaging (MRI) of the Soft Tissue Components of the Pelvis. Reston, VA: American College of Radiology; Amended 2006
15. ACR Practice Guideline for the Performance of Pelvic Ultrasound in Females. Reston, VA: American College of Radiology; 2006.

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