

Saline Infusion Sonography Versus Hysteroscopy in Postmenopausal Bleeding

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Abstract

Postmenopausal bleeding (PMB) is bleeding from the vagina that occurs after a woman has stopped having regular menstrual periods due to menopause. Diagnostic tools in postmenopausal women with abnormal uterine bleeding are TVS, SIS, hysteroscopy and biopsy for histopathological examination. To compare diagnostic accuracy of saline infusion sonography with hysteroscopy in detecting intracavitary abnormalities in postmenopausal women with abnormal uterine bleeding. This prospective observational comparative study was conducted at Department of Obstetrics and Gynecology, Benha University Hospitals on 50 female patients complaining of PMB. All patients were subjected to full history taking, examination, transvaginal ultrasonography and routine preoperative investigations. In operation room under general anesthesia, patients were undergoing SIS then hysteroscopy. Biopsy was taken and sent for histopathological examination. Most commonly encountered endometrial lesions were hyperplasia (52%), myoma (16%), polyp (12%) and atrophy (12%). Diagnostic accuracy of hysteroscopy in detection of submucosal myoma was better than SIS and TVS with respect to pathological diagnosis. There was an agreement between SIS and hysteroscopy in the diagnosis of polypoid lesions of uterine cavity with sensitivity and specificity of 100%, being more accurate than TVS. The diagnostic accuracy of SIS in the detection of endometrial hyperplasia was better than hysteroscopy and better than TVS with respect to pathological diagnosis. Hysteroscopy has the highest diagnostic accuracy for diagnosing endometrial pathology. SIS may be used as the primary method for the detection of uterine abnormalities among postmenopausal women with abnormal uterine bleeding.

Keywords: Postmenopausal bleeding, Saline infusion sonography, Hysteroscopy.

1. Introduction

Postmenopausal bleeding (PMB) refers to an episode of bleeding in a woman who had amenorrhea for at least 12 months. It occurs in up to 10% of women over 55 years of age [1].

The most common causes of postmenopausal bleeding are benign and include vaginal or endometrial atrophy, cervical polyps, and submucosal fibroids. However, it is estimated that the prevalence of endometrial carcinoma is about 10% of women with PMB and vaginal bleeding is the presenting symptom in 90% of women with endometrial cancer [2].

Most common modalities used to assess anatomic causes of abnormal uterine bleeding (AUB) are endometrial biopsy, curettage, transvaginal sonography (TVS) and hysteroscopy. Transvaginal ultrasonography is highly applicable, non-invasive and preferred initially in evaluation of women with abnormal uterine bleeding [3].

However, the accuracy of transvaginal sonography is limited in the diagnosis of focal endometrial lesions. This can be overcome by saline infusion sonography; which refers to a procedure in which fluid is instilled into the uterine cavity transcervically to provide enhanced endometrial visualization during transvaginal ultrasound examination. The technique improves sonographic detection of endometrial pathology, such as polyps, hyperplasia, cancer, leiomyomas, and adhesions. In addition, it can help avoid invasive diagnostic procedures in some patients as well as optimize the preoperative triage process for those women who require therapeutic intervention. It is easily and rapidly performed at minimal cost, well-tolerated by patients, and is virtually devoid of complications [4].

Hysteroscopy directly evaluates the uterine cavity which is a reliable method for investigating women with

abnormal uterine bleeding and is easy to perform and widely available in our setup. Hysteroscopy can accurately detect endometrial hyperplasia, endometrial polyp, submucosal myoma and endometrial atrophy [5].

The aim of this study is to compare the diagnostic accuracy of saline infusion sonography with hysteroscopy in detecting intra-cavitary abnormalities in postmenopausal women with abnormal uterine bleeding.

2. Patients and methods

This prospective interventional comparative study was conducted at the department of Obstetrics and Gynecology, Benha University Hospitals during the period starting between January 2018 and January 2020.

This study was carried out on 50 female patients complaining of postmenopausal bleeding, to compare the diagnostic accuracy of saline infusion Sonohysterography to hysteroscopy in detecting intra-cavitary abnormalities in cases of postmenopausal bleeding.

Inclusion criteria

- Women with postmenopausal bleeding defined as any bleeding occurring 12 months after permanent cessation of menses.
- Women with suspected intracavitary lesions by 2DUltrasound.
- Women did not take hormone replacement therapy.

Exclusion criteria

- Patients with known present or past history of genital tract malignancy.
- Vaginal or cervical cause of bleeding.
- TVS showing adnexal pathology.
- Women with active pelvic infections.
- Patient receiving hormone replacement therapy.

- Bleeding due to coagulopathies.
- Bleeding due to systemic diseases.

Methods

All patients were subjected to:

- Full history taking (personal history, obstetric history, menstrual history and medical and surgical history)..
- General and pelvic examination.
- Ultrasound. Transvaginal ultrasonography was done to detect any uterine or adnexal lesions using 7.5 MHz vaginal probe (Voluson 730 PRO V, GE Healthcare, USA).
- Routine laboratory investigations including complete blood count (CBC), coagulation profile, urea, creatinine, liver function tests, ECG and echocardiography.

In operation room under general anesthesia, patients were undergoing: Saline infusion (SIS): Patient was in lithotomy position. And under complete aseptic precautions. Cervix was exposed by a standard bivalve vaginal speculum (sims) that was inserted into the vagina and the cervix was cleaned and anterior lip was grasped by vulsellum. A sterile disposable balloon catheter (size Ch 08) was introduced into the cervical orifice until it reached the fundus and fixed in place with 1.5-2 ml saline inflation of its balloon to prevent backflow of the infused saline. The speculum was then withdrawn and TVS probe introduced. 50 ml sterile syringe was attached to the catheter and slow infusion of 20-25 ml saline was done until the intrauterine cavity was clearly observed. Uterine cavity was evaluated in coronal and sagittal views). The catheter of SIS was deflated and removed to perform hysteroscopy. Biopsy was then taken and sent for histopathological examination.

