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ORIGINAL ARTICLE

Sonohysterography versus Hystroscopy in Evaluation of Uterine Cavity Pathology

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ABSTRACT

Background: Intrauterine pathologies are the underlying causes of infertility in about 15% of infertile women. Multiple uterine abnormalities may interfere with implantation and can cause spontaneous abortion, such as uterine septum, intrauterine adhesions, endometrial polyps or submucous myomas. Variable diagnostic modalities including hysterosalpingography, transvaginal ultrasound, sonohysterography and hysteroscopy can be used to assess the uterine cavity. The purpose of our study is to evaluate the importance of sonohysterography in correlation with vaginal hysteroscopy in evaluating uterine cavity pathology.

Methods: This prospective cross-sectional study was performed on 48 women suspected of having an intrauterine abnormality. Between days 7 and 10 of the menstrual cycle, sonohysterography was done. In the mid proliferative phase of the menstrual cycle for premenopausal women, hyteroscopy was done. Histopathology was our gold standard reference.

Results: The results of sonohysterography and hysteroscopy have been compared with histopathology. We observed that sonohysterography showed 26.7 percent of cases as normal and 73.3% had abnormal finding in form of endometrial polyp 30.3%, increased endometrial thickness 30.3%, submucous leiomyoma 24.3% and intra-uterine septum 15.1%, while hystroscopic findings showed 13.3 percent of cases as normal and 86.7% had abnormal finding in form of endometrial polyp 26.7%, increased endometrial thickness 17.8%, submucous leiomyoma 20.0%, intra-uterine adhesion 13.3% and intra-uterine septum 8.9%.

Conclusions: Sonohysterography is an integral examination procedure in the study of uterine cavity pathology; so it can be provided as a first-line diagnostic modality for uterine abnormality assessment; eliminating the costly need for hysteroscopy which considered more discomfort to women concerned.

Keywords: Sonohysterography; Hysteroscopy; Uterine cavity; Infertility

INTRODUCTION

Sonohysteography (SHG) serves as a complementary approach to vaginal sonography for better endometrial assessment [1]. It requires, in particular, the instillation of sterile saline solution into the endometrial cavity to improve the detection of endometrial lesions and to determine the anatomical causes of infertility [2-3].

The abnormal uterine bleeding, primary or secondary infertility, repeated miscarriage, congenital uterine anomaly, uterine myomas, uterine polyps or cysts, suspected uterine synechiae, and further evaluation of suspected transvaginal sonogram found endometrial lesions are its main indications [3]. It not only assists in evaluating uterine cavity lesions, but also in the decision on patient surgery versus medical care and, if surgical treatment is required, guides the procedure and instrumentation needed. It also helps to evaluate the correct endometrial biopsy site and alleviates issues related to blind biopsy [4].

Ideally, it should be performed before the 10th day early in the follicular phase of the menstrual cycle (after cessation of menstrual blood) to ensure thin endometrium at this phase. There is a need for a thin endometrium so that the saline can more readily distend the uterine cavity and accentuate detection of endometrial pathology. For evaluating women with irregular vaginal bleeding; it can be done in any menstrual phase. It became an effective, economical and non-invasive alternative for assessment of irregular uterine bleeding; replacing hysteroscopy and the gold standard hysteroscopic directed biopsy [4-5].

Typically, in both pre- and postmenopausal women, it is used to determine the cause of abnormal vaginal bleeding. SHG clinical usefulness lies in its ability to differentiate anovulatory bleeding from an anatomical lesion in premenopausal women with dysfunctional vaginal bleeding. Meanwhile; in postmenopausal women with irregular vaginal bleeding, SHG can differentiate between atrophy and biopsy-requiring anatomical uterine or endometrial lesions [5-6].

To evaluate intrauterine and endometrial pathologies, multiple diagnostic modalities are used, e.g. Hysterosalpingography (HSG), MRI and hysteroscopy. They are costly and deliver indirect data on uterine cavity. They are capable of delineating fibroids and polyps, but they cannot adequately assess the endometrium [7]. Furthermore, SHG helps to detect the exact position and depth within the myometrium. This data assists in the planning of the necessary surgical management. HSG or hysteroscopy cannot be used to assess the size or depth of myomas, thereby providing little benefit in the planning of surgical treatment for myomas, which can vary from major surgical intervention to no intervention [8-9].

Diagnostic hysteroscopy, an invasive and costly technique, enables direct observation of the endometrial cavity and enables the excision of a suspected abnormality. In addition, it does not add further details on adnexa or myometrium and has been associated with pain and discomfort during the procedure with risk of complications that prolong hospitalization, increase the acquisition of nosocomial infections, and increase the cost of co-morbidity management. Multiple complications such as thrombosis, infection, damage to the bowel or bladder, and hemorrhage may be induced. Hysteroscopy is also not readily available, technically complex, and requires excellent skilled hands [10-11]. Our research aimed to determine the importance of sonohysterography in correlation with vaginal hysteroscopy in the assessment of uterine cavity pathology.

