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Original Research Article

STUDY OF DIAGNOSTIC HYSTEROSCOPY IN EVALUATION OF ABNORMAL UTERINE BLEEDING AND ITS HISTOPATHOLOGICAL CORRELATION

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Abstract

Background: Abnormal uterine bleeding (AUB) is a common condition with varied menstrual irregularities and is often difficult to diagnose using traditional methods. Diagnostic hysteroscopy enhances the accuracy by providing real-time visualization and enabling targeted biopsies. This study aimed to evaluate the diagnostic accuracy of hysteroscopy in detecting endometrial lesions in women presenting with AUB and to correlate hysteroscopic findings with histopathological examination (HPE) results. **Materials and Methods:** This descriptive observational study included 167 patients with abnormal uterine bleeding in the Department of Gynaecology of a tertiary care hospital between March 2023 and 2024 The patients underwent preoperative investigations followed by diagnostic hysteroscopy, during which endometrial biopsies were collected for histopathological analysis. **Result:** The mean age of the patients was 45.7 ± 5.8 years, with the majority (66.5%) in the 40-49 age group. Hysteroscopy showed a high agreement with histopathological examination in detecting secretory endometrium and polyps, with 76% overall agreement. It has 50% sensitivity and 100% specificity for carcinoma detection. The sensitivities for atrophic lesions, secretory lesions were 100%, and proliferative lesions were 73.3%, 100%, and 64.7%. Hysteroscopy showed excellent diagnostic performance for secretory and polypoidal lesions, with high sensitivity and specificity. It was less accurate for hyperplastic and proliferative lesions, with a moderate diagnostic accuracy (82.6% for hyperplasia and 86.2% for proliferative lesions). **Conclusion:** Diagnostic hysteroscopy offers high specificity and accuracy for identifying endometrial pathologies in patients with AUB. When combined with histopathological analysis, it improves the diagnostic precision and aids in better AUB management.

INTRODUCTION

Abnormal uterine bleeding (AUB) is a common gynaecological complaint affecting women of all ages and represents a significant proportion of gynaecological healthcare visits. It poses a considerable burden on health systems worldwide, affecting women's quality of life, productivity, and mental health. AUB encompasses a range of menstrual abnormalities, often categorised as heavy, prolonged, or irregular bleeding in terms of volume, duration, and frequency. This condition has various aetiologies, from hormonal imbalances to structural abnormalities, and it can also be an early indication of underlying endometrial pathology, including benign, pre-malignant, or malignant lesions.[1]

The evaluation of AUB is multifaceted and incorporates patient history, clinical examination, and various diagnostic modalities. Traditionally, transvaginal ultrasound (TVS) and endometrial biopsy have been used as initial investigations; however, they have limitations in identifying focal lesions, such as polyps and submucosal fibroids. Diagnostic hysteroscopy has emerged as a valuable tool that offers direct visualization of the uterine cavity and allows targeted biopsies of suspicious lesions. This invasive procedure enhances diagnostic accuracy and enables better therapeutic planning, thus improving patient outcomes.[2]

Diagnostic hysteroscopy has gained popularity in recent decades because of its high sensitivity and specificity in detecting intrauterine abnormalities. Studies have indicated that hysteroscopy has a diagnostic accuracy rate of over 90% in assessing AUB, particularly in postmenopausal women, where the risk of endometrial pathology is higher. Hysteroscopy offers real-time visualization of the endometrial cavity, enabling clinicians to identify

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structural abnormalities and distinguish between focal and diffuse lesions that may not be detected with ultrasound or blind biopsy methods. Its utility in diagnosing endometrial hyperplasia and carcinoma has made it an essential procedure, especially for patients with persistent AUB who have inconclusive or negative biopsy results.[3] Histopathological examination remains the gold standard for diagnosing endometrial pathology, as it provides definitive tissue diagnosis. Correlating hysteroscopic findings with histopathological results strengthens hysteroscopy's diagnostic accuracy and reliability in AUB evaluation.[4]

This correlation is crucial because hysteroscopy provides visual clues to abnormal endometrial morphology; only histopathology can confirm specific diagnoses, such as endometrial hyperplasia, endometrial carcinoma, or endometrial polyps. Thus, histopathological evaluation complements hysteroscopy by providing microscopic confirmation of the nature of lesions, facilitating early intervention in cases of pre-malignant or malignant changes.[5] By establishing a clear diagnostic correlation, this research seeks to reinforce the role of hysteroscopy as an essential diagnostic tool in evaluating AUB. Through this study, we hope to contribute to the more accurate, efficient, and targeted management of patients with AUB, ultimately improving clinical outcomes and optimizing healthcare resources.

