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Role of Transvaginal ultrasonography in the diagnosis of abnormal uterine bleeding: A hospital-based study

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Abstract

Introduction: AUB (Abnormal uterine bleeding) affects approximately one in every three women during their reproductive years. AUB is a considerable health care burden not only for women but their families and has a definite effect on their quality of life. **Aim:** To compare the ultrasonographic, hysteroscopic and histopathological findings in patients with abnormal uterine bleeding. **Material and Methods:** This prospective observational study was conducted at the Department of Obstetrics and Gynaecology, Indraprastha Apollo Hospital, New Delhi, from July 2018 to June 2019. The women who came to the OPD with the complaint of AUB in the one year period and met the eligibility criteria as per our study. TVS was performed in 126 patients presenting with complaints of abnormal uterine bleeding followed by hysteroscopic biopsy or curettage. The specimens were sent for histopathologic examination. **Results:** Mean age = 43.95±8.48 years. Maximum number of cases 53 (42.0%) were found to be para 2. Most common presenting complaint was found to be menorrhagia (n=53; 42%) followed by post-menopausal bleeding (n=30, 24.0%). The Mean Endometrial Thickness was 9.79± 4.84 mm. The diagnostic specifications of TVS taking histopathological examination as gold standard were: sensitivity = 64/77= 83.1%, specificity 39%, positive predictive value 68%, Negative predictive value 59% and accuracy 66%. Hysteroscopy has a sensitivity of 87%, specificity of 51%, positive predictive value of 74%, negative predictive value of 71.4% and diagnostic accuracy of 73% in diagnosing aetiology of abnormal uterine bleeding. **Conclusion:** Both transvaginal sonography and hysteroscopy are good diagnostic modalities for investigation of women with Abnormal Uterine Bleeding. However, hysteroscopy has an edge over TVS in diagnosing aetiology of AUB in terms of high sensitivity, specificity and negative predictive value.
Key words: Ultrasonography, Uterine Haemorrhage, Sensitivity and Specificity, Diagnosis

Introduction

Menstrual disorders are a common indication for medical visits among women of reproductive age[1]. Heavy menstrual bleeding affects up to 30% of women throughout their reproductive lifetime[2]. Abnormal uterine bleeding (AUB) may be defined as any variation from the normal menstrual cycle, and includes changes in regularity and frequency of menses, in duration of flow, or in amount of blood loss. A menstrual cycle of fewer than 21 days or more than 35 days or a menstrual flow of less than two days or, more than seven days is considered abnormal. AUB can be categorized as excessive menstrual bleeding, irregular bleeding and inter-menstrual bleeding including, post-coital bleeding in any age group. AUB not only affects the intimate relationships and day-to-day living but can also have serious adverse consequences as anaemia or it may be the result of an underlying malignancy[3,4].

AUB affects approximately one in every three women during their reproductive years[5]. Incidence varies with age and reproductive status of the women in different populations. Incidence generally increases with age, reaching 24% in those aged 36-40 years[6]. It accounts for approximately 15-20% of clinic visits and 25% of gynaecological surgeries. This proportion rises to 69% when the perimenopausal and postmenopausal age groups are considered[7].

AUB is a considerable health care burden not only for women but their families and has a definite effect on their quality of life[8]. So, our **Aim** is to compare the ultrasonographic, hysteroscopic and histopathological findings in patients with abnormal uterine bleeding.

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Material and methods

Study setting
Department of Obstetrics and Gynaecology, Indraprastha Apollo Hospital, New Delhi-110076.

Study design
It was a prospective observational study.

Study period
The study was conducted from July 2018 to June 2019.

Study subjects
The subjects were the women who visited the OPD of Department of Obstetrics and Gynaecology at Indraprastha Apollo Hospital, New Delhi with the complaint of abnormal uterine bleeding in terms of volume, duration, regularity or frequency of menstrual flow.