METHODS

This prospective cross-sectional work was performed on 48 women suspected of having uterine cavity lesions, ranging in age from 22 to 65 years. It was carried out between July 2019 and October 2020 at the Departments of Radiodiagnosis and Obstetrics & Gynecology, Faculty of Medicine, Zagazig University Hospitals. All participants received written informed consent; the study was certified by the Faculty of Medicine, Zagazig University's research ethical committee (ZU-IRB#5481/19-7-2019). This research was performed respecting The Code of Ethics of the World Medical Association (Declaration of Helsinki) for studies involving humans. Our research included peri-menopausal & post-menopausal women with unexplained vaginal bleeding, women with endometrial thickness greater than 8 mm in the proliferative phase and 16 mm in the secretory phase in vaginal sonography, and primary or secondary infertile females. Pregnant ladies, virgins and women with intrauterine contraceptive devices were excluded. Acute pelvic inflammatory disorder cases were withdrawn by the gynecologist.

All the involved women were subjected to complete history taking, general & gynecological examinations, vaginal sonography using both gray scale and color doppler scanning, sonohysterography, vaginal hysteroscopy. Following endometrial biopsy, D&C or postoperative, histopathology was performed. The flowchart of the study including the inclusion and exclusion criteria

as well as the used procedures is added in the supplementary file section.

Vaginal sonography and sonohysterography were done using a Voluson 730 Pro V (GE Medical Systems, Zipf, Austria) ultra-sound machine; in cases of infertility or thickened endometrium during the 7th to 10th day of the menstrual cycle; and in cases of excessive uterine bleeding during any phase of the menstrual cycle.

Technique of the test; In order to optimize our views; the patient emptied her bladder before the scan for her comfort, and on dorsal lithotomy position, the vaginal transducer was introduced to visualize the pelvic contents before instilling any fluid into the uterine cavity. The vaginal transducer was then removed and an open-sided vaginal speculum was inserted and the cervix was swabbed with a cleaning solution. A Foley 8-Fr pediatric catheter (length: 30 cm & diameter: 2.7 mm) was gently inserted into the uterine cavity through the cervix and the balloon was inflated into the endometrial cavity. Then carefully extract the vaginal speculum was and a 50 ml plastic syringe containing sterile saline solution was attached to the catheter. The vaginal transducer was reintroduced and the uterine cavity was steadily infused with saline solution while uterine distention was observed. Depending on uterine distention and patient tolerance, the amount of fluid instilled was variable. In order to distend the endometrial cavity, 15:20 ml of saline was usually required. Under sonographic direction, the catheter was retracted into the proximal cervical canal to ensure that the entire endometrial single layer thickness was thoroughly measured without catheter interference. The uterine cavity and adnexa were reevaluated in sagittal and coronal views. At the end of examination; vaginal transducer was carefully withdrawn and the catheter was removed after deflating the balloon. Before the procedure, antibiotics and non-steroidal anti-inflammatory drugs may be administered to reduce the few complications reported, such as pelvic pain, vagal symptoms, nausea and mild fever after the procedure.

Diagnostic Criteria; The vaginal sonography and sonohysterography image analysis was done by three radiologists with different experiences in women imaging. Upon saline instillation, a normal uterine cavity extended symmetrically. The endometrial lining appears smooth, with both sides of the canal having a symmetrical depth. Any uterine abnormalities were assessed and interpreted. The endometrial polyp; appeared as an echogenic homogeneous texture lesion with cystic areas can be found representing hemorrhage and infraction. Color Doppler US shows single feeding artery sign. Submucous leiomyoma was mostly hypo echoic or heterogeneous echo texture and usually differentiated from endometrial polyps or other endometrial abnormalities by acoustic attenuation or shadowing. Endometrial polyp and sub-mucous leiomyoma could be differentiated by seeing the normal endometrium around the leiomyoma. In endometrial hyperplasia; the endometrium is usually thick and echogenic with well-defined margins without focal abnormality. Intra-uterine adhesions appeared as endometrial irregularities or hyperechoic bridges within the endometrial cavity. A convex, smooth or indented fundal contour with a complete division of the endometrial canals by an echogenic mass, its echotexture close to that of myometrium, was present in the septate uterus. The intra uterine blood clot seen as an echogenic mass inside uterine cavity with no vascularity no color Doppler scanning and it moved with moving the catheter and gushing of saline. The endometrial carcinoma could be seen as inhomogeneous focal mass. Cervical stenosis was a relative contraindication according to its degree.

Hysteroscopy was done by an expert gynecologist with 15years experience in diagnostic vaginal hysteroscopy. In our study, an interval ranging from 1:10 days was separating the sonohysterography and hysteroscopy. The hysteroscope used in this study was Karl Storz (Germany). It is a rigid continuous flow panoramic hysteroscopy 25 cm long, 2.8 mm in diameter, with an outer sheath of 3 mm and a 30 degree fibro-optic lens. A metal halide automatic light source

from the Circon Acmi G71A/Germany with a 300 W lamp was the used light source. A fibro-optic cable is connected to the light source and to the hysteroscope.

The patient was positioned in dorsal lithotomy position and a vaginal disinfection with povidone-iodine10% was used. Visualization of the cervix was first obtained then insertion of the hysteroscope was done. Glycine (1.5%) solution was used as distension media insufflated at atmospheric pressure (two 5L bags connected by a urological "Y" outflow and located 1.5 meter above the patient). By rotating the fibre-optic scope, the uterine cavity was evaluated, the 30 ° lens is rotated to detect any uterine wall abnormality and/or both tubal ostia.

Histopathologic biopsy +/- excision was performed and submitted to an experienced pathologist with 20 years of endometrial lesion experience. Our gold standard guide for final diagnosis was the pathology findings.

