ORIGINAL ARTICLE

Diagnostic Accuracy Of 3D Dimensional Sono-hysterography versus Hysteroscopy in The Evaluation of Uterine Cavity in Cases of Perimenopausal Bleeding with Suspected Intra-Cavitary Lesions with Correlation to Histopathological Findings

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Abstract

Background: ***In the perimenopausal stage, abnormal uterine bleeding (AUB) is the most frequent reason for gynecological appointments. Intrauterine abnormalities are the primary cause of perimenopausal bleeding, aside from dysfunctional uterine bleeding (DUB). The most frequent physical reasons why women experience perimenopausal bleeding are endometrial hyperplasia, endometrial polyps, and submucosal fibroids.***

Aim and objectives: ***To determine the relationship between histological results and the diagnostic accuracy of hysteroscopy and three-dimensional sono-hysterography (3D SHG) in instances with perimenopausal hemorrhage with suspected intra-cavitary lesions.***

Patients and methods: ***One hundred patients who attended the Obstetrics and Gynecology department at Al-Hussein University Hospitals for six months, from August 2023 to February 2024, were included in this prospective comparison study.***

Results: ***In contrast to the hysteroscopy group (22.00 ± 0.75 mm), the 3D SHG group's mean endometrial thickness was lower (18.74 ± 1.22 mm). Compared to premenopausal women's normal endometrial thickness range of 4–8 mm, both groups displayed increased endometrial thickness. This increased thickness indicates the existence of endometrial pathology in both groups and is consistent with the presenting symptom of abnormal uterine bleeding.***

Conclusion: ***For perimenopausal women with irregular uterine bleeding, 3D SHG may be as diagnostically accurate as hysteroscopy in identifying intracavitary lesions. Our findings support the potential use of 3D SHG as a first-line diagnostic tool in this population, potentially reducing the need for more invasive and costly procedures.***

Keywords: Perimenopausal bleeding; Histopathology; 3D SHG; Uterine cavity; Hysteroscopy

1. Introduction

Any step of the Müllerian developmental process can cause intrauterine anomalies, which affect 5.5% of the general population, 8% of infertile women, and 13.3% of women who have experienced a miscarriage. Infertility, repeated miscarriages, and an increased risk of miscarriage in the first and second trimesters, as well as early birth, are commonly associated with congenital uterine abnormalities.[1]

Diagnostic hysteroscopy, along with histological analysis of endometrial aspiration or biopsy, is the gold standard for diagnosing intrauterine abnormalities. A top-notch technique for assessing the uterus' inside is hysteroscopy.[2]

Infusion of saline Sono-hysterography (SIS) is a minimally invasive technique used to assess a single layer of the endometrial lining by dispensing the uterine cavity with saline. Radiologists can distinguish between focal and dispersed endometrial pathologic situations with the use of SIS. Compared to hysteroscopy, it is less expensive, simpler, and requires less time to detect and quantify intracavitary abnormalities.[3]

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Furthermore, the accuracy of diagnosing endometrial disease is increased when three-dimensional sono-hysterography (3D SHG) is added to traditional sono-hysterography. In contrast to traditional two-dimensional assessments, the simultaneous presentation of three perpendicular planes provides a more thorough summary of the area under examination and connects to planes.[4]

Most patients readily accept 3D SHG as an outpatient surgery.6 3D SIS rarely causes problems. When the balloon is inflated, and saline is injected, the patient may feel anxious and uncomfortable and have slight cramping in the lower abdomen. But shortly after the procedure is over, the symptoms go away. Additionally, vaginal spotting could happen for a day or two following the surgery. There were only 1% to 2% of infections recorded, primarily endometritis.[5]

The purpose of this study is to determine the link between histopathological results and the diagnostic accuracy of 3D SHG and hysteroscopy in cases of perimenopausal hemorrhage with suspected intra-cavitary lesions.

2. Patients and methods

One hundred patients who attended the Obstetrics and Gynecology department at Al-Hussein University Hospitals for six months, from August 2023 to February 2024, were included in this prospective comparison study.

