Al-Azhar International Medical Journal

Volume 3 | Issue 2 Article 12

2-1-2022

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How to Cite This Article

Ahmed, Mohammed; Mohamed, Ashraf; and El tammamy, Emad (2022) "Comparative Study between the Diagnostic accuracy of 3D Ultrasound and Hysteroscopy in patients with premenopausal uterine bleeding," *Al-Azhar International Medical Journal*: Vol. 3: Iss. 2, Article 12.
DOI: https://doi.org/10.21608/aimj.2022.104507.1646

OPEN AIMJ ORIGINAL ARTICLE

Comparative Study Between The Diagnostic Accuracy Of 3d Ultrasound And Hysteroscopy In Patients With Premenopausal Uterine Bleeding

Obstetrics and Gynecology

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Received *for publication November 14, 2021;* ***Accepted*** *February 19, 2022;* ***Published online*** *February 19, 2022.*

doi: *10.21608/aimj.2022.104507.1646*

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Disclosure: *The authors have no financial interest to declare in relation to the content of this article. The Article Processing Charge was paid for by the authors.*
Authorship: *All authors have a substantial contribution to the article.*

ABSTRACT

Background: Abnormal uterine haemorrhage has become a popular cause for gynecological visits and a significant cause for anemia in perimenopausal women which should be investigated properly.

Aim of the work: to see how accurate 3D U/S and hysteroscopy were at detecting uterine lesions in cases of perimenopausal haemorrhage.

Patients and methods: The research involved 100 cases from the outpatient Gynecological Clinic, Al Hussein, Al Sayed Galal Hospitals, Al-Azhar University during the period starting from October 2019 till May 2021. All of the women were between the ages of 41 and 50 and had premenopausal bleeding.

Results: Hysteroscopy didn't detect any case of adenomyosis (0%), fibroid in 32 cases (32%), hyperplasia in 19 cases (19%), polyps in 17 cases(17%) and no pathology in 32 cases (32%). In cases of fibroids: 3D U/S has a sensitivity 96 %, specificity 45.45 % and accuracy 80.56% as for hysteroscopy; it has a sensitivity 95.24%, specificity 78.57% and accuracy 88.57 %. In cases of polyps: 3D U/S does have a sensitivity of 80%, specificity of 80%, and accuracy of 95%. As for hysteroscopy, it does have a sensitivity of 100%, specificity of 100%, and accuracy 100%. In cases of all lesions: 3D U/S has a sensitivity 67.74 %, specificity 54.55 % and accuracy 65.75 % as for hysteroscopy; it has a sensitivity 84.48%, specificity 78.57% and accuracy 83.33%.

Conclusion: Although 3D ultrasound is a sensitive approach for evaluating lesions in the endometrial cavity, hysteroscopy offers direct visualisation of the uterine cavity, allowing it to identify small localised intrauterine lesions that 3D ultrasound or curettage may miss.

Keywords: *Diagnostic accuracy of 3D Ultrasound; Hysteroscopy; Premenopausal uterine bleeding.*

INTRODUCTION

One of the most prevalent present complaints in premenopausal women is abnormal uterine haemorrhage. It's a complicated clinical issue with a variety of reasons. Physicians with a strong understanding of menstrual physiology and a thorough strategy for differential diagnosis, on the other hand, may confidently assess and treat the issue.[1]

The cervical canal and uterine cavity can be viewed directly with hysteroscopy. Diagnostic hysteroscopy can diagnose intrauterine anomalies and is both precise and practical. Because diagnostic hysteroscopy is typically performed in an outpatient clinic, a precise diagnosis is critical in directing therapy to the specific pathology and avoiding unnecessary surgery.[2]

