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A STUDY TO EVALUATE THE EFFICACY OF ULTRASONOGRAPHY FOR STRUCTURAL CATEGORISATION OF ABNORMAL UTERINE BLEEDING

Obstetrics & Gynaecology

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ABSTRACT

Background: Abnormal uterine bleeding (AUB) is defined as any bleeding from the genital tract that is a deviation from the normal in frequency , regularity ,duration or quantity . The International Federation of Gynecology and Obstetrics (FIGO) has classified AUB using the acronym PALM-COEIN, where "PALM" represents structural causes such as P - Polyp, A -Adenomyosis, L - Leiomyoma, and M - Malignancy. Transabdominal (TAS) or Transvaginal ultrasound (TVS) or combined are first-line imaging tests for evaluating abnormal uterine bleeding . The main objective of this study is to determine the diagnostic accuracy of ultrasound (transabdominal or transvaginal) in identifying the structural causes of AUB (abnormal uterine bleeding) and to compare the results with histopathological findings **Methods:** This prospective study was carried out in the Department of Obstetrics and Gynecology at a Tertiary care center , for 3 months from March 2024 to May 2024, involving 120 consecutive women between the age group of 18-60 yrs. All patients underwent routine investigations for Abnormal Uterine Bleeding (AUB) and ultrasonography (USG). The USG findings were later compared with histopathology findings. **Results:** Diagnostic accuracy of USG was 78.85 % with sensitivity and specificity of 90.00 % and 41.67 %. Positive predictive value (PPV) and negative predictive value (NPV) was 83.72 % and 55.56 %. USG is a simple, safe, fast, efficient and tolerable procedure. In diagnosing structural uterine pathology responsible for abnormal uterine bleeding, it has outstanding diagnostic accuracy and should be followed in all cases. **Conclusions:** In conclusion, the findings emphasize that ultrasonography is a valuable, fast, and well-tolerated procedure for diagnosing structural uterine pathology underlying abnormal uterine bleeding, with remarkable diagnostic accuracy. Therefore , USG is a reliable modality to help us identify the structural causes. However, the gold standard for identifying endometrial pathology is histopathology .

KEYWORDS

Abnormal uterine bleeding, ,USG , Leiomyoma, Polyp , Adenomyosis , Malignancy, FIGO classification of AUB

INTRODUCTION :

In recent decades, several advances have significantly improved the imaging of female pelvic structures. The use of sonography in gynecology is becoming an important part and is used as a problem solving tool in various circumstances [1] . An alternating current is applied to a transducer containing piezoelectric crystals, which convert electric energy to high-frequency sound waves. A water-soluble gel is applied to the skin and acts as a coupling agent. Sound waves then pass through tissue layers, encounter an interface between tissues of different densities, and are reflected back to the transducer [2]. Ultrasonography is the primary imaging test for evaluating abnormal uterine bleeding in both premenopausal and postmenopausal women.

Abnormal uterine bleeding (AUB) is defined as any bleeding from the genital tract that is a deviation from the normal in frequency , regularity ,duration or quantity. The prevalence of AUB varies with population and is underreported since many women do not seek medical help . About 18 % women of reproductive age group , in India were reported to have AUB .

According to the Menstrual Disorders committee (M D C) of the International Federation of Gynaecology and Obstetrics , AUB may be chronic or acute . Acute AUB is defined as an episode of uterine bleeding in a women of reproductive age , who is not pregnant ,that is of sufficient quantity to require immediate intervention to prevent further blood loss . Chronic AUB is defined as bleeding from the uterine body that is abnormal in frequency , regularity , duration, and /or volume , has been present for at least the majority of the past 6 months.

The International Federation of Gynecology and Obstetrics (FIGO) has classified AUB using the acronym PALM-COEIN, where "PALM" represents Polyp, Adenomyosis, Leiomyoma, and Malignancy and COEIN represents Coagulopathies ,Ovulatory disorders , Endometrial disorders , Iatrogenic causes and Not otherwise classified [3]

Ultrasonography (USG) is highly effective in accurately diagnosing the clinical pathology of AUB. The introduction of USG has helped identify cases where further diagnosis through endometrial sampling is necessary, thus reducing the rate of complications.

