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ORIGINAL ARTICLE

Comparative Study between the Diagnostic Accuracy of 3D Ultrasound and Hysteroscopy in Patient with Post Menposal Uterine Bleeding

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Abstract

Background: ***One of the most frequent problems that women in the postmenopausal age group deal with is abnormal uterine bleeding. It is a challenging clinical issue with numerous underlying causes.***

Aim and objectives: ***To assess whether abdominal ultrasonography is more accurate than hysteroscopy in diagnosing endometrial abnormalities in postmenopausal women.***

Patients and methods: ***The study included 100 patients from the Outpatient Gynecological Clinic, AL HUSSIEN, SAYED GALAL AL-AZHAR University Hospitals from the beginning of January 2023 to early December 2023. All patients suffering from postmenopausal bleeding and those above 45 years old.***

Results: ***Regarding the diagnoses of pathologies found with hysteroscopy, 35% didn't have any pathology, 42% had endometrial polyp, 12% had submucous fibroids, 8% had endometrial thickness, 3% had Leiomyoma, & regarding the diagnoses of pathologies found with 3D TVUS, 23% didn't have any pathology, 58% had endometrial polyp, 7% had submucous fibroids, 7% had endometrial thickness, 5% had Leiomyoma. , 3D TVUS detected endometrial thickness in the patients under study with a sensitivity of 66.67%, selectivity of 93.41%, PPV of 50%, NPV of 96.59%, and accuracy of 91%.***

Conclusion: ***When diagnosing cases of abnormal uterine bleeding, hysteroscopy is a quick, safe, and accurate procedure with excellent accuracy, specificity, positivity predictive value, and negative predictive value***

Keywords: Diagnostic hysteroscopy (DH); 3D Ultrasound; Post Menposal Uterine Bleeding

1. Introduction

Direct vision of the uterine cavity and cervical canal is possible with hysteroscopy. Diagnostic hysteroscopy is used to accurately and practically diagnose intrauterine anomalies. As a prognostic, Most hysteroscopy procedures take place in outpatient clinics; a precise diagnosis is crucial to focusing treatment on the particular pathology and preventing unnecessary surgery.[1]

When diagnosing intrauterine pathology in several gynecologic problems, such as abnormal uterine bleeding, infertility, recurrent abortion, and retained IUCD, hysteroscopy is a crucial tool. This method, which has a high diagnostic failure rate, has taken the position of dilatation and curettage as a blind technique.[2]

Stock & Kanbour noted that out of 60% of the hysterectomy specimens, just over half of the endometrium lining had been sampled in patients who had dilatation and curettage performed before the hysterectomy.[3]

The most frequent reason for an endometrial biopsy is the detection of any bleeding in postmenopausal women or irregular bleeding of unclear cause in women over 40. In all age groups, bleeding is the most typical sign of endometrial cancer; nevertheless, abnormal uterine bleeding is also frequently seen in conjunction with endometrial hyperplasia. Seventy-five to eighty per cent of women who receive an endometrial biopsy within five years of their diagnosis survive five years or longer.[4]

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Pelvic sonography now offers additional usefulness thanks to three-dimensional (3D) ultrasonography. Due to its capacity to outline exterior uterine contours and endometrial abnormalities, it has improved the accuracy of ultrasound in identifying uterine anomalies by enabling the display of coronal pictures that were previously not achievable with 2D ultrasound. Saline infusion sonohysterography (SIS) and 3D ultrasound complement techniques better at defining endometrial disease than 2D ultrasound. The volumetric data enable off-line data analysis and enhance workflow efficiency. The ability to alter data sets without repeating research makes consultation with referring providers and other professionals conceivable.[5]

The current study compares the diagnostic accuracy of hysteroscopy and abdominal ultrasonography in postmenopausal women for identifying endometrial abnormalities.

2. Patients and methods

From January 2023 to early December 2023, one hundred (100) participants participated in the study at the Gynecological Outpatient Clinic, SAYED GALAL Hospitals, AL-HUSSIEN, and AL-AZHAR University in Cairo. The study included every patient experiencing postmenopausal haemorrhage and those over 45.

