Original Article

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Validity of Hysteroscopy and Transvaginal Sonography in Evaluating Abnormal Uterine Bleeding- A Retrospective Study

Obstetrics and Gynaecology Section

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ABSTRACT

Introduction: Abnormal Uterine Bleeding (AUB) affects 14-25% of women of reproductive age group and accounts for 66% of hysterectomies. Accurate diagnosis of the cause of AUB will reduce the hysterectomy burden, but the ideal evaluating tool to accurately diagnose the cause of the same is debatable.

Aim: To evaluate the diagnostic accuracy of Transvaginal Sonography (TVS) and hysteroscopy in the evaluation of abnormal uterine bleeding, using histopathological diagnosis as gold standard.

Materials and Methods: This retrospective descriptive study was conducted on patients who underwent transvaginal sonography and hysteroscopy for evaluation of abnormal uterine bleeding from January 2017 to January 2020. Data including demographic details, sonographic details, preoperative diagnosis, anaesthesia used, operative notes, complications and histopathological diagnosis were obtained from clinical record sheet of the patients. Sensitivity, specificity, diagnostic accuracy of TVS and hysteroscopy was calculated using MedCalc software version 19.2.6.

Results: A total of 214 patients were enrolled in the study. Hysteroscopy reported >95% diagnostic accuracy for all intrauterine pathology compared to TVS which revealed diagnostic accuracy of 73.13% for polyp, 77.1% for endometrial hyperplasia and 73.6% for all other pathology. Hysteroscopy revealed strong to almost perfect correlation with histopathological diagnosis for all pathology compared to TVS which demonstrated weak correlation for various intrauterine pathology.

Conclusion: Hysteroscopy should be used as initial evaluating tool in AUB as it is simple and minimal-invasive with high diagnostic accuracy.

Keywords: Endometrial hyperplasia, Intrauterine adhesions, Intrauterine pathology, Uterine polyp

INTRODUCTION

Abnormal uterine bleeding is defined as uterine bleeding which is abnormal in amount or occurs outside the normal menstrual cycle [1]. It is a significant clinical entity and affects 14-25% of women of reproductive age and accounts for 66% of hysterectomies [2]. It adversely affects women's life from adolescence through reproductive age to postmenopausal period. An organised approach to establish the cause according to FIGO PALM-COEIN classification system [1] will enable accurate diagnosis and uniform treatment. The first step in the evaluation of AUB is a thorough history taking and meticulous clinical examination followed by judicious use of investigation tools.

Transvaginal sonography being non invasive is the first line modality used for the evaluation of AUB though it has poor sensitivity in detecting intrauterine pathology like endometrial polyp, submucosal fibroid, Intrauterine Adhesion (IUA) and septum [3]. Traditional use of dilatation and curettage for investigation of AUB has been challenged for its several shortcomings like blind procedure, low sensitivity, failure to diagnose intrauterine lesion and higher risk of complications [4]. Hysteroscopy has emerged as better option for evaluating uterine cavity. It eliminates the limitation of blind dilatation and curettage by allowing direct visualisation of endometrial cavity and performance of targeted biopsy from suspected area thereby improving the chance to yield accurate histological diagnosis [3,4].

In the light of current knowledge, the present study was conducted with the aim to evaluate the diagnostic accuracy of transvaginal sonography and hysteroscopy in the evaluation of abnormal uterine bleeding, using histopathological analysis of endometrial/tissue biopsy obtained during hysteroscopy as gold standard.

MATERIALS AND METHODS

The study has been started after obtaining approval (AIIMS/Pat/IEC/2020/514). This study has been conducted in accordance with the Helsinki Declaration of 1975 that was revised in 2013. This retrospective descriptive study was conducted from January 2017 to January 2020 in the Department of Obstetrics and Gynaecology.

Inclusion criteria: All patients in the age group 18-45 years who underwent hysteroscopy for evaluation of abnormal uterine bleeding during specified period were included in the study.

Exclusion criteria: Women with postmenopausal bleeding, diagnosed genital cancer, pelvic inflammatory disease or patients under 18 years of age were excluded from the study.

Data pertaining to demographic details, sonographic details, preoperative diagnosis, operative procedures and histopathological diagnosis were obtained from clinical record sheet of the patients.