Sample size:

The following assumptions were taken into account for calculating the sample size for this investigation, which was based on a study conducted by El-Khayat et al.6 Epi Info STATCALC: 80% power and a two-sided confidence level of -95%. The computed odds ratio, with a 5% error, is 1.115. The Epi-Info output's final maximum sample size was 50.

Inclusion criteria:

Age>40 years old, patients in the premenopausal stage, patients with abnormal uterine bleeding, signs suggesting intrauterine cavity lesions: pelvic pain, history of miscarriages, dysmenorrhea, and sense of pressure or fullness in the lower abdomen.

Exclusion criteria:

Anticoagulant use, severe vaginitis or cervicitis, significant cervical stenosis, recent or ongoing pelvic inflammatory disease, bleeding condition, and refusal to participate.

Methods:

Each patient gave their informed permission after completing a thorough history that included their family history, medical and surgical history, obstetric history, menstrual history, personal history, and any complaints.

Body mass index (BMI), local abdominal examination, and vital signs (blood pressure, temperature, heart rate, and respiratory rate) comprise the general examination.

Laboratory tests include the liver and kidney function tests, coagulation profile, CBC, and random blood sugar.

There were two groups of patients: 50 patients in Group (A) underwent 3D SHG, while 50 patients in Group (B) underwent diagnostic hysteroscopy. In contrast, the patient was in the dorsal lithotomy posture, a sterile bivalve vaginal speculum was inserted, and the cervix was cleansed with povidone-iodine (Betadine).

Within group (A): A 5 French H/S catheter with a single lumen was inserted into the uterus through the cervix. The catheter will be fixed into the cavity by inflating the balloon. Subsequently, 10 to 15 milliliters of saline were injected into the uterus, causing it to dilate. About ten minutes are needed for the procedure. After removing the speculum, a high-frequency (7 MHZ) 3D transvaginal transducer will do a 3D transvaginal scan. The transducer's automated sweep will produce a 3D ultrasound. To assess endometrial thickness, echogenicity, and the existence of endometrial lesions, mode imaging was used. Each lesion's location, dimensions, form, echogenicity, and relationship to the uterine cavity were assessed.

Hysteroscopy in group (B) involved the use of a rigid hysteroscope with a traumatic tip housed in a diagnostic sheath with a 4-mm diameter. The hysteroscope had a continuous flow and a 30-degree forward-oblique view. In order to light up the uterine cavity, a fiber optic cable and a powerful cold light source will be utilized. With careful manipulation, the hysteroscope was inserted into the vagina and led into the endocervical canal. The uterine cornua, tubal ostia, uterine fundus, and lateral, anterior, and posterior uterine walls were all thoroughly examined for intrauterine abnormalities as soon as the examiners entered the uterine cavity. Endometrial curettage was done in order to obtain tissue samples for histopathology analysis. In the pathology lab, tissue samples were taken at a thickness of 3 mm after the specimens were preserved in a 10% formalin solution. Gross dissection followed. Following standard processing protocols, the tissue slices were fixed in 10% neutral buffered formalin for 24 hours, dried, cleaned, and embedded in paraffin wax. Hematoxylin and eosin (H&E) staining was applied to the paraffin wax blocks before they were placed on glass slides and cut into 5-μ slices for histopathological assessment. Findings from 3D HSG and hysteroscopy were found to correlate with histological examination results.