Endometrial polyps are localized excess growth of endometrial glands and stroma that extend beyond the surface of the endometrial lining [4]. Transvaginal ultrasound (TVUS) is the first-line imaging technique for detecting endometrial polyp [5-7]. However, its sensitivity and specificity is lower in women with postmenopausal bleeding and endometrial thickness equal to or more than 5 mm [8].

Adenomyosis is a benign gynecological disorder characterized by the presence of ectopic endometrial glands and stroma within the myometrium, usually surrounded by enlarged uterine corpus [9]. Histological examination of hysterectomy specimen is the gold standard for diagnosis, but TVUS and MRI are crucial for accurate detection [10,11]. Typical TVUS findings include asymmetrical thickening of the myometrial walls, myometrial cysts, hyperechoic islands, an irregular junctional zone (JZ) [12].

Leiomyomas are common benign smooth muscle tumors that cause AUB in women of reproductive age [13]. They appear as solid, well-defined, homogeneous hypoechoic masses on TVUS, but their echogenicity may vary due to differences in the extracellular matrix and fibroblasts, or due to calcification and necrosis [14].

Malignant and Premalignant causes for AUB refers to women having abnormal bleeding associated with malignant and premalignant lesions of the uterus, such as endometrial carcinoma and atypical endometrial hyperplasia. TVUS is the primary imaging technique for detecting malignancies. An endometrial thickness of 4 mm or more rises suspicion of endometrial hyperplasia or cancer where further endometrial sampling is necessary [15,16].

The findings of uterine pathology are greatly enhanced with this modality at a fraction of the cost , time , and inconvenience of an MRI .

Patients can have a quick scan and subsequent analysis can be done at the earliest .

Aims & Objectives:

The present study determines the diagnostic accuracy of ultrasound (transabdominal or transvaginal or both combined) in identifying the structural causes of AUB (abnormal uterine bleeding) and to compare the results with histopathological findings

MATERIAL AND METHODS :

This observational study was carried out in the Department of Obstetrics and Gynecology at a tertiary care centre , involving 120 consecutive women for 3 months from march 2024 to may 2024 . All patients underwent routine investigations for Abnormal Uterine Bleeding (AUB) and ultrasonography (USG). The USG (structural) findings were later compared with histopathology findings.

Inclusion Criteria: -

- Women presenting with abnormal uterine bleeding between the ages of 18-60 years.

Exclusion Criteria: -

- Women with pelvic organ prolapse
- Women with any cervical or uterine malignancy
- Pregnant women
- Women with abnormal bleeding post intra uterine device insertion

After obtaining ethical committee clearance and informed consent from each participant, the following data were collected: age, parity, obstetric history, detailed menstrual history , associated co-morbidities , past medical history , surgical history, and detailed drug history. A comprehensive physical examination along with pelvic examination was conducted and transabdominal (TAS) or transvaginal ultrasound (TVS) or combined scans were performed on patients and all the findings were documented . Patients also underwent routine investigations for AUB . Patients were initially scanned trans abdominally, and those patients with unsatisfactory findings underwent trans vaginal scan. Ultrasonographic findings were correlated with histopathological findings after surgery.

The quantitative data was represented as mean ± standard deviation (SD). Categorical and nominal data were expressed in percentages. The t-test was used to analyze quantitative data, and non-parametric data were assessed using the Mann-Whitney test. Categorical data were analyzed using the chi-square test.

RESULTS :

Table 1 : Age wise distribution :

Age :	No.of patients	%
< 30 years	6	5 %
30 – 40 yrs	33	27.5%
40 – 50 yrs	59	49.1%
50 – 60 yrs	22	18.3%
TOTAL	120	100%

It was observed that mean age of the study cases was 43.21 years with most of the cases (49.1%) were in the age range of 41 to 50 years of age

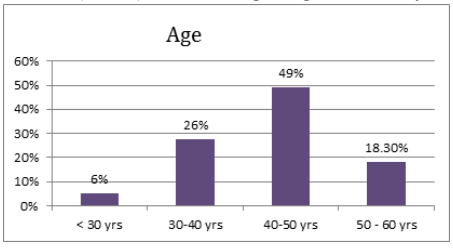

Figure 1 : Age wise distribution :

Table 2: Distribution based on menstrual flow :

Menstrual flow	No. of patients	%
Heavy menstrual bleeding	62	51.66 %
Increased frequency	27	22.5 %
Decreased frequency	7	5.83 %
Scanty bleeding	7	5.83 %
Inter menstrual bleeding	9	7.5 %
Postmenopausal bleeding	8	6.66 %
TOTAL	120	100 %

In this study most common presenting complaint was heavy menstrual bleeding (51.66%), followed by increased frequency (22.5%) of bleeding, scanty bleeding and decreased frequency followed by intermenstrual and postmenopausal bleeding.