Study Procedure

All patients after full clinical evaluation underwent transvaginal sonography for evaluation of uterus and adnexa using 5-7.5 MHz (Medison Accuvix A30 Ultrasound System). Any focal lesions like polyp, fibroid, IUA, retained products of conception etc., were noted. Endometrial Thickness (ET) was measured in mid-sagittal plane and at the point of maximum thickness of the stripe. Single-layer ET of less than 6 mm, the double-layer thickness less than 12 mm and thickened non homogeneous, cystic with ill-defined endomyometrial junctions were defined [5].

After obtaining pre-anaesthetic fitness, patients underwent hysteroscopy. Type of anaesthesia (conscious sedation, short general or spinal) was decided according to expected duration of procedure and clinical characteristics of the patients inside the OT. All hysteroscopy were performed following vaginoscopic approach by surgeon using 2.9 mm hysteroscope. Uterine distension was provided with normal saline by using the continuous flow and pressure-controlled pump system. Hysteroscopy was executed with usual order, inspection of cervix, endocervical canal, uterine cavity, tubal ostia and endometrium. Procedures like septal resection, adhesiolysis, foreign body removal, polypectomy and myoma resections were performed using appropriate techniques at the same sitting when required. Endometrial biopsy had

been taken after hysteroscopy. Operative findings were documented in the record sheets.

STATISTICAL ANALYSIS

Data were displayed as number and percentage, mean and standard deviations, as appropriate. Sensitivity, specificity, Positive Predictive Value (PPV), Negative Predictive Value (NPV) and diagnostic accuracy of transvaginal sonography and hysteroscopy were calculated considering histopathological reports as final. Statistical analysis was done using MedCalc Statistical software version 19.2.6 (MedCalc Sofware bvba, Ostend, Belgium; http://www.medcalc.org; 2020).

RESULTS

A total of 214 patients were enrolled in the study. Sonographic findings were available for 201 cases and hysteroscopy findings for 214 patients. Mean age of presentation was 36.3±8.6 years (range 18-45 years). Most common presenting complaints was menorrhagia in 146/214 (68.2%) of cases [Table/Fig-1]. Out of 214 patients 140 women did not require anaesthesia whereas 74 women required. Among this, short GA, conscious sedation and spinal were used in 47, 21 and 6 women, respectively. TVS findings along with its association with hysteroscopic findings is summarised in [Table/Fig-2]. Normal endometrium were found in 62/201 (30%) of women on imaging.

Complaints	Number	Percentage
Menorrhagia	146	68.2%
Hypomenorrhoea	19	8.8%
Intermenstrual bleeding	11	5.1%
Polymenorrhagia	38	17.7%

[Table/Fig-1]: Presenting complaints of the studied population.

Hysteroscopic findings were categorised into two groups:

1. **Intrauterine lesion-** Predominant lesion was polyp in 56 cases, followed by submucosal fibroid myoma in 19 and IUA in 12 cases. The other lesions observed were bony chip, RPOCs, septate uterus and IUD. [Table/Fig-3] summarise the intrauterine lesion detected on hysteroscopy with its histopathological correlation in 109 cases.
2. **Endometrial characterisation-** [Table/Fig-3] summarise the endometrial characters on hysteroscopy in 105 patients. Normal endometrium was observed in 44 patients. Endometrial hyperplasia was noted in 31 cases. Two cases of endometrial carcinoma were diagnosed.

Considering histological diagnosis as gold standard, hysteroscopy failed to diagnose following lesions: one case of fibroid which was diagnosed as polyp, two polyps which were diagnosed as fibroid, four cases of hyperplasia misdiagnosed as normal endometrium and one case of endometrial carcinoma diagnosed as endometrial hyperplasia. False positive and false negative cases are summarised in [Table/Fig-4].

[Table/Fig-5] summarise the statistics of TVS and hysteroscopy in diagnosing uterine pathology keeping histopathology as gold standard. Hysteroscopy reported >95% diagnostic accuracy for all intrauterine pathology compared to TVS which revealed diagnostic accuracy of 77.13% for polyp, 77.1% for endometrial hyperplasia and 73.6% for other pathology. Hysteroscopy showed strong to almost perfect correlation with histology for all diagnosed pathology compared to TVS which demonstrated weak correlation with histology.

