Original Research

Role of diffusion-weighted imaging and MRI in identifying uterine and adnexal lesions

Dr. Robin Goel
Associate Professor, Department of Radio Diagnosis, Saraswathi Institute of Medical Sciences, Hapur

Correspondence Author
Dr. Robin Goel
Associate Professor, Department of Radio Diagnosis, Saraswathi Institute of Medical Sciences, Hapur

Received Date:16 September 2021 Accepted Date: 31 Octobar 2021

ABSTRACT

Background: The term "uterine and adnexal pathologies" describes a range of illnesses and disorders that can impact the female reproductive system's uterus and adnexal components. The present study was conducted to evaluate the role of diffusion-weighted imaging and MRI in identifying uterine and adnexal lesions.

Materials & Methods:70 patients with uterine and adnexal lesions were selected. Siemens Avanto Magnetic Resonance Imaging (1.5 Tesla) was performed on each.

Results: The age group 21-30 years had 26 patients, 31-40 years had 37 and 41-50 years had 7 patients. The difference was non- significant (P> 0.05). Benign lesions were 56 and malignant lesions were 14. Under benign, 49 were cystic, 5 were solid and 2 were solid-cystic. Under malignant, 7 were cystic, 3 were solid and 4 were solid-cystic. The difference was significant (P< 0.05). Diffusion restriction was absent in 23 benign uterine and cervical lesions and present in 8 malignant lesions. Diffusion restriction was absent in 18 and present in 15 benign adnexal lesions and present in 6 malignant lesions. The difference was significant (P< 0.05). The sensitivity, specificity, positive predictive, negative predictive value and accuracy of MRI in detecting and differentiating benign and malignant uterine and adnexal lesions was 95%, 100%, 100%, 97.2% and 96.4% respectively.

Conclusion: Lesions in the uterus and adnexa can be easily identified and described using magnetic resonance imaging (MRI). DWI has a limited significance in cases of adnexal lesions because many benign lesions had low ADC values.

Key words: Adnexal, Uterine, MRI

Introduction

The term "uterine and adnexal pathologies" describes a range of illnesses and disorders that can impact the female reproductive system's uterus and adnexal components.[1]The term "adnexa" describes the uterine auxiliary structures, such as the fallopian tubes and ovaries.

Although most are benign, malignant ones carry a significant risk of death.[2] Therefore, a precise diagnosis is essential for taking early action, and magnetic resonance imaging (MRI) can provide a high-accuracy diagnostic.[3] The gold standard for diagnosing pelvic pathologies in women is ultrasonography (USG), but magnetic resonance imaging (MRI) is a more efficient way to evaluate pelvic lesions in women because of its excellent tissue differentiation ability, multiplanar imaging capability, and superior tissue resolution, all of which can help reach aconclusive diagnosis.[4]

Diffusion weighted imaging (DWI) is one kind of functional imaging sequence. It is based on the idea that water molecules flow through tissues at random. Because water diffusion differs amongst tissues, appropriate imaging contrast can be achieved without the need for an exogenous contrast injection.[5] The acquired DWI image is examined both qualitatively and quantitatively using b-values, which represent different intensities of the diffusion-sensitizing gradient, and Apparent Diffusion Coefficient (ADC) maps.[6] In addition to identifying and characterizing a variety of uterine and adnexal lesions, the combination of MRI and DW Imaging has shown promise in assessing the anatomical extent of these lesions and understanding their pathophysiology through ADC values, which help differentiate benign from malignant lesions.[7]The present study was conducted to evaluate the role of diffusion-weighted imaging and MRI in identifying uterine and adnexal lesions.

Materials & Methods

The present study consisted of 70 patients with uterine and adnexal lesions. All gave their written consent to participate in the study.

Data such as name, age, etc. was recorded. Siemens Avanto Magnetic Resonance Imaging (1.5 Tesla) was performed on each. Short TI Inversion Recovery (STIR) in axial, coronal, and sagittal planes; T1-Fat Supressed (FS) in axial plane; Diffusion Weighted Sequence (DWI) in axial plane; Gradient Echo (GRE)

in sagittal or axial plane; and T1 Weighted Imaging (T1WI) in axial, coronal, and sagittal planes were the sequences used. Data thus obtained were subjected to statistical analysis. P value < 0.05 was considered significant.

