

To Determine the Role of Ultrasonography and Magnetic Resonance Imaging in Evaluation of Female Pelvic Masses: Reproductive Organs with Histopathological Correlation

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ABSTRACT

OBJECTIVE

To determine the role of ultrasonography and magnetic resonance imaging in evaluation of female pelvic masses from reproductive organs with histopathological correlation.

MATERIALS AND METHODS

Present prospective study was conducted at department of Radio diagnosis with collaboration with department of Obstetrics and Gynecology, in Kamineni institute of medical sciences, Narketpally on 30 female patients in suspected to have pelvic masses clinically with USG, MRI and HPE.

RESULTS

In the present study 11 (36%) patients were in age group of 31- 40 years. Lower abdominal pain was the most common presenting complaint in 18 (60%) patients. On USG 16 were given as benign and 14 were given as malignant. On Magnetic Resonance Imaging (MRI) 17 cases were given as benign and 13 cases were given as malignant. On HPE 18 cases were confirmed as benign and 12 were confirmed as malignant. USG showed a sensitivity, specificity, positive predictive value and negative predictive value of 88.8%, 100%, 100% and 85.7% respectively compared to gold standard HPE. MRI showed a sensitivity, specificity, positive predictive value and negative predictive value of 94.5%, 100%, 100% and 92.4% respectively compared to gold standard HPE. The chi square (p -value < 0.05) is significant.

CONCLUSION

Present study has shown that MRI is a very sensitive imaging modality for the evaluation of female patients with pelvic masses and the disease extent is better evaluated than USG. Pre-operative MRI can be preferred as a noninvasive non radiation method for female patients with pelvic masses.

KEYWORDS

Female pelvic masses, Histopathology, Magnetic resonance imaging, Ultrasonography

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INTRODUCTION

Pelvic masses from female reproductive organs are the most common gynecological disorders. The primary goal of imaging is the evaluation of masses to differentiate malignant from benign condition in order to direct patients to appropriate treatment [1,2]. Surgery for benign masses is simple excision but for a malignant mass in radical surgery. Screening examinations including imaging modalities are important for early detection and evaluation of these lesions. Sonography is the initial imaging modality of choice in the evaluation of women with suspected pelvic mass from reproductive organs because of its wide spread availability, relatively low cost and high sensitivity in the detection of masses [3]. However, it has less specificity for the diagnosis of benignity, limited field of view and sometimes bowel gas obscures proper visualization of pelvic organs [4]. MRI has demonstrated considerable potential in pelvic imaging. The ability of MRI to accurately characterize clinically and sonographic ally indeterminate pelvic masses from female reproductive organs has been previously documented in the literature[5]. Other advantages are its non-invasiveness, multiplane imaging, and excellent tissue differentiating capabilities. It has high sensitivity and specificity for differentiating benign and malignant masses [6,7]. Histopathological diagnosis for pelvic masses from female reproductive organs serves as a gold standard for diagnosis and staging[8]. In this study we assessed the role of USG and MRI in evaluation of female pelvic masses from reproductive organs and compared them with HPE diagnosis.

MATERIALS AND METHODS

Present study was conducted in Kamineni Institute of Medical Sciences, Narketpally, Nalgonda District, and Telangana, India from November 2016 to September 2018 on 30 subjects after obtaining institutional ethical clearance. The outcome parameters were to know the incidence and severity of shivering after spinal anesthesia in patients undergoing TURP. The secondary outcome was to look for effect of both drugs on hemodynamics.

Inclusion Criteria

Patients with clinically suspected cases of uterine and adnexal masses.

Patients with incidental detection of uterine and adnexal masses on ultrasonography.

Patients of all age groups were included in the study.

Exclusion Criteria

- Patients with bladder carcinoma and rectal carcinoma.
- Patients who have underwent treatment for pelvic mass.
- Patients with metallic implants, cardiac pace makers and cochlear implants.
- Patients who are claustrophobic.
- Patients who are unwilling for imaging.

All patients were informed in detail about aim, objectives of study and written consent was taken. A thorough clinical history was taken followed by physical examination. Clinically suspected pelvic masses were subjected to USG and MRI. Incidentally detected USG pelvic mass lesions (as of the inclusion criteria) were further imaged with MRI. A radiological diagnosis was made. Surgery was done in all cases and tissue biopsy was sent for histopathological examination. The

radiological diagnosis was correlated with his pathology report. The average time gap between USG and MRI was 3 days and between MRI and HPE diagnosis was 15 days.

Imaging Technique

Ultrasound Examination. All cases underwent transabdominal ultra-sonographic examination on Phillips with full urinary bladder with an htz curvilinear probe and htz transvaginal sonography was done with a linear probe of htz with empty bladder wherever necessary.

During sonographic examination, the uterine borders (regular or irregular), size, myometrial echo texture, endometrial thickness and the presence of any mass lesions were noted.