Inclusion Criteria: Age over 45, complained of postmenopausal bleeding, experiencing a bleeding episode for the first time, or experiencing any pattern of bleeding (menorrhagia, metrorrhagia) for longer than three months, without recognized general causes, and without bleeding being brought on by a contraceptive problem.

Exclusion Criteria: Premenopausal Patients have systematic disorders that lead to postmenopausal bleeding, have chronic liver disease, are diabetics or hypertensive, are on hormonal therapy, use hormones irregularly, use any IUD, or are known to have contraindications to D and C, such as cervical stenosis.

Methods: Patients experienced:

Complete history taking: Current bleeding history, encompassing the beginning, progression, length, and characteristics of the bleeding pattern. History of recent hormonal contraception, specific medication use, history of bleeding tendency, and history of general bleeding cause. Previous experiences with surgeries or blood transfusions, a family history of a related illness, and a history of fractional curettage or hormone therapy.

Examination:

General examination: height, weight, and overall look. Vital indicators, including pulse and blood pressure, pallor, and anemia-related symptoms. Lastly, a cardiac examination to check for murmurs, a chest exam, and an abdominal exam.

Local examination: Examination of genitalia on the outside. Perform a bimanual examination to find the uterine size, mobility, pain, and adnexal masses. & speculum examination for vaginal lesions, ulcers, hypertrophy, erosions, and masses in the cervical region.

Laboratory investigation: Hemoglobin content (Hb%), the number of red blood cells (RBCs), white blood cells (WBCs), and platelet count make up the complete blood picture (CBC). The renal function test includes serum creatinine, blood urea, and urine analysis. Profile of Liver Test: Serum gamma-glutamyl transferase (GGT), prothrombin time, albumin, bilirubin, aspartate, and alanine aminotransferases (AST and ALT), and international normalized ratio (INR). Platelets, fibrinogen, APTT, and INR comprise the coagulation profile: postprandial blood sugar levels and fasting.

Follicular stimulating hormone FSH.

2D-Ultrasound:

They were conducted to look for any adnexal masses at the outpatient clinic. The following procedures are followed for each patient participating in the study: total bladder emptying. The whole clinical evaluation of the patient includes a 2D ultrasound examination. To capture images in different planes, depths, and orientations, the probe handle can be rotated gently along its longitudinal axis to change the scanning plane throughout a 360-degree range, and the shaft can be tilted or angled. The probe can also be pushed and pulled in its entirety.

We need to evaluate the following: measurement of the uterus's anteroposterior, transverse, and longitudinal diameters. The uterus's longitudinal and transverse sections measure the

endometrial thickness, and the mean thickness is computed. Reports are made for any localized lesions, including adenomyosis, endometrial polyps, endometrial hyperplasia, and endometrial cancer. If a fibroid is found, we must discuss its location, size, relationship to the cavity, and if it has undergone degeneration or calcification. The ovaries are examined to check for related histopathology.

3D Ultrasound:

The data is stored in the three planes to obtain the coronal plane and the relation of focal lesions to the endometrium, such as myomas or polyps. Following the completion of the B-mode, three-dimensional volumes were captured. Three-dimensional vaginal Ultrasound was done for all the patients with Voluson S6 3D System (country of origin USA) with an SVDW 5-8, which is an electronic sector transducer with a frequency of 5-8 MHz. The patient was requested to hold their breath, the needle was kept stable, and the loudness mode was turned on. The average acquisition time when using a medium-sized line density was 4-10 seconds. The obtained volume was shaped like a truncated cone, with an angle alpha of 90 degrees and a mean depth of 4.3-8.6 cm.

The volume of the region of interest was measured and saved using a 3D U/S. The digitally stored volume data can be altered and exhibited in several ways. The most practical display is the multiplanar display, which provides navigation across multiple perpendicular planes (axial, sagittal, and coronal) and allows users to switch between any preferred plan.

Figure 1. 2D Transvaginal Ultrasound picture of endometrial polyp for a patient with postmenopausal bleeding.