Statistical Analysis

The Statistical Package for Social Sciences (SPSS) Version 21 was used to collect, tabulate and statistically analyze our study data. Descriptive statistics in the form of numbers and percentages for qualitative data were also carried out in the current research. Additionally; sensitivity, specificity, accuracy, negative predictive value and positive predictive value were measured. Several tests were used as Chi square test (X2), kappa test, t-test, ANOVA, and Pearson's correlation coefficient.

RESULTS

This study was carried out on 48 women; their age ranged from 22:65 years old with mean age 34.58 +/- 10.08 SD. Sonohysterography was successful in 45 women (93.75%) and failed in 3women (6.25%). The failed cases were due to failure of introduction of catheter due to severe retroverted uterus in 2 cases and very narrow cervix in one case; these women were not included in statistical analysis.

The major clinical presentations of the included 45 cases were irregular vaginal bleeding in 17 cases (37.8%), infertility in 16 cases (35.6%), and menorrhagia in 12 cases (26.6%).

Sonohysterography was normal in 26.7% of cases; while in 73.3% of cases it revealed abnormal findings; endometrial polyp (30.3%), increased endometrial thickness (30.3%), sub-mucous leiomyoma (24.3%)**,** and intra-uterine septum (15.1%). The final diagnosis of the included 45 cases regarding the sonohysterography findings, diagnostic hysteroscopy findings and histopathology results is illustrated in **table 1**. Endometrial polyp (Fig.1), submucosal leiomyoma (Fig.2), intra-uterine adhesions (Fig.3), septate uterus (Fig.4 A:C) and intra-uterine blood clot (Fig.4 D: F) were illustrated.

Statistical analysis revealed that SHG had 100% agreement with histopathology results regarding sub-mucous leiomyoma and increased endometrial thickness; while it had 75% sensitivity, 96.97% specificity, 90% PPV, 91.43% NPV and 91.11% accuracy in detection of endometrial polyp and 100% sensitivity, 95.12% specificity, 66.67% PPV, 100% NPV, and 95.56% accuracy in detection of intra-uterine septum. **Table 2** shows the agreement (sensitivity, specificity, PPV, NPV and accuracy) between histopathology results versus sonohysterography (SHG) and diagnostic hysteroscopy (DH) findings.

The agreement between sonohysterography (SHG) and histopathology results in diagnosis of uterine cavity pathology was found to be 84.62%, 100%, 100%, 50% and 86.67% regarding sensitivity, specificity, PPV, NPP and accuracy respectively; while it was 92.31%, 50%, 92.31%, 50% and 86.67% respectively regarding of the diagnostic efficacy of diagnostic hysteroscopy (DH) in detection of uterine cavity pathology compared to histopathology results; as shown in **table 3**.

Table (1): Distribution of the studied cases according to Sonohysterography, Hysteroscopy and Histopathology finding (N=45).

Final diagnosis of included cases	Sonohysterography		Hysteroscopy		Histopathology	
	No	%	No	%	No	%
Normal findings:	12	26.7	6	13.3	6	13.3
Abnormal findings:	33	73.3	39	86.7	39	86.7
Endometrial polyp	10	30.3	12	26.7	12	26.7
Sub-mucous leiomyoma	8	24.3	9	20.0	9	20.0
Increased endometrial thickness:	10	30.3	8	17.8	8	17.8
Endometrial hyperplasia without atypia	-	-	-	-	4	8.9
Endometrial hyperplasia with atypia	-	-	-	-	2	4.45
Endometrial adenocarcinoma	-	-	-	-	2	4.45
Intra-uterine adhesion	-	-	6	13.3	6	13.3
Intra-uterine septum	5	15.1	4	8.9	4	8.9
Total	45	100	45	100	45	100

No: Number, **%:** Percentage.

Table (2): Agreement (sensitivity, specificity, PPV, NPV and accuracy) between histopathology results versus sonohysterography (SHG) and diagnostic hysteroscopy (DH) findings**.**

SHG & DH Findings	Agreement of Histopathology Results				
	Sensitivity	Specificity	PPV	NPV	Accuracy
Endometrial polyp					
SHG	75.0	96.97	90.0	91.43	91.11
DH	75.0	90.91	75.0	90.91	86.67
Sub-mucous leiomyoma					
SHG	100.0	100.0	100.0	100.0	100.0
DH	100.0	100.0	100.0	100.0	100.0
Increased endometrial thickness					
SHG	100.0	100.0	100.0	100.0	100.0
DH	100.0	100.0	100.0	100.0	100.0
Intra-uterine adhesion					
SHG	-	-	-	-	-
DH	100.0	100.0	100.0	100.0	100.0
Intra-uterine septum					
SHG	100.0	95.12	66.67	100.0	95.56
DH	100.0	100.0	100.0	100.0	100.0

PPV: Positive predictive value**,** NPV**:** Negative predictive value.

Table (3): Agreement (sensitivity, specificity, PPV, NPV and accuracy) of sonohysterography (SHG) and diagnostic hysteroscopy (DH) (n = 45).

Histopathology results	Se	Sp	PP	NP	Ac

	Normal (n =6)		*Abnormal* (n=39)						
	No.	%	No.	%					
Sonohysterography (SHG)									
Normal	6	100.0	6	15.4	84.62	100.0	100.0	50.0	86.67
Abnormal	0	0.0	33	84.6					
Diagnostic hysteroscopy (DH)									
Normal	3	50.0	3	7.7	92.31	50.0	92.31	50.0	86.67
Abnormal	3	50.0	36	92.3					

PPV: Positive predictive value, NPV: Negative predictive value.

