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Research Article

ROLE OF MAGNETIC RESONANCE IMAGING IN EVALUATION OF UTERINE PATHOLOGIES AND ITS CORRELATION WITH ULTRASOUND

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ABSTRACT

Objective: Uterine pathologies, both benign and malignant, are common among reproductive age females and postmenopausal females. Herein, we aim to assess the role of magnetic resonance imaging (MRI) in the evaluation of uterine pathologies and to correlate them with ultrasonographic findings (USG).

Methods: We conducted a prospective study in the Department of Radiodiagnosis at Government Medical College and Rajindra Hospital, Patiala. It included 45 females who were referred from department of obstetrics and gynecology with clinical suspicion of uterine pathologies**.** All the patients underwent both USG and MRI, results were compiled and statistical tests applied.

Results: The mean (±SD) age of patients was 38.9±10.8 years. About 82% of the females were premenopausal. Nineteen females were diagnosed with fibroids, nine had adenomyosis, and two patients had endometrial polyps. Five of each were histopathologically proven cases of cervical and endometrial carcinoma. Four patients were diagnosed with Mullerian anomalies. MRI could diagnose more number of fibroids and in more number of patients. On USG, adenomyosis was falsely diagnosed in one patient and was reported as normal in one other patient. In cases of endometrial carcinoma, myometrial invasion was better predicted through MRI. Similarly, in cases of cervical carcinoma, parametrial extension was underdiagnosed by USG alone. MRI detected bicornuate bicollis uterus and septate uterus in two cases each. Very good correlation was observed between the USG and MRI findings with Kappa coefficient of 0.823 ($p<0.001$).

Conclusion: MRI is the radiological imaging of choice in patients with suspected uterine pathologies and correlates well with USG. Therefore, USG and MRI should be combined together in case of diagnostic dilemma for better decision-making and patient management.

Keywords: Fibroid, Adenomyosis, Magnetic resonance imaging, Ultrasonographic.

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INTRODUCTION

Ultrasound is considered to be the first choice of imaging for the female pelvis [1]. The advantages of ultrasonographic (USG) are that it is easily available, inexpensive, and safe and simple to use. However, the disadvantages are that it has a short field of view (FOV), bowel gas can obscure its field of view and is dependent on operator's skill [2,3].

Transvaginal ultrasonography (TVS) is helpful in diagnosing certain lesions. However, TVS has a few disadvantages such as small FOV and obscuration of acoustic window due to bowel gas [1].

Magnetic resonance imaging (MRI) has an accuracy rate of 91–93% in the diagnosis of various uterine pathologies especially when contrast sequences are added [4]. MRI has a high resolution and is a multiplanar imaging modality, thus it helps in the characterization of multiple lesions [5]. MRI is usually performed with or after the USG. However, MRI has a few drawbacks such as unavailability, unaffordability, and is contraindicated in claustrophobic patients and patients with certain metallic [6].

METHODS

The study was conducted in the Department of Radiodiagnosis in collaboration with the Departments of Obstetrics and Gynecology at Government Medical College and Rajindra Hospital, Patiala

Study design

This was a hospital-based and prospective study.

Sample size and study population

This prospective study was conducted on 45 females with clinically suspected or sonographically diagnosed uterine pathologies.

Patient preparation

All the patients provided their informed consent and all the patient's details were recorded.

Inclusion criteria

The study included patients with:

- Clinically suspected uterine pathologies
- Uterine pathologies detected incidentally on USG.

Exclusion criteria

The following criteria were excluded from the study:

- Patients who did not undergo both the investigations (USG and MRI).
- Claustrophobic patients.
- Patients with history of ferromagnetic device implantation, cardiac pacemakers, cochlear implants, and indwelling metallic foreign bodies.
- Patients not giving consent.

Study equipment

- USG-MAKE PHILIPS EPIQ 5
- MR imaging was done with 1.5 Tesla superconductive scanner (Seimens 1.5 T Magnetom AERA Machine).

Image analysis and interpretation

USG and MRI scans were thoroughly reviewed for the evaluation of uterine pathologies. Broadly, the uterine pathologies were categorized

into benign (Fibroid, adenomyosis, and endometrial Polyp), malignant (Endometrial carcinoma and cervical carcinoma), and congenital Mullerian duct anomalies (Septate uterus and bicornuate uterus). Using both the imaging modalities, location and number of lesions were evaluated. Local staging was done for malignant diseases using the FIGO staging systems for endometrial and cervical carcinoma. Mullerian anomalies were classified on the basis of ESHRE classification system.

Statistical analysis

The acquired data were compiled, tabulated, and statistically analyzed in Microsoft Office Excel version 2019. Mean (±SD) age was calculated for the entire study population and separately for patients with fibroid, adenomyosis, and endometrial and cervical carcinoma. Correlation between USG and MRI was done by calculation of the Kappa coefficient.