Aim

To evaluate the role of diagnostic hysteroscopy in identifying the causes of abnormal uterine bleeding (AUB) and correlate hysteroscopic findings with histopathological results.

MATERIALS AND METHODS

This descriptive observational study included 167 patients with abnormal uterine bleeding in the Department of Gynaecology of a tertiary care hospital at KAP Vishwanatham Government Medical College, Tiruchirappalli. between March 2023 and 2024. This study was approved by the Institutional Ethics Committee before initiation, and informed consent was obtained from all patients.

Inclusion criteria

Women with metrorrhagia, polymenorrhagia, infertility associated with AUB, suspected fibroids, or polymenorrhagia were included in the study.

Exclusion criteria

Women with menorrhagia, severe anaemia, pelvic infections, cervical carcinoma, intrauterine contraceptive device (IUCD) complications, or endocrine disorders were excluded.

Methods

Patients who underwent preoperative investigations, including a complete hemogram, blood sugar levels, blood urea, creatinine, blood grouping and typing, HIV testing, visual inspection with acetic acid (VIA), visual inspection with Lugol's iodine (VILI), colposcopy, electrocardiography (ECG), chest radiography, and ultrasonography (USG) of the abdomen. Patients were assessed for anaesthesia fitness. Diagnostic hysteroscopy was performed to visually inspect the endometrial cavity and identify structural abnormalities. Endometrial curettings were obtained during histopathological examination. Histopathological reports were collected and correlated with hysteroscopic findings. The primary outcome measures were the identification of endometrial lesions and the correlation between hysteroscopic and histopathological findings.

Statistical analysis

Data are presented as mean, standard deviation, frequency, and percentage. Cross tabs were created to determine the sensitivity and specificity; PPV and NPV were calculated for hysteroscopic examination, keeping HPE as the gold standard. Data analysis was performed using IBM-SPSS version 21.0 (IBM-SPSS Corp., Armonk, NY, USA).

RESULTS

The mean age was 45.7 ± 5.8 years, most of the females were in the age group, and the duration of amenorrhea among these females was 8.1 ± 9.6 months. The mean AOM was 13.3 ± 1.2, while the duration was 7.0 ± 2.4, duration of amenorrhea among these females was 8.1 ± 9.6 months, with the mean cycle length being 31.4 ± 7.6 days. The mean blood pressure among the females was 112.7 ± 9.7 mmHg (systolic) and 74.4 ± 8.8 mmHg (diastolic). The mean haemoglobin was 10.2 ± 1.1 g%, the mean UCL was 5.8 ± 0.6 cm [Table 1].

Most patients were aged 40-49 years 111 (66.5%), followed by 50–59 years 34 (20.4%), with only 5 (2.9%) aged ≥ 60 years. Most women had two live births 82 (49.4%), while 79 (47.3%) had a parity of two. Abortions were rare, with 133 (79.6%) patients reporting none. Intrapartum history revealed that 123 (74.1%) patients had normal deliveries of LN, while 39 (23.5%) underwent LSCS. A significant proportion of the 134 patients (80.2%) underwent sterilisation. Amenorrhea 39 (23.4%) and abnormal uterine bleeding 77 (46.1%) were the most frequently associated complaints, intermenstrual bleeding was 51 (34%), and menstrual irregularities were 28 (19.7%). Heavy menstrual bleeding was the most common complaint 70 (41.9%), and heavy flow was reported by 87 patients (61.7%). Abdominal pain was the leading comorbidity in 77 (46.1%) patients. Regarding BMI, 75 (45.2%) were normal weight, while 51 (30.7%) were obese [Table 2].