The addition of three-dimensional (3D) ultrasound to pelvic sonography has increased its value. It has enabled the presentation of coronal images not previously feasible with 2D ultrasound, improving ultrasound's precision in the detection of uterine abnormalities by allowing it to outline both the exterior uterine contour and abnormalities of the endometrium. 3D ultrasound is superior to 2D ultrasound in defining endometrial pathology and complements saline infusion sonohysterography (SIS). Volumetric data improves work flow effectiveness and enables data analysis off-line. The storing of data sets which could be manipulated without the requirement for repeat studies allows for consultation with referring physicians as well as other specialists.[3]

The ability to obtain a coronal (frontal) view of the uterus is one of the most significant benefits of 3D ultrasound. This allows the organ to be visualised lying flat, as it is frequently depicted in medical drawings. The study of the uterus's frontal plane increases visualisation of potential interactions among structures like uterine fibroids and the endometrium. 3D U/S is also necessary to reconstruct the surface views of organs or interfaces. This is particularly useful when evaluating the surface of the endometrium. [4]

Modern hysteroscopes are cystoscopes that have been modified to allow light to be introduced by fiberoptics. To distend the uterine cavity, which is required for inspection, several infusion media are employed. For diagnostic biopsies and pathology elimination, as well as curative procedures, a variety

of surgical equipment and devices are available. Hysteroscopy in the clinic and operating room necessitates a thorough understanding of instruments, techniques, contraindications, indications, and complication treatment.[5]

The use of office hysteroscopy necessitates the implementation of appropriate office safety protocols. Unfortunately, many physicians do not have the equipment and staffing available to perform hysteroscopy in the office. It is a low-risk technique to insert a hysteroscope solely for diagnostic purposes. The key is determining what diagnostic procedures would be difficult due to severe cervical stenosis as well as which complex surgical hysteroscopic procedures will be safer in the operating room. [5]

Hysteroscopy, both diagnostic and surgical, has become a gynaecological practise standard due to its safety and effectiveness.[6] Surface rendering mode enables investigation of the lesion's exterior and interior contours, whereas "niche aspect" allows for detection and analysis of specific uterine lesion sections. 3D ultrasound allows for better imaging of lesions, more precise volume estimation, retrospective evaluation of stored data, tumour invasion evaluation, and could pinpoint abnormalities that require operative intervention more precisely by employing rendered images.[7]

The present research is aimed at comparing the diagnostic accuracy of 3D U/S and hysteroscopy in detecting leions of the uterine in cases of perimenopausal bleeding.

PATIENTS AND METHODS

The research involved 100 cases from the outpatient Gynecological Clinic, Al Hussein, Al Sayed Galal Hospitals, Al-Azhar University during the period starting from October 2019 till May 2021. All of the women were between the ages of 41 and 50 and had premenopausal bleeding.

Inclusion criteria: Age between and 50 years, any pattern of abnormal haemorrhage such as menorrhagia or metrorrhagia for more than 3 months, and no ovarian lesions or local causes of bleeding, such as vaginal or cervical ulcer.

Exclusion criteria: Postmenopausal patients, systemic causes of perimenopausal bleeding, patients with Chronic liver diseases, diabetic patients, hypertensive patients, patients on hormonal therapy, using any contraception e.g., IUD, known to have contra indication for hystroscopy e.g. cervical stenosis, pregnancy, not known to have general causes of bleeding, and bleeding is not caused by a complication of contraception

All patients were subjected to the following:

Detailed History: Current haemorrhage history, recent hormonal contraception history, specific drug intake, haemorrhage tendency history, or general cause of haemorrhage history, previous operations or blood transfusion history, family history of comparable conditions, and history of previous fractional curettage or hormonal treatment.

General examination: Weight, height, overall appearance, vital indications (blood pressure and pulse), anaemia manifestations and pallor, and cardiac investigation for the presence of murmurs, chest examination, and abdominal investigation.

Local examination: External genitalia examination, bimanual investigation for uterine size, mobility, tenderness, and adnexal masses, and speculum examination for cervical masses, hypertrophy, erosions, ulcers or vaginal lesions.