Benign uterine lesions like fibroids were diagnosed based on the following features like well-defined hypoechoic or heterogeneous mass causing distortion of normal uterine contour with calcifications and sometimes posterior acoustic shadowing showing peripheral vascularity.

Ultrasound features like irregular solid tumor, at least four papillary projections, Irregular multilocular solid tumor, strong blood flow, presence of ascites and thick irregular septae were considered malignant. Features like unilocular lesion, cystic components with thin wall and septae, acoustic shadowing, no detectable blood flow were considered benign to categories ovarian and extra ovarian adnexal lesions.

MRI: All 30 pts underwent MRI of the pelvis on 1.5 T Siemens Magneto Essensa. Scanning was performed after a fasting period of four to six hours prior to the examination to limit bowel motion. Gadolinium dimeglumine (omniscan) 10 ml was administered as and when required. Post contrast T1FS (TE=10 ms/TR=500 MS) images were obtained in axial, coronal and sagittal planes. In adnexal lesions (ovarian and extra ovarian) the following features if present was considered malignant like thick enhancing wall, more than 4 enhancing papillary projections, mural nodules/solid component with in the mass. Presence of ascites, peritoneal deposits, lymphadenopathy and metastasis were also recorded. In the absence of the above features the lesion was categorized benign. Each mass was assigned into one of the following groups: 1 Benign, 2 probably benign, 3 possibly malignant, 4 probably malignant or 5 Malignant.

Statistical Analysis

All the data were entered and analyzed using SPSS by consulting the biostatistician. The obtained results were compared using Chi square tests for qualitative data using Chi-Square test p-value<0.05 was considered to be significant.

The sensitivity, specificity positive predictive value and negative predictive value of a correct USG and MRI diagnosis of a mass (malignant or benign), as determined by the final diagnosis, were calculate.

RESULTS

Evaluation of pelvic masses from reproductive organs prior to surgery has important implications as it enables to perform most appropriate surgical procedure. Especially in premenopausal age group there are no specific clinical or laboratory data to point towards definite malignant nature of a lesion. Hence USG and MRI have become very useful modalities of imaging. In the present study, most commonly affected age group was 31-40 years (36%), which was similar to other studies (Table 1).

Age in Years	Number of Cases	Percentage (%)
21-30	7	30%
31-40	11	36%
41-50	5	16%
51-60	3	10%
>60	4	13%

Table 1. Distribution According to Age (n=30).

Adnexal cysts are common in the reproductive age group, whereas, the risk of malignancy increases with age and it is more common in post-menopausal age group.⁴ Most common presenting complaint was lower abdominal pain (60%) followed by lump in abdomen (20%) (Table 2).

Presenting complaints	Number of Cases	Percentage (%)
Lower abdominal pain	18	60%
Lump in abdomen	6	20%
Infertility	4	13%
Menorrhagia	3	10%
Irregular cycles	3	10%
Bloody vaginal discharge	1	3%

Table 2. Distribution According to Presenting Complaints (n=30).

Our findings correlated with study done by^[9-11]. In the present study maximum number of cases (64%) were Adnexal origin (Table 3),

Origin of lesion	Number of Cases (n=30)	Percentage (%)
Uterine	11	36%
Adnexal	19	64%

Table 3. Distribution Based on Origin of Lesion.

Which correlated well with studies where ovarian lesions accounted for about 68% and 56% respectively. In the present study there were 2 cases of intramural fibroids which were correctly diagnosed both on USG and MRI (Table 4).

MRI Diagnosis	Benign / Malignant	Number of cases (n=30)	Percentage (%)
Right side broad ligament fibroid with degenerative changes	Benign	1	3.40%
Sub serosal fibroid with degeneration	Benign	2	6.60%
Intramural fibroids	Benign	2	6.60%
Left ovarian	Benign	1	3.40%

dermoid			
Right ovarian dermoid	Benign	1	3.40%
Epithelial cystic tumor of right ovary	Benign	1	3.40%
Epithelial tumor of left ovary	Benign	2	6.60%
Serous cystadenoma of left ovary	Benign	1	3.40%
Left ovarian torsion secondary to complex cyst	Benign	2	6.60%
Right ovary torsion secondary to hemorrhagic cyst	Benign	1	3.40%
Right ovarian endometrioma	Benign	1	3.40%
Left ovarian endometrioma	Benign	2	6.60%
Bilateral ovarian epithelial carcinoma	Malignant	1	3.40%
Malignant epithelial tumor of right ovary	Malignant	1	3.40%
Malignant epithelial tumor of left ovary	Malignant	1	3.40%
Right ovarian germ cell tumor	Malignant	1	3.40%
Carcinoma endometrium stage 1A	Malignant	2	6.60%
Carcinoma endometrium stage 1B	Malignant	1	3.40%
Carcinoma of cervix stage 1B	Malignant	1	3.40%
Carcinoma cervix with hematometra stage 1B	Malignant	1	3.40%
Carcinoma cervix stage 2A	Malignant	1	3.40%
Carcinoma cervix stage 3A	Malignant	1	3.40%
Endometrial polyp	Benign	1	3.40%
Tubo ovarian abscess	Benign	1	3.40%

Table 4. Distribution According to MRI Diagnosis.