Abdominal pain was the most frequent associated complaint 74 (44.5%), followed by dysuria 15 (9%), leucorrhea 12 (7.2%), and constipation 3 (1.8%), while 63 (37.7%) reported no complaints. Among the comorbidities, diabetes was the most common 44 (26.3%), followed by systemic hypertension 33 (19.8%) and coronary artery disease 7 (4.2%), with 81 (48.5%) reporting no comorbidities. Abdominal examination was normal in all patients 167 (100%), and most patients had an anteverted uterus 145

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(86.8%) per vaginal examination, and 22 (13.2%) had a retroverted uterus. VIA/VILI findings were normal in all patients, 167 (100%), and Pap smear results were normal in 153 (92.2%), with inflammatory changes seen in 12 (7.2%) and LSIL in 1 (0.6%).

On ultrasonography, fibroids were the most common abnormality 59 (35.3%), followed by adenomyosis and thickened endometrium 32 (19.2%), while 30 (18%) had normal findings. The endometrial thickness was 6–9 mm in 113 (67.6%) patients, ≤ 5 mm in 31 (18.6%), and ≥ 10 mm in 23 (13.8%). Hysteroscopic findings showed polypoidal, hyperplastic, or disordered appearance in 54 (32.3%), pinkish and smooth proliferative patterns in 38 (22.7%), and strawberry secretory patterns in 31 (18.7%) patients, with fewer cases of polyp in 25 (14.9%), atrophy in 17 (10.2%), and carcinoma in 2 (1.2%) patients. Histopathological examination revealed hyperplasia or disordered findings in 55 (34.2%) patients, proliferative patterns in 51 (30.6%), secretory patterns in 30 (17.9%), atrophic changes in 15 (8.9%), polyps in 10 (5.9%), and carcinoma/metaplasia in 4 (2.5%) being less common [Table 3].

Hysteroscopy findings against HPE were observed, and hysteroscopy was able to differentiate between secretory endometrium and polyps in complete agreement with HPE. However, in patients with proliferative and hyperplastic endometria, there is no consensus. In identifying carcinoma, hysteroscopy was in only 50% agreement with HPE. Overall, hysteroscopy showed a close to 76% agreement with HPE [Table 4].

Hysteroscopy revealed carcinoma in 1.2% of patients (2 out of 163). Atrophic lesions were observed in 17 patients, with 11 confirmed and 6 showing overlap with other findings. Secretory lesions were present in 30 patients (18%), whereas proliferative lesions were more common in 33 patients (19.8%). Hyperplasia was the most frequent abnormality, identified in 41 patients (24.6%). Polypoidal lesions were noted in 10 patients (6%), with 15 patients showing overlapping findings [Table 5].

For carcinomas, hysteroscopy showed a sensitivity of 50% and specificity of 100%, with a diagnostic accuracy of 98.8%. A positive predictive value (PPV) and negative predictive value (NPV) of 100% and 98.8%, respectively, indicate high reliability in carcinoma. Sensitivity, specificity, and diagnostic accuracy were 73.3%, 96.1%, and 94%, respectively. The PPV were 64.7% and 97.3%, respectively, indicating a strong ability without atrophic lesions.

Secretory lesions showed diagnostic performance with a sensitivity of 100%, specificity of 99.3%, and diagnostic accuracy of 99.4%. The PPV was 96.7% and the NPV was 100% for identifying these lesions. Proliferative lesions had a sensitivity and specificity of 64.7% and 95.7%, respectively, with a diagnostic accuracy of 86.2%. A PPV of 86.8% and NPV of 86.1% indicated a moderate diagnostic accuracy for these lesions.

For hyperplastic lesions, the sensitivity and specificity were 71.9% and 88.2%, respectively, and diagnostic accuracy was 82.6 %. The PPV and NPV were 75.9% and 85.8%, respectively, for the detection of hyperplasia. Polypoidal lesions demonstrated a sensitivity and specificity of 100% and 90.5%, respectively, with a diagnostic accuracy of 91%. The PPV was relatively low at 40%; however, the NPV was 100%, and hysteroscopy was effective for polypoidal lesions [Table 6].