DISCUSSION

The diagnostic methods available for the evaluation of uterine cavity have evolved significantly in last two decades from TVS, SIS to hysteroscopy. The diagnostic abilities of TVS and hysteroscopy keeping histopathology as gold standard were compared. TVS is simple, non invasive and well accepted by the patients though considerable variability has been observed in the literature for its sensitivity and specificity in detecting intrauterine pathology [6,7,8]. In the present study, out of 52 sonographically diagnosed polyp, only 24 were confirmed on subsequent histopathology. Similarly, among 14 submucosal myoma identified on TVS, only 9 were confirmed on histology. This shows that false positive diagnoses were high on sonography. In this study, TVS has showed sensitivity of 48.08% on specificity of 81.8% for polyp and sensitivity of 50% on specificity of 97.2% for submucosal myoma which is similar to other studies [3,7]. The reliability of ultrasound in diagnosing various causes of thickened endometrium is also poor [6,9]. Ultrasound demonstrated 64.3% sensitivity on 79.1% specificity for endometrial hyperplasia in the current study. Similar sensitivity (58%) has been reported by Wanderley MS et al. and De Vries LD et al., [7,10]. However Veena BT and Shivalingaiah N, reported lower sensitivity of 37.5% [9]. Submucosal myoma, polyp and normal endometrium were obscured by thickened endometrium. Visualisation of endo-myometrial echo is influenced by many factors that includes uterine position, menstrual phase, presence of myometrial lesion that distort endometrial cavity and finally resolution of the imaging tool. These all may lead to reduced diagnostic accuracy of ultrasound. None of the histologically diagnosed case of endometrial cancer were suspected on sonography. Similar to our finding, in the study by Wanderley MS et al., TVS could not differentiate between thickened endometrium and endometrial carcinoma [7]. Considerable number of false negative diagnoses on TVS is a concern and therefore mandate the use of other more efficacious diagnostic tool to investigate the cause of abnormal bleeding.

Hysteroscopy demonstrated higher diagnostic accuracy for both endometrial characterisation as well as intrauterine pathology. It has been described in the literature that characteristic endometrial pattern on hysteroscopy may be used to differentiate normal and abnormal endometrium with high accuracy [11,12]. The diagnostic accuracy for endometrial characterisation was 90.6% along with strong agreement with histological diagnosis in this study. Similar high diagnostic accuracy has been reported by Pandey D et al., and Bourdel N et al., [12,13]. Hysteroscopy demonstrated 95% diagnostic accuracy for endometrial hyperplasia and 99.5% for endometrial carcinoma. Sequeira N and Fernandes S, reported 68.5% diagnostic accuracy for endometrial hyperplasia, [14] whereas Sinha P et al., reported 0% detection rate

TVS findings	Hysteroscopic findings									
	Normal endometrium	EH	DE	Polyp	Myoma	IUA	Bony chip/IUDs	Mullerian anomaly	RPOC	Total
Normal endometrium (<14 mm)	36	2	8	2	2	10	_	2	_	62
Thickened endometrium	6	13	4	26	2	_	_	_	3	54
Polyp	2	16	5	25	4	-	-	-	-	52
Submucosal fibroid	-	-	-	3	11	-	-	-	-	14
Intrauterine adhesion	-	-	-	-	-	2	-	-	-	2
Septate uterus	-	-	-	-	-	-	-	1	-	1
Intrauterine device	-	-	-	-	-	-	4	-	-	4
Bony chip	-	-	-	-	-	-	8	-	-	8
RPOC									4	4
Total	44	31	17	56	19	12	12	3	7	201

[Table/Fig-2]: Association of sonographic and hysteroscopic findings.
TVS: Transvaginal sonography; EH: Endometrial hyperplasia; DE: Dysfunctional endometrium; IUA: Intrauterine adhesion; IUD: Intrauterine device; RPOC: Retained product of contraception

Intrautrine lesions	Hysteroscopic findings	Histopathological diagnosis
Intracavitary lesion (n=109)		
Polyp	56[a]	52
Submucosal fibroid	19[b]	18
Intrauterine adhesions	12	-
Bony chip (ossified endometrium)	8	8
Septate uterus	3	-
IUD	4	-
RPOCs	7	7
Endometrial characterisation (n=105)		
Functional endometrium	44	43
Atrophic endometrium	8	9
Endometrial hyperplasia	31	28
Endometritis	3	3
Dysfunctional endometrium	17	24
Endometrial carcinoma	2	3

[Table/Fig-3]: Intrauterine lesion: hysteroscopic and histopathology findings.
[a]: FP (False positive) 5 cases returned as functional endometrium; [b]: FP 2 cases were polyp; IUD: Intrauterine device; RPOC: Retained product of contraception

Hysteroscopic findings	Histopathology diagnosis	
		False positive
Polyp	Functional endometrium	5
Submucosal fibroid	Polyp	2
Endometrial hyperplasia	Functional endometrium	4
Atrophic endometrium	Functional endometrium	2
Endometrial hyperplasia	Atrophic endometrium	2
		False negative
Polyp	Fibroid	1
Functional endometrium	Hyperplasia	4
Functional endometrium	Disordered proliferative endometrium	7
Functional endometrium	Atrophic endometrium	1
Endometrium hyperplasia	Carcinoma	1

[Table/Fig-4]: Failure of endometrial diagnosis (False positive and False negative).