Both the cases of broad ligament fibroids and a case of sub serosal fibroid were given as adnexal mass lesions in USG as the origin of the lesions could not be clearly traced, one case of Broad ligament fibroid was given as malignant adnexal mass on USG and MRI which was diagnosed correctly on

HPE. Malignancy was given both on USG and MRI based on it's a typical features like solid mass with degenerative changes, large size. Rest of the 2 cases were diagnosed correctly on MRI. In this study out of total 22 cases 16 cases were

diagnosed correctly on USG and all 22 were diagnosed correctly on MRI.

All cases of fibroids were correctly diagnosed showing a sensitivity and specificity of 94% and 100% respectively.

In the present study, the sensitivity and specificity of USG in characterizing female pelvic masses from reproductive organs into benign and malignant is 88.8% and 100% (Table 5).

Diagnosis	USG	MRI	HPE
Benign	16	17	18
Malignant	14	13	12
Total	30	30	30

Table 5. Comparison of USG, MRI and HPE diagnosis.

In the present study a case of endometrial hyperplasia was given benign and was proved malignant on HPE. In the same way a case of large complex cyst in pelvis was categorized into benign which was proved malignant on HPE. A case of endometrial polyp was given as malignant endometrial mass on USG. Another case of large complex right ovarian lesion was categorized as malignant on USG and was proved benign on HPE.

In the present study MRI showed a sensitivity and specificity of 94.5% and 100% (Table 6).

Performance Indices	USG Diagnosis	MRI Diagnosis
Sensitivity	88.80%	94.50%
Specificity	100%	100%
Positive predictive value	100%	100%
Negative predictive value	85.70%	92.40%
Chi square value	12.6	27.4
P value	0.009	0.007

Note: p value <0.05- significant
Table 6. Comparison of Performance Indices in USG and MRI Diagnosis.

In characterizing female pelvic masses from reproductive organs into benign and malignant lesions 100%,97.7%,90%& 92% and 100%, 98.4% [12]. MRI has high sensitivity and specificity which will help in staging of cancers, patient selection for treatment and detection of disease recurrence.

DISCUSSION

The thermoregulatory mechanism in human body is a complex one that normally keeps the temperature within a tight range (36.5°C-37.5°C) known as "inter-threshold range". If the core temperature decreases below this range, the body responds by vasoconstriction and shivering which increases heat production two to five folds. Thus, shivering is a protective mechanism to preserve body heat but no definite linear relationship exists between body temperature and occurrence of shivering. SA induces inhibition of vasoconstriction below the level of block through sympathetic and somatic blockade.

Subsequent vasodilatation and increased cutaneous blood flow results in increased heat loss *via* the skin.

In contrast to these changes, vasoconstriction and shivering are restricted to the upper body during SA.

Large number of animal studies has been under taken to prove that intrathecal nalbuphine was not neurotoxic.

In a sheep model using histopathological methods that intrathecal nalbuphine, even at large doses 15-24 mg were not associated with histopathological changes of the spinal cord. In our study, we compared the efficacy and adverse effects of nalbuphine as an adjunct to intrathecal bupivacaine and bupivacaine alone in TURP. The severity of shivering was low in albuphine group as compared to only bupivacaine group.

Nalbuphine also provided hemodynamic stability. None of patient had respiratory depression (respiratory rate below 10 bpm, SPO2 <90%). Since respiratory depression is predominantly μ receptor-mediated and nalbuphine is a μ receptor antagonist, respiratory depression effect is expected to be attenuated by nalbuphine.

Patients who received bupivacaine with nalbuphine had significantly longer duration for first request of analgesia when compared with patients who received bupivacaine alone. In our study, nalbuphine also exhibits analgesic ceiling effect at 0.8 mg dosage, above which there was no increase in analgesic efficacy. This analgesic ceiling effect can be a significant limitation of nalbuphine usage. Patient who received bupivacaine alone had significantly higher pain scores earlier than patients who received nalbuphine-bupivacaine combinations as assessed by VAS. In bupivacaine group, patients were wide awake whereas patients who received nalbuphine-bupivacaine combinations were sedated, calm, and easily reusable with verbal commands (Grade 2 sedation score).

CONCLUSION

In practice USG is the primary imaging modality for diagnosing female pelvic masses from reproductive origin. It was helpful in evaluating cystic or solid masses.

MRI is an excellent tool for the assessment of disorders of the uterus and the adnexa. Present study has shown that MRI is a very sensitive imaging modality for the evaluation of female patients with suspected or confirmed uterine and adnexal masses and the disease extent is better evaluated than USG. It also detects ultra sonographically occult lesions. MRI has high accuracy in differentiating benign from malignant masses. Pre-operative MRI can be preferred as a noninvasive non radiation method for female patients with suspected or confirmed pelvic masses.

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