Sample-Size Calculation
The women who came to the OPD with the complaint of AUB in the one-year period and met the eligibility criteria were taken for the study.

Inclusion Criteria
- Patients with abnormal uterine bleeding.
- Both parous and nulliparous females.
- Patients who do not require any emergency management.

Exclusion Criteria
- Patients presenting as an emergency requiring immediate attention.
- Patients with Genital tract infection.
- Pregnant women.

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- Patients on anticoagulants, hormonal replacement therapy and hormonal contraceptives.
- Patients who refuse to be part of the study.

Statistical Analysis

The analysis included profiling of patients on different demographic, comorbidities, etiology, clinical, laboratory as well as radiological findings. Quantitative data was presented in terms of means and standard deviation. Qualitative/categorical data was presented as absolute numbers and proportions. Cross tables were generated and chi square test was used for testing of significance. Student t test was used for comparison of quantitative outcome parameters for a dichotomous independent variable. Sensitivity, specificity, positive predictive value and negative predictive values were calculated to assess the accuracy of ultrasonography in diagnosis of patients with abnormal uterine bleeding. p value < 0.05 was considered statistically significant. IBM SPSS software version 24.0 was used for statistical analysis.

Procedures

Before proceeding for examination and investigations, detailed history was obtained regarding onset, duration and amount of bleeding; **i**ts characteristics and cyclical features; antecedent cause such as IUCD, recent delivery, abortion, hormone therapy; bleeding disorders; medical disorders especially thyroid dysfunction and diabetes; menstrual history; age at menarche, menstrual patterns, history of dysmenorrhea, pre-menstrual spotting, menopausal status; obstetric history; past medical history and family history.

The examination of the patient included: A thorough general physical examination noting weight, height, BMI, built, nutritional status, petechiae, ecchymosis, pallor, icterus, pedal edema, lymphadenopathy, thyroid enlargement and vital signs.

A detailed systemic examination was undertaken. Abdominal examination was carried out to rule out any palpable lump or presence of any scar. Any free fluid in abdomen was looked for. Any significant organomegaly was checked.

Local examination of labia, vulva, urethra, introitus, any bleeding, discharge, or any pathology was noted. Per speculum examination was done to rule out cervical or vaginal pathology such as infection, erosion, polyp, fibroid, abnormal growth, discharge and bleeding.

Per vaginal examination was carried out to note

1. Uterus: position, size, consistency, tenderness, mobility, any mass
2. Cervix: position, consistency, bleeding on touch.
3. Fornices: tenderness, thickening, mass.

Investigations: All necessary investigations were taken viz Complete blood counts, Coagulation profile, Blood grouping and Rh typing, KFT, LFT, Serum electrolytes, Blood sugar, Urine routine and microscopy, HIV, HBsAg, Anti HCV, ECG and Chest X-ray.

Transvaginal sonography (TVS): It was performed with Philip ultrasonography machine without referring to the phase of cycle. Informed verbal consent was taken after explaining the procedure to the patient. Patient, after evacuating her bladder, was made to lie on the examination table in supine position with knees bent and slightly apart. The transducer was cleaned thoroughly before and after use. The probe was covered with condom containing scanning gel. The gel was placed on the outer surface also as the lubricant. The probe was introduced into the posterior fornix of the vagina in the coronal scan plan and swept anteriorly. The endometrium was first imaged on its longitudinal axis by gently angled (anterior for antiflexed uterus, posterior for retroflexed uterus) sagittal scans through uterus with probe head in region of cervix. Then endometrium was imaged in its short axis in semi-coronal or semiaxial plane by turning the probe approximately 90°. In this plan one can delineate invagination of endometrium into the area of ostia. The fundus was imaged by directing the probe in various degrees of anterior or posterior inclinations as it is held next to cervical lips. The uterine size was recorded. Any deformity in the shape was also recorded.