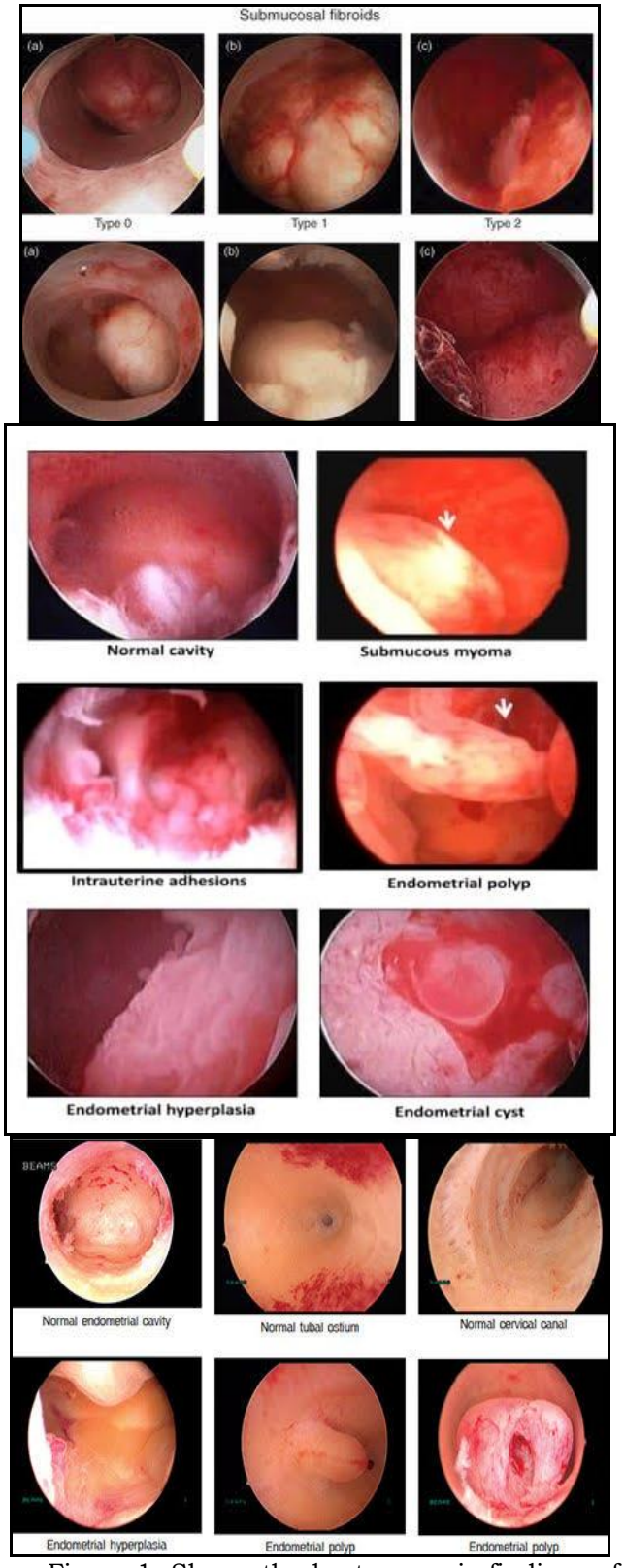


Figure 1. Shows the hysteroscopic findings of the studied patients.