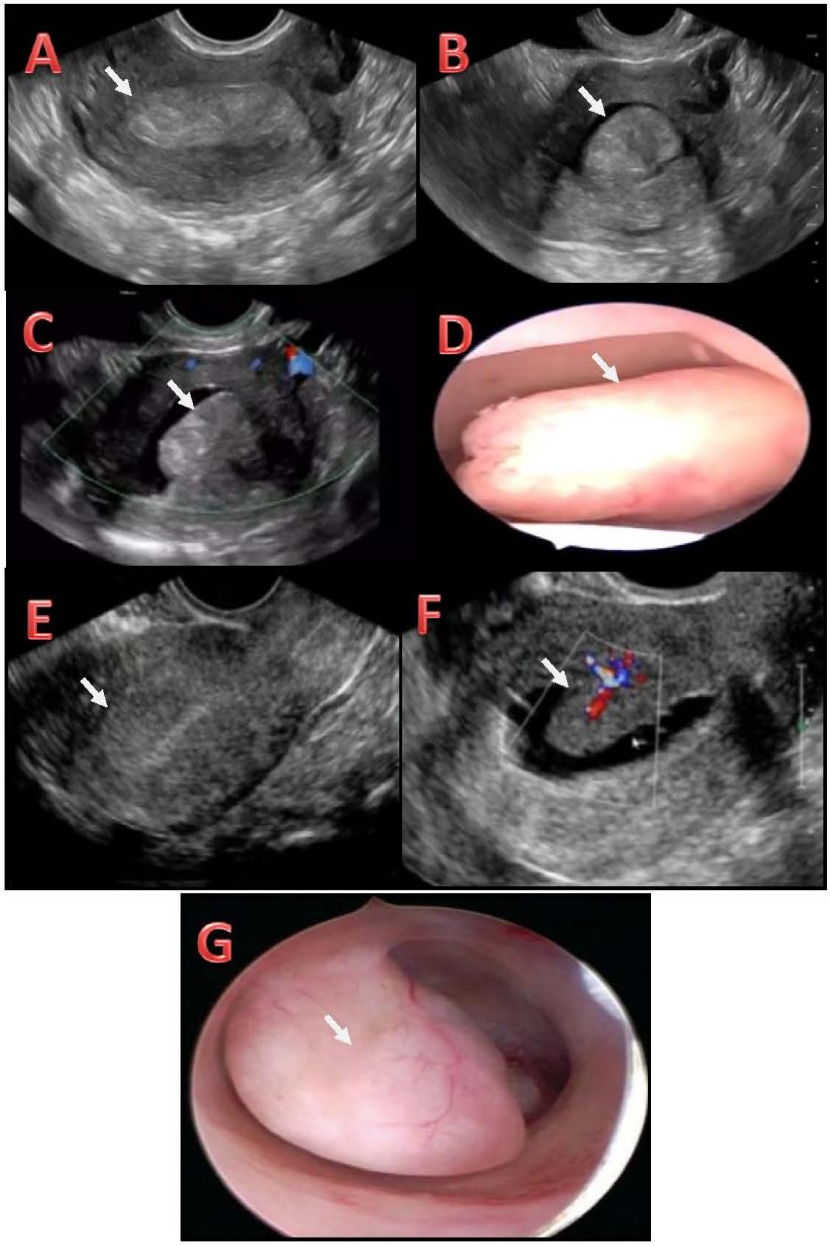

Figure (1): Endometrial polyp (Two cases). The 1st case (A:D) for 36 years old female was

complaining of menorrhagia. A (Trans-vaginal sonography) shows thickened hyperechoic endometrium (25mm in its maximum thickness). B & C (Sonohysterography) show a well-defined smooth outline hyperechoic intra-uterine mass 24x45mm. D (Vaginal diagnostic hysteroscopy) shows long endometrial polyp with a narrow base. The 2nd case (E:G) for 30 years old female was complaining of primary infertility. E (Trans-vaginal sonography) shows thickened hyperechoic endometrium (18mm in its maximum thickness). F (Sonohysterography with color Duplex scanning) show a well-defined smooth outline hyperechoic intra-uterine mass 19x33mm with a broad base and single feeding artery sign. G (Vaginal diagnostic hysteroscopy) shows endometrial polyp with a broad base.

