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Transvaginal Ultrasound Compared with Diffusion-Weighted Magnetic Resonance Image in Endometrial Factor Postmenopausal Bleeding

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Abstract:

Purpose: The purpose of this work was to conduct a comparative analysis of the diagnostic capabilities of transvaginal ultrasonography (TVUS) and diffusion-weighted magnetic resonance image (DW-MR) in distinguishing between malignant and benign lesions of the endometrium in post-menopausal women presenting with bleeding from their vaginas and endometrial thickness. **Patients and Methods:** This prospective cohort observational work was conducted on 30 ladies over 45 years old with postmenopausal vaginal bleeding and thickening of the endometrium more than 5mm. a comparative analysis of the diagnostic capabilities of TVUS and DW-MR imaging was done to differentiate between malignancies and benign conditions of the endometrium in postmenopausal women presenting with bleeding from their vaginas and endometrial thickness. **Results:** TVUS examination demonstrated a statistically significant variance in endometrial thickness, with lower measurements noticed in instances of benign conditions of the endometrium. There was a statistically substantial variance in the mean apparent diffusion coefficient (ADC) values between endometrial cancers and benign conditions of endometrium, with the earlier exhibiting reduced ADC values. The variation in ADC values between benign conditions of endometrium was statistically significant. Sensitivity of TVUS was 93.8% and specificity was 87.5 % in determining endometrial pathologies, while DW-MR had a sensitivity of (92.9%) and specificity (100.0%) in the diagnosis of endometrial pathology in post-menopausal individuals. **Conclusions:** TVUS and DW-MR are valuable for differentiating between malignancies and benign conditions of the endometrium. However, this work acknowledges that while both imaging modalities are effective, DW-MR offers superior specificity, potentially reducing false-positive diagnoses.

Keywords: Transvaginal ultrasound; Diffusion-weighted; Magnetic Resonance Image; Endometrial; Postmenopausal bleeding

Introduction

Endometrial carcinoma (EC) is the prevailing gynaecological malignancy. The condition primarily impacts women who have reached menopause. In a clinical context, individuals have atypical uterine bleeding [1] .

Endometrial cancer typically presents with either endometrial thickness or the presence of an endometrial masses. Certain non-malignant endometrial abnormalities, including endometrial hyperplasia and endometrial polyps, can also result in bleeding from the uterus and the thickening of the endometrium or the existence of a localized mass. Hence, it is imperative to distinguish and differentiate these disorders in order to effectively navigate the therapeutic process[2].

Transvaginal ultrasonography (TVUS) is considered the optimal initial diagnostic modality for evaluating post-menopausal bleeding. The sensitivity of TVUS in the detection of endometrial diseases is rather good, although its specificity is comparatively low. Hence, it is advisable to consider biopsy as the subsequent diagnostic approach in cases when the endometrial thickness surpasses 5mm. Nevertheless, postmenopausal individuals may have challenges in undergoing a biopsy of the endometrium or dilatation and curettage (D&C) owing to factors such as endometrial adhesions, endometrial atrophy, or the necessity of general anaesthesia [3] .

Magnetic resonance image (MRI) is an effective approach in the evaluation of potential endometrial pathology due to its exceptional ability to provide detailed visualization of soft tissues and its capacity for multiplanar imaging. A meta-analysis has shown that contrast-enhanced T1 weighted MRI surpasses ultrasound, computed tomography (CT), and non-contrast MRI in this regard [4].

According to previous studies, dynamic contrast enhanced MRI has demonstrated superior accuracy in tumour detection and evaluation of invasion of the myometrium when contrasted with T2 weighted imaging. This advantage is primarily attributed to the enhanced ability of dynamic contrast enhanced MRI to establish a more distinct boundary between the tumor and the myometrium [5].

Nevertheless, due to the recognized risk of nephrogenic systemic fibrosis and subsequent renal failure associated with contrast-enhanced MRI, there is a growing need for imaging techniques that do not require contrast enhancement when assessing the pathologies of the endometrium and myometrial invasion among individuals with diagnosed EC. However, it should be noted that traditional MRI sequences do not possess the ability to distinguish between cancer, benign polyps, or endometrial hyperplasia [6].