Table 1: Demographic and clinical profile.

	Mean ± SD
Age (in years)	45.7 ± 5.8
Duration (in months)	8.1 ± 9.6
Age of menarche (AOM)	13.3 ± 1.2
Length of cycle (in days)	31.4 ± 7.6
Duration	7.0 ± 2.4
Pulse rate (beats/min)	80.1 ± 6.1
Systolic blood pressure (SBP) (mm/Hg)	112.7 ± 9.7
Diastolic blood pressure (DBP) (mm/Hg)	74.4 ± 8.8
Haemoglobin (g/dL)	10.2 ± 1.1
Uterine cavity length (UCL) (cm)	5.8 ± 0.6
Endometrial thickness (mm)	7.4 ± 2.5

Table 2: Clinical and demographic profile of women presenting with menstrual irregularities and associated complaints

		Frequency (%)
Age (in years)	30–39	17 (10.2%)
	40–49	111 (66.5%)
	50–59	34 (20.4%)
	≥ 60	5 (2.9%)
Parity	0	4 (2.4%)
	1	10 (6%)
	2	79 (47.3%)
	3	47 (28.1%)
	4	22 (13.2%)
	5	4 (2.4%)
	6	1 (0.6%)
Live births	0	4 (2.4%)

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	1	15 (9%)
	2	82 (49.4%)
	3	43 (25.9%)
	4	19 (11.4%)
	5	3 (1.8%)
Abortions	0	133 (79.6%)
	1	21 (12.6%)
	2	9 (5.4%)
	3	2 (1.2%)
	4	1 (0.6%)
	5	1 (0.6%)
Intrapartum history	LN	123 (74.1%)
	LSCS	39 (23.5%)
	Nullipara	4 (2.4%)
Sterilisation	Sterilised	134 (80.2%)
	Not Done	33 (19.8%)
Complaints	Heavy menstrual bleeding	70 (41.9%)
	Intermenstrual bleeding	51 (30.5%)
	Post-Menopausal bleeding	26 (15.7%)
	Irregular bleeding	20 (11.9%)
Associated complaints	Amenorrhea	39 (23.4%)
	Abnormal uterine bleeding	77 (46.1%)
	Intermenstrual bleeding	51 (34%)
	Postmenopausal bleeding	26 (15.6%)
	Irregular menstrual history	28 (19.7%)
Volume of flow	Heavy	87 (61.7%)
	Normal	54 (38.3%)
Associated co-morbidities	Abdominal pain	77 (46.1%)
	White discharge	12 (7.2%)
BMI	Normal	75 (45.2%)
	Overweight	26 (15.7%)
	Obese	51 (30.7%)
	Underweight	14 (8.4%)

Table 3: Clinical, radiological, and histopathological findings in women with gynaecological complaints

		Frequency (%)
Associated complaints	Abdominal pain	74 (44.5%)
	Constipation	3 (1.8%)
	Dysuria	15 (9%)
	Leucorrhea	12 (7.2%)
	No	63 (37.7%)
Co-morbidities	CAD	7 (4.2%)
	CKD	2 (1.2%)
	Diabetics	44 (26.3%)
	No	81 (48.5%)
	SHTN	33 (19.8%)
Per abdomen	Normal	167 (100%)
Per vaginum	Anteverted	145 (86.8%)
	Retroverted	22 (13.2%)
VIA/VILI	Normal	167 (100%)
Pap smear	Normal	153 (92.2%)
	Inflammatory	12 (7.2%)
	LSIL	1 (0.6%)
USG Findings	Normal	30 (18%)
	Fibroid	59 (35.3%)
	Adenomyosis	32 (19.2%)
	Thickened Endometrium	32 (19.2%)
	Bulky Uterus	9 (5.4%)
	Polyp	5 (2.9%)
Endometrial thickness (mm)	≤ 5	31 (18.6%)
	6-9	113 (67.6%)
	≥ 10	23 (13.8%)
Hysteroscopic appearance	Polypoidal - hyperplastic/disordered	54 (32.3%)
	Pinkish, smooth - proliferative	38 (22.7%)
	Strawberry - secretory	31 (18.7%)
	Tongue-shaped - polyp	25 (14.9%)
	Starry Sky - Atrophic	17 (10.2%)
	Cerebroid - endometrial carcinoma	2 (1.2%)
Histopathological findings	Hyperplasia/disordered	57 (34.2%)
	Proliferative	51 (30.6%)
	Secretory	30 (17.9%)
	Atrophic	15 (8.9%)