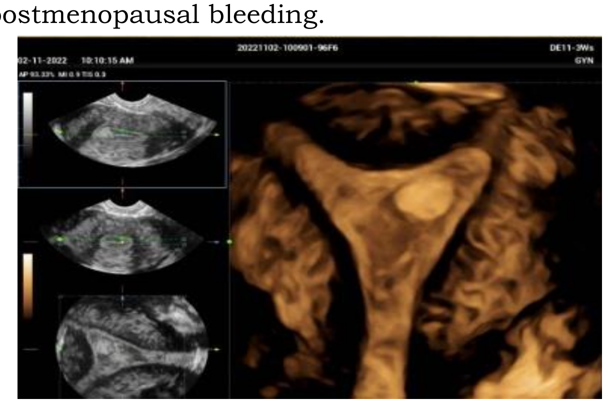

Figure 2. Picture of endometrial polyp by coronal view (3D) transvaginal ultrasound for a patient with postmenopausal bleeding.

Figure 3. Myoma FIGO 2, Coronal view (3D) transvaginal ultrasound, for a patient with postmenopausal bleeding.

Hysteroscopic Evaluation:

Under general anaesthesia, all patients underwent diagnostic hysteroscopy performed by a single, skilled operative blind to the ultrasonography results. We employed a 25 cm long, inflexible, constant-flow panoramic hysteroscopy with a 6 mm outer sheath. By securing saline or Glycine 1.5% solution-filled bags of plastic to dual infusion tubing, the approach allowed for continuous uterine distention. The cavity was examined to find polyps, masses, myomas, or polyploidy endometrium.

A 150-watt metal halide automated light source was employed in this investigation. A fibre optic cable linked the hysteroscope and the light source. It is necessary to attach plastic bags filled with saline solution to cause the uterine cavity to dilate. A pneumatic cuff operated under manometric control raised the infusion pressure between 100 and 120 mmHg. A fluid medium, such as 1.5% glycine, was employed by a blood pressure cuff close to 500 or 1000 ml bags of plastic at a pressure of about 150 mmHg in cases of severe uterine bleeding that obstructed the vision.

An operator-visible monitor showed the image captured by a single-chip video camera used to monitor the process. The lens's focal length ranges from F70 to F140. With the camera installed on the optic's eyepiece, the hysteroscopic image that emerged through the lens was shown on the monitor, enabling more precisely and visually appealing panoramic diagnostic hysteroscopy procedures.

Figure 4. Hysteroscopic picture of the endometrial polyp for a patient with postmenopausal bleeding.

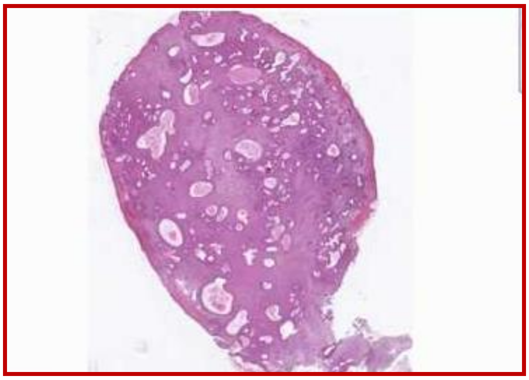

Figure 5. Histopathological finding of the endometrial polyp for a patient with postmenopausal bleeding.

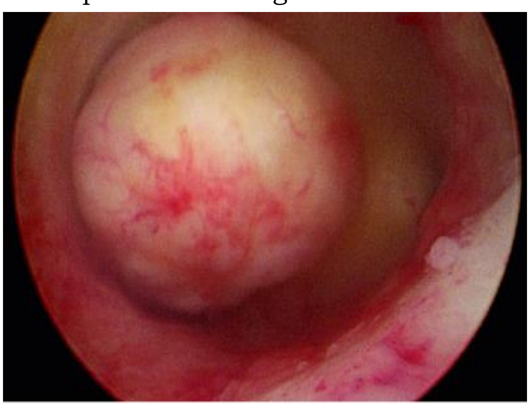

Figure 6. Hysteroscopic picture of a patient with submucous Myoma for a patient with postmenopausal bleeding.