The endometrial thickness was measured at the widest part of endometrium in longitudinal plane or if this was not possible then in transverse plane of the uterus, the landmark being where ostia were seen. Measurement included both the layers of the endometrium. This means that if the cavity was distended by polyp or fluid, it was included in the measurement.

TVS was followed by curettage and histopathological examination to confirm the findings.

Hysteroscopy

After the patient satisfied all the criteria for the study, the procedure was explained to the patient in detail and an informed written consent was obtained. Hysteroscopy was done with KARL STORZ 5 mm diameter panoramic hysteroscope.

Results

In the present study, TVS was performed in 126 patients presenting with complaints of abnormal uterine bleeding followed by hysteroscopic biopsy or curettage. The specimens were sent for histopathologic examination. The TVS, hysteroscopic and histopathologic patterns were studied and the measures of validities were computed taking histopathology as the gold standard.

Table 1: **Depicts the general characteristics and symptoms of the study participants.**

General characteristics and symptoms		Number (%)
Age-group	<30	10(8)
	30-39	33(26)
	40-49	59(47)
	50-59	21(16.5)
	≥60	3(2.5)
Parity	0	8(6.5)
	1	28(22.0)
	2	53(42.0)
	3	25(20.0)

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	4	7(5.5)
	≥5	5(4.0)
Menopausal status	Post-menopausal	30(23.8)
	Pre-menopausal	96(76.2)
Presenting symptoms	Menorrhagia	53(42.0)
	Polymenorrhea	9(7.0)
	Polymenorrhagia	13(10.0)
	Metrorrhagia	15(12.0)
	Post-menopausal bleeding	30(24.0)
	Meno-metrorrhagia	4(3.0)
	Heavy and prolonged menstural bleeding	2(1.5)
Duration of symptoms	< 6 Months	77(61.0)
	6 Months - 1 Year	40(32.0)
	> 1 Year	9(7.0)

Most of the cases were between the age group of 40-49 years (47%) followed by 30-39 years (26%). Mean age = 43.95±8.48 years. The range was from 25 to 60 years. Range of parity was from 0-10. Eight (6.5%) cases were nulliparous, while 5 cases (4%) had a parity of 5 or more. Maximum number of cases 53 (42.0%) were found to be para 2 followed by 28(22%) cases who were para one. In our study, 30(23.8%) were postmenopausal. Most common presenting complaint was found to be menorrhagia (n=53; 42%) followed by post-menopausal bleeding (n=30, 24.0%), Metrorrhagia (n=15; 12%), polymenorrhagia (n=13; 10.0%) and polymenorrhea (n=9; 7.0%). In the study group, majority of the patients, 77 cases (61%) had symptoms for duration less than 6 months, 40 cases (32%) had symptoms for period between 6 months to 1 year and 9 cases (7%) had symptoms for more than 1 year.

Table 2: Depicts the distribution of cases according to endometrial thickness (ET) on transvaginal sonography(TVS).

E.T. (range in mm)	No. of Cases	% (percentage)
≤4	11	9.0
4.1-6	22	17.0
6.1-8	25	20.0
8.1-10	16	12.5
10.1-12	18	14.5
>12	34	27.0
Total	**126**	**100.0**

The Mean Endometrial Thickness was 9.79± 4.84 mm with a range of 2.0 to 25.7 mm. Endometrium was classified as, thickened if ET >4 in postmenopausal women and >12 mm in premenopausal women irrespective of cycle phase, and labelled as hyperplasia if no focal pathology was detected. 11 (9%) patients had ET≤ 4. Endometrial thickness was >12 mm in 34 (27%) of the patients which suggested either thickened endometrium or intracavitary abnormalities such as polyp, fibroid etc.

Table 3: Depicts the distribution of cases according to finding on TVS.