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	Polyp	10 (5.9%)
	Carcinoma/Metaplasia	4 (2.5%)

Table 4: Comparison of findings between hysteroscopy and HPE

Hysteroscopy findings	Histopathological findings					
	Atrophic	Secretory	Proliferative	Hyperplasia/ Disordered	Carcinoma	Polyp
Starry Sky - Atrophic	11 (73.3%)	0	3 (5.8%)	3 (5.3%)	0	0
Strawberry - secretory	1 (6.7%)	30 (100%)	0	0	0	0
Pinkish, Smooth - Proliferative	0	0	33 (64.7%)	5 (8.8%)	0	0
Polypoidal - Hyperplasia/Disordered	2 (13.3%)	0	10 (19.7%)	41 (71.9%)	1 (25%)	0
Cerebroid - Carcinoma	0	0	0	0	2 (50%)	0
Tongue shaped - Polyp	1 (6.7%)	0	5 (9.8%)	8 (14%)	1 (25%)	10 (100%)

Table 5: Distribution of hysteroscopic findings in women with gynaecological complaints

Hysteroscopy findings		Complaints	
		Yes	No
Carcinoma	Yes	2	0
	No	2	163
Atrophic lesions	Yes	11	6
	No	4	146
Secretory lesions	Yes	30	1
	No	0	136
Proliferative lesions	Yes	33	5
	No	18	111
Hyperplasia	Yes	41	13
	No	16	97
Polypoidal lesions	Yes	10	15
	No	0	142

Table 6: Diagnostic performance of hysteroscopy in identifying gynaecological lesions: sensitivity, specificity, and accuracy

	Sensitivity	Specificity	Diagnostic accuracy	PPV	NPV
Carcinoma	50%	100%	98.80%	100%	98.80%
Atrophic Lesions	73.30%	96.10%	94%	64.70%	97.30%
Secretory Lesions	100%	99.30%	99.40%	96.70%	100%
Proliferative Lesions	64.70%	95.70%	86.20%	86.80%	86.10%
Hyperplastic Lesions	71.90%	88.20%	82.60%	75.90%	85.80%
Polypoidal Lesions	100%	90.50%	91%	40%	100%

DISCUSSION

In our study, nearly one-third of the patients had polypoidal, hyperplastic, or disordered proliferative endometria. More than two-fifths of the patients had a smooth, pinkish proliferative endometrium. Nearly two-fifths of the patients had strawberry-like secretory endometria. Only a few patients had a cerebroid appearance associated with endometrial carcinoma, while more than one-tenth had a tongue-shaped polyp. The importance of hysteroscopy in detecting proliferative disorders missed by imaging effectively differentiates proliferative endometritis from other causes of bleeding.

In our study, 1.2% of patients had a cerebroid appearance associated with endometrial carcinoma and the detection of this appearance on hysteroscopy highlights its role in detecting malignant lesions. Valson et al., and Singh et al., reported polyps as the most common abnormality. Hyperplasia or disordered endometrium was found in 34.2% of the study patients, followed by proliferative endometrium, secretory endometrium, atrophic endometrium, polyps, and carcinomas. This study found an overall 76% agreement between hysteroscopy and HPE, with a Cohen's Kappa of 0.6883 indicating moderate to substantial agreement.[6,7] Supported by a study by Sinha et al. the overall agreement between hysteroscopy and histopathological examination is 62.5%.[8] A study by Pradhan et al. found the agreement to be 63.3%.[9]