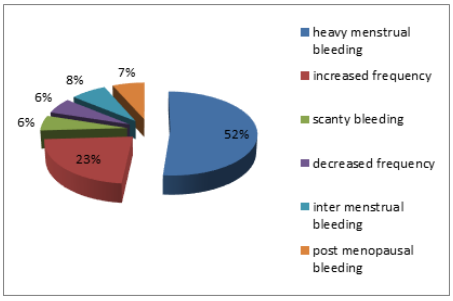

Figure 2: Distribution based on menstrual flow :

Table 3 : Distribution based on USG

USG	NO. Of CASES	%
STRUCTURAL CAUSES	81	67.5 %
NON- STRUCTURAL CAUSES	39	32.5 %
TOTAL	120	100 %

The above table highlights the distribution of cases after USG . Out of which 67.5 % were structural causes and 32.5 % were non - structural causes.

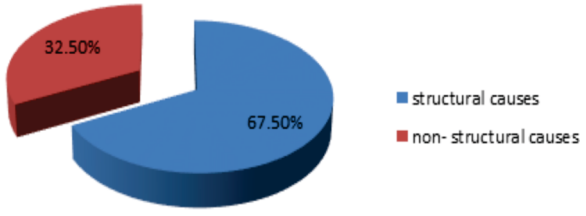

Figure 3 : Distribution based on USG

Table 4 : Distribution based on management :

USG	Surgical management		Conservative management		TOTAL
	No. of patients	%	No. of patients	%	
Structural causes	43	53.08 %	38	46.91 %	81
Non – structural causes	9	23.07 %	30	76. 9 %	39
TOTAL	52		68		120

This table show the distribution according to the management of the patients where 43 (53.08 %) cases in structural causes and 9 (23.07 %) cases in non – structural causes were subjected to surgical management . Whereas 38 (46.91 %) cases in structural causes and 30 (76.9 %) cases in non – structural causes were subjected to conservative management

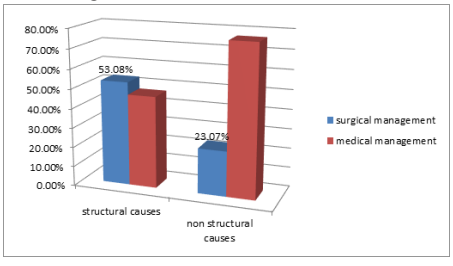

Figure 4 : Distribution based on management

Table 5 : Distribution based on HPE pathology in relation to USG findings

USG	HPE : Same pathology		HPE : Different pathology		TOTAL
	N	%	N	%	
Structural causes	36	89.47 %	7	10.5 %	43
Non – structural causes	4	44.44 %	5	55.55 %	9

TOTAL	40	12	52

STATISTICAL PARAMETERS	VALUE
SENSITIVITY	90.00 %
SPECIFICITY	41.67 %
POSITIVE PREDICTIVE VALUE	83.72 %
NEGATIVE PREDICTIVE VALUE	55.56 %
ACCURACY	78.85 %

Overall diagnostic accuracy of USG was 78.85 % with sensitivity and specificity of 90.00% and 41.67 %. PPV and NPV was 83.72 % and 55.56 % .

Table 6 : Individual structural abnormality on USG :

STRUCTURAL ABNORMALITY	NO.OF CASES	%
polyp	10	12.34 %
Adenomyosis	22	27.16 %
leiomyoma	45	55.55 %
endometrial hyperplasia	4	4.9 %
Malignancy/	-	-
TOTAL	81	100 %

Most common finding on USG was leiomyoma (55.55%), adenomyosis (27.16%), polyp (12.34%) , endometrial hyperplasia (4.9 %) and malignancy was not suspected in any cases.