Ethical statement

Approval for this study was received by Ethics and Research Committee, Government Medical College and Rajindra Hospital, Patiala. All the patients enrolled in the study were asked to provide written informed consent.

RESULTS

We included a total number of 45 patients between 20 and 72 years of age. Mean (±SD) age of the participants was 38.9±10.8 years. Most of the patients belonged to the age group of 30–40 years. Thirty-seven patients (82%) were in the premenopausal group and the rest of them were postmenopausal.

On USG, majority of the patients (10 patients, 22%) were diagnosed with intramural fibroids on USG. Four patients (9%) had subserosal fibroids, 3 patients (7%) had submucosal fibroids, and 1 patient (2%) had subserosal and intramural fibroids. Seven patients were found to have adenomyosis and two had concomitant adenomyosis with fibroids. Endometrial polyp was observed in 2 cases (4%). Among the Mullerian ductal anomalies, 2 patients (4%) were diagnosed with bicornuate bicollis uterus and 1 patient (2%) diagnosed with septate uterus. Five patients (11%) were diagnosed with endometrial and cervical carcinoma each. Three patients (7%) had normal scans.

On MRI, 12 patients (27%) were diagnosed with intramural fibroids. Two patients (5%) had subserosal fibroids, 3 patients (7%) had submucosal fibroids, and 2 patients (5%) had both subserosal and intramural fibroids. Six patients (13%) were diagnosed with Adenomyosis and 3 patients (7%) had concomitant adenomyosis with fibroids. Endometrial polyp was observed in 2 cases (4%). Among the Mullerian ductal anomalies, 2 patients (4%) were diagnosed with bicornuate bicollis uterus and 2 patients (4%) diagnosed with septate uterus. Five patients (11%) were diagnosed with endometrial and cervical carcinoma each. Only 1 patient (2%) had normal scan who was diagnosed with adenomyosis on USG.

Fibroid

The average age (±SD) of patients diagnosed with fibroids was 39.8 years. About 39% of the patients belonged to the age group of 40–50 years. The most common presenting complaint among females diagnosed with fibroids was menorrhagia (17 patients, 74%) followed by irregular menstrual cycles (8 patients, 35%) and discharge per vaginum (7 patients, 30%). Other complaints observed were dysmenorrhea (five patients), postmenopausal bleeding (four patients), and infertility and lower abdominal pain (two patients each).

On USG, 21 patients were diagnosed with fibroids of which 15 patients (71%) had hypoechoic fibroids and 6 patients (29%) had heterogeneous fibroids. None of the patients had hyperechoic fibroids. Majority of the patients with fibroids (57%) had peripheral vascularity on color Doppler imaging, 8 patients (38%) did not show any significant vascularity and 1 patient (5%) had internal vascularity.

Twenty-three patients were diagnosed with fibroid on MRI. On T1WI, 10 patients had hypointense fibroids and 13 patients had isointense fibroids. None of the patients had hyperintense fibroids on T1WI. On T2WI, 18 patients had hypointense fibroids and five patients had hyperintense fibroids. None of the patients had isointense fibroids on T2WI. Sixteen patients (69%) had intramural fibroids, 2 patients (9%) had subserosal fibroid, 3 patients (13%) had submucosal fibroids, and 2 patients (9%) had both intramural and subserosal fibroids. A total of 33 fibroids were detected on USG while MRI detected a total of 40 fibroids. Sensitivity, specificity, positive predictive value, and negative predictive value of USG were 91%, 100%, 100%, and 91%, respectively.

Adenomyosis

The average age (±SD) among patients presenting with adenomyosis was 38.7 years. About 45% of the patients belonged to the age group of 30–40 years. Dysmenorrhea was the most frequent presenting complaint in patients diagnosed with adenomyosis on MRI, observed in eight cases. Menorrhagia and discharge per vaginum were seen in three cases each. Irregular menstrual cycles and lower abdominal pain were infrequently observed in one patient each.

Adenomyosis was detected in seven patients on USG, while two patients had concomitant adenomyosis and fibroid. All the patients diagnosed with adenomyosis had bulky uterus, heterogeneous myometrial echopattern, anechoic cystic lesions in myometrium, and loss of endomyometrial interface. Seven patients (77%) had globular shaped uterus. Four patients had thickened posterior myometrium and one patient had Venetian lines.

Adenomyosis was diagnosed in six cases on MRI, while three patients had concomitant adenomyosis and fibroid. On MRI, all the patients diagnosed with adenomyosis had thickened junctional zone and tiny cystic lesions in myometrium. Eight patients (88%) had bulky uterus and 6 patients (66%) had thickened posterior myometrium. Two of our patients had T1 hyperintense lesions in the myometrium indicating areas of hemorrhage.