Diffusion-weighted magnetic resonance imaging (DW-MRI) is a non-enhanced imaging modality that enables the visualization of tissue properties by leveraging disparities in the diffusion movement of water molecules. Multiple recent investigations have indicated that DW-MR is an effective tool for the detection and distinction of EC from both normal endometrium and benign lesions [7].

DW-MR imaging offers the determination of the ADC of tissues, a parameter

indicative of the restricted translational motion of water molecules within an environment that encompasses cellular membranes [8].

Patients and Methods

This prospective cohort observational work was conducted on 30 ladies over 45 years old with postmenopausal vaginal bleeding and thickening of the endometrium more than 5mm. a comparative analysis of the diagnostic capabilities of TVUS and DW-MR imaging was done to differentiate between malignancies and benign conditions of the endometrium in postmenopausal women presenting with bleeding from their vaginas and endometrial thickness.

The work was performed from October 2021 to October 2023 following permission from the Ethics Committee of Benha University and Tanta Health Insurance hospitals, Egypt (Approval code: MD 4-1-2017). Each participant provided informed written permission.

Study Setting: Radiodiagnosis and medical imaging department, Faculty of medicine, University of Benha, Benha, Alqalubyia, Egypt.

Exclusion criteria were refusing to undergo TVUS, individuals who experience contraindications to doing MRI, like the presence of a cardiac pacemaker, aneurysm clip, hip or pelvic metal prostheses, as well as those who experience claustrophobia or are unable to cooperate and individuals with contraindications for the use of contrast material.

All participants underwent a comprehensive process of obtaining their complete medical history, followed by a thorough clinical examination that encompassed general observations, abdominal assessment, and pelvic evaluation. The purpose of these examinations was to evaluate the overall health status of the participants and potentially identify any local factors contributing to vaginal bleeding. Additionally, the uterine size, involvement of the parametrium and adnexa, and lab investigations [Complete blood count (CBC), coagulation profile, liver and kidney function test, random blood sugar (RBS) and urine analysis], MRI examination and ultrasound (US).

Ultrasound: Initially, an US was conducted to rule out the presence of the liver, kidneys or other systemic disorders, as well as any pelvic masses. Subsequently, a TVUS) was conducted, regardless of the period of the menstrual cycle. A 2-dimensional TVUS examination was conducted using an endo-cavitary transducer with a frequency range of 4-11MHz on a Toshiba Aplio 500 ultrasonic machine. The thickening of the endometrium was assessed at its maximum point during the TVUS examination. The callipers were positioned in a perpendicular manner relative to the outside boundary of the endometrium. If fluid is present within the endometrial cavity, the measurement of the endometrial thickening is conducted in a manner consistent with the aforementioned description. However, this measurement incorporates both the fluid within the uterine cavity and the double lining of the endometrium. Subsequently, the diameter of the fluid is subtracted at the corresponding location.

The sonographic appearances of the endometrium were categorized on TVUS based on specific factors, including the thickness being classed as normal or

abnormal, and the echogenicity being categorized as homogenous or heterogeneous. The normal endometrial and uterine cavity were characterized by the presence of an echogenic line located centrally inside the uterus. This line exhibited a uniform endometrial lining with clearly defined boundaries in relation to the myometrium.

MRI: The study was conducted using a 1.5-Tesla MR imaging device, specifically the Philips Achieva model, equipped with a standard pelvic surface coil. Prior to MRI, a 10mg dose of an antispasmodic medicine ([Visceralgine; Organon, Livron, France]) was administered intravenously to mitigate intestinal peristalsis. Each participant received a series of imaging procedures, starting with Conventional MRI, followed by DW-MRI, and concluding with Conventional MRI with the application of contrast.

Image analysis: The radiologists conducted a thorough evaluation of all the images during two distinct sessions. They specifically examined the signal intensity and homogeneity of the images on T1WI and T2WI, comparing them to the surrounding normal myometrium.

Histopathologic correlation: The definitive diagnosis for all lesions of the endometrium was established through the correlation of MRI, including diffusion data, TVUS, and histopathological sections. These diagnostic procedures were conducted in all instances, either following hysterectomy or dilatation and curettage. The procedure of fractional curettage was performed utilizing general anaesthesia and the Kevorkian Younge Endocervical Curette.