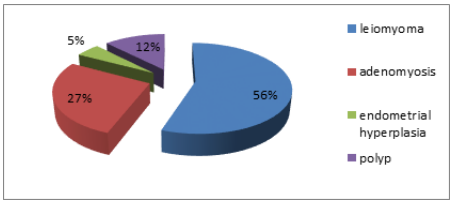

Figure 5 : Structural abnormality on USG :

Table 7 : Distribution based on management in individual structural cause:

Structural abnormality on USG	Surgical management		Conservative management		TOTAL
	No. of patients	%	No. of patients	%	
Polyp (n =10)	8	80 %	2	20 %	10
Adenomyosis (n= 22)	15	68.18 %	7	31.81 %	22
Leiomyoma (n= 45)	17	37.77 %	28	62.22 %	45
Endometrial hyperplasia (n= 4)	3	75 %	1	25 %	4
TOTAL	43		38		81

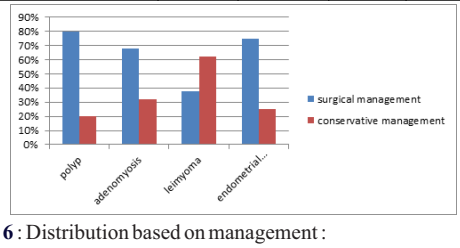

Figure 6 : Distribution based on management :

Table 8 : Distribution based on HPE findings in relation to USG

USG DIAGNOSIS	HPE same pathology		HPE different pathology		TOTAL
	N	%	N	%	
Polyp	7	87.5 %	1	12.5 %	8
Adenomyosis	11	73.3 %	4	36.3 %	15
Leiomyoma	16	94.1 %	1	5.8 %	17
Endometrial hyperplasia	2	66.6 %	1	33.3 %	3
TOTAL	36		7		43

On histopathology, most common diagnosis was leiomyoma followed by adenomyosis , polyp and endometrial hyperplasia.

Table 9 : Diagnostic accuracy of USG in POLYP

	HPE - POLYP	HPE – OTHER	TOTAL
USG -POLYP CASES	7	1	8
USG –OTHER	2	33	35
TOTAL	9	34	43

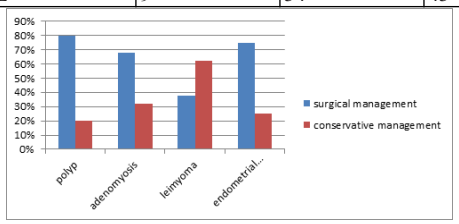

Figure 7 : Distribution based on HPE findings

This study results indicates, in cases of polyp, sensitivity and specificity of USG was 77.78 % and 97.06 % while PPV and NPV was 87.50 % and 94.29 %. Overall diagnostic accuracy was 93.02 %.

Table 10 : Diagnostic accuracy of USG in Adenomyosis

	HPE - ADENOMYOSIS	HPE- OTHER	TOTAL
USG - ADENOMYOSIS	11	4	15
USG OTHERS	6	22	28
TOTAL	17	26	43

In cases of adenomyosis, sensitivity and specificity of USG was 64.71 % and 84.62 % while PPV and NPV was 73.33 % and 78.57 %. Overall diagnostic accuracy was 76.74 %.

Table 11 : Diagnostic accuracy of USG in Leiomyoma

	HPE - LEIOMYOMA	HPE- OTHER	TOTAL
USG - LEIOMYOMA	16	1	17
USG OTHERS	1	25	26
TOTAL	17	26	43

In cases of leiomyoma, sensitivity and specificity of USG was 94.12 % and 96.16 % while positive predictive value (PPV) and negative predictive value (NPV) was 94.12 % and 96.15 %. Overall diagnostic accuracy was 95.35 %.

Table 12 : Diagnostic Accuracy Of Usg In Endometrial Hyperplasia

	HPE –EH	HPE- OTHER	TOTAL
USG – EH	2	1	3
USG OTHERS	3	37	40
TOTAL	5	38	43

In cases of endometrial hyperplasia, sensitivity and specificity of USG was 40.00 % and 97.37 % while PPV and NPV was 66.67 % and 92.50 %. Overall diagnostic accuracy was 90.70 %.