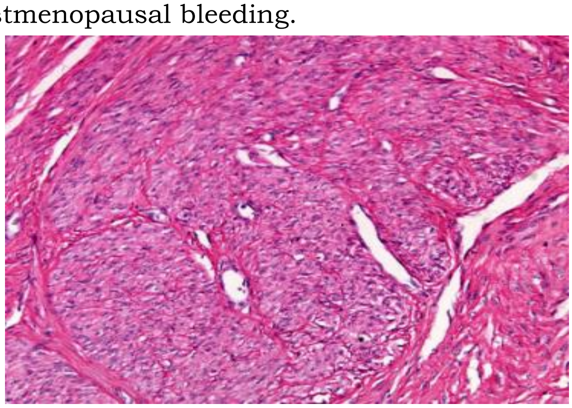

Figure 7. Histopathological finding of the myoma for a patient with postmenopausal bleeding.

Dilation and Curattage

Individuals exhibiting deviations in their research underwent dilating and cauterizing, while the specimen was forwarded to histology for diagnosis confirmation.

Table 1. Time schedule.

Topic	*Observed*
Preparatory phase	1 month
Design of examination sheet	2 months
Review of literature	3 months
Data gathering, organizing, input, and statistical analysis	4 months

Ethical Consideration:

The study protocol was submitted for approval to the Institutional Review Board of AL-HUSSIEN and SAYED GALAL HOSPITALS, AL-AZHAR University, Cairo. Each participant in the study provided their verbal, informed consent. Confidentiality and personal privacy had been upheld during the entire investigation.

Data management and Statistical Analysis

Microsoft Excel is used for the coding, entering, and analysis of historical data, basic clinical examinations, laboratory studies, and outcome measurements. The program known as the Statistical Software Package for the Social Sciences (SPSS version 20.0) was then used to import the data and analyze them. Using either the correlation coefficient of Pearson or Spearman's test, the following differences were tested for significance in correlation: qualitative data were represented as numbers and percentages, while quantitative data were represented as mean ± SD. P-values were established at less than 0.05 and less than 0.001 for outcomes that were considered significant. Following data collection, statistical analysis was performed. The following parameters and statistical tests were applied.

Mean

$$\bar{x} = \sum x \,/\mathbf{n}$$

$\sum x$: is the sum of the values?

N: is the number of subjects.

Standard deviation (SD):

$$SD = \sqrt{\frac{\sum\left(x-\bar{x}\right)^2}{n-1}}$$

$\sum\left(x-\bar{x}\right)^2$: is the sum of the square of the differences of each observation from the mean?

sensitivity specificity predictive value:

Table 2. Shows the sensitivity specificity predictive value.

		Condition (as determined by "Gold standard") *Positive*	*Negative*	
Test outcome	+ve	True Positive	False Positive (Type I error)	→ Positive predictive value $= \frac{\Sigma \text{ True Positive}}{\Sigma \text{ Test outcome Positive}}$
	-ve	False Negative (Type II error)	True Negative	→ Negative predictive value $= \frac{\Sigma \text{ True Negative}}{\Sigma \text{ Test outcome Negative}}$
		↓ Sensitivity $= \frac{\Sigma \text{ True Positive}}{\Sigma \text{ Condition Positive}}$	↓ Specificity $= \frac{\Sigma \text{ True Negative}}{\Sigma \text{ Condition Negative}}$	

3. Results

Table 3. Demographic data of the studied patients.

		n=100
Age (years)	Mean±SD	53.5±4.22
	Range	46-60
Weight (Kg)	Mean±SD	74.5±8.27
	Range	59-88
Height (m)	Mean±SD	1.7±0.06
	Range	1.55-1.75
BMI (Kg/m^2)	Mean±SD	27.2±3.32
	Range	20.72-36.21

With a mean age of 53.5 ± 4.22 years, the age varied from 46 to 60 years. The weight distribution was as follows: the mean was 74.5 ± 8.27 kg, with a range of 59 to 88 kg. With a mean of 1.7 ± 0.06 m, the height ranged from 1.55 to 1.75 m. The BMI was 27.2 ± 3.32 kg/m2, with a range of 20.72 to 36.21 kg/m2.