Statistical analysis

The data was inputted into the computer and subsequently analyzed employing IBM SPSS 20.0. (IBM Corp, Armonk, NY). The qualitative data were represented utilizing numerical values and percentages. The normality of the distribution was assessed utilising the Kolmogorov-Smirnov test. The quantitative data were characterized utilizing multiple statistical measures, including the range (comprising the minimum and maximum values), the mean, the standard deviation, the median, and the interquartile range (IQR). The findings' significance was determined at the 5% level.

Results:

The age of the studied cases with a mean of 55.72 years, body mass index (BMI) with a mean of 28.7 kg/m^2, 83.3% were multiparous and 86.7% were rural, 80% were housewives, 86.7% were married, duration of menopause with a mean of 7.21 years, the duration of bleeding with a mean of 29.76 days, 36.7% had endometrial hyperplasia, 13.3% had an endometrial polyp, 13.3% had submucosal fibroid, 3.3% had choriocarcinoma and 33.3% had endometrial adenocarcinoma and trans-vaginal appearance of different endometrial lesions of the studied cases was uniform in 56.7% and non-uniform in 43.3%. Table 1

Table 1: Demographic data, histopathology data and trans-vaginal appearance of different endometrial lesions of the studied cases

		(N=30)
Age (years)		55.72 ± 11.72
BMI (Kg/m^2)		28.7 ±4.53
Parity	**Nulliparous**	5 (16.7%)
	Multiparous	25 (83.3%)
Residency	**Rural**	26 (86.7%)
	Urban	4 (13.3%)
Occupational	**Employee**	6 (20%)
	Housewife	24 (80%)
Marital status	**Married**	26 (86.7%)
	Unmarried	4 (13.3%)
Duration of menopause		7.21 ± 5.40
Duration of bleeding		29.76 ± 24.97
Histopathology Data		
Benign lesion		19 (63.3%)
Endometritis- hyperplasia		11 (36.7%)
Polyp		4 (13.3%)
Submucosal Fibroid		4 (13.3%)
Malignant lesion		11 (36.7%)
Endometrioid adenocarcinoma		10 (33.3%)
Grade 1		7 (23.3%)
Grade 2		3 (10.0%)
Benign lesion		19 (63.3%)
Endometrial lesions		
Uniform		17 (56.7%)
Non uniform		13 (43.3%)

Data are presented as mean ± SD or frequency (%). BMI: Body mass index.

Endometrial thickness by TVUS revealed a significant statistical difference with lower values observed in cases of benign endometrial lesions. Endometrial malignancies had lower mean ADC values compared to benign endometrial lesions, which was statistically significant. Table 2
Usually, abnormalities of the endometrium exhibit a hyperintense signal on T2WI, accounting for around 80% of instances. Conversely, approximately 20% of instances display non-homogeneous hyperintense signal features. In the post-contrast investigation conducted at T1WI, it was shown that the endometrium abnormalities exhibited delayed enhancement compared to the adjacent myometrium in 36.7% of cases. Conversely, no enhancement of the abnormalities was seen in 63.3% of cases. In DW-MR sequences, it was observed that all cases exhibited a hyperintense signal, indicating a positive finding. Additionally, 83.3% of the cases shown a corresponding low ADC, which is indicative of actual signal restriction. Conversely, 16.7% of the instances displayed a high ADC, suggesting a lack of true signal restriction. Accurate measurement of the depth of myometrial invasion is achieved through the utilization of T2WI, we found that there was less than 26.7% myometrial invasion 10% and more than 50% myometrial invasion 12.5%. The variation in values of ADC across benign lesions of the endometrium was statistically significant. Table 3
15 patients were benign in pathological finding and TVS, 2 patients were malignant in pathological finding while

were benign in TVS, 4 patients were benign in pathological finding while were malignant in TVS and 9 patients were malignant in pathological finding and TVS. 17 patients were benign in pathological finding and DW-MR, 1 patient was malignant in pathological finding while was benign in DW-MR, 2 patients were benign in pathological finding while were malignant in DW-MR and 10 patients were malignant in pathological finding and DW-MR. Sensitivity of TVUS was 93.8% and specificity was 87.5 % in detecting endometrial pathology, while DW-MR had a sensitivity of (92.9%) and specificity (100.0%) in the diagnosis of endometrial pathology in post-menopausal women. Table 4