Laboratory Investigations: Full blood count, bleeding and clotting times, coagulation profile, fasting and postprandial blood sugar levels, kidney and liver functions, and follicular stimulating hormone FSH

2D-Ultrasound: For all cases, it was done in an outpatient clinic by the same sonographer to detect any focal uterine lesions or adnexal masses. It is performed with Hitachi EUB450 (country of origin Japan) ultrasound machine with transvaginal probe. (5- 7.5 MHz) and 3.5 MHz for the transabdominal probe.

3D Ultrasound: To obtain the coronal plane and the relationship of any focal lesion, such as myomas or polyps, in three planes of endometrium, and to store the data. All of the patients underwent three-dimensional vaginal ultrasounds performed with a Voluson E6 3D system (USA) and an S-VDW 5-8 probe that has a frequency of 5- 8 MHz and is an electronic sector transducer.

Hysteroscopic Evaluation: All cases have been subjected to diagnostic hysteroscopy under general anaesthesia by a single experienced operator who was blind to the ultrasound results. We utilized a 25 cm long rigid continuous flow panoramic hysteroscopy (ENDOMED SYSTEMS) with an outer sheath of 6 mm. By attaching plastic bags of normal saline solution to infusion tubing, the technique provided constant uterine distention. The cavity was explored looking for polyps, masses, myomas or polyploidy endometruim.

Fractional Curettage: Before cervical dilatation, a specimen is taken from the endocervical canal, followed by cervical dilation up to 7- 8 Hegar. Curettage was performed with a sharp curette, beginning with the fundus, afterward the posterior wall, after that the anterior wall, and finally the right and left lateral walls. The specimen is fixed in 10% formalin and sent for histopathological identification of the nature of the endometrium or of the pathological lesion.

Statistical analysis:

When applicable, data has been statistically defined in aspects of range, mean, standard±deviation (±SD), median, frequency (number of instances), and percentages. Agreement between US, hysteroscopy diagnosis and endometrial sampling diagnosis was done using kappa statistic. The Chi square ($\chi 2$) test has been used to compare categorical data. When the expected frequency is < 5, the exact test could be used instead, and p values < 0.05 have been regarded as statistically significant. SPSS (Statistical Package for the Social Science; SPSS Inc., Chicago, IL, USA)

version 15 for Microsoft Windows has been used for all statistical calculations. ANOVA (analysis of variance): It has been used to test the difference in mean values of some variables among numerous groups by evaluating the equality of many group means. A receiver operating characteristic (ROC) curve: It is a graphical plot of sensitivity vs. 1-specificity that's been used to demonstrate a test's diagnostic properties on a numeral scale.

RESULTS

In our present study, 100 patients were included, complaining of abnormal uterine haemorrhage and were between the ages of 41 and 50, with a mean age of 43.5 years with no subgroup division (Table 1).

	Age (Years)
Number of Cases	100
Minimum	41
Maximum	50
Mean±SD	43.5± 6.12
Parity	3.43±2.81

Table 1: Age and parity presentation among the study group

In cases of adenomyosis: 3D U/S has a sensitivity, specificity, and accuracy higher than hysteroscopy (Table 2).

Adenomyosis	Sensitivity	Specificity	+ve PV	-ve PV	Accuracy
3D-US	90%	92.8%	69.2%	98.1%	92.42%
Hysteroscopy	70%	58.9%	23.3%	35.6%	60.61%

Table 2: Comparison between 3D-US and Hysteroscopy in diagnosis of adenomyosis.

In cases of fibroids: 3D U/S has sensitivity similar to hystroscpoy but specificity is higher for hysteroscopy (Table 3).

Fibroid	Sensitivity	Specificity	+ve PV	-ve PV	Accuracy
3D-US	96%	45.45%	80%	83.3%	80.56%
Hysteroscopy	95.24%	78.57%	86.96%	91.6%	88.57%

Table 3: Comparison between 3D-US and Hysteroscopy in diagnosis of fibroids.

In cases of thick endometrium: 3D U/S has sensitivity specificity and accuracy less than for hysteroscopy (Table 4).