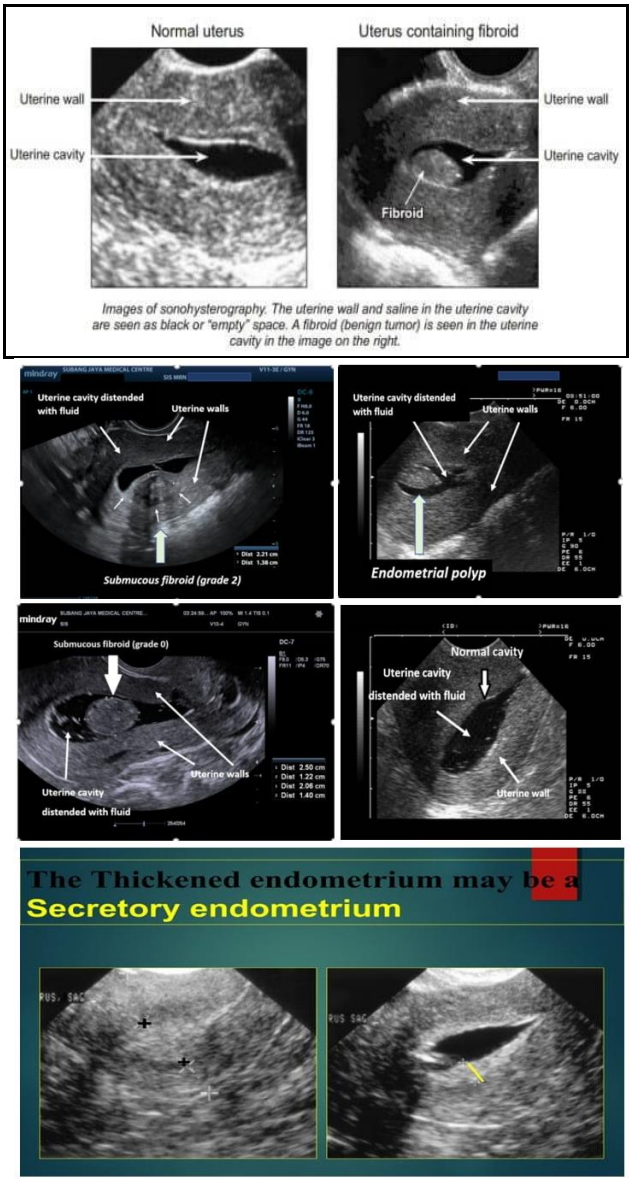
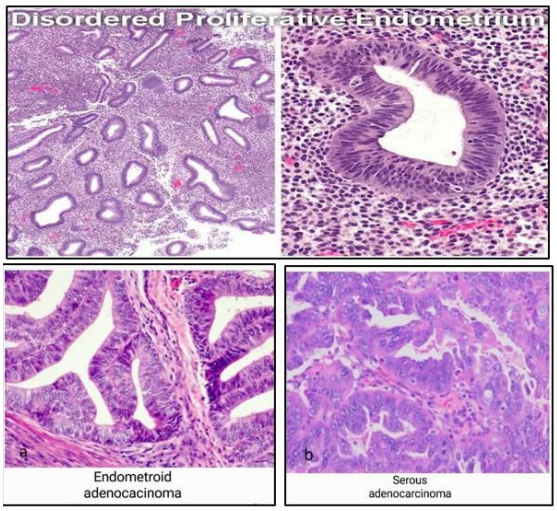
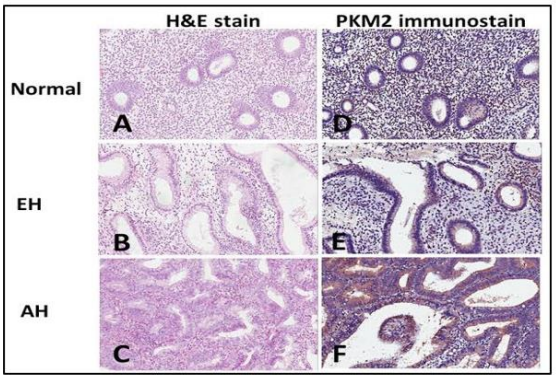
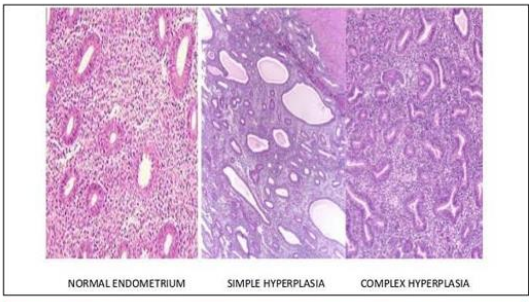
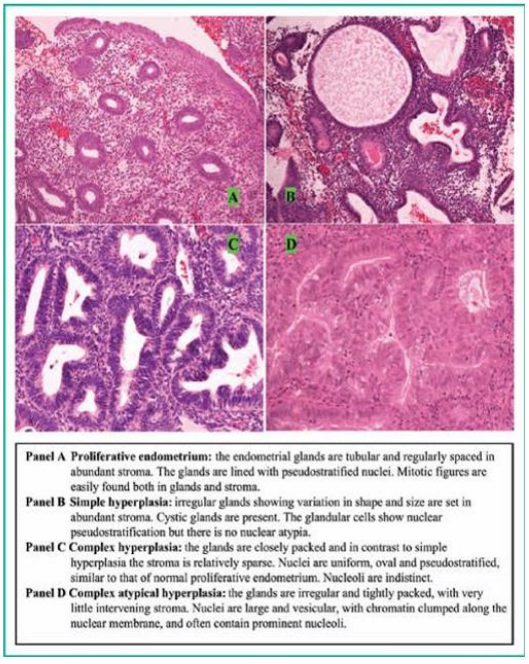


Figure 2. Shows the 3D sonohystrography findings of the studied patients.









