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ORIGINAL ARTICLE

Diagnostic Accuracy of Diffusion Weighted Magnetic Resonance in Differentiating Between Malignant and Benign Endometrial Soft-Tissue Lesions

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ABSTRACT

Background and Aim: Pathological variation and image overlapping due to several endometrial conditions could be challenging for radiologists. Diffused weighted magnetic resonance imaging (DWI) is a reliable and promising imaging technique for the diagnosis and characteristics of endometrial lesions. The present study aimed to assess the diagnostic accuracy of diffused weighted magnetic imaging resonance in differentiating between malignant and benign endometrial soft-tissue lesions.

Methodology: This descriptive cross-sectional study was carried out on 50 suspected endometrial lesions in the department of radiology, Benazir Bhutto hospital, Rawalpindi from January 2021 to December 2021. Non-probability consecutive sampling technique was used for all the participants meeting the inclusion criteria. Patients were categorized into two groups; Group I and Group II comprised 25 suspected benign and malignant endometrial lesions respectively. All the study patients were subjected to ultrasound and MRI examination of the pelvis. DWI imaging was done and the ADC value was calculated at a high b value. Histopathological data was collected. Data were analyzed using SPSS version 23.

Results: Of the total 50 endometrial lesions, histopathological results were divided into the malignant group (25 lesions, 50%) and benign group (25 lesions, 50%). Out of 50, 38 lesions (21/25 benign and 17/25 malignant lesions) were correctly diagnosed by the conventional magnetic resonance imaging technique. The sensitivity, specificity, predictive positive value (PPV), and negative-positive value (NPV) of conventional MRI were 76.82%, 79.41%, 74.12%, AND 81.5% respectively. However, combining the apparent diffusion coefficient (ADC) value at b=1000 with DWI, about 48 lesions (24/25 benign and 24/25 malignant lesions) were correctly diagnosed. The sensitivity, specificity, predictive positive value (PPV), and negative-positive value (NPV) of conventional MRI were 94.82%, 93.23%, 91.6%, and 97% respectively.

Conclusion: Diffusion-weighted MRI can help in distinguishing uterine endometrial lesions as benign and malignant. The diagnostic accuracy of Combined DWI with ADC mapping is higher than conventional MRI when differentiating benign lesions from malignant lesions. Additionally, sensitivity, specificity, and accuracy of combined DWI with ADC mapping increased in pelvic MRI examination for differentiating endometrial focal lesions.

Keywords: Pelvic ultrasound; MRI Pelvis; Benign and Malignant endometrial lesions, Validity.

INTRODUCTION

Uterine endometrial lesions are lesions arising from abnormal proliferation of endometrial lesions. Many a times the uterine endometrial lesions pose a diagnostic challenge for radiologists. This might be due to the different appearances of endometrium during different phases of menstrual cycle and also due to varied benign and malignant endometrial lesions [1]. These include submucosal fibroid, endometrial polyp, endometrial hyperplasia, and endometrial neoplasms. Endometrial neoplasm is one of the most common gynecological malignancies with a prevalence of 5% [2]. Incidence of endometrial cancer in Asia is reported in Armenia as 26.7/100,000 population and mortality being 1.6/100,000 population [3, 4]. Different radiological investigations can be used to diagnose endometrial lesions which includes transabdominal, transvaginal ultrasound and MRI pelvis [5]. MRI is considered the gold standard imaging modality for evaluation of endometrial lesions. It is noninvasive, lacks use of ionizing radiations and provides high soft tissue contrast. Early diagnosis can help to efficiently treat the patient giving better survival rates.

The varying endometrial conditions and pathologies such as endometrial carcinoma, polyps, and submucosal fibroid causes overlapping of imaging features with normal endometrial phase [6, 7]. Ultrasound is less accurate and specific in terms of characterization of endometrial lesion as compared to MRI. MRI is more sensitive in diagnosis of origin, composition, shape, and lesion enhanced pattern specify the diagnosis differences [8]. Diffusion-weighted (DW) MRI is based on water molecules random movement within different tissues [9]. MRI has high tissue contrast and can be used to evaluate peritoneal deposits, metastatic lesions, tumour recurrence, and treatment response when combined with apparent diffusion coefficient (ADC) mapping [10]. Functional imaging, specifically diffusion-weighted imaging (DWI), has recently been discovered to be extremely useful in assessing various tumours. Its ability to detect changes at the molecular level has dramatically altered radiologists' diagnostic approach, which was previously based on morphological criteria. It has the potential to enhance the conventional MRI diagnostic accuracy in terms of diagnosing the tumor recurrence and treatment regimens response with higher spatial resolution. The purpose of the study is to use diffusion weighted MRI imaging with ADC mapping at high b value (1000) as adjunct to normal MRI sequences to differentiate benign and malignant endometrial lesions