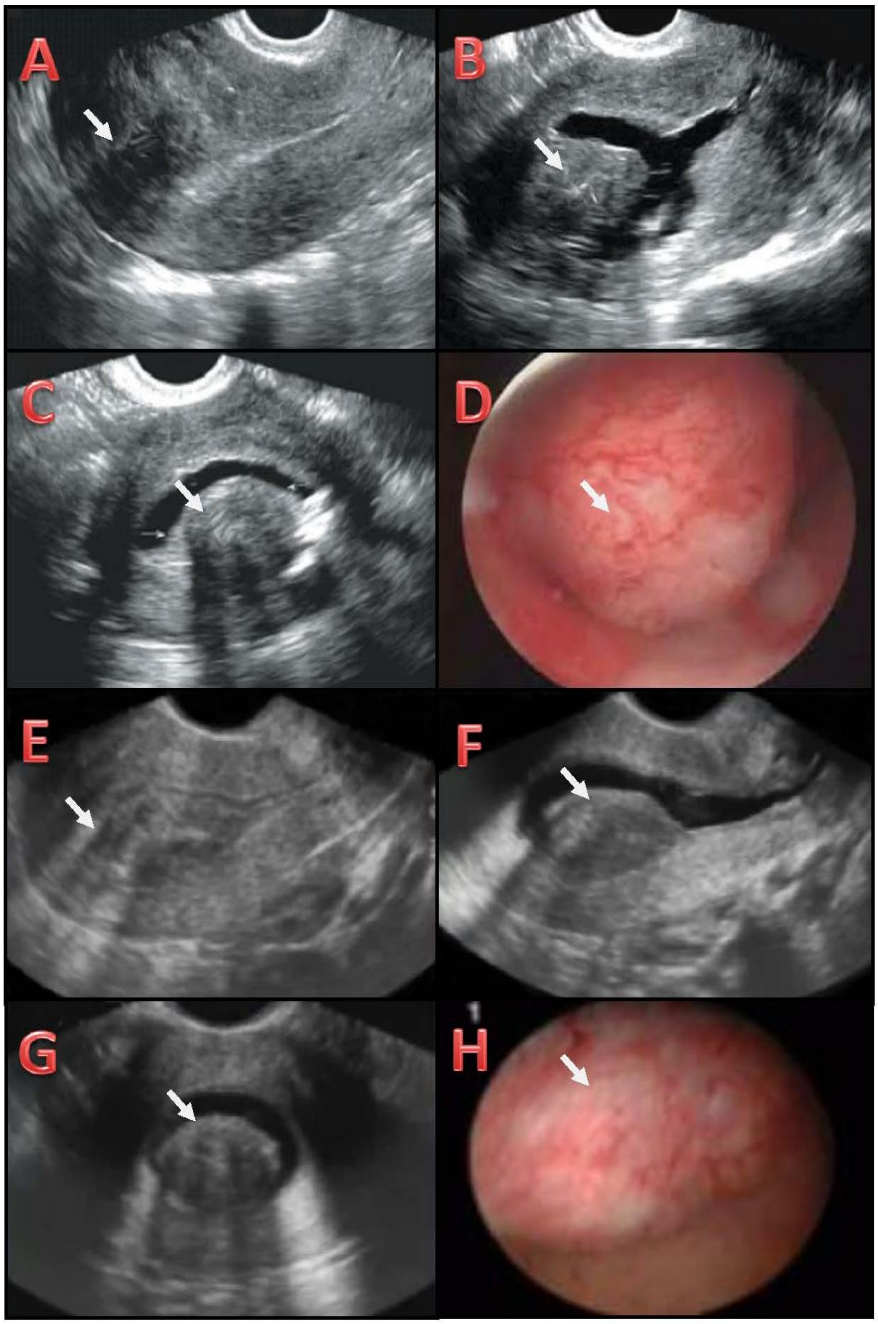

Figure (2): Submucosal leiomyoma (Two cases). The 1st case (A:D) for 28 years old female was complaining of irregular vaginal bleeding. A (Trans-vaginal sonography) shows ill-defined hypoechoic myometrial mass 25x31mm. B & C (Sonohysterography) show a well-defined smooth outline hypoechoic myometrial mass with posterior acoustic shadowing and intact overlying

endometrial lining arising from the uterine fundus. D (Vaginal diagnostic hysteroscopy) shows submuocosal fibroid. The 2nd case (E:H) for 32 years old female was complaining of menorrhagia. E (Trans-vaginal sonography) shows ill-defined hypoechoic myometrial mass 20x30mm. F & G (Sonohysterography) show a well-defined smooth outline hypoechoic myometrial mass with posterior acoustic shadowing and intact overlying endometrial lining arising from the posterior uterine wall. H (Vaginal diagnostic hysteroscopy) shows submuocosal fibroid.