Thick endometrium	Sensitivity	Specificity	+ve PV	-ve PV	Accuracy
3D-US	75%	81.48%	47.3%	93.6%	80.3%
Hysteroscopy	83.33%	88.89%	62.5%	96%	87.8%

Table 4: Comparison between 3D-US and Hysteroscopy in diagnosis of thick endometrium>12mm.

In cases of endometrial polyps: 3D U/S has sensitivity specificity and accuracy less than for hysteroscopy (Table 5).

Polyps	Sensitivity	Specificity	+ve PV	-ve PV	Accuracy
3D-US	80%	80%	95%	93%	96%
Hysteroscopy	100%	1oo%	100%	100%	100%

Table 5: Comparison between 3D-US and hysteroscopy in the prognosis of polyps.

In cases of all lesions: 3D U/S has sensitivity specificity and accuracy less than for hysteroscopy (Table 6).

All Lesions	Sensitivity	Specificity	+ve PV	-ve PV	Accuracy
3D-US	67.74%	54.55%	89.36%	23.08%	65.75%
Hysteroscopy	84.48%	78.57%	94.23%	55%	83.33%

Table 6: Comparison between 3D-US and Hysteroscopy in diagnosis of all lesions.

DISCUSSION

The most common clinical manifestations were: bleeding in 100 instances (100%). Menorrhagia is represented by 37 instances (37%), metrorrhagia by 27 instances (27%), and menometrorrhagia by 36 instances (36%).

In cases of adenomyosis: 3D U/S has a sensitivity, specificity, and accuracy higher than hysteroscopy. In cases of fibroids: 3D U/S has sensitivity similar to hystroscpoy but specificity is higher for hysteroscopy. In cases of thick endometrium: in comparison to hysteroscopy, 3D U/S has lower sensitivity, specificity, and accuracy. In cases of polyps: 3D U/S has lower sensitivity, specificity, and accuracy than hysteroscopy. In cases of all lesions: 3D U/S has sensitivity specificity and accuracy less than for hysteroscopy. Although 3D ultrasound is a sensitive approach for evaluating lesions in the

endometrial cavity, hysteroscopy offers direct visualisation of the uterine cavity, allowing it to identify small localised intrauterine lesions that 3D ultrasound or curettage may miss.

Sousa et al.[8] conducted a similar study on 50 women who had abnormal uterine haemorrhage and revealed the most prevalent complaints were: hypomenorrhea 3 cases (6%), polymenorrhea (8%), menometrorrhagia (14%), polymenorrhea (8%), and menorrhagia (40%).

In cases of adenomyosis: 3D U/S has a sensitivity, specificity, and accuracy higher than hysteroscopy. In cases of fibroids: 3D U/S has sensitivity similar to hystroscpoy but specificity is higher for hysteroscopy. In cases of thick endometrium: 3D U/S has sensitivity specificity and accuracy higher than for hysteroscopy. In cases of polyps: 3D U/S has sensitivity specificity and accuracy less than for hysteroscopy.

Our study agreement with Grigore et al. [9] found that the sensitivity, specificity, PPV, NPV, and total overall accuracy of 3D transvaginal ultrasonography for total abnormal results were 89.13 %, 100 %, 100 %, 44.44 %, and 90 %, respectively, when compared to hysterocopy.

Also, agreement with Decloedt et al. [10] while performing hysteroscopy on 665 women with an average age of 47 years. The study only comprised women who presented with abnormal uterine hemorrhage. The aim of this study was to detect indications and hysteroscopic results in premenopausal and postmenopausal women. And the results show sensitivity for intrauterine lesions simiar to our study.

Another agreement with Allameh et al. [11] study done on 105 patients showing the hysteroscope's value in detecting endometrial polyps, endometrial hyperplasia, and submucous myomas shows sensitivity, specificity, PPV, and NPV higher than 3D U/S. Endometrial hyperplasia was overdiagnosed in some instances by hysteroscopy, but no instances of hyperplasia have been missed via this procedure.