USG missed the diagnosis in one of our case and also falsely diagnosed adenomyosis in one other case. Sensitivity, specificity, positive predictive value, and negative predictive value of USG were 88.8%, 97%, 88.8%, and 97%, respectively.

Endometrial polyps

Two of our patients were diagnosed to have endometrial polyps on USG and MRI. Both of the patients complained of menorrhagia. One of the patient complained of dysmenorrhea while the other one complained of primary infertility. On USG, both of the patients revealed thickened endometrium and a well-defined round to oval hyperechoic lesion in the endometrial cavity with a vascular pedicle. Interrupted mucosa sign could also be depicted in one of the patient. On MRI, both the patients had an endometrial lesion appearing hypointense on T1 and T2WI. On post-contrast scan, these lesions depicted homogenous enhancement.

Endometrial carcinoma

Five patients who were histopathological proven cases of endometrial carcinoma underwent USG and MRI. Postmenopausal bleeding was the most frequent complaint, observed in 4 (80%) patients. Discharge per vaginum was observed in 3 (60%) patients and 2 patients (40%) presented with menorrhagia. Irregular cycles, lower abdominal pain, and loss of weight and appetite were observed in 1 patient each (20%). The mean age of patients with endometrial carcinoma was 50 years.

On USG, all of the patients with endometrial carcinoma had thickened and heterogeneous endometrium with raised internal vascularity. Myometrial invasion was evident on USG in 4 cases (80%). Hydrometra was observed in 2 patients (40%) and hydroureteronephrosis was observed in 1 patient (20%).

All of the patients with endometrial carcinoma showed heterogeneously enhancing T2 hyperintense mass in the endometrial cavity. Myometrial invasion was also evident in all of the cases. Hydrometra was observed

in three of our cases (60%). Necrotic lymph nodes and parametrial extension were observed in two cases each and cervical stromal invasion and hydroureteronephrosis were observed in one case each. Locoregional staging was done and it was observed that two of our cases were Stage IB, two of Stage IIIC1, and one of Stage II.

Table 1: Age-wise distribution of patients

Age group	Number of patients	Percentage
20–30	8	18
30–40	16	36
40–50	14	31
50–60	5	11
60–70	1	2
70–80	1	2
Total	45	100.0
Mean±SD	38.9±10.8 years	
Range	20–72	

Table 2: Distribution of different uterine pathologies based on USG and MRI

Diagnosis	USG	MRI
Intramural fibroid	10	12
Subserosal fibroid	4	2
Submucosal fibroid	3	3
Subserosal and intramural fibroids	1	2
Adenomyosis	7	6
Adenomyosis with fibroid	2	3
Endometrial polyp	2	2
Septate uterus	1	2
Bicornuate bicollis uterus	2	2
Endometrial carcinoma	5	5
Cervical carcinoma	5	5
Normal	3	1
Total	45	45

USG: Ultrasonographic, MRI: Magnetic resonance imaging

Table 3: Number of patients and number of fibroids detected by USG and MRI

	USG	MRI
No. of patients with fibroids	21	23
Total number of fibroids	33	40

USG: Ultrasonographic, MRI: Magnetic resonance imaging

Table 4: Distribution of patients according to location of fibroids as detected by USG and MRI

Location	USG	MRI
Intramural	15	16
Subserosal	2	2
Submucosal	3	3
Intramural and Subserosal	1	2
Total	21	23

USG: Ultrasonographic, MRI: Magnetic resonance imaging

Table 5: USG findings in patients with adenomyosis

Findings	No. of patients	Percentage
Bulky uterus	9	100
Globular shape	7	77
Heterogeneous echopattern	9	100
Anechoic cystic lesions in myometrium	9	100
Loss of endomyometrial interface	9	100
Thickened posterior myometrium	4	44
Venetian lines	1	11

Cervical carcinoma

Five patients who were histopathological proven cases of cervical carcinoma underwent USG and MRI. Discharge per vaginum and lower abdominal pain was the most frequent complaints, observed in 4 (80%) patients. Three patients (60%) presented with dysmenorrhea and irregular cycles. Post-coital bleeding and loss of weight and appetite were observed in 2 patients each (40%). The average age of patients with cervical carcinoma was 43 years.