Table 2: Comparing the endometrial thickness of benign and malignant lesions measured by trans-vaginal ultrasound and apparent diffusion co-efficient values

	Benign lesions	**Malignant lesions**	**P-value**
Endometrial thickness by TVUS	(12 mm ± 1.8)	(20 mm ± 3.2)	0.001
Apparent diffusion value $\times 10^{-3}$ mm^2/s	1.44 ± 0.15	0.82 ± 1.09	0.000

Data are presented as mean ± SD. p: p value for comparing between studied groups. *: Statistically significant at $p \leq 0.05$. TVUS: trans-vaginal ultrasound.

Table 3: MRI finding and benign endometrial Lesions of the studied patients

MRI finding		**N=30**
T2WI	**Hyperintense**	24(80%)
	Non homogenes hyper intense	6 (20%)
T1post Contrast	**Negative**	19(63.3%)
	Positive	11(36.7%)
ADC	**High**	5 (16.7%)
	Low	25 (83.3%)
Depth of endometrial invasion	**More than 50%**	3 (10%)
	Less than 50%	8 (26.7%)
Benign endometrial Lesions		
	Mean ADC ($\times 10^{-3}$ mm^2/s)	**P value**
Endometrial hyperplasia	1.43 ± 0.15	
Endometrial polyp	1.63 ± 0.021	0.000
Submucosal fibroid	1.33 ± 0.041	

Data are presented as Mean ± SD and frequency (%). ADC: apparent diffusion coefficient. T2WI: T2-weighted image. MRI: magnetic resonance imaging. p: p value for comparing between studied groups. *: Statistically significant at $p \leq 0.05$.

Table 4: The diagnostic potential of DW-MR and TVUS in evaluation of Endometrial pathology in studied cases

Study	Findings	Pathological finding		Diagnostic potential	(%)
		Benign	Malignant		
TVS	Benign	15	2	Sensitivity	93.8%
				Specificity	87.5%
	Malignant	4	9	PPV	93.8%
				NPV	87.5%
	Total	19	11	Accuracy	91.7
DW-MR	Benign	17	1	Sensitivity	92.9%
				Specificity	100.0%
	Malignant	2	10	PPV	100.0%
				NPV	92.0%
	Total	19	11	Accuracy	93.3%

PPV: Positive predicted value. NPV: Negative predicted value. TVUS: trans-vaginal ultrasound. DW-MR: diffusion-weighted magnetic resonance imaging. p: p value for comparing between studied groups. *: Statistically significant at $p \leq 0.05$.

Case 1: Histopathologically proven EC Grade III

Low signal masses of the endometrium and bilateral enlarged pelvic lymph nodes. Figure 1 (A, B)

Poor enhancement of the lesion and heterogenous poor enhancement of the lesion and heterogenous enhancement of regional and retroperitoneal lymph nodes. **Figure 1(C, D)**

Deep myometrial invasion. **Figure1 (E, G)**

Rrestricted diffusion of the mass, the ADC value measured 0.63x10-3 mm2/s, bilateral enlarged local pelvic and retro peritoneal lymph nodes displayed high signal at DW and low signal at ADC maps similar to primary tumor. **Figure 1(F, H)**

Thickened irregular endometrium measured about 23x15 mm (CC xAP) in its maximum diameter. **Figure 1**