METHODOLOGY

This descriptive cross-sectional study was carried out on 50 suspected endometrial lesions in the department of Radiology, Benazir Bhutto hospital and Holy Family Hospital, Rawalpindi from January 2021 to December 2021. Non-probability consecutive sampling technique was used for all the participants meeting the inclusion criteria. Patients were categorized into two groups; Group I and Group II comprised 25 suspected benign and malignant endometrial lesions respectively. All the study patients were subjected to ultrasound and MRI examination of the pelvis. DWI imaging was done and the ADC value was calculated at a high b value. Histopathological data was collected. Women aged 18 to 79 years were included in study. All patients with abnormal vaginal bleeding and thickened endometrium, either focal or diffuse proven on Ultrasound pelvis were included in the study. The patients with hormonal therapy, any systemic cause of bleeding and the ones with a contraindication to MRI were excluded from the study. After informed written consent from the parents, the study patients were subjected to ultrasound followed by MRI examination. Ultrasound examination was performed by experienced radiologist using linear array probe of 5MHz.

Transabdominal and transvaginal ultrasound examination was performed with patient in supine position on Xario. A 1.5-Tesla superconducting magnet was utilized for MRI examination of the pelvic standard surface coil. DW-MRI was followed by conventional MRI upon the participants with contrast administration. The patient's examination was done in the supine position and tend to immobilize the patient during an examination. Automatic DWI were generated with ADC value measured at b=1000 s/mm2. SPSS version 23 was used for data analysis. All the gathered data were statistically expressed in terms of mean, range, frequencies, standard deviation, and percentage. DWI and conventional MRI sensitivity, specificity, positive prediction value, and negative prediction value were calculated separately for each factor.

RESULTS

Of the total 50 endometrial lesions, histopathological results were divided into the benign group (25 lesions, 50%) and the malignant group (25 lesions, 50%). Out of 50, 38 lesions (21/25 benign and 17/25 malignant lesions) were correctly diagnosed by the conventional magnetic resonance imaging technique. The sensitivity, specificity, predictive positive value (PPV), and negative-positive value (NPV) of conventional MRI were 76.82%, 79.41%, 74.12%, AND 81.5% respectively. However, combining the apparent diffusion coefficient (ADC) value at b=1000 with DWI, about 48 lesions (24/25 benign and 24/25 malignant lesions) were correctly diagnosed. The sensitivity, specificity, predictive positive value (PPV), and negative-positive value (NPV) of conventional MRI were 94.82%, 93.23%, 91.6%, and 97% respectively as shown in Table-I. Patients presented with post-menopausal bleeding and pelvic pain are shown in Figure-1. Figure-2 illustrates the patient's presented with abnormal vaginal bleeding and pelvic pain. Figure-3 and Figure-4 depicts the histopathological results of the lesions in both groups.

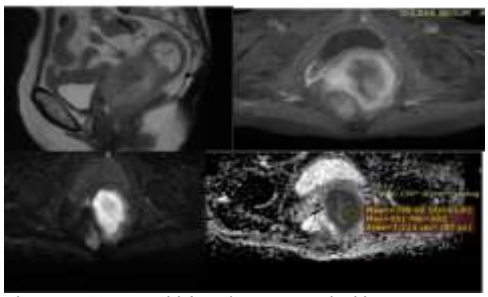

Figure-1: 66 year old female presented with post-menopausal bleeding and pelvic pain. a. Sagittal T2WS shows a large heterogenous mass occupying the whole uterine cavity and invading the myometrium and extending into cervix as well. b. Post gadolinium axial section shows intermediate enhancement compared to myometrium. (c and d) Axial DWI & ADC map show restricted diffusion of the mass with low ADC measures 0.79 x 10^{-3}mm2/s. pathologically proven as endometrial carcinoma.

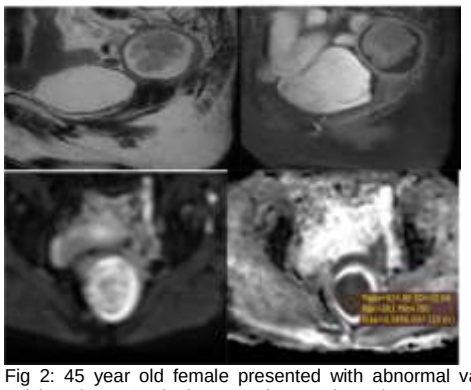

Fig 2: 45 year old female presented with abnormal vaginal bleeding and pelvic pain. a. Sagittal T2WS shows a large heterogenous polypoidal mass arising from the fundus and distending the endometrial cavity along with fluid in endometrial cavity. b. Post gadolinium sagittal section shows intermediate enhancement. (c and d) Axial DWI & ADC map show restricted diffusion of the mass with low ADC measures 0.82 x 10^{-3}mm2/s. pathologically proven as endometrial carcinoma.