In cases of fibroids: 3D U/S has sensitivity similar to hystroscpoy but specificity is higher for hysteroscopy. In cases of polyps: 3D U/S has sensitivity specificity and accuracy less than for hysteroscopy.

Ryu et al. [12] on 105 patients, reviewed by transvaginal ultrasonography (TVS) whose diagnosis was confirmed pathologically. The study concluded that while TVS is a sensitive approach for evaluating endometrial cavitary lesions, it frequently does not offer enough diagnostic information to the clinician. Hystroscopy, which has higher sensitivity, specificity, and positive and negative predictive values than TVS, is a better way to assess patients with abnormal uterine hemorrhage. And this study agrees with our results.

Badawy et al. [13]; their study was to determine if ultrasonography, hysteroscopy, or both are required to make the best treatment options. They looked at the records of 100 randomly chosen women who had abnormal uterine bleeding of different forms. Our findings indicate that pelvic ultrasonography as well as diagnostic hysteroscopy give complementary information for patient treatment and that both must be used for the most accurate evaluation of menstrual symptoms, which agrees with our study.

Grimbizis et al. [14] examined 105 consecutive patients who presented to an outpatient clinic having symptoms of menorrhagia and premenopausal hemorrhage, and every patient underwent TVS and diagnostic hysteroscopy. Diagnostic hysteroscopy has been found to have much superior diagnostic performance than TVS in a comparison study of the area under the curve. Furthermore, when the receiver operating characteristic curves have been compared, diagnostic hystroscopy has been found to be much more accurate than TVS in diagnosing intracavitary masses. This agrees with our research.

The study by Kelekci et al.[15] on 50 women showed that the sensitivity, specificity, PPV, and NPV of hysteroscopy in the diagnosis of endometrial polyps and submucous myomas were higher than ultrasound. So, because hysteroscopy does have a high diagnostic capacity for detecting localised intracavitary uterine lesions like polyps and myomas, it saves patients with such lesions a lot of money and time by avoiding unnecessary interventions. This study agrees with our study.

Our results disagree with Hemila et al. [16] in their research of 70 women to detect the cause of uterine bleeding, which shows that 3D U/S is comparable to hysteroscopy to determine the causes of uterine bleeding. This is study was carried on smaller number of cases comparing to our study.

Anather disagreement with Emanuel et al. [17] in their study carried on 121 patients to detect the cause of uterine bleeding which show that 2D U/S is better than hysteroscopy to detect causes of uterine bleeding. These results quite different from our study.

Also, disagreement with Ebrashy et al. [18], who studied 65 patients using both TVS 2D and 3D ultrasonography, and the findings were consistent with 2D ultrasound, but 3D U/S didn't offer a better potential for diagnosis than 2D U/S except in more diagnostic perception of site and size of lesion..

CONCLUSION

our study provides evidence that hysteroscopy is a reliable and valuable tool for perimenopausal bleeding diagnosis .

The results of this study showed the accuracy of hysteroscopy as an accurate diagnostic tool for endometrial lesions of perimenopausal bleeding.

Panoramic hysteroscopic inspection of the uterine cavity offers an accurate method to investigate endometrial and endocervical pathology with high sensitivity and specificity values. Moreover, it could be an excellent guide for the localization of the pathological lesion before endometrial curettage is used.

While hysteroscopy with guided biopsy is more sensitive than 3D ultrasound or dilatation and curettage in diagnosing causes of abnormal uterine haemorrhage, hysteroscopy without directed biopsy is inadequate in order to diagnose endometrial hyperplasia.

Transvaginal ultrasound is an outstanding tool for investigating uterine cavity anomalies because it offers valuable data. 3D U/S enables surface and volume rendering, which can result in photographic images. It is extremely useful in distinguishing intramyometrial lesions such as adenomyosis and detecting the precise location of submucous myomas or endometrial polypi in connection with the cavity. It is expected that 3D U/S equipment will become less costly in the near future, allowing for widespread application.

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