Table 4. Clinical investigations in the studied patients.

		n=100
Heart rate (Beat/min)	Mean±SD	82.8±7.34
	Range	70-95
SBP (mmHg)	Mean±SD	126±9.85
	Range	110-140
DBP (mmHg)	Mean±SD	72.7±10.24
	Range	60-90

SBP: Systolic blood pressure, DBP: Diastolic blood pressure

Heart rate ranged from 70 to 95 beat/min with a mean of 82.8±7.34 beat/min. SBP ranged from 110 to 140 mmHg with a mean of 126±9.85 mmHg. DBP ranged from 60 to 90 mmHg with a mean of 72.7±10.24 mmHg.

Table 5. Parity and pattern of bleeding of the studied patients.

		n=100
Parity	Nullipara	27 (27%)
	Multipara	73 (73%)
Pattern of bleeding	Menorrhagia	45 (45%)
	Metrorrhagia	55 (55%)

Twenty seven (27%) females were nullipara and 73 (73%) females were multipara. Regarding pattern of bleeding in the studied patients, 45 (45%) females had menorrhagia and 55 (55%) females had metrorrhagia.

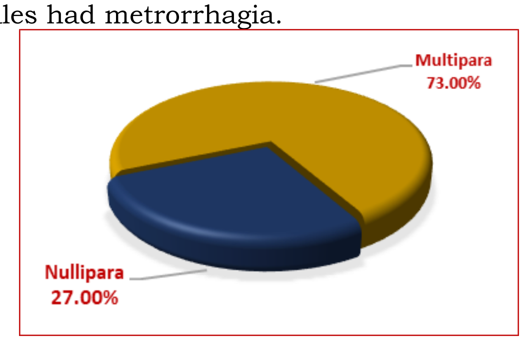

Figure 8. Parity of the studied patients.

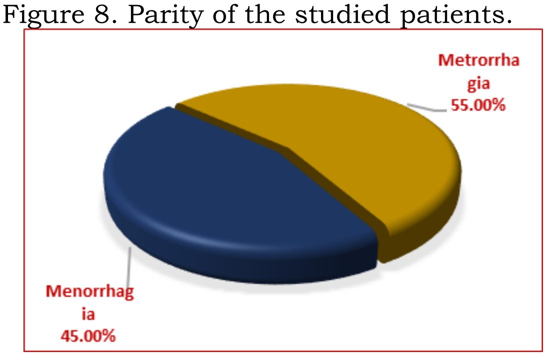

Figure 9. Pattern of bleeding of the studied patients.

Table 6. Blood picture of the studied patients.

		n=100
Hb (g/dL)	Mean±SD	10.8±1.05
	Range	9-12.5
WBCs (x 10^9)	Mean±SD	7.7±1.92
	Range	4.6-11
PLT (x 10^9)	Mean±SD	271.7±44.17
	Range	200-350
ALT (U/L)	Mean±SD	40.5±12.49
	Range	20-60
AST (U/L)	Mean±SD	31.1±8.42
	Range	18-45

Hb: Hemoglobin, WBCs: White blood cells, PLT: Platelets, ALT: Alanine Transaminase,

AST: Aspartate aminotransferase.

The mean Hb was 10.8±1.05 g/dL, with a range of 9 to 12.5 g/dL. WBCs had a mean of 7.7 ± 1.92 x 109 and ranged from 4.6 to 11 x 109. PLT had a mean of 271.7±44.17 x 109 and varied from 200 to 350 x 109. The mean ALT was 40.5±12.49 U/L, with a range of 20 to 60 U/L. The average AST was 31.1±8.42 U/L, with a range of 18 to 45 U/L.

Table 7. Fasting blood glucose and postprandial blood sugar in the studied patients

		n=100
FBG (mg/dL)	Mean±SD	271.7±44.17
	Range	200-350
Postprandial blood sugar (mg/dL)	Mean±SD	269.8±43.86
	Range	200-350

FBG: Fasting blood glucose.