Results

Table: I Distribution of patients

Age group (years)	Number	P value
21-30	26	0.57
31-40	37	
41-50	7	

Table I shows that the age group 21-30 years had 26 patients, 31-40 years had 37 and 41-50 years had 7 patients. The difference was non- significant (P> 0.05).

Table: II Benign and malignant adnexal lesion

Lesions	Benign (56)	Malignant (14)	P value
Cystic	49	7	0.01
Solid	5	3	0.26
Solid-cystic	2	4	0.05

Table II, graph I show that benign lesions were 56 and malignant lesions were 14. Under benign, 49 were cystic, 5 were solid and 2 were solid-cystic. Under malignant, 7 were cystic, 3 were solid and 4 were solid-cystic. The difference was significant (P< 0.05).

Graph: I Benign and malignant adnexal lesion

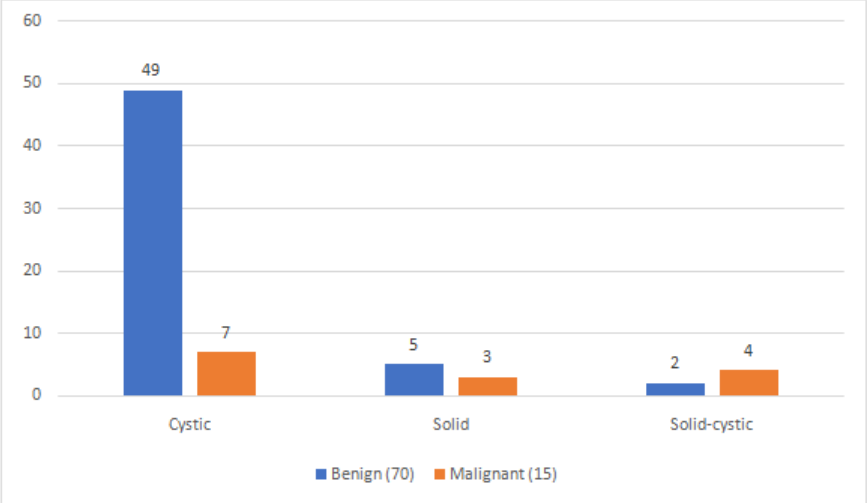

Table: III Benign and malignant lesion on diffusion restriction

Lesions	Variables	Absent	Present	P value
Uterine and cervical lesions	benign	23	0	0.05
	malignant	0	8	
Adnexal lesions	benign	18	15	0.03
	malignant	0	6	

Table III shows that diffusion restriction was absent in 23 benign uterine and cervical lesions and present in 8 malignant lesions. Diffusion restriction was absent in 18 and present in 15 benign adnexal lesions and present in 6 malignant lesions. The difference was significant (P< 0.05).

Table: IV Evaluation of efficacy of MRI

Efficacy	Percentage
Sensitivity	95%
Specificity	100%
Positive predictive value	100%

Negative predictive value	97.2%
Accuracy	96.4%

Table IV show that the sensitivity, specificity, positive predictive, negative predictive value and accuracy of MRI in detecting and differentiating benign and malignant uterine and adnexal lesions was 95%, 100%, 100%, 97.2% and 96.4% respectively.

Discussion

The primary cause of morbidity in females is uterine and adnexal lesions. The specific condition determines the diagnosis and course of treatment for uterine and adnexal disorders. Biopsies, blood tests, and imaging studies can all be utilized to make a diagnosis.[8] Depending on the type and severity of the problem, treatment options may involve medication, surgery, or a combination of the two.[9] For appropriate assessment and treatment, it is crucial that people who are exhibiting symptoms or who are at risk for certain disorders consult a doctor. A comprehensive evaluation of the suspected illnesses in USG is necessary when using MRI.[10]

We found that the age group 21-30 years had 26 patients, 31-40 years had 37 and 41-50 years had 7 patients. According to Naganawa et al[11], cervical cancer has been found to have hindered diffusion in comparison to normal cervical stroma, and its ADC (1.09 ± 0.2 × 10-3 mm2 /sec) is significantly lower than that of the normal cervix (1.79 ± 0.24 × 10-3 mm2 /sec).