In our study, the secretory endometrium detected in HPE showed 100% agreement with the hysteroscopic findings of strawberry appearance. Pandey et al. reported that the strawberry pattern had 100% sensitivity, specificity, positive predictive value, and negative predictive value for detecting secretory endometrium and identified the starry sky appearance in hysteroscopy as 33.3% accurate for detecting atrophic endometrium, with a sensitivity of 100% and specificity of 94%.[10] Kumar et al. found 66.6% sensitivity, 100% specificity, 100%, positive predictive value, and 95.6% negative predictive value.[11] Edwin et al. reported a diagnostic accuracy of 87.5% for secretory endometrium.[12]

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Our study found a 71.9% agreement between hysteroscopy and histopathological examination for this pattern of endometrial pathology. Shrestha et al. reported a diagnostic accuracy of 72% for hysteroscopy in detecting endometrial hyperplasia.[13] Saravanan et al. found an accuracy of 67.9%.[14] Patil et al. reported 72% accuracy, 75% sensitivity, 92.5% specificity, 71.4% positive predictive value, and 93.6% negative predictive value.[15]

Our study found an overall agreement of 64.7% between hysteroscopy and histopathological examination for proliferative endometrium, and a 73.3% overall agreement between hysteroscopy and histopathological examination of the atrophic endometrium. Singh et al. reported a diagnostic accuracy of 93.3% for hysteroscopy in identifying proliferative endometrium and found the diagnostic accuracy of hysteroscopy for endometrial polyps to be 100%.[7] Edwin et al. found an 84.8% accuracy, 87.5% sensitivity, 89.6% specificity, 82.3% positive predictive value, and 92.8% negative predictive value and found a 40% success rate, with sensitivity of 100%, specificity of 95.5%, positive predictive value of 200%, and negative predictive value of 100%.[12] Patil et al. reported an 81% accuracy, 78.5% sensitivity, 86.2% specificity,80.4% positive predictive value, and 84.7% negative predictive value.[15] Our study found 100% overall agreement between hysteroscopy and histopathological examination for endometrial polyps, underscores the diagnostic benefit of hysteroscopy in cases of suspected polyps. A diagnostic accuracy of 63% for hysteroscopy in detecting atrophic endometrium, with a sensitivity of 100%, specificity of 96.8%, positive predictive value of 62.5%, and negative predictive value of 100%.[15]

In our study, hysteroscopy showed 100% specificity and 50% sensitivity for endometrial carcinoma. Kumar et al. reported hysteroscopy for diagnosing endometrial carcinoma had 50% sensitivity, 100% specificity, 100% positive predictive value, and 97.9% negative predictive.[12] Shrestha et al. and Puhan et al. found hysteroscopy had 100% sensitivity, specificity, positive predictive value, and negative predictive value. And reported a negative predictive value of 98.8%, highlighting hysteroscopy's utility in evaluating abnormal uterine bleeding.[13,16]

CONCLUSION

Hysteroscopy is an accurate and reliable way to detect benign changes in the endometrium, such as polyps and hyperplasia. This is shown by the fact that it agrees well with the histopathological examination under the same conditions. However, hysteroscopy shows only moderate sensitivity in cases of carcinoma, which indicates that hysteroscopy alone in high-risk cases may not be sufficient to rule out malignant cases. Hysteroscopy with histopathological examination maximizes the diagnostic accuracy, making it an effective diagnostic tool for differentiating benign from malignant lesions. Hysteroscopy, as a minimally invasive procedure, can serve as a screening tool; however, histopathological examination is essential for definitive diagnosis, particularly in high-risk cases.

Future research should focus on improving the diagnostic protocol and evaluating the effectiveness of newer imaging modalities, along with hysteroscopy, in detecting subtle carcinomatous changes. This study can also be expanded to other demographics to validate these findings and enhance the generalizability of hysteroscopy diagnostic values. Additionally, long-term follow-up studies can be planned to assess the predictive value of the initial hysteroscopic findings, especially for conditions that progress slowly over time.

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