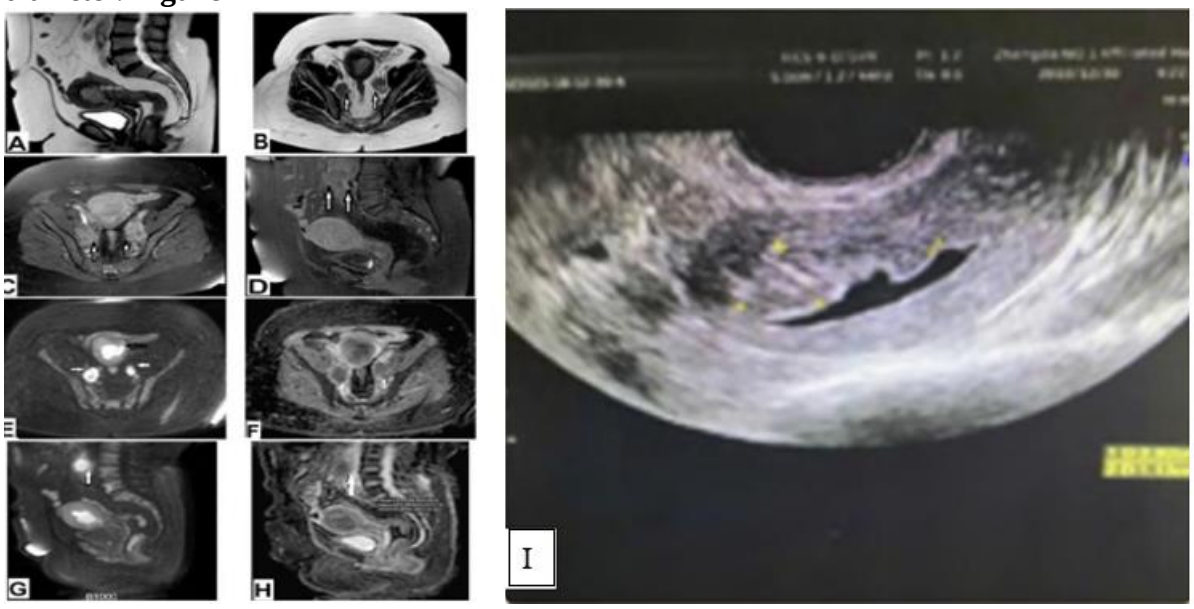

Figure 1: T2W images (A) sagittal, (B) axial, Post contrast T1 fat suppressed images (C) axial, (D) sagittal, DW images (E) axial, (G) sagittal, ADC map (F) axial, (H) sagittal, TVUS (I) TVUS: trans-vaginal ultrasound

Case 2: Pathological proven stage IA endometrial carcinoma
Distended uterine cavity to distal lumber region with intermediate signal on T2W images. **Figure 2 (A, B).**
High signal with corresponding low signal on ADC denoting restricted diffusion. Figure 2(C)
Distended uterine cavity with thickened echogenic endometrium measuring about 27mm. **Figure 2 (D)**

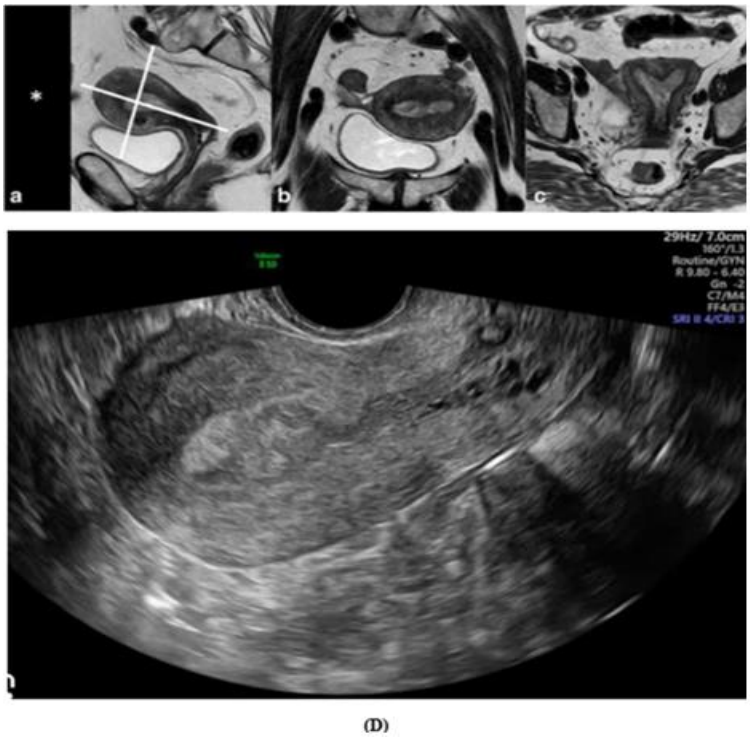

Figure 2: Sagittal T2W images (A, B), axial DW images (D) and Sagittal TVUS (E)
TVUS: trans-vaginal ultrasound