On USG, all the patients had bulky cervix with hypoechoic mass lesion in 80% of the cases and heterogeneous mass in 20% of the cases. All the cases showed raised internal vascularity within the mass on

Table 6: MRI findings in patients with adenomyosis

Findings	No. of patients	Percentage
Bulky uterus	8	88
Thickened junctional zone	9	100
Thickened posterior myometrium	6	66
Tiny T2 hyperintense cystic lesions in myometrium	9	100
Tiny T1 hyperintense lesions in myometrium	2	20

Table 7: USG findings in patients with endometrial carcinoma

Findings	No. of patients	Percentage
Thickened and heterogeneous endometrium	5	100
Raised internal vascularity	5	100
Myometrial invasion	4	80
Hydrometra	2	40
Hydroureteronephrosis	1	20

Table 8: MRI findings in patients with endometrial carcinoma

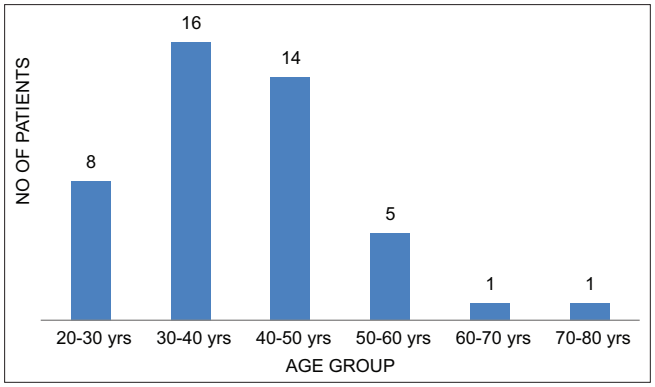
Findings	No. of patients	Percentage
T2 Hyperintense mass in endometrial cavity	5	100
Heterogeneous enhancement	5	100
Myometrial invasion	5	100
Cervical stromal invasion	1	20
Hydrometra/hematometra	3	60
Parametrial extension	2	40
Hydroureteronephrosis	1	20
Necrotic lymph nodes	2	40

Table 9: USG findings in patients with cervical carcinoma

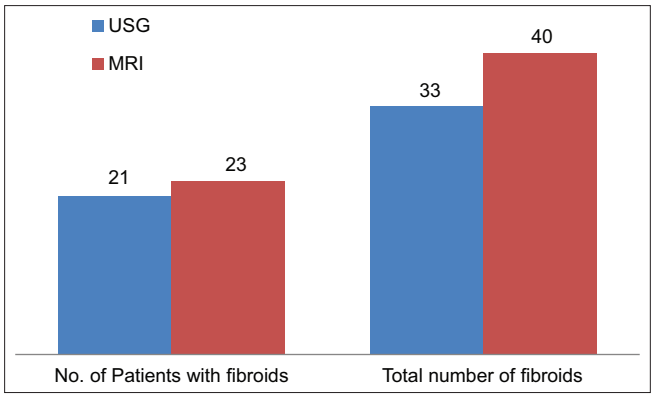
Findings	No. of patients	Percentage
Bulky cervix with hypoechoic mass	4	80
Bulky cervix with heterogeneous mass	1	20
Raised internal vascularity	5	100
Hydrometra	2	40
Hydroureteronephrosis	2	40

Table 10: MRI findings in patients with cervical carcinoma

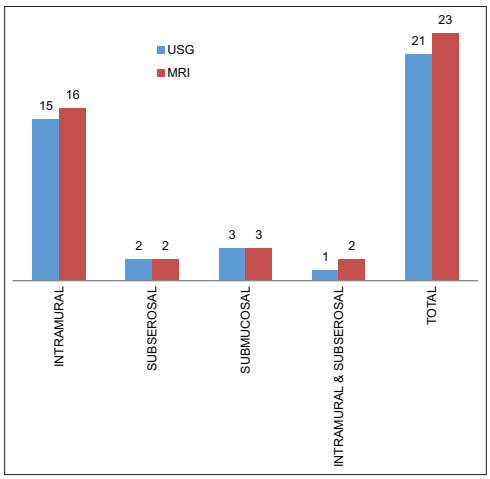
Findings	No. of patients	Percentage
Heterogeneously enhancing mass in cervix	5	100
Hydrometra/hematometra	2	40
Parametrial extension	3	60
Hydroureteronephrosis	2	40
Loss of fat planes with bladder	1	20
Loss of fat planes with rectum	1	20



Graph 1: Age-wise distribution of patients



Graph 2: Number of patients and number of fibroids detected by USG and MRI



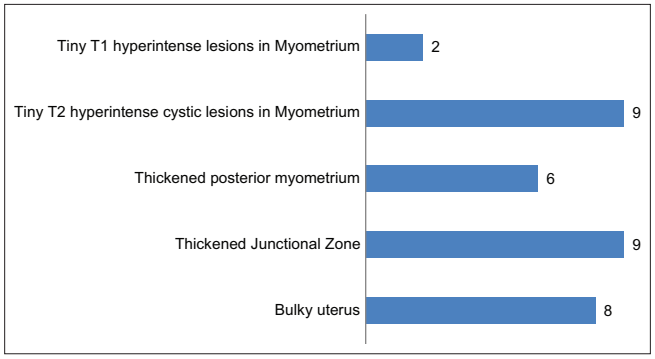
Graph 3: Distribution of patients according to location of fibroids as detected by USG and MRI

color Doppler imaging. Two cases (40%) each had hydrometra and hydroureteronephrosis.