Table 13 : Diagnostic accuracy of USG in individual cause summarised

	USG and surgery done	HPE	Usg missed HPE diagnosed	SENSITIVITY	SPECIFICITY	PPV	NPV	ACCURACY
POLYP	8	7	2	77.78 %	97.06 %	87.50 %	94.29 %	93.02 %
ADENOMYOSIS	15	11	6	64.71 %	84.62 %	73.33 %	78.57 %	76.74 %
LEIOMYOMA	17	16	1	94.12 %	96.16 %	94.12 %	96.15%	95.35 %
ENDOMETRIAL HYPERPLASIA	3	2	3	40.00 %	97.37 %	66.67 %	92.50 %	90.70 %

DISCUSSION :

Abnormal uterine bleeding (AUB) is a common issue among women seeking gynecological guidance, with more than 30 - 40% of affected women found to have intrauterine abnormalities [17] . Transvaginal ultrasound (TVS) is the primary imaging test for evaluating abnormal uterine bleeding in both premenopausal and postmenopausal women. It helps diagnose structural causes such as Polyps, Adenomyosis, Leiomyomas, Hyperplasia, and Malignancy as well as ovulatory dysfunction like Ovarian cysts and PCOS [5-7]

The use of 3D imaging and saline infusion Sono hysterography

enhances traditional 2D imaging. This hospital-based observational study aimed to assess the efficacy of TAS or TVS or both , for structurally categorizing abnormal uterine bleeding [18]. The study included 120 consecutive cases with abnormal uterine bleeding. Detailed patient data, including medical history, physical examination, routine investigations, pelvic examination, and Ultrasonography reports were collected. The study correlated ultrasonographic diagnoses with histopathological findings.

The study showed that the average age of the participants was 43.21 years, with the highest percentage (49.1%) falling within the 41 to 50 years age range. Similar age distributions were observed in other studies conducted by different authors [19-24]. For instance, In Panda et al found that the peak incidence of cases was in the 35-45 years age group, with an average age of 46.7 years[25]. Gianninoto's series indicated an age range of 30-80 years, with the most common incidence occurring between 30-45 years (average age was 43.3 years)[26]. Trotsenburg reported the highest incidence of cases between 41-50 years, with an average age of 43.2 years.[27]

This study reported 55 % cases with a history of irregular cycles and others with regular studies. Other studies also found that a majority of females with abnormal bleeding had similar presenting complaints , with percentages ranging from 40% to 60% [19-24].In this study the most common presenting complaint in this study was heavy menstrual bleeding accounting 51.66 % followed by irregular frequency and lastly intermenstrual and postmenopausal bleeding.

This study showed that out of 120 cases of AUB subjected to USG , 81 (67.5 %) had structural causes and 39 (32.5 %) had other non – structural causes and no significant abnormality. Out of 81 (67.5 %) structural abnormalities , Polyp were 10 (12.34 %) , Adenomyosis were 22 (27.16 %) , Leiomyoma cases were reported as 45 (55.5 %) and lastly endometrial hyperplasia cases as 4 (4.9 %) and no malignant cases were reported .

Venugopalan et al. identified fibroid uterus (40%) as the most common cause in the study population, followed by cyst (34%) and adenomyosis (6%) [28]. Mishra et al. also noted leiomyoma (41.1%) as the most prevalent structural cause of abnormal uterine bleeding in their study .[29] Betha et al. categorized women with AUB according to the "PALM COEIN" classification system, with the PALM group accounting for 60.4% and the COEIN group accounting for 39.6%. The leading cause of AUB was leiomyoma (30.4%), and ovulatory disorders were the second most common cause (13.6%). [30]

Sudha et al. revealed the breakdown of cases according to PALMCOEIN as follows: polyps (4%), adenomyosis (6%), leiomyoma (70%), malignancy (6%), ovulatory dysfunction (2%), endometrial (6%), and unclassified (6%) .[31] Wamsteker et al. found an endometrial polyp in 19% of cases, endometrial hyperplasia in 12.2%, and submucous myoma in 7.8%. [32]