TVS finding	No. of Cases	% (percentage)
Cervical polyp	5	4.0
Fibroid	14	11.0

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Endometrial polyp	29	23.0
Adnexal mass	2	1.5
Adenomyosis	9	7.14
Endometrial hyperplasia	35	27.77
No abnormality detected	32	25.39
Total	**126**	**100.0**

In 32 (25.39%) study subjects, TVS could not detect any abnormality while in 35 (27.77%) cases TVS detected endometrial hyperplasia, in 29 (23%) cases endometrial polyp, in 14 (11%) cases fibroid was detected.

Table 4: Distribution of cases based on finding on Histopathology

Histopathological finding	No. of Cases	% (percentage)
Normal	2	1.5
Normal-proliferative	35	27.5
Normal –secretory	12	9.5
Simple endometrial hyperplasia	27	21.5
Cystic glandular hyperplasia	5	4.5
Atypical hyperplasia	2	1.5
Polyp	26	20.5
Fibroid	6	5.0
Endometritis	1	0.008
Atrophy	7	6.0
Carcinoma	3	2.5
Total	**126**	**100.0**

On histopathological examination, normal endometrium: Proliferative in 35 (27.5%) cases and secretory in 12 (9.5%) cases were, seen out of 49 cases. Hyperplasia in 34 (27.5%) cases. Polyp in 26 (20.5%) cases, fibroid in 6 (5.0%) cases, Carcinoma was detected in 3 (2.5%) study subjects.

Table 5: Correlation of TVS finding and Histopathological finding

Histo-pathological findings	TVS Finding							Total	p-value
	Normal	EH	Cervical polyp	Fibroid	Endometrial polyp	Adnexal mass	Adeno-myosis		
Normal	19	3	2	10	9	0	6	49	0.01
Endometrial Hyperplasia	5	20	0	2	3	2	2	34	0.98
Polyp	3	4	3	1	14	0	1	26	0.16
Fibroid	3	0	0	1	2	0	0	6	0.03
Endometritis	0	1	0	0	0	0	0	1	-
Atrophy	2	5	0	0	0	0	0	7	-
Carcinoma	0	2	0	0	1	0	0	3	-

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| Total | 32 | 35 | 5 | 14 | 29 | 2 | 9 | 126 | |

Of the 32 cases showing normal endometrium on TVS, 19 patients had normal endometrium on histopathology as well while in the rest abnormality was detected as shown in table 5. Of the 35 cases showing hyperplasia on TVS, only 20 had hyperplasia on histopathology as well. Of the 29 cases showing endometrial polyps on TVS, histopathology detected 14 cases and 9 cases were described as normal. Out of 14 cases showing fibroid on TVS, histopathology detected 1 case. Significant difference was observed between histopathological and TVS finding with respect to number of normal endometrium (p <0.01) and fibroid detection (p<0.05).

Table 6: Overall comparison between TVS and Histopathology

		Histopathology		
		Abnormal	**Normal**	**Total**
TVS	**Abnormal**	64	30	94
	Normal	13	19	32
	Total	77	49	126

- Sensitivity = 64/77= 83.1%
- Specificity = 19/49= 39%
- Positive predictive value = 64/94= 68%
- Negative predictive value = 19/32= 59%
- $Accuracy = (Sensitivity)(Prevalence) + (Specificity)(1 - Prevalence)$
- $Accuracy = (83.1)\left(\frac{77}{126}\right) + 39\left(1 - \frac{77}{126}\right) = 65.84\% = 66\%$

Table 7: Distribution of cases based on finding on hysteroscopic examination

Hysteroscopic finding	No. of Cases	% (percentage)
Normal	35	28.0
Cervical polyp	3	2.5
Endometrial hyperplasia	21	17.0
Endometrial polyp	40	32.0
Fibroid	14	11.5
Endometritis	1	0.008
Atrophy	9	7.0
Adenomyosis	1	0.008
Growth	2	1.5
Total	**126**	**100.0**

In all 126 study subjects hysteroscopic examination was done. Out of 126 study subjects, no abnormality found in 35 (28%) cases while endometrial polyp was seen in 40 (32%) cases, endometrial hyperplasia in 21(17%) cases, fibroid in 14 (11.5%) cases, atrophy in 9 (7%) cases and irregular growth was detected in 2 (1.5%) cases.