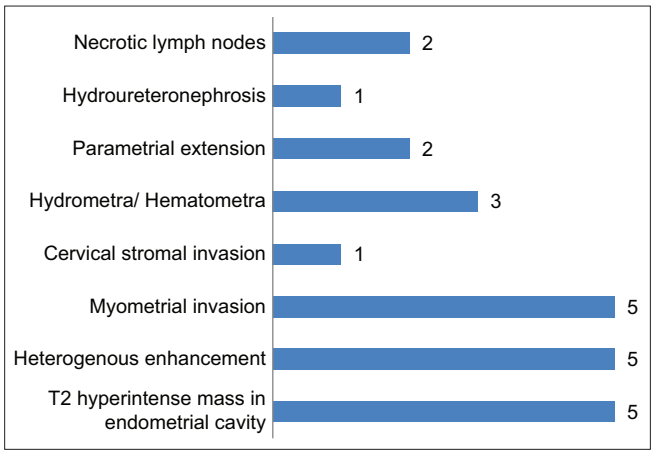
On MRI, all the patients showed heterogeneously enhancing mass in cervix. Parametrial extension was observed in 3 of our cases (60%) and hydrometra and hydroureteronephrosis were observed in 2 cases each (40%). Loss of intervening fat planes with urinary bladder and rectum was seen in one patient each. All the cases showed restricted diffusion on diffusion-weighted images.

Mullerian duct anomalies

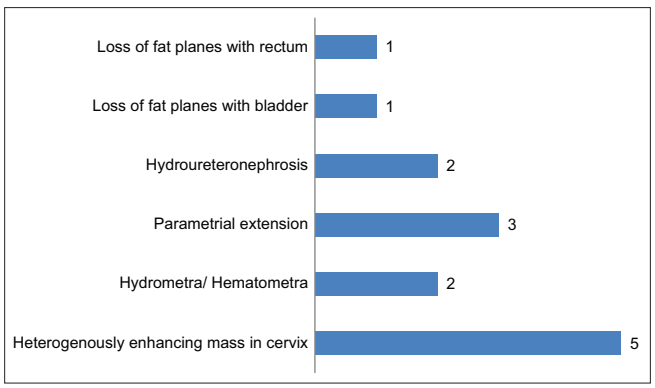
We detected two cases of bicornuate bicollis uterus and two cases of septate uterus on MRI. Although USG (TAS and TVS) could accurately



Graph 4: MRI findings in patients with adenomyosis



Graph 5: MRI findings in patients with endometrial carcinoma



Graph 6: MRI findings in patients with cervical carcinoma

identify bicornuate bicollis uterus in both the cases, it missed the diagnosis of septate uterus in one of the two cases on both TAS and TVS. The patient with missed diagnosis of septate uterus was taken up for MRI due to high clinical suspicion of congenital anomaly as patient complained of recurrent pregnancy losses.

DISCUSSION

Demographic characteristics

The average age of patients in our study was 38.9±10.8 years ranging from 20 to 72 years and majority of them were premenopausal (37/45). Thirty of our cases (67%) had benign lesions, 10 cases had malignant lesions and 4 patients (9%) diagnosed with Mullerian anomalies. One patient diagnosed with adenomyosis on USG had normal scan on MRI. Patel *et al.* in 2020 reported that the average age of females with uterine pathologies was 35 years [7]. Shankar *et al.* in a study in 2019 reported that the majority of the patients (68%) were in the premenopausal phase while only few of the patients were in the postmenopausal phase (32%) [8].

The most common presenting complaint among females diagnosed with fibroids was menorrhagia (17 patients, 74%) followed by irregular menstrual cycles (8 patients, 35%) and discharge per vaginum (7 patients, 30%). Munusamy *et al*. performed in a study in 2017 which included 362 women of which 136 patients had uterine fibroids. About 66% of the patients diagnosed with fibroids complained of menorrhagia [9].

Dysmenorrhea was the most frequent presenting complaint in patients diagnosed with adenomyosis on MRI, observed in eight cases. Menorrhagia and discharge per vaginum were seen in three cases each. Gupta *et al*. (2016) concluded that the most common complaint in females diagnosed with adenomyosis was dysmenorrhea followed by menorrhagia [10].