Intrauterine lesions	Sensitivity, CI (%)	Specificity CI (%)	PPV, CI (%)	NPV, CI (%)	Accuracy, CI (%)	Kappa value[b]
Endometrial hyperplasia						
TVS	64.3 (44.07 to 81.3)	79.19 (72.3 to 84.98)	33.33 (25.09 to 42.7)	93.2 (89.2 to 95.7)	77.1 (70.68 to 82.73)	0.316
Hysteroscopy	86.21 (68.3 to 96.1)	96.76 (93.07 to 98.8)	80.65 (65.1 to 90.2)	97.8 (94.7 to 99.1)	95.3 (91.5 to 97.7)	0.823
Polyp						
TVS	48.08 (34.0 to 62.3)	81.88 (74.7 to 87.7)	48.08 (37.2 to 59.05)	81.8 (77.5 to 85.5)	77.13 (66.4 to 79.1)	0.312
Hysteroscopy	98.08 (89.7 to 99.95)	96.91 (92.9 to 98.9)	91.07 (81.1 to 96)	99.37 (95.7 to 99.9)	97.2 (94 to 98.96)	0.924
Submucosal fibroid						
TVS	50.00 (26.02 to 73.98)	97.27 (93.74 to 99.11)	64.29 (40.31 to 82.75)	95.19 (92.57 to 96.91)	93.03 (88.59 to 96.14)	0.530
Hysteroscopy	94.4 (72.7 to 99.8)	98.9 (96.3 to 99.8)	89.4 (68 to97.1)	99.49 (96.6 to 99.9)	98.6 (95.9 to 99.7)	0. 979
Intrauterine adhesion						
TVS	16.67 (2.09 to 48.41)	100 (98.07 to 100.00)	100	94.97 (93.62 to 96.05)	95.02 (91.04 to 97.59)	0.230
Hysteroscopy	100 (73.5 to 100)	100 (98.19 to 100)	100	100	100 (98.2 to 100)	1
Others[a]						
TVS	55.70 (44.08 to 66.88)	85.25 (77.69 to 91.02)	70.97 (60.45 to 79.63)	74.82 (69.66 to 79.37)	73.63 (66.97 to 79.58)	0.426
Hysteroscopy	85.88 (76.6 to 92.4)	99.2 (95.7 to 99.9)	98.6 (91.1 to 99.8)	91.4 (86.3 to 94.7)	93.93 (89.8 to 96.7)	0.859

[Table/Fig-5]: Diagnostic accuracy statistics and agreement test of TVS and hysteroscopy, considering histology as gold standard.
[a]: Others include Normal, Atrophic & Dysfunctional endometrium, endometritis and endometrial carcinoma; [b]: Interpretation of Cohen's kappa: 0-.20-None, .21-.39 - Minimal, .40-.59 - Weak, .60-.79 - Moderate, 80-.90 -Strong, Above.90 - Almost Perfect

for endometrial hyperplasia [15]. Diagnostic efficacy of hysteroscopy is influenced by various factors which include the hysteroscopist experience, quality of equipment, distension medium, quality of the endometrial sampling, population studied (pre- or postmenopausal), and patient selection (clinically symptomatic or suspected on imaging). This explains the variable diagnostic efficacy of hysteroscopy reported in the literature.

False negative diagnosis on the endometrial characterisation needs mention. Sometimes subtle endometrial hyperplasia may be masked by normal endometrium. Discordant endometrium represents the discrepancy between endometrial maturation and hormonal cycle which can be focal or diffuse. These lesions may be too subtle to be diagnosed on hysteroscopy and need biopsy to confirm the diagnosis. Hysteroscopic morphological pattern like uneven surface, papillary or polypoidal pattern and abnormal vessels can be seen in both atypical hyperplasia and low-grade endometrial cancer so hysteroscopic differentiation of these two entities could be difficult at times [16]. In this study too, histology reported low grade endometrial cancer. So hysteroscopy should always be complemented by biopsy.