In this study , 43 (53.08 %) cases in structural causes and 9 (23.07 %) cases in non – structural causes underwent surgical management . Whereas 38 (46.91 %) cases in structural causes and 30 (76.9 %) cases in non – structural causes were subjected to conservative management. Out of which the Overall diagnostic accuracy of USG was 78.85 % with sensitivity and specificity of 90.00% and 41.67 %. PPV and NPV was 83.72 % and 55.56 % . In their research, Sujatha Audimulapu et al found that out of 50 cases, TVS findings matched with histopathology findings in 26 cases (52%), and the results differed in 24 patients (48%) [33]. The sensitivity and specificity for TVS are 62.8% and 86.6%. The PPV and NPV were 91.6% and 50% respectively. In their research, Gowri et al found that the specificity, sensitivity, PPV, and NPV of TVS in the identification of endometrial pathology was 67.1%, 72.2%, 91.1%, 34.2%, respectively.[34]

This study results indicates, in cases of polyp, sensitivity and specificity of USG was 77.78 % and 97.06 % while PPV and NPV was 87.50 % and 94.29 %. Overall diagnostic accuracy was 93.02 %.In Feitosa et al study where sensitivity and specificity of TVS for polyps was 68.9% and 94.7%. Vathanan et al in their study found sensitivity and specificity of 60.53% and 97.06% respectively, PPV of 95.83%, and NPV of 68.75% for polyps.[35,36] Swathi et al observed the sensitivity and specificity of TVS for polyps as 22.1% and 95.1%. Dana et al in another similar study observed the sensitivity and specificity of TVS for polyps as 44.5% and 81.8%. Nicula et al observed that for patients with polyps, TVS sensitivity was 67% and specificity was 96.67%.[37-39]

In cases of adenomyosis, sensitivity and specificity of USG was 64.71 % and 84.62 % while PPV and NPV was 73.33 % and 78.57 %. Overall diagnostic accuracy was 76.74 %.

Swathi et al observed sensitivity and specificity of TVS for adenomyosis as 50% and 88.6% which were in accordance with our results.[37] Nicula et al observed that for patients with adenomyosis, sensitivity and specificity were 8% and 47.6% respectively.[39]

In cases of leiomyoma, sensitivity and specificity of USG was 94.12 % and 96.16 % while positive predictive value (PPV) and negative predictive value (NPV) was 94.12 % and 96.15 %. Overall diagnostic accuracy was 95.35 %. Vathanan et al in their study observed the following results for leiomyoma: sensitivity 57.14%, specificity 93.48%, PPV 84.21%, and NPV 78.18%. Swathi et al observed sensitivity and specificity of TVS for leiomyoma as 100% each while PPV and NPV were 91.9% and 92% respectively.[36,37] Nicula et al. observed that for patients with leiomyoma, sensitivity and specificity were 94% and 77.8% respectively.[39]

In cases of endometrial hyperplasia, sensitivity and specificity of USG was 40.00 % and 97.37 % while PPV and NPV was 66.67 % and 92.50 %. Overall diagnostic accuracy was 90.70 %.

Limitations Of The Study :

- It was difficult to counsel patients to not to opt for surgical management directly
- Majority of patients wanted a permanent solution and not to try any other options for treatment, so many opted for surgical management
- It was difficult to follow up patient who were on medical management.
- Though the study had a positive outcome , sample size was minimal ,so it would have been better for confirmatory results if done on a larger population .

CONCLUSION :

Upon reflecting on the study, it is evident that AUB greatly impacts women of all ages, causing social embarrassment and affecting various aspects of their lives. It is crucial to approach the management of this common condition with standardized, systematic practices. This study highlights the effectiveness of ultrasonography as a diagnostic and screening method for identifying structural causes of AUB, particularly polyps and leiomyomas, with high accuracy. Specifically, ultrasonography enables evaluation of the endometrial thickening, allowing for thorough assessment endometrial cavity. The study also observed that hysterectomy was commonly sought by patients as a definitive treatment, often due to social embarrassment, fear of malignancy, and debilitating symptoms impacting their daily lives.

In conclusion, the findings emphasize that ultrasonography is a valuable, fast, and well-tolerated procedure for diagnosing structural uterine pathology underlying abnormal uterine bleeding, with remarkable diagnostic accuracy. This surveillance approach plays a pivotal role in providing tailored and appropriate treatment to individuals. Lastly, it is crucial to note that while ultrasonography is highly effective, histopathology remains the gold standard for identifying endometrial pathology and should not be overlooked

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