Both the patients diagnosed with endometrial polyps complained of menorrhagia. One of the patient complained of dysmenorrhea while the other one complained of primary infertility.

Among patients of endometrial carcinoma, postmenopausal bleeding was the most frequent complaint, observed in four patients. Discharge per vaginum was observed in three patients and two patients presented with menorrhagia. Boeckstaens *et al*. (2020) observed that the most frequent symptom observed was postmenopausal bleeding [11].

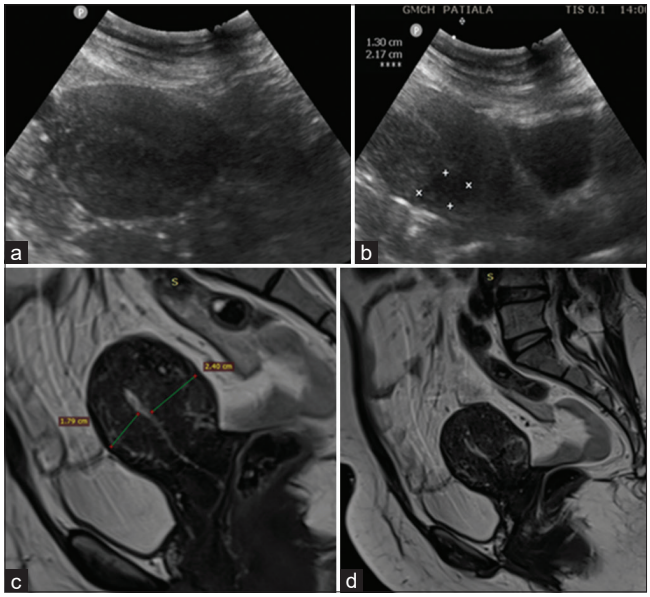


Fig. 1: (a and b) Transabdominal USG reveals globular uterus with heterogenous myometrial echopattern and ill-defined endomyometrial interface. Intramural fibroid in posterior myometrium. (c and d) T2WI showing enlarged uterus with asymmetrically thickened posterior myometrium and few tiny hyperintense cystic lesions in the myometrium. T2WI showing intramural fibroid in posterior myometrium

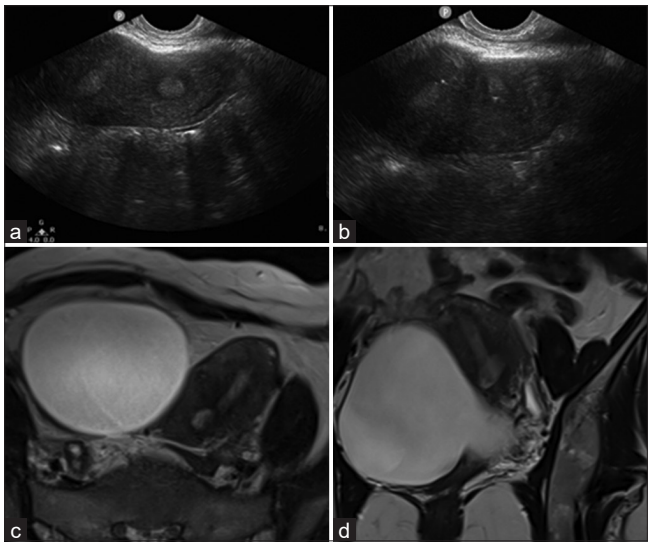


Fig. 2: (a and b) Transabdominal USG showing separation of endometrial cavities in the fundal region of uterus. (c and d) T2-weighted axial image (2C) showing separation of endometrial cavities in the fundal region with no dip in the external uterine. T2-weighted coronal image (2D) showing separation of endometrial cavities in the fundal region with angle ~ 70° indicating septate uterus

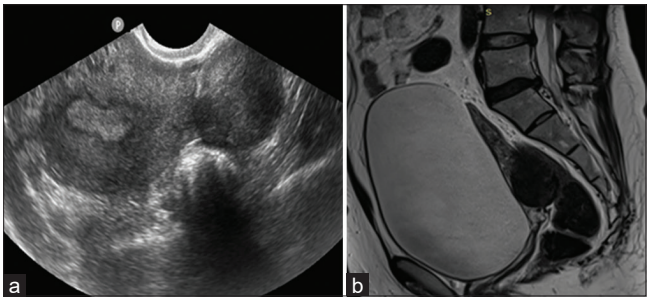


Fig. 3: Transvaginal USG depicting a well defined hypoechoic lesion in subserosal location arising from posterior myometrium contour. (a) T2-weighted sagittal (b) showing a hypointense subserosal fibroid arising from posterior myometrium