Hysteroscopy showed high sensitivity and specificity for intrauterine lesion in our analysis. The diagnostic accuracy for polyp and submucosal fibroid were 97% and 98% respectively with almost perfect correlation with histopathology. Kelekci S et al., also reported high accuracy of 95% and100% respectively [17]. False positive and negative case were low, one case of fibroid was misdiagnosed as polyp, two polyps were misdiagnosed as fibroid. Small fibroid covered with secretory endometrium may resemble polyp and fibromatous polyp may simulate myoma on hysteroscopy.

Detection of other pathology like intrauterine adhesion and embedded bony chip deserve particular discussion. IUA can develop following uterine surgery, infection or abortion and reported prevalence is 19% [18]. It can manifest in form of menstrual abnormalities, adverse pregnancy outcome and infertility, thus warrants early diagnosis and treatment. IUA was diagnosed in 5.6% of cases in this analysis. Hysteroscopy demonstrated 100% diagnostic accuracy for IUA, in addition adhesiolysis could be performed in the same sitting thereby avoiding multiple visits. Similarly hysteroscopy would be double advantageous for diagnosis and treatment concurrently for embedded bones in uterine cavity. This observation is in agreement with the observation by Sinha P et al. [15]. [Table/Fig-6] compares the sensitivity and specificity of TVS and hysteroscopy in diagnosing endometrial pathologies of different studies [3,7,10,12,14,15,17,19].

The advent of high definition miniature hysteroscope has facilitated its performance in the office without need of anesthesia besides increasing its diagnostic efficacy. In addition, many therapeutic procedures can be performed at the same sitting thereby, minimising the multiple visits to the hospital, working days loss of the women and the financial burden. These qualities make the hysteroscope, a gold standard tool for the management of AUB.

There are many strength of this study. Firstly this study has compared the two modalities for intra-cavitary lesion as well as endometrial characterisation. Secondly, it has clearly demonstrated

Study	Country	Sample size	Pathology	Sensitivity/ specificity
TVS				
De Vries LD et al., 2000 [10]	Netherlands	62	Polyp/submucosal myoma/EH	60%/93%
Kelekci S et al., 2005 [17]	Turkey	50		56.3%/72%
Vitner D et al., 2013 [3]	Israel	128	Polyp/myoma/EH/ synechiae	93%/58%
Wanderley MS et al., 2016 [7]	Brazil	191	Polyp/myoma/EH	69%/75.5%
Sequeira N and Fernandes S, 2019 [14]	India	103	EH	55.5%/74.1%
Present study	India	214	Polyp/myoma/EH	54.1%/85.7%
Hysteroscopy				
Kelekci S et al., 2005 [17]	Turkey	50	Intra-cavitary lesion	87.5%/100%
Allameh T, Mohammadizadeh F, 2007 [19]	Iran	105	Intra-cavitary lesion	80.5%/88.9%
Wanderley MS et al., 2016 [7]	Brazil	191	Polyp/myoma/EH	>90%/80-100%
Pandey D et al., 2017 [12]	India	74	EH	85.7% /88.4%
Sinha P et al., 2018 [15]	India	56	Polyp/myoma/ necrotic mass	78.3%/63.6%
Sequeira N and Fernandes S, 2019 [14]	India	103	EH	100%/64.94%
Present study	India	214	Polyp/myoma	96.2%/98%
			Endometrial characterisation	86.2%/96.7%

[Table/Fig-6]: Comparing sensitivity and specificity of TVS and hysteroscopy in diagnosing endometrial pathologies of different studies [3,7,10,12,14,15,17,19].

the higher efficacy of hysteroscopy compared to TVS in diagnosing as well managing these two endometrial lesions in women with AUB. So we recommend that hysteroscopy exam should include thorough inspection of cervix, endocervical canal, endometrial cavity and biopsy from the suspected endometrial lesion. Our findings strongly support the utilisation of hysteroscopy as initial evaluating tool in AUB.

Limitation(s)

The main limitation of this study is its retrospective observational nature and small sample size.

CONCLUSION(S)

Hysteroscopy should be used as initial evaluating tool in AUB as it is simple and minimal-invasive tool with high diagnostic accuracy. Hysteroscopy should always be combined with biopsy for whatever benign or malignant pathology.

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