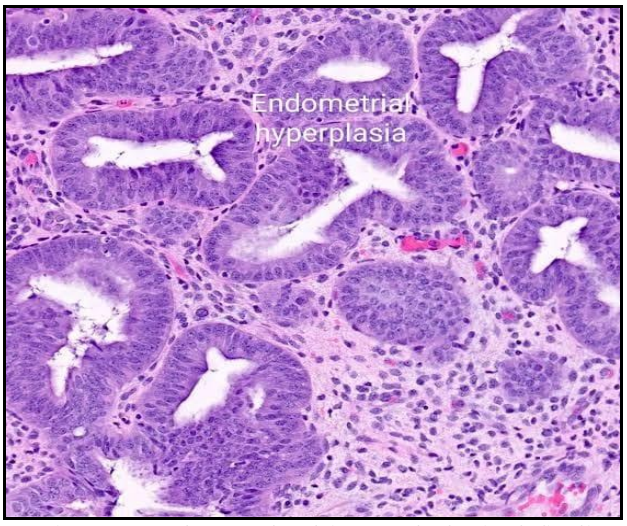


Figure 3. Shows the histopathological findings of the studied patients

Ethical considerations:

The Research Ethics Committee gave their stamp of approval after reviewing the procedure. Patients were asked to provide their informed consent before they could be enrolled in the trial. No one's management will be affected if they want to withdraw from the research.

Statistical analysis:

Statistical Package for the Social Sciences, Version 20.0, was used for data entry and analysis. We computed the mean, proportion, and percentage. The relationship was established using a chi-square test.

3. Results

Table 1. Information on the patients' demographics.

		N	minimum	maximum	Mean	Std. Deviation
Age	Group 1	50	41	51	45.36	2.724
	Group 2	50	43	52	47.76	2.56
BMI	Group 1	50	24.76	32.84	29.82	2.56
	Group 2	50	28.56	36,63	33.97	2.35

The mean age of group (1) was 45.36 ± 2.724 (SD) ranging from (41 to 51years) while the mean age of group (2) was 47.76± 2.56 (SD) ranging from (43 to 52 years), While the mean BMI of group (1) was 29.82 ± 2.56 (SD) ranging from (24.76 to 32.84) while the mean BMI of group (2) was 33.97 ± 2.35 (SD) ranging from (28.56 to 36,63), table 1.

Table 2. Parity and gravidity of Group 1.

Gravidity group 1			
	N	Frequency	Percent
Group 1	2	24	48.0
	3	26	52.0
	Total	50	100.0
Parity group 1			
Group 1	1	16	32.0
	2	22	44.0
	3	12	24.0
	Total	50	100.0

Regarding the demographic data of group 1

and according to the gravidity: 2 times gravidity frequency was 24(48 %) and or 3 times gravidity frequency was 26(52%) and according to the parity: 1 time parity frequency was 16(32%), 2 times parity frequency was 22(44%) and 3 times parity frequency was 12(24%), table 2; figures 4&5.

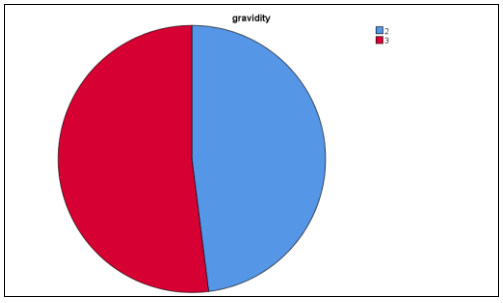


Figure 4. Pie chart of gravidity of group 1.