Fasting blood glucose ranged from 200 to 350 mg/dL with a mean of 271.7±44.17 mg/dL. Postprandial blood sugar ranged from 200 to 350 mg/dL with a mean of 269.8±43.86 mg/dL.

Table 8. Histopathology findings of the studied patients.

		N=100
No pathology		34%
Endometrial polyp		43%
submucous fibroids		11%
Endometrial hyperplasia 9%	with atypia	4%
	without atypia	5%
Leiomyoma		3%

Thirty four percent didn't have any pathology, 43% had endometrial polyp, 11% had submucous fibroids, 9% had endometrial thickness, 3% had Leiomyoma.

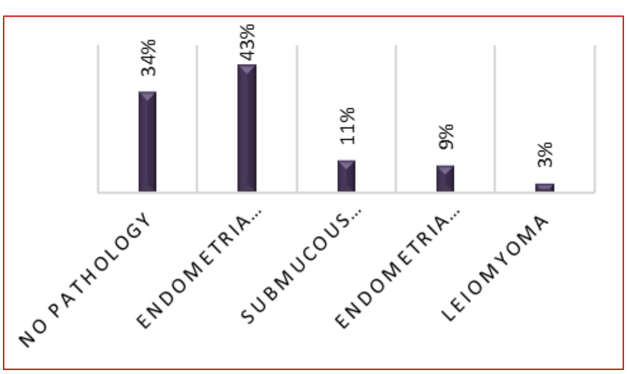

Figure 10. Histopathology findings of the studied patients.

4. Discussion

In the current study, in agreement with Jayni et al., We sought to assess endometrial pathology in pre-menopausal & postmenopausal women and identify the aetiology of AUB in these individuals by comparing the diagnostic accuracy of TVS and SIS to diagnostic hysteroscopy. The results showed that the participants' ages varied between 25 and 71 years, with a mean age of 38.1 ±8.8 years. With a range of 47 to 125 kilos, the average weight of the participants was 73.53 kg ± 16.2 kg, and the range for the average body mass index (BMI) was 27.6±5.7 kg/m2 (19.4 to 41.9 kg/m2).[6]

Furthermore, our outcomes align with those of Komy et al., who contrasted the ability of three-dimensional in-nature ultrasonography to detect uterine abnormalities (hysteroscopy) with that of the gold standard. They showed that the minimum age of 40 years and the highest age of 55 years were in their investigated population, with a mean age of 48.2 ± 7.3 years.[7]

Similarly, our results, in line with Jayni et al., found that eight (20%) females were primipara, seven (17.5%) females were multipara, and twenty-five (62.5%) females were nulliparous. Regarding the type of bleeding, researchers reported that 3 (7.5%), 5 (12%), and 28 (70%) of the patients had a history of amenorrhea or hypomenorrhea, respectively, and that 5 (12%) had a postmenopausal haemorrhage.[6]

Also, in concordance with Komy et al., our study demonstrated that, with a minimal parity of 1 and a maximum age of 4, the average parity of the patients under study was 3.8 ± 1.9. Regarding bleeding patterns, they found that 35 patients (35%) had menorrhagia, 25 patients (25%) had metrorrhagia, and 40 patients (40%) had menometrorrhagia.[7]

As regards the pattern of bleeding, our study is consistent with Ahmed et al., who reported that 37 (37%) cases presented with menorrhagia, 27 (27%) cases with metrorrhagia and 36 (36%) cases with menometrorrhagia.[8]

Furthermore, our outcomes align with those of Grigore et al., who aimed to compare 3D ultra-sound with hysteroscopy to assess the uterine cavity and find a place for this technology in gynecologic practice. They revealed that 8 (17,3%) patients had metrorrhagia, 20 (43,47%) patients had menorrhagia and 9 (19,57%) patients had menorrhagia and metrorrhagia.[9]

According to 3D TVUS findings, the current study demonstrated that 23% of patients had no pathology, 58% had an endometrial polyp, 7% had submucous fibroids, 7% had endometrial thickness, and 5% had Leiomyoma.