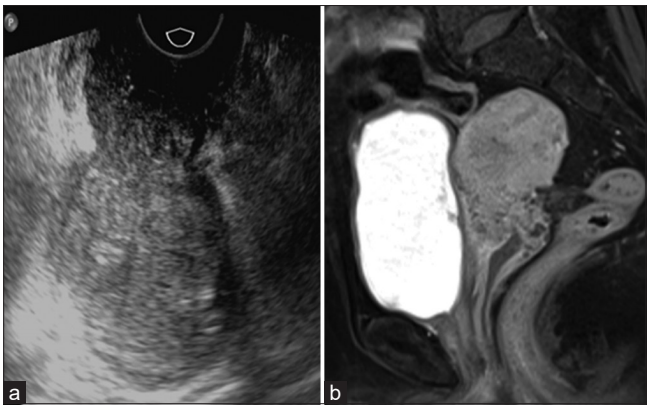


Fig. 4: Transvaginal image (a) of uterus and cervix showing bulky cervix with ill-defined heterogeneously hypoechoic mass in cervix. T1FS post-contrast image showing ill-defined heterogeneously enhancing mass lesion in the region of cervix (b).

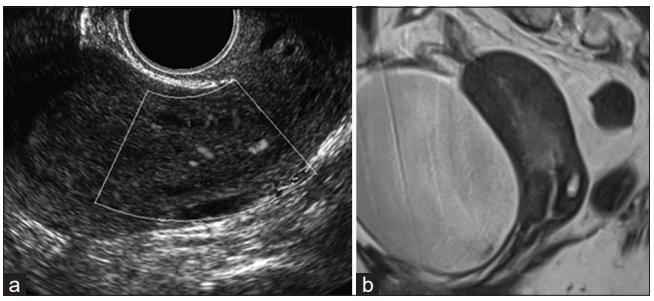


Fig. 5: Transvaginal USG revals ill-defined endomyometrial interface in the body region with raised internal vascularity. (a) T2-weighted sagittal image showing ill-defined hyperintense mass in the body region. Cervical stromal extension is evident predominantly anteriorly (b).

In patients diagnosed with cervical carcinoma, discharge per vaginum and lower abdominal pain was the most frequent complaints, observed in four patients. Three patients presented with dysmenorrhea and irregular cycles. Post-coital bleeding and loss of weight and appetite were observed in two patients each. Sachdev *et al*. (2022) found that the average age of presentation was 55 years and discharge per vaginum was the most frequent symptom (58% cases) [12].

USG findings

In our study, most of the fibroids detected on USG were hypoechoic in echopattern (71%) followed by heterogeneous echopattern which was observed in rest of the patients.

Daga and Phatak in their study stated that 78% of the fibroids had hypoechoic echopattern followed by heterogeneous pattern which was observed in 10% of the fibroids [13]. Most of the patients with fibroids (57%) demonstrated peripheral vascularity on color Doppler imaging.

Tsuda *et al*. evaluated vascularity in 70 women with uterine leiomyomas. Perifibroidal vascularity could be detected in 51.5% of the leiomyomas [14].

On USG, all the patients diagnosed with adenomyosis had bulky uterus, heterogeneous myometrial echopattern, anechoic cystic lesions in myometrium, and loss of endomyometrial interface. Seven patients had globular shaped uterus. Four patients had thickened posterior myometrium and one patient had Venetian lines. Bromley *et al*. evaluated the USG findings in patients with adenomyosis. All patients with adenomyosis had a heterogeneous myometrial echopattern, 95% showed globular shaped uterus, 82% of patients had tiny myometrial anechoic areas, and 82% had an indistinct endomyometrial junction [15].

On USG, both of the patients of endometrial polyp revealed thickened endometrium and a well-defined round to oval hyperechoic lesion in the endometrial cavity with a vascular pedicle. Interrupted mucosa sign could also be depicted in one of the patient. Kwon *et al*. retrospectively evaluated ultrasound findings in 24 patients with endometrial polyps. They found a well-delineated (100%), rounded (66%patients), hyperechoic (83%), and solid lesion (87%) with vascular pedicle (100%) [16].

On USG, all of the patients diagnosed with endometrial carcinoma had thickened and heterogeneous endometrium with raised internal vascularity. Myometrial invasion was evident on USG in four cases. Hydrometra was observed in two patients and hydroureteronephrosis was observed in one patient.

Epstein *et al*. described that the most frequent USG findings were thickened endometrium and a raised color score [17]. Alcazar *et al*. found that USG could detect myometrial invasion in 80% of the cases as compared to histopathology [18].

Among the patients diagnosed with cervical carcinoma, all had bulky cervix with hypoechoic mass in 80% of the cases and heterogeneous mass in 20% of the cases. All the cases showed raised internal vascularity within the mass on color Doppler imaging. Two cases (40%) had hydrometra and hydroureteronephrosis each.