Table 8: Correlation of Hysteroscopic finding and Histopathological finding

Hysteroscopic finding	Histopathological finding								p-value
	Normal	**Hyperplasia**	**Polyp**	**Fibroid**	**Endometritis**	**Atrophy**	**Carcinoma**	**total**	
Normal	25	10	0	0	0	0	0	35	0.03
Cervical polyp	1	0	2	0	0	0	0	3	-
Endometrial hyperplasia	5	15	0	0	0	0	1	21	0.01

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Endometrial polyp	9	7	24	0	0	0	0	40	<0.01
Fibroid	7	1	0	6	0	0	0	14	0.01
Endometritis	0	0	0	0	1	0	0	1	-
Atrophy	1	1	0	0	0	7	0	9	0.98
Adenomyosis	1	0	0	0	0	0	0	1	-
Carcinoma	0	0	0	0	0	0	2	2	0.72
Total	**49**	**34**	**26**	**6**	**1**	**7**	**3**	**126**	

Of the 35 cases showing normal endometrium on hysteroscopy, 25 patients had normal endometrium on histopathology as well and 10 cases had hyperplasia detected on histopathology. Of the 21 cases showing hyperplasia on hysteroscopy, 15 had hyperplasia on histopathology as well while 5 patients had normal endometrium on histopathology examination. Of the 40 cases showing endometrial polyps on hysteroscopy, histopathology detected 24 cases as polyp and 7 cases were described as normal. Histopathology diagnosed hyperplasia was seen in significantly higher proportion of patients as compared to hysteroscopy (p = 0.01). Hysteroscopy diagnosed significantly higher proportion of patients with polyp (p<0.01) and fibroid (p = 0.01). Statistically, no significant difference between two modalities was observed with respect to other pathologies (p>0.05)

Table 9: Overall comparison between Hysteroscopy and Histopathology

Hysteroscopy	Histopathology Abnormal	Histopathology Normal	Total
Abnormal	67	24	91
Normal	10	25	35
Total	77	49	126

- Sensitivity = 87%
- Specificity = 51%
- Positive predictive value = 74%
- Negative predictive value = 71.4%
- Accuracy = 73.0%
- P value < 0.001

Discussion

The present study was a hospital based observational study conducted on 126 patients with complaints of abnormal uterine bleeding. All the patients in this study underwent ultrasonography and Dilatation and Curettage and the collected biopsy specimen or curetting's were sent for Histopathological analysis. The age group studied was 25-60 years. Most of the patients belonged to the age group 40-49 years (47%). The mean age was 43.95±4.8 years. These findings are supported by Barman et al with maximum age incidence between 40-43 years (38.9%)[9]. Mean age of the patients enrolled in the study by Sujatha A, et al was 44.5±5.36 years[10].

Maximum number of patients (42%) were para[2]. In study by Sujatha A, et al maximum incidence of abnormal uterine bleeding was seen in the parity of 2 (36%) followed by parity 3 (32%)[10].

The commonest presenting complaint in this study was menorrhagia (42%) followed by Postmenopausal bleeding (24%). Metrorrhagia comprised 12% of the cases and Polymenorrhagia 10 % of the cases. Study by Singh et al showed 40.6% of cases presented as complaint of menorrhagia, 14.6% as postmenopausal bleeding and 11.3% as polymenorrhea[11]. These findings are also supported by Rajesh P et al in which 60% of the cases had menorrhagia[12].

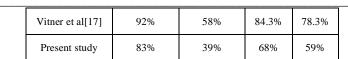In Transvaginal sonography, 47.0% patients showed endometrial thickness between 6.1 to 12 mm while in 27% endometrial thickness was more than 12 mm. 9% of cases showed thickness less than 4 mm. Study by Barman et al in which TVS showed endometrial thickness between 6.1 to 12 mm in 63.5% of cases while in 22.3% endometrial thickness was more than 12 mm[9].