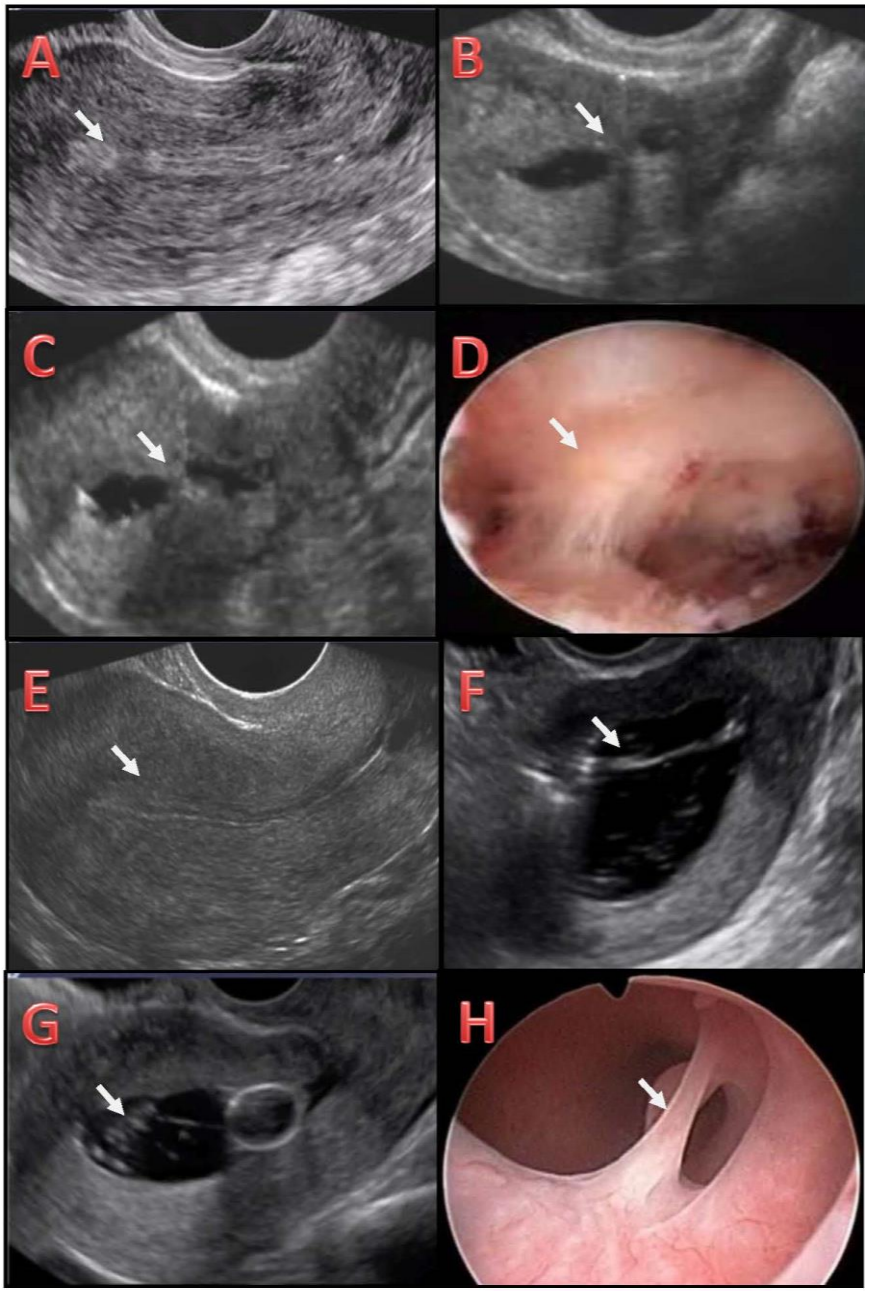

Figure (3): Intra-uterine adhesions (Two cases). The 1st case (A:D) for 31 years old female was complaining of secondary infertility. A (Trans-vaginal sonography) shows loss of normal continuity of endometrial lining. B & C (Sonohysterography) show thick hyperechoic irregular band extending from the anterior and posterior uterine walls. D (Vaginal diagnostic hysteroscopy) shows thick uterine adhesive band. The 2nd case (E:H) for 34 years old female was complaining of secondary infertility. E (Trans-vaginal sonography) shows interrupted endometrium. F & G (Sonohysterography) show thin hyperechoic regular smooth band extending from the anterior and

posterior uterine walls. H (Vaginal diagnostic hysteroscopy) shows thin smooth uterine adhesive band.