Discussion:

EC is classified as the prevailing gynaecological malignancy in developed nations, with an annual incidence rate of 15-25 cases per 100,000 women. While EC is primarily observed in post-menopausal females, it is additionally found in around 10-15% of pre-menopausal or peri-menopausal females. Among this group, 2-5% of instances found in women with the age below 40 years. Bleeding from the vagina is the prevailing manifestation of EC, frequently facilitating prompt detection. However, it is worth noting that approximately 5-10% of postmenopausal women with EC exhibit no apparent symptoms. In the population under consideration, EC accounts for approximately 1-14% of instances of vaginal bleeding [9].

In our study, histopathology Data, 36.7% of the studied cases had endometrial hyperplasia, 13.3% had an endometrial polyp, 13.3% had Submucosal Fibroid, 3.3% had Choriocarcinoma and finally, 33.3% had endometrial adenocarcinoma. This agrees with Solyman et al. [10] The primary aetiology of irregular uterine bleeding is non-organic factors, accounting for 46% of cases. This is followed

by fibroids (14%), adenomyosis (14%), polyps (8%), hyperplasia of the endometrium (4%), carcinoma of the endometrium (2%), co-occurrence of fibroids and adenomyosis (4%), co-occurrence of polyps and hyperplasia (4%), co-occurrence of adenomyosis and polyps (2%), and co-occurrence of fibroids and polyps (2%). Scepanovic et al. [11] reported that, among 199 patients, A total of 37 instances were verified to have malignant lesions of endometrium, whereas the remaining instances were determined to be benign. The prevalence of benign lesions among female patients was found to be 68.9%, with endometrial polyps and simple hyperplasia of the endometrium emerging as the most often observed conditions. Also, Elsammak et al. [12] reported that, there were 18 instances with the presence of malignancies and 24 instances with benign alterations.

This work investigates the usage of several MRI sequences for diagnosing post-menopausal bleeding in a cohort of 30 women. Most instances (80%) exhibit hyperintense signal anomalies in the endometrium when assessed using T2WI. Conversely, a non-homogenous hyperintense signal is observed in 20% of instances. In the T1-weighted post-contrast investigation, it was shown that the endometrial abnormality exhibited delayed enhancement compared to the neighboring myometrium in 36.7% of cases. Conversely, no enhancement of the abnormality was seen in 63.3% of cases. During this study, we examined the phenomenon known as DW-MR.

In our research, we observed that endometrial carcinomas exhibited reduced mean ADC values in comparison to benign lesions of the endometrium. This variation existed to be statistically substantial. The mean ADC value for malignancies was determined to be $0.82 + 1.09 \times 10^{-3}$ mm^2/s (with a range of $0.58–1.09 \times 10^{-3}$ mm^2/s), while for benign lesions, it was 1.44 + 0.15 × 10−3 mm2/s (with a range of 1.33–1.77 × 10−3 mm^2/s). The calculated p-value for this comparison was 0.000. The present investigation observed similar ADC values in both cancers of the endometrium and benign conditions in the endometrium, consistent with the findings reported by Tamai et al. [13] . Shen et al. [14] and Takeuchi et al.[15] have both documented a substantial reduction in the ADC value of EC compared to normal endometrium. Furthermore, this finding aligns with the research conducted by Çavuşoğlu et al.[16], which demonstrated that the ADC values of EC were markedly lower compared to benign lesions of the endometrium, with no observed overlap, using a cut-off value of 1.18×10^{-3} mm^2/s. no statistically substantial variation was observed in the mean ADC value between FIGO stage 1A and FIGO stage 1B lesions. This finding aligns with the research conducted by Scepanovic et al. [11], which demonstrated a statistically substantial variation in the ADC values between malignant and benign lesions of the endometrium. According to the determined ADC cut-off value of 1.007×10−3 mm2/s obtained from MRI analysis, the researchers categorized 45 instances in their study as potentially malignant lesions of the endometrium, while 74 of the instances were classified as benign lesions of the endometrium. Furthermore, the findings of the majority of research provide confirmation that there exists a statistically substantial variance in the ADC value of EC when compared to benign lesions of the endometrium

(Haldorsen and Salvesen [17]; Mainenti et al. [18]. Bakir et al. [19] and Ahmed et al. [20] confirm that the utilization of quantitative analysis with ADC map is essential in the process of characterizing endometrial lesions. Elsammak et al. [21] also showed that The mean ADC values of malignancies were found to be considerably less than the values of benign tumours ($p<0.001$).