Li *et al*. (2021) found that hypoechoic mass lesion was seen in 74% of the study subjects, while heterogeneous mass lesion was observed in rest of the study subjects. Color Doppler signal was observed in all of the study subjects. About 20% of the patients were also observed to have uterine effusion [19].

MRI findings

Majority of the fibroids appeared isointense on T1WI (13 patients, 57%) and hypointense on T2WI (18 patients, 78%). Jondal *et al*. studied the signal characteristics of fibroids on 102 patients. They observed that most of the fibroids appeared isointense on T1WI (84%) and hypointense on T2WI (86%) [20].

In our study, all the patients diagnosed with adenomyosis on MRI had thickened junctional zone (>6 mm) and tiny cystic lesions in myometrium. Eight patients had bulky uterus and six patients had thickened posterior myometrium. Two of our patients had tiny T1 hyperintense lesions in the myometrium indicative of hemorrhage. Bazot *et al*. concluded that myometrial spots appearing hyperintense on T2WI and thickened junctional zone (>12 mm) were the most accurate MRI findings in diagnosing adenomyosis. They observed T1 hyperintense areas in 40% of the patients which were confirmed to be local hemorrhage by histopathology [21].

On MRI, both the patients with endometrial polyps had an endometrial lesion appearing hypointense on T1 and T2WI. On post-contrast scan, these lesions depicted homogenous enhancement.

On MRI, all of the patients diagnosed with endometrial carcinoma showed heterogeneously enhancing T2 hyperintense mass in the endometrial cavity. Myometrial invasion was observed in all of the cases, detecting invasion in one more case than USG. Diffusion restriction was observed in all of the cases. Hydrometra was observed in three of our cases (60%). Necrotic lymph nodes and parametrial extension were observed in two cases each and cervical stromal invasion and hydroureteronephrosis were observed in one case each. One of our cases also showed a concomitant anterior myometrial fibroid. Two of our cases were Stage IB, two of Stage IIIC1, and one of Stage II. Tao *et al*. found that the most frequent MRI findings in patients with endometrial carcinoma were widening of endometrial canal and high signal intensity area causing widening of the body of uterus. Most of the cases also showed uneven enhancement on post-contrast scans [22].

On MRI, all the patients diagnosed with cervical carcinoma showed heterogeneously enhancing mass in cervix on MRI. Parametrial extension was observed in three of our cases (60%) and hydrometra and hydroureteronephrosis were observed in 2 cases each (40%). Loss of intervening fat planes with rectum and bladder were observed in one case each. All the cases showed restricted diffusion on diffusion-weighted images.

Zand *et al*. stated that MRI, especially dynamic contrast-enhanced sequences, could accurately detect vaginal and parametrial involvement in most of the cases [23].

USG and MRI correlation

In our study, very good correlation was found between the USG and MRI findings in the detection of uterine pathologies. Kappa coefficient was calculated to be 0.823 with significant ($p<0.001$).

Goyal *et al*. evaluated 50 patients with suspected uterine masses. They found that USG and MRI had good correlation with Cohen's kappa value ~ 0.63 [24].

Another study conducted by Azhar (2022) who evaluated 52 patients with suspected uterine pathologies. In their study, fibroids were diagnosed in 24 patients, Adenomyosis affected 12 individuals, endometrial cancer affected three patients and cervical cancer affected ten patients. Cervical polyp was diagnosed in two patients. In identifying myometrial mass lesions, there is a 54% diagonal agreement between TAS and MRI, and a 67% agreement between TVS and MRI. Sufficient correlation was observed with Cohen's kappa of 0.65, with $p=0.01$ suggesting statistical significance [25].

CONCLUSION

Uterine pathologies are common among reproductive age females and postmenopausal females with benign pathologies common in the former and malignancies more so in the latter. Ultrasound, when transabdominal and transvaginal combined is an adequate modality in diagnosing of uterine pathologies. MRI is the optimal imaging

investigation for identification, characterization, localization, and staging of uterine pathologies. In the present study of 45 patients with suspected uterine pathologies conducted in the Department of Radiodiagnosis, Rajindra Hospital, Patiala, very good correlation was found between USG and MRI.

AUTHORS CONTRIBUTION

Dr. Simmi Bhatnagar had conceptualized, planned, supervised, collection of data and interpretation, analyzed research, and edited the write up of research article. Dr. Aayush Bansal had contributed in planning, collection of data, analysis of research and write up of research, and editing of the research article. Dr. Manoj Mathur assisted in planning, supervision, collection and interpretation of data.

CONFLICTS OF INTEREST

Nil.

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