In the present study, Transvaginal sonography was done for all study subjects with AUB, in which most of the patients (27.77%) were diagnosed to have endometrial hyperplasia, 23% cases as endometrial polyp, 11% as fibroid, 7.14% as adenomyosis, 1.5% as adenexal mass and in 25.39% no abnormality was seen on TVS. Study by Goyal et al showed 57.0% cases as normal uterine cavity by TVS while in 19% endometrial hyperplasia was seen[13]. Endometrial polyp was seen in 16% and fibroid in 6% cases. Study by Kathuria et al detected 38% as fibroid, 16 % as polyp, 26% as adenomyosis and in 16% no abnormality detected[14].

In present study, on histopathology, which was the gold standard, most common finding was endometrial hyperplasia in 27.5% patients, while polyp was seen in 21.5% patients, atrophy in 6%, fibroid in 5% and endometrial carcinoma in 2.5%. Histopathology could not detect any abnormality in 38.5% of patients. Consequently, the overall sensitivity and specificity of TVS in diagnosing causes of AUB was 83% and 39% respectively. The PPV and NPV was 68% and 59% respectively.

Comparison of different studies with the present study for detection of diagnosing AUB by TVS

	Sensitivity	Specificity	PPV	NPV
Pyari et al[15]	86	31	78	44
Nazim et al[16]	100%	63.7%	56.3%	100%

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Vitner et al[17]	92%	58%	84.3%	78.3%
Present study	83%	39%	68%	59%

In this study most common abnormality detected on hysteroscopy was the endometrial polyp in 32% cases, followed by endometrial hyperplasia in 17% cases, fibroid in 11.5%, atrophy in 7.0%, a growth in 1.5% cases. In 28% patients no abnormality was detected. In a study by Kathuria et al[14], 22% patients were found to have no abnormality on hysteroscopy, 38% patients were found to have endometrial hyperplasia, 20% patients had fibroids, 14% had polyps, 4% had endometritis and 2% cases had endometrial atrophy. Study by Pop Trajković Dinić S al[18] found hysteroscopic findings normal in almost 30% of the cases, and the most common pathological finding was endometrial polyp. In a study by Rajesh P et al[12], most common lesion detected on hyteroscopy was Endometrial hyperplasia in 40% patients followed by endometrial polyp (32%), atrophic endometrium (12%) and submucous fibroid (8%). Similarly, in a study by Pyari et al[15], common lesions detected in AUB patients on hysteroscopy were myoma (34%), polyp (18%), and endometrial hyperplasia (10%) while in 18% of cases no abnormality was seen in uterus.

This study showed hysteroscopy has a sensitivity of 87%, specificity of 51%, positive predictive value of 74%, negative predictive value of 71.4% and diagnostic accuracy of 73% in diagnosing aetiology of abnormal uterine bleeding. Study by Sinha et al[19] showed hysteroscopy to have a sensitivity of 78.3%%, specificity of 63.6%, positive predictive value of 60%, negative predictive value of 80.6%

Conclusion
From the present study it may be concluded that both transvaginal sonography and hysteroscopy are good diagnostic modalities for investigation of women with Abnormal Uterine Bleeding. However, hysteroscopy has an edge over TVS in diagnosing aetiology of AUB in terms of high sensitivity, specificity and negative predictive value. Hysteroscopy is a safe & reliable procedure and gives a magnified view of whole uterine cavity, which allows an adequate exploration of the uterine cavity under visual control. However endometrial histopathology improves the diagnostic accuracy of both hysteroscopy and TVS and is important for confirming the diagnosis especially in peri- or postmenopausal patients. Thus Hysteroscopy, TVS and histopathology do not substitute, rather complement each other.

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