The presence of greater cellular density in EC restricts the dispersion of water molecules in DW-MR and consequently reduces ADC value. Conversely, benign conditions, including hyperplasia of the endometrium and endometrial polyps, result in an elevated (ADC value. This is attributed to the expansion of the extracellular space due to the presence of oedematous tissues and cystic components [15].

In the work conducted by, Gallego et al. [7] reported that ADC maps exhibited greater efficacy compared to traditional sequences in accurately determining the extent of invasion of myometrium.

The phenomenon of restricted diffusion in EC has been documented because of heightened cellular density, leading to a reduction in extracellular space and impeded mobility of water molecules[13, 22]. Hence, it is anticipated that high-grade adenocarcinomas characterized by high cellular density will exhibit reduced ADC values in comparison to low-grade adenocarcinomas.

The lack of correlation between tumour ADC value and histological tumour grade has been described by Rechichi et al. [23], which is consistent with the findings of Shen et al.[14] and Lin et al.[24]. The present investigation also failed to identify any statistically significant association between ADC values and tumour grade.

In contrast, Tamai et al.[13] observed a statistically significant decrease in ADC values in G3 tumours relative to G1 tumours. Conversely, Seo et al. [25] identified a statistically significant increase in ADC values in G1 tumours when contrasted with G2 or G3 tumours. Nevertheless, precisely determining the histological grade based on ADC values is challenging because of the substantial overlap observed among different histological tumour grades. According to the findings of Husby et al. [8], a statistically substantial variation was existed in the average tumour ADC value between tumours with DMI and tumours with superficial myometrial invasion.

In our study, the sensitivity of TVUS was 93.8% and specificity was 87.5 % in detecting endometrial pathology, while DW-MR had a sensitivity of (92.9%) and specificity (100.0%) in the diagnosis of endometrial pathologies in post-menopausal women.

This slightly agreed with Wong et al. [26] they showed that Both ultrasound and MRI provide similar levels of diagnostic accuracy in detecting DMI and CSI in women diagnosed with EC. The agreement and reliability in diagnosing CSI had been determined to be greater ($\kappa=0.69$) compared to DMI ($\kappa=0.49$). Additionally, the study revealed that ultrasound had a greater degree of sensitivity for DMI compared to MRI (86% vs. 77%). This discrepancy may be attributed to the inclusion of only EC where ultrasound imaging yielded satisfactory results. Additionally, it was discovered that both ultrasonography and MRI had a considerable percentage of false-positive results in the detection of DMI. Additionally, Solyman et al.[10] reported that the sensitivity of MRI for detecting

uterine disease was found to be 100%, while the specificity was shown to be 82.60%. The study findings indicated that the sensitivity of TVUS for identifying pathology of uterus was determined to be 100%, while the specificity was reported to be 95.56%. The study demonstrated that MRI had a specificity of 100%, sensitivity of 100%, NPV of 100%, PPV of 90.9%, and an accuracy of 98% for the detection of uterine myomas. In relation to the diagnosis of fibroids of the uterus, TVUS demonstrated a specificity of 100%, sensitivity of 80%, PPV of 100%, NPV of 95.23%, and an overall accuracy of 96%. The evaluation of endometrial polyps was conducted using MRI, which demonstrated a sensitivity of 100% and a specificity of 90.4%.

The researchers disclosed that the sensitivity of TVUS in detecting endometrial polyps was found to be 50%, while the specificity was shown to be 100%. In the investigation of endometrial hyperplasia, the sensitivity of MRI was found to be 100%, The specificity of MRI was determined to be 93.4%. Overall, the accuracy of MRI in diagnosing hyperplasia of the endometrium was determined to be 96%. The study findings indicated that the sensitivity of TVUS in detecting hyperplasia of the endometrium was 75%, with a specificity of 91.3%. The PPV was determined to be 42.8%, while the NPV was found to be 97.67%. The overall accuracy of TVUS in diagnosing endometrium hyperplasia was reported to be 90%. The sensitivity and specificity of MRI in the examination of EC were both 100%. TVUS demonstrated a sensitivity of 100% and specificity of 100% in detecting EC.