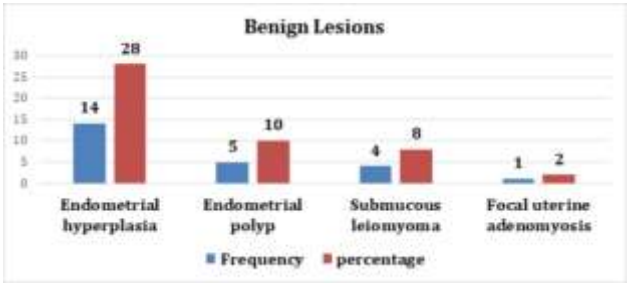

Figure-3: Histopathological results of benign lesions group (n=24/25)

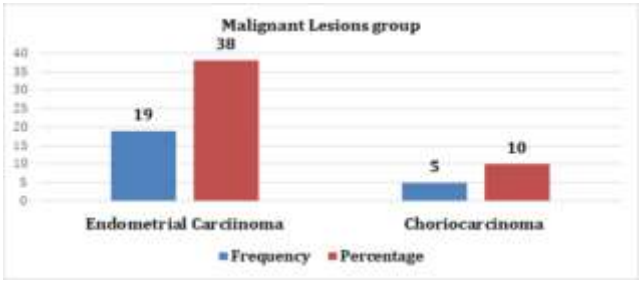

Figure-4 Histopathological results of Malignant lesions group (n=24/25)

Table-1: Diagnostic accuracy of conventional MRI versus DW-MRI

Parameters	Conventional MRI	DW-MRI
Sensitivity	76.82%	94.82%
Specificity	79.41%	93.23%
Positive Prediction Value	74.12%	91.6%
Negative Prediction Value	81.5%	97%

DISCUSSION

The present study investigated 50 endometrial lesions that were group into benign lesions (n=25) and malignant lesions (n=25). Endometrial carcinoma and endometrial hyperplasia was the most prevalent benign and malignant lesion diagnosed by DWI with ADC respectively. Other common benign lesions were endometrial polyps, submucous leiomyoma, and focal uterine adenomyosis. Choriocarcinoma was the second prevalent malignant lesions. Pelvic and gynaecological malignancies could be effectively detected and staged using MRI as compared to CT [11]. The present study results resembled with Elsammak et al., findings, who divided 42 lesions into 24 cases of benign lesions and 18 cases of malignant lesion group [12] and found that endometrial hyperplasia was the most common benign lesions whereas endometrial carcinoma was malignant lesions.

Y. Zhuang et al. found that in malignant lesions, endometrial carcinoma was the most prevalent endometrial lesions [13]. Another study conducted by Wang et al. reported that 40 malignant lesions out of total 42 lesions were endometrial carcinoma and 7 out of 14 benign lesions were endometrial polyps. Other benign lesions were submucosal fibroid (n=5) and endometrial hyperplasia in 2 lesions [14].

The present study findings resembled the Habib et al. study who found that signal characteristics and morphology of both benign and malignant lesions were not significantly different when conventional MRI was performed [15]. Moreover, fewer studies shown that mostly focal mass occupied in uterine cavity were benign hyperplasia and endometrial polyps presenting non-specific endometrial thickness. The accurate diagnosis of hyperplasia, carcinoma, and polyps are not possible based on the presented signs [16]. On T1- and T2-weighted images of ordinary leimymoas

exhibited low signals as per a previous study conducted by Kierans et al. [17].

Neurological diseases could be accurately diagnosed with Diffusion-weighted MRI which is reflected as a reliable efficient imaging technique. Recently, it shows promising results in diagnosis of suspected lesions especially pelvic malignancies. Malignant tumors, in general, have a low ADC value and a water diffusion restriction due to their high cellularity [18]. DWI with conventional MRI is useful for assessing invasion of myometrical endometrial disease and differentiating malignant lesions from benign one [19].

ADC value measurement has potential capability to differentiate malignant lesions from benign lesions endometrial disease. The mean ADC value of malignant and benign endometrial masses differed significantly ($p = 0.000$). In line with the current study, Duarte et al. [20] and Ahmed et al. [21] found that malignant endometrium had a significantly lower ADC value than benign endometrium.

Elsammak et al. found that malignant lesions ADC values measured (0.82 103 mm2/s) was significantly different from benign lesions ADC values (1.44 103 mm2/s) [12]. Another study by Cavusoglu et al. measured ADC mean value which was (0.94 0.18 103/s) significantly lower as compared to benign ADC value [22]. Additionally, Lima et al [23] reported lower ADC mean value in malignant endometrial lesions as compared to benign lesions.

According to Sefidbakht et al. [24], the addition of DWI to conventional MRI increased the sensitivity and specificity in the diagnosis of uterine endometrial lesions to 86 % and 100%, respectively; Keriakos et al. [25] reported that specificity and sensitivity of DWI in endometrial lesions of 100% and 81% respectively.

CONCLUSION

Diffusion-weighted MRI can help in distinguishing uterine endometrial lesions as benign and malignant. The diagnostic accuracy of Combined DWI with ADC mapping is higher than conventional MRI when differentiating benign lesions from malignant lesions. Additionally, sensitivity, specificity, and accuracy of combined DWI with ADC mapping increased in pelvic MRI examination for differentiating endometrial focal lesions.

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