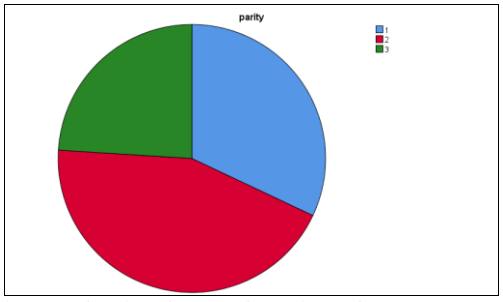


Figure 5. Pie chart of parity of group 1.

Table 3. Parity and gravidity of Group 2.

	Gravidity group 2		
	N	Frequency	Percent
Group 2	1	4	8
	2	46	92
	Total	50	100
	Parity group 2		
	N	Frequency	Percent
Group 2	0	2	4.0
	1	12	24.0
	2	36	72.0
	Total	50	100.0

Regarding the demographic data of group 2 and according to the gravidity: 1 time gravidity frequency was 4(8 %) and or 2 times gravidity frequency was 46(92%) and according to the parity: 0-time parity frequency was 2(4%), 1 time parity frequency was 12(24%) and 2 times parity frequency was 36(72%), table 3; figures 6&7.

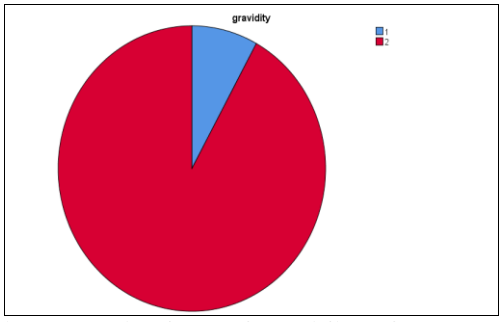


Figure 6. Pie chart of gravidity of group 2.

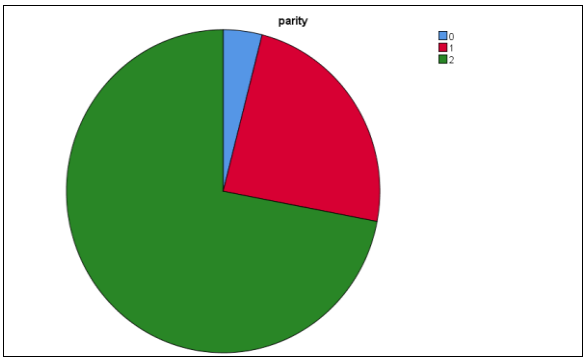


Figure 7. Pie chart of parity of group 2.

Table 4. Endometrial thickness between both groups.

	endometrial thickness			
	N	Minimum	Maximum	Mean	Std. Deviation
Group 1	50	16.20	20.60	18.74	1.22
Group 2	50	20.60	24.30	22.00	0.75

Regarding the demographic data the mean endometrial thickness of group 1 was 18.74 ± 1.22(SD) with minimum endometrial thickness 16.20 and maximum endometrial thickness 20.60 and the mean endometrial thickness of group 2 was 22.00 ± 0.75 (SD) with minimum endometrial thickness 20.60 and maximum endometrial thickness 24.30, table 4.

Table 5. Endometrial thickness between both groups.

	bleeding pattern		
		Frequency	Percent
Group 1	menorrhagia	46	92.0
	Menometrorrhagia	4	8.0
	Total	50	100.0
Group 2	menorrhagia	44	88.0
	polymenorrhea	6	12.0
	Total	50	100.0

Regarding the demographic data the bleeding pattern of group 1 classified as follow menorrhagia 46 (92%) and menometrorrhgia 4(8%) and for group 2 menorrhagia 44(88%) and polymenorrhea 6 (12%), table 5; 8&9.