A prior meta-analysis [27] indicated that there was no significant difference in the diagnostic accuracy between ultrasound and MRI for identifying DMI. The pooled sensitivity for ultrasonography and MRI has been stated as 75% and 83%, correspondingly.

The study conducted by Cubo-Abert et al.[28] determined that there was no statistically significant difference in the sensitivity and specificity of ultrasound and MRI for diagnosing DMI. The sensitivity rates were found to be 69% for ultrasonography and 51% for MRI, while the specificity rates were 87% for ultrasonography and 91% for MRI.

In contrast to ultrasound, Gastón et al.[29] found that MRI exhibits greater specificity for DMI, with subjective assessment yielding a specificity of 87% compared to 74%. The comparable sensitivities were 80% for MRI and 75% for ultrasonography).

The sensitivity and specificity values obtained for 3D-US in the detection of deep myometrium invasion are within the range of 84% to 89% and 86% to 91%, correspondingly [30, 31]. According to the study conducted by Lin et al.[32], magnetic resonance dynamic contrast-enhanced (MRI-DCE) imaging was identified as the most effective method to identify DMI in pre-menopausal individuals with EC. Conversely, magnetic resonance diffusion weighted imaging (MRI-DWI) proved to be preferable in post-menopausal women. In a study conducted by Scepanovic et al. [11], it was observed that the sensitivity of the test was 100%, the specificity was 92.7%, the PPV was 60.3%, and the NPV was 100%. The sensitivity of MRI examination was found to be 100%, while the specificity was determined to be 90.2%. PPV was calculated to be 82.2%, and NPV was shown to be 100% when compared to histological findings.

The study conducted by Moharamzad et al.[33] revealed that the sensitivity varied from 80% to 100%, whereas the specificity varied from 75% to 100%. Additionally, the cut-off values had been determined to be within the range of 0.90 to 1.20×10−3 mm2/s. Two investigations reported the greatest levels of sensitivity (100%) and specificity (97%) when utilizing cut-off ADC values of 0.90 and 0.98×10−3 mm2/s. In a study conducted by Elsammak et al.[12], it was observed that when using a cut-off value of 1.19×10−3 mm2/s to differentiate between malignancy and benign lesions, the sensitivity was found to be 88.9%, specificity was 100%, PPV was 100%, and NPV was 92%.

This finding corresponds to the research conducted by Yadav[34] , which reported a sensitivity rate of 100% and a specificity rate of 98.41% for the identification of pathologies using MRI.

The study conducted by Bharwani et al.[35] found that the specificity of DWI for identifying EC was 100%. This finding is consistent with the conclusion drawn by Jagannathan [36], who stated that MRI had a sensitivity of 100% and a specificity of 97% in identifying EC.

The findings of our study are in contrast to those reported by Dueholm et al.[37], who observed MRI sensitivity of 76% and specificity of 92%. Additionally, our findings differ from the findings of Ahmad et al.[38], who reported a sensitivity of 78.75% and specificity of 63.64%. The potential diagnostic usefulness of MRI to identify contemporaneous cancer or cancerous changes among individuals with hyperplasia of endometrium with atypia has been demonstrated by Natarajan et al.[39]

Conclusions:

The use of DW-MR and TVUS proves to be advantageous in differentiating between malignancies and benign conditions of the endometrium in post-menopausal women who experience vaginal bleeding and exhibit thickening of the endometrium. DW-MR exhibits high sensitivity (92.9%) and exceptional specificity (100.0%), making it particularly useful in this context. TVUS also shows strong sensitivity (93.8%) but with slightly lower specificity (87.5%). Moreover, DW-MR provides quantitative data, with substantially reduced mean ADC values in malignant lesions compared to benign ones. T2WI and DW-MR sequences help assess the depth of myometrial invasion. However, this study acknowledges that while both imaging modalities are effective, DW-MR offers superior specificity, potentially reducing false-positive diagnoses.

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