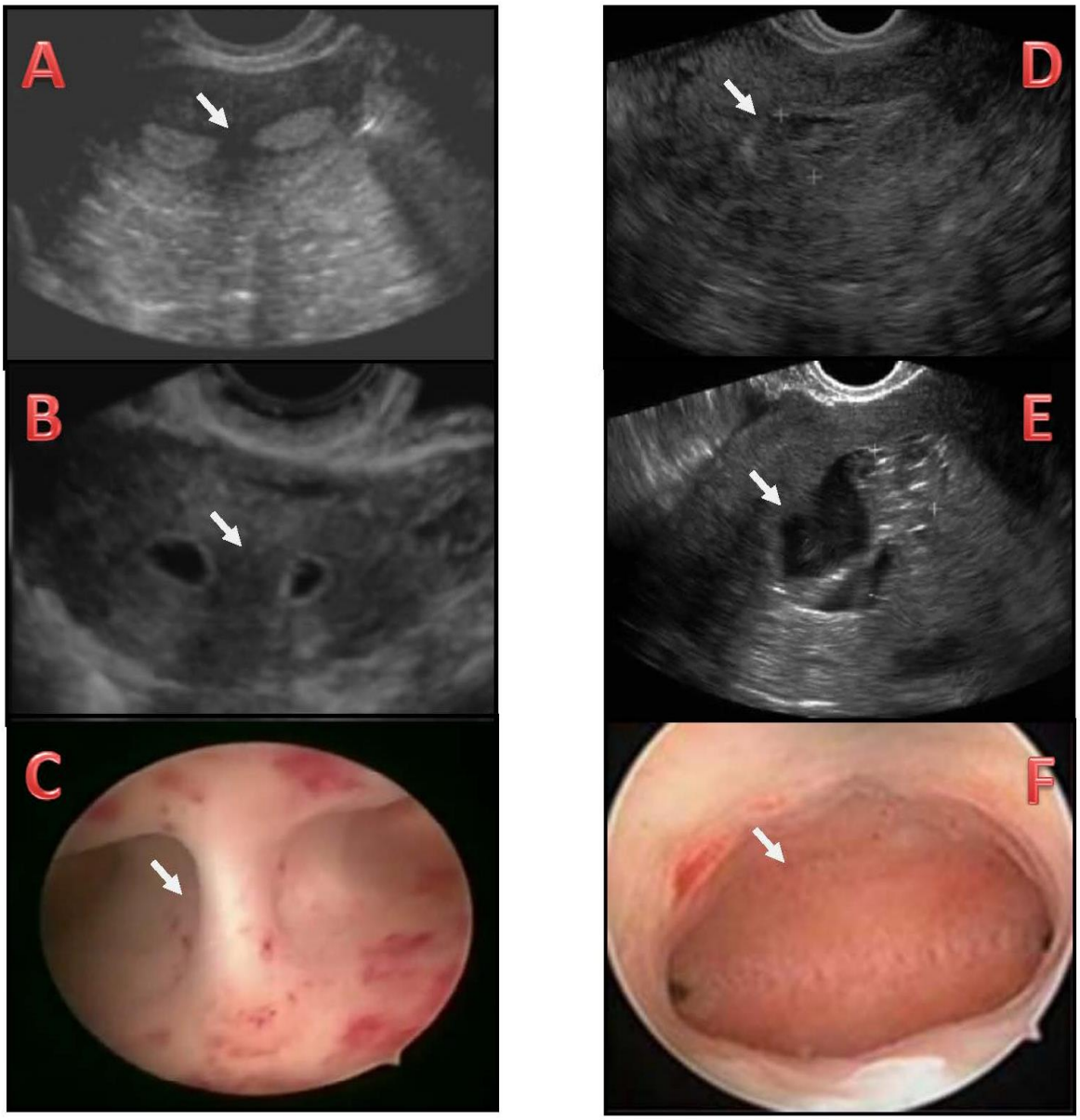

Figure (4): (A:C) Septate uterus. 24 years old female was complaining of primary infertility. A (T sonography) shows two hyperechoic endometrial lining. B (Sonohysterography) shows two separate endome filled with saline with smooth regular contour and isoechoic (myometrial) septum. C (Vaginal diagnostic hy shows septate uterus. **(D:F) Intra-uterine blood clot**. 32 years old female was complaining of irregular vagi D (Trans-vaginal sonography) shows ill-defined mixed echogenicity intra-uterine mass. E (Sonohysterograph echogenic mass that movable when moving the catheter and installing saline (blood clot). F (Vagina hysteroscopy) shows normal uterine cavity.

DISCUSSION

Our sonohysterography abnormal findings were; endometrial polyp (30.3%), increased endometrial thickness (30.3%), sub-mucous leiomyoma (24.3%) and intra-uterine septum (15.1%). This was accepted with Khan F et al [12], who showed that SHG was done for 101 patients, where polyps were seen in 60 patients (60%), submucosal fibroids in 17 patients (17%), normal cavity in 8 patients (8 percent). In the same study; SHG was not performed in six patients (6%); among these six patients, three patients (3%) were unable to insert the catheter due to cervical stenosis, one

(1%) patient rejected SHG, one (1%) had marked vaginal adhesions, and one (1%) had a large cervical polyp masking the external cervical os [12]; this was consistent with our study; where sonohysterography failed in 3 women.

Sonohysterography (SHG) improves the endometrial visualization obtained by standard transvaginal ultrasonography. To properly evaluate the endometrium, it acts as a supplemental technique to transvaginal ultrasound. In particular, it includes instilling sterile saline into the endocervical canal to improve the detection of endometrial anomalies, further detecting possible lesion initially identified by conventional transvaginal ultrasound, and determining anatomical causes of infertility, such as submucosal myomas, endometrial polyps, uterine anomalies and intrauterine adhesions. Distension of the endometrial cavity in patients with endometrial stripes may enable the radiologist to better visualize and characterize uterine lesions [8].

In a study done by Sinha P et al [10]; hysteroscopy was able to diagnose 53.6% presented with abnormal uterine pathology, it diagnosed polyps in 16.1%, submucous fibroma in 10.7%, necrotic mass in 7.1%, adhesion 5.4%. Another research by Khan F et al [12] found that 58 patients who underwent hysteroscopy had healthy cavities in 3 patients (3%), endometrial polyps in 40 patients (39%), submucous fibroids in 13 patients (13%), a blurred cavity in 1 patient (1%), and endometrial thickening in 1 patient (1 percent). Both studies agreed with our hystrosecopic finding; where 13.3% of patients were normal and 86.7% had abnormal finding in form of endometrial polyp (26.7%), increased endometrial thickness (17.8%), submucous leiomyoma (20%), uterine adhesion (13.3%) and uterine septum (8.9%).

Our histopathology results were in contrast to those of Khan F et al [12], where histopathology obtained in 59 patients. The histopathology results were obtained by curetting the endometrium on hysteroscopy for 57 patients while hysterectomy was done for two patients. Four patients (7 percent) had proliferative endometrium, 39 patients had endometrial polyps (66 percent), 14 patients had submucous fibroids (24 percent) and 2 patients had hyperplasia. Of the 39 polyps confirmed by histopathology, 2 were found to be uterine adenocarcinoma (5 percent). The findings of histopathology were then separately correlated with the results of SHG and hysteroscopy [12].

Our statistical study was equivalent to the AAGL guidelines [13] where SHG has sensitivity range of 58 : 100 percent, specificity range of 35 : 100 percent, PPV range of 70 : 100 percent and NPV range of 83 : 100 percent, compared to hysteroscopically guided biopsy. The addition of intrauterine contrast (with or without 3D imaging) to sonography increases its ability to detect endometrial polyps. For diagnosing endometrial polyps, several studies documented no observable difference between SHG and hysteroscopy. SHG benefits include the evaluation of both uterine cavity and other pelvic structures and the ability to detect tubal patency [13].

Our findings were also similar with the earlier systematic review performed by Vroom AJ et al [14], who recorded 86.5 percent sensitivity and 91.1 percent specificity for SHG in endometrial polyp diagnosis. In their meta-analysis, de Kroon CD et al [15] also stated that the feasibility of saline contrast hysterosonography was 93 percent.