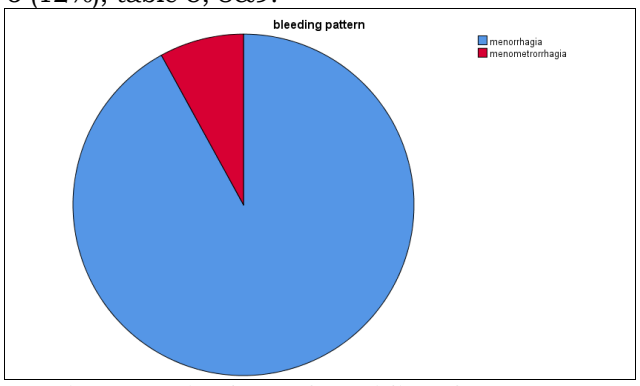


Figure 8. Pie chart of gravidity of group 1.

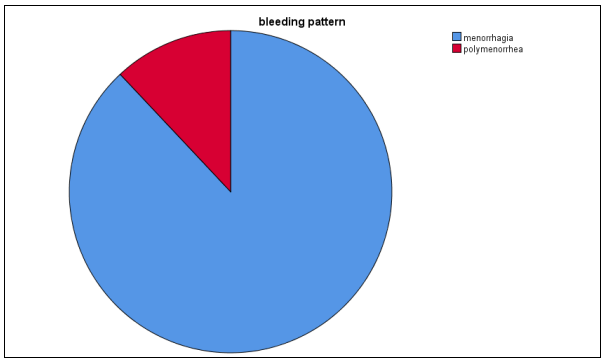


Figure 9. Pie chart of gravidity of group 2.

Table 6. Histopathology of the 2 groups.

		histopathology					Total
		carcinoma	hyperplasia	Endometrial polyp	Submucous myoma	normal	
Group	Group A	2	8	14	18	8	50
	percent	4	16	28	36	16	100
	Group B	2	8	16	16	8	50
	percent	4	16	32	32	16	100
Total		4	16	30	34	16	100

Regarding the demographic data histopathology of the 2 groups was classified as follow: Group (1) 2 patients (4%) was diagnosed with carcinoma, 8(16%) with hyperplasia, 14(28%) with endometrial polyp, 18(36%) with submucous myoma and 8(16%) was normal.

Group (2) 2(4%) patients was diagnosed with carcinoma, 8(16%) with hyperplasia, 16(32%) with endometrial polyp, 16(32%) with submucous myoma and 8 was normal, table 6; figure 10.

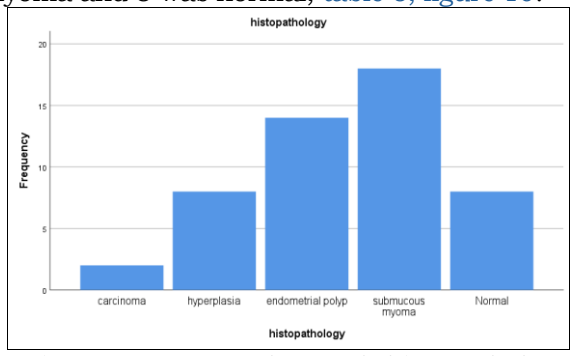


Figure 10. Bar chart of histopathology of group 1.

Chi square test as shown in the next bar chart (figure 10) shows that, there is no significant difference between group (1) and group (2) according to diagnosis of carcinoma as p-value is 1.0000 as carcinoma is found in 2 patients in both groups.

4. Discussion

In our study, the mean age of the 3D SHG group (45.36 ± 2.724 years) was slightly lower than that of the hysteroscopy group (47.76 ± 2.56 years).

This age range is consistent with the perimenopausal period, which typically occurs between 45-55 years of age. [7]

The slight age difference between the groups is unlikely to significantly impact the results, as both groups fall within the perimenopausal range.