We found that benign lesions were 56 and malignant lesions were 14. Under benign, 49 were cystic, 5 were solid and 2 were solid-cystic. Under malignant, 7 were cystic, 3 were solid and 4 were solid-cystic. We found that diffusion restriction was absent in 23 benign uterine and cervical lesions and present in 8 malignant lesions. Diffusion restriction was absent in 18 and present in 15 benign adnexal lesions and present in 6 malignant lesions. We found that the sensitivity, specificity, positive predictive, negative predictive value and accuracy of MRI in detecting and differentiating benign and malignant uterine and adnexal lesions was 95%, 100%, 100%, 97.2% and 96.4% respectively.RC Jha et al[12] demonstrated that ADC measurements can quantitatively distinguish between normal and malignant uterine lesions. The modality of choice for the assessment of tumour size and its spread is MRI. The MRI has a high negative predictive value (NPV) of 95 percent for parametrial invasion in cervical carcinoma.

The limitation of the study is the small sample size.

Conclusion

Authors found that lesions in the uterus and adnexa can be easily identified and described using magnetic resonance imaging (MRI). DWI has a limited significance in cases of adnexal lesions because many benign lesions had low ADC values.

References

1. Motoshima S, Irie H, Nakazono T, Kamura T, Kudo S. Diffusion-weighted MR imaging in gynecologic cancers. Journal of gynecologic oncology. 2011;22(4):275-87.
2. Koc Z, Erbay G, Ulusan S, Seydaoglu G, Aka-Bolat F. Optimization of b value in diffusion-weighted MRI for characterization of benign and malignant gynecological lesions. Journal of Magnetic Resonance Imaging. 2012; 35(3):650-9.
3. Corwin MT, Gerscovich EO, Lamba R, Wilson M, McGahan JP. Differentiation of ovarian endometriomas from hemorrhagic cysts at MR imaging: utility of the T2 dark spot sign. Radiology. 2014;271(1):126-32.
4. Qayyum A. Diffusion-weighted imaging in the abdomen and pelvis: concepts and applications. Radiographics. 2009;29(6):1797-810.
5. Kaji Y, Sugimura K, Kitao M, Ishida T. Histopathology of uterine cervical carcinoma: diagnostic comparison of endorectal surface coil and standard body coil MRI. Journal of computer assisted tomography. 1994;18(5):785-94.
6. Rockall AG, Ghosh S, Alexander-Sefre F, Babar S, Younis MT, Naz S, Jacobs IJ, Reznek RH. Can MRI rule out bladder and rectal invasion in cervical cancer to help select patients for limited EUA?.Gynecologic oncology. 2006 ;101(2):244- 9.
7. Koyama T, Tamai K, Togashi K. Staging of carcinoma of the uterine cervix and endometrium. European radiology. 2007;17(8):2009-19.
8. Bernardin L, Dilks P, Liyanage S, Miquel ME, Sahdev A, Rockall A. Effectiveness of semi-quantitative multiphase dynamic contrast-enhanced MRI as a predictor of malignancy in complex adnexal masses: radiological and pathological correlation. EurRadiol. 2012;22(4):880–90.
9. Zahra MA, Hollingsworth KG, Sala E, Lomas DJ, Tan LT. Dynamic contrast-enhanced MRI as a predictor of tumour response to radiotherapy. Lancet Oncol. 2007;8(1):63–74.
10. Kwee TC, Takahara T, Koh DM, Nievelstein RA, Luijten PR. Comparison and reproducibility of ADC measurements in breathhold, respiratory triggered, and free-breathing diffusion-weighted MR imaging of the liver. J Magn Reson Imaging. 2008;28(5):1141–8.
11. Jha RC, Zanello PA, Ascher SM, Rajan S. Diffusion-weighted imaging (DWI) of adenomyosis and fibroids of the uterus. Abdominal imaging. 2014;39(3):562-9.
12. Naganawa S, Sato C, Kumada H, Ishigaki T, Miura S, Takizawa O. Apparent diffusion coefficient in cervical cancer of the uterus: comparison with the normal uterine cervix. European radiology. 2005;15(1):71-8.