Fifty patients with irregular uterine bleeding were included in another study by Dijkhuizen FB et al [16]; their histological analysis showed normal endometrial histology in 27 patients, submucous myomas in 13 patients, and endometrial polyps in 10 patients. In their study; TVS sensitivity and specificity were 61 percent & 96 percent respectively; while SHG sensitivity and specificity were 100% & 85%, respectively; fore precisely detecting uterine cavity lesions. SHG did not miss any of these lesions [16].

The diagnostic performance of hysteroscopy in this study was in contrary to Garuti G et al [17], who reported a sensitivity of 95.3 percent and a specificity of 95.4 percent for hysteroscopy in endometrial polyp

detection, while it was in agreement with Tandulwadkar S et al [18] showed that sensitivity and specificity of hysteroscopy in diagnosing endometrial hyperplasia, submucous leiomyoma and endometrial polyp were 100% and 100% respectively; while for endometrial carcinoma sensitivity and specificity were 87.5 % & 98.1 % respectively and this shows the highxly efficacy of hysteroscopy in diagnosing of endometrial pathology. In Maiti G et al [19] hysteroscopy showed 93.3 % sensitivity and 100 % specificity in diagnosing endometrial polyp, 100% sensitivity and specificity in diagnosing submucous fibroid, 75% sensitivity and 100% specificity in diagnosing endometrial hyperplasia in postmenopausal bleeding and 50% sensitivity and 100% specificity in diagnosing endometrial carcinoma.

In a prospective study by Bonnamy L et al [20], it was concluded that sonohysterography could reduce 30 percent of hysteroscopy prior to any surgical intervention. Many recent articles have reported the high diagnostic performance of SHG and it has been concluded that SHG can replace diagnostic hysteroscopy [21]. It is now generally accepted that SHG is the primary technique for the endometrial pathology assessment; after which; the patient may be referred to the appropriate therapeutic option [22-24].

Sonohysterography was superior to vaginal sonography for the diagnosis of endometrial polyps and submucous fibroids; thus, it should be regarded as an intermediate investigation technique to determine uterine pathology and verify the diagnosis; while hysteroscopy should be reserved if a therapeutic intervention is warranted. In 50 percent of women, hysteroscopy had normal results, so it is considered not only costly and invasive, but also unnecessary procedure, this suggesting sonohysterography as an initial alternative method in evaluating women with irregular uterine bleeding [25].

A total of 2228 women were included in a meta-analysis conducted by Dedhia J et al [26] that compared sonohysterography with hysteroscopy. Sonohysterography sensitivity and specificity for uterine cavity assessment were 95% and 88 % respectively. This meta-analysis indicated that sonohysterography was an excellent mean for assessing the endometrial cavity in females with irregular uterine bleeding in pre- and postmenopausal women, and this was consistent with our study findings.

For a suspected female patient with uterine cavity abnormality, on behalf of our study, we suggest firstly gynecological evaluation and clinical reviewing of the patient presentation, either irregular uterine bleeding or primary or secondary infertility. The second step is imaging by vaginal sonography with sonohysterography. If imaging is able to detect the cause of abnormal uterine bleeding or infertility in the form of endometrial polyp, uterine leiomyoma, endometrial hyperplasia, intra-uterine adhesion, uterine congenital anomalies or malignancy; therapeutic management is immediately started without the need for hysteroscopy. While the sonohysterography is unsuccessful, contraindicated, denied by the patient, or if the procedure reveals normal uterine cavity and the patient is still complaining, the vaginal hysteroscopy is done to reach the final diagnosis.

The shortcomings of our research included the limited sample size, some patients refusing to conduct the technique, noncompliance of some patients to complete the protocol, failure to insert the catheters in some patients due to abnormal uterine position, cervical stenosis or severe narrowing, cervical scarring, air injection, and uterine cavity non-distension due to saline leakage into the vagina. Cervical dilatation may be required to in extreme cervical stenosis. Also a guide wire can be passed via the cervical os and then pass the catheter over the guide wire without a balloon tip. By shifting the handle of the speculum up or down, we adjusted the toe of the speculum to alleviate catheter insertion difficulties, thereby adjusting the angle of entry to the cervix; this also makes effective catheter insertion. Distension of the endocervical canal was accomplished by the

catheter balloon's synchronous gentle collapse while slowly instilling fluid into the canal while retracting or passively slipping the catheter out of the uterus. Accidental air injection causes an echogenic artifact; it can be overcome before the procedure by flushing the catheter with saline. Uterine cavity under distension due to backflow of injected saline from around the balloon may mask of endometrial pathology. This can be overcome via gentle retraction of the inflated catheter balloon to occlude the internal cervical os. Balloon hyperinflation may also mask the underlying pathology, so the balloon was needed to be relocated or partially deflated to solve this issue. No complications have been recorded on over distension of the endometrial cavity.

SHG may be combined with guided endometrial biopsies in future studies, thus further enhancing the sensitivity and specificity of the procedure. The new ultrasound-guided biopsy technique has promising results [27].

CONCLUSION

Sonohysterography is less invasive, quick, causes less discomfort, costs less to perform, and carries no risk of perforation; so it can be offered as a first-line diagnostic tool for uterine abnormality assessment. Using its optimal techniques, enable more precise characterization of different endometrial abnormalities. This decreases the costly need for hysteroscopy which induces more discomfort for the women concerned.

Conflict of interests: Non

Financial disclosure: Non

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