As regards 3D-transvaginal ultrasounds, the present study is in agreement with Jayni et al., who stated that 6 (15%) endometrial polyps, 7 (17.5%) submucosal fibroids, and 27 (67.5%) normal cavity patients.[6]

Regarding3D-transvaginal ultrasounds, our results are consistent with Komy et al., who disclosed that 40 patients (40%) had fibroids, twenty patients (20%) had endometrial thickening, and twenty patients (20%) had polyps. No tumours in the uterus were shown (average).[7]

According to 3D-transvaginal ultrasounds, the present study, in line with Grigore et al., revealed that sixty-one people had normal uteruses, eight individuals contained endometrial hyperplasia, seven of them had submucous myoma, and 45 cases had endometrial polyps. 9

Regarding hysteroscopy findings, the present study revealed that 35% of patients had no pathology, 42% had endometrial polyp, 12% had submucous fibroids, 8% had endometrial thickness, and 3% had Leiomyoma.

Regarding the outcomes of hysteroscopy, our findings are in line with Jayni et al.; They found that 34 cases (85%) had uterine cavity abnormalities, including 52.5% of cases with submucous myoma, 20% with endometrial polyp, 15% with uterine adhesions, 5% with adenomyosis (endometroid cyst), and 2.5% with cervical polyp. Six cases (15%) had standard cavities.[6]

As regards diagnostic accuracy of 3D TVUS and hysteroscopy in identifying endometrial polyps, our study is in agreement with Ahmed et al., who revealed that 3D TVUS could identify endometrial polyps with 80% sensitivity, 80% specificity, 95% PPV, 93%NPV and 96% accuracy. We reported that hysteroscopy could identify endometrial polyps with 100% sensitivity, 100% specificity, 100% PPV, 100% NPV and 100% accuracy.[8]

Regarding the diagnostic accuracy of 3D TVUS in identifying endometrial polyps, our results were in line with Grigore et al., who showed that 3D TVUS could identify endometrial polyps with 97% sensitivity, 95% specificity, 95% PPV, and 98% NPV.[9]

The current study revealed that 3D TVUS could identify endometrial fibroids with a sensitivity of 61.54%, specificity of 93.1 %, PPV of 57.14%, NPV of 94.19%, and accuracy of 89 %.

The present study concurs with Ahmed et al., who reported that 3D TVUS could identify endometrial fibroids with 96% sensitivity, 45.45% specificity, 80% PPV, 83.3% NPV, and 80.56% accuracy.[8]

The present study demonstrated that hysteroscopy could identify endometrial fibroids with a sensitivity of 91.67%, specificity of 98.86%, PPV of 91.67%, and accuracy of 98 %.

Similarly, our results agree with Ahmed et al., who revealed that hysteroscopy could identify endometrial fibroids with 95.24% sensitivity, 78.57% specificity, 86.96% PPV, 91.6% NPV and 88.57% accuracy.[8]

According to our findings, 3D TVUS was 66.67% sensitive, 93.41% specific, 50% PPV, 96.59% NPV, and 91% accurate in identifying endometrial thickening.

The present study aligns with Ahmed et al., who demonstrated that 3D TVUS could identify endometrial thickening with 75% sensitivity, 81.48% specificity, 47.3% PPV, 93.6% NPV and 80.3% accuracy.[8]

Similarly, our results agree with Komy et al., who reported that 3D TVUS could identify endometrial thickening with 60% sensitivity, 90% specificity, 60% positive predictive value, 90% negative predictive value and 84% accuracy.[7]

5. *Conclusion*

Hysteroscopy is a quick, safe, reliable procedure for diagnosing abnormal uterine bleeding. It has good sensitivity, specificity, positive predictive value, and negative predictive value. While transvaginal sonography can be used as a first-line diagnostic method, the "Gold standard" for evaluating abnormal uterine bleeding should be hysteroscopy followed by histological analysis..

Disclosure

The authors have no financial interest to declare in relation to the content of this article.

Authorship

All authors have a substantial contribution to the article

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Conflicts of interest

There are no conflicts of interest.

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