The two groups in our study had significantly different mean BMIs; the 3D SHG group's mean BMI was lower (29.82 ± 2.56) than the hysteroscopy group's (33.97 ± 2.35. This difference in BMI could potentially influence the diagnostic accuracy of the imaging techniques, as higher BMI has been associated with increased difficulty in ultrasound imaging.[8]

The current study was in line with Abd Elkhalek et al.,[9] The goal of this research was to find out how well 3D saline infusion sonohysterography and hysteroscopy could detect intracavitary uterine anomalies in women who were not yet menstruating but were experiencing abnormal bleeding. Fifty cases of abnormal uterine bleeding involving women aged 25 were included in the research. In our study, the 3D SHG group showed a lower mean endometrial thickness (18.74 ± 1.22 mm) compared to the hysteroscopy group (22.00 ± 0.75 mm). Endometrial thickness was higher in both groups than in premenopausal women, which is typically 4-8 mm.[10]

This thickening is in line with the initial sign of abnormal uterine bleeding and indicates that endometrial disease is present in both sets of patients.

In our study, the predominant bleeding pattern in both groups was menorrhagia (92% in the 3D SHG group and 88% in the hysteroscopy group).

This finding is consistent with other studies on perimenopausal bleeding, where menorrhagia is often the most common presenting symptom.[11]

The slight difference in the distribution of bleeding patterns between the two groups is unlikely to significantly impact the comparison of diagnostic techniques.

In our study, the histopathological findings were remarkably similar between the two groups, with no statistically significant differences observed.

When compared to previous research on endometrial pathology in perimenopausal women experiencing abnormal uterine bleeding, our results are in line with the consensus. Think about research by Dreisler et al.:[12] across Polyps were found in 5.8% of women before menopause and 11.8% of women after menopause (P<0.01). Of the women with polyps confirmed by histopathology, 29 (or 82% of the total) did not have any symptoms. While 7.6% of asymptomatic premenopausal women had polyps, 13% of asymptomatic postmenopausal women had. Among women who did not have polyps, AUB, specifically IMB, was more common (38%). Ultrasound imaging revealed that an additional 4.2% of women had submucosal myomas (26/622; 95% CI, 2.6-5.8%), and an additional

11.1% had intramural myomas (76/684; 95% CI, 8.8-13.5%). Just 2% of women using oral contraceptives and 25% of women using hormone therapy were found to have polyps.

Our most startling discovery is that the 3D SHG and hysteroscopy groups did not differ significantly in histological diagnosis. This provides more evidence that 3D SHG can detect intracavitary lesions with diagnostic accuracy comparable to hysteroscopy in perimenopausal women experiencing abnormal uterine bleeding.

This finding is consistent with several other studies that have compared SHG to hysteroscopy. For example, a meta-analysis by de Kroon et al.[13] found that SHG had high sensitivity (95%) and specificity (88%) for the detection of intrauterine abnormalities, comparable to hysteroscopy. However, most previous studies have focused on 2D SHG, and this study adds to the growing body of evidence supporting the use of 3D SHG.

When compared to DH's 91.6% accuracy rate, SIS's detection of submucosal fibroids was a perfect 100%. For polyps, both SIS and DH had similar detection accuracies: 97.6% and 97.5%, respectively.

Farquhar et al.,[14] found that when it comes to detecting endometrial hyperplasia, polyps, and submucous fibroids, 3D SIS and DH are equally accurate.

This study's finding that 3D SHG and hysteroscopy performed similarly in terms of diagnostic accuracy has significant implications for clinical practice. 3D SHG has several advantages over hysteroscopy, including being more accessible, less costly, and less invasive. For perimenopausal women experiencing atypical uterine bleeding, 3D SHG has the potential to serve as a first-line diagnostic tool, with hysteroscopy being reserved for situations requiring additional confirmation or therapy if it can achieve equal diagnostic accuracy.

Limitations: Although one hundred people is sufficient for a pilot study, it is still on the small side. The research did not check whether 3D SHG or hysteroscopy was more accurate in diagnosing the same individuals. Important aspects of clinical decision-making that the study failed to evaluate were the two procedures' cost-effectiveness and patient acceptance.

4. Conclusion

When it comes to diagnosing intracavitary lesions in perimenopausal women with abnormal uterine bleeding, 3D SHG may be just as accurate as hysteroscopy. Our findings support the potential use of 3D SHG as a first-line diagnostic tool in this population, potentially reducing the need for more invasive and costly procedures.

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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