Statistical analysis

The Data were collected and statistically analyzed using The Statistical Package for Social Sciences (SPSS, Chicago, USA) software version 15.0 for Windows. The collected data were expressed as “mean \pm standard deviation (SD)”and range for quantitative data and as frequency and percentage (%)for qualitative data where appropriate. The sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV) and the area under the ROC curve were calculated by comparing the results of each of the methods with those obtained by pathological diagnosis as the gold standard. The 95% CI for all parameters was also calculated. The diagnostic accuracy was calculated for each uterine disease separately.

3. Results

Table (1) shows that the age of the studied group ranged between 45 and 63 years with a mean of 51.64 (± 5.16) years. The average parity was 3.32 (± 1.66) and ranged from zero to 7. The duration of menopause among the studied group ranged between one and ten years with an average of 3.36 (± 2.88) years. The mode of delivery reported by the studied women was only NVD

in 62.5%, both NVD and CS in 12.5% and only CS in 25%.

The frequency distribution of intra-uterine abnormalities as identified by US, SIS, hysteroscopy and biopsy is demonstrated in Fig (1). On biopsy, 12% had atrophic endometrium, 52% had hyperplasia (both alone and with other abnormalities), 16% had myoma (both alone and with other abnormalities) and 12% had polyp.

Table (2) shows the diagnostic performance of US for intrauterine abnormalities as compared to biopsy as a gold standard diagnostic method. The prevalence of atrophic endometrium using US was 12%, the sensitivity, specificity, Positive Predictive Value (PPV) and Negative Predictive Value (NPV) were 100%, 95.5%, 75% and 100% respectively. The prevalence of uterine hyperplasia was 54%, the corresponding sensitivity, specificity, PPV and NPV were 80.77%, 75%, 77.78% and 78.26% respectively. The prevalence of myoma was 16%, and the sensitivity, specificity, PPV and NPV were 50%, 76.2%, 28.6% and 88.9% respectively. The prevalence of uterine polyps was 12%, the sensitivity, specificity, PPV and NPV were 66.67%, 95.45%, 66.67% and 95.45% respectively.

Table (3) shows the diagnostic performance of SIS for intrauterine abnormalities as compared to biopsy as a gold standard diagnostic method. The prevalence of atrophic endometrium using SIS was 12%, the sensitivity, specificity, PPV and NPV were 100.0%, 97.7%, 85.7% and 100.0% respectively. The prevalence of uterine hyperplasia was 50%, the corresponding sensitivity, specificity, PPV and NPV were 92.31%, 95.83%, 96% and 92% respectively. The prevalence of myoma was 16%, and the sensitivity, specificity, PPV and NPV were 50%, 95.24%, 66.67% and 90.91% respectively. The prevalence of uterine polyps was 12%, the sensitivity, specificity, PPV and NPV were 100%, 86.4%, 50% and 100% respectively.

Table (4) shows the diagnostic performance of hysteroscopy for intrauterine abnormalities as compared to biopsy as a gold standard diagnostic method. The prevalence of atrophic endometrium using hysteroscopy was 12%, the sensitivity, specificity, PPV and NPV were 100.0%, 97.7%, 85.7% and 100.0% respectively. The prevalence of uterine hyperplasia was 52%, the corresponding sensitivity, specificity, PPV and NPV were 88.46%, 87.5%, 88.46% and 87.5% respectively. The prevalence of myoma was 16%, with a perfect diagnostic performance (100%). The prevalence of uterine polyps was 12%, the sensitivity, specificity, PPV and NPV were 100%, 95.5%, 75% and 100% respectively.

Fig (2) shows a comparison of the diagnostic performance of US, SIS and hysteroscopy for the detection of atrophic endometrium against uterine biopsy as a gold standard test. There were no significant differences between the different methods. The Area Under the Curve (AUC) was 0.9773, 0.9886 and 0.9886 for US, SIS and hysteroscopy, respectively.

Fig (3) shows a comparison of the diagnostic performance of US, SIS and hysteroscopy for the

detection of uterine hyperplasia against uterine biopsy as a gold standard test. SIS examination had the highest diagnostic performance with AUC = 0.9407 compared to US and hysteroscopy (0.8826 and 0.7386 respectively).

Fig (4) shows a comparison of the diagnostic performance of US, SIS and hysteroscopy for the detection of myomas against uterine biopsy as a gold standard test. Hysteroscopy is a perfect diagnostic

method for myomas followed by SIS (AUC=0.7262) and US (AUC=0.631).

Fig (5) shows a comparison of the diagnostic performance of US, SIS and hysteroscopy for the detection of uterine polyps against uterine biopsy as a gold standard test. Hysteroscopy had the highest diagnostic performance with AUC = 0.9773 compared to SIS and US (0.9318 and 0.8106 respectively).

Table (1) Characteristics of the study population.

Variable	No.=50	
Age (years)	51.64±5.16; (45-63)	
Mean ± SD; (range)		
Parity	3.32±1.66; (0-7)	
Mean ± SD; (range)		
Mode of delivery*	NVD	30 (62.5)
N (%)	1 NVD & 2 CS	2 (4.17)
	2 NVD & 1 CS	4 (8.33)
	1 CS	4 (8.33)
	2 CS	2 (4.17)
	3 CS	4 (8.33)
	4 CS	2 (4.17)
Duration of menopause (years)	3.36±2.88; (1-10)	
Mean ± SD; (range)		

*No.=48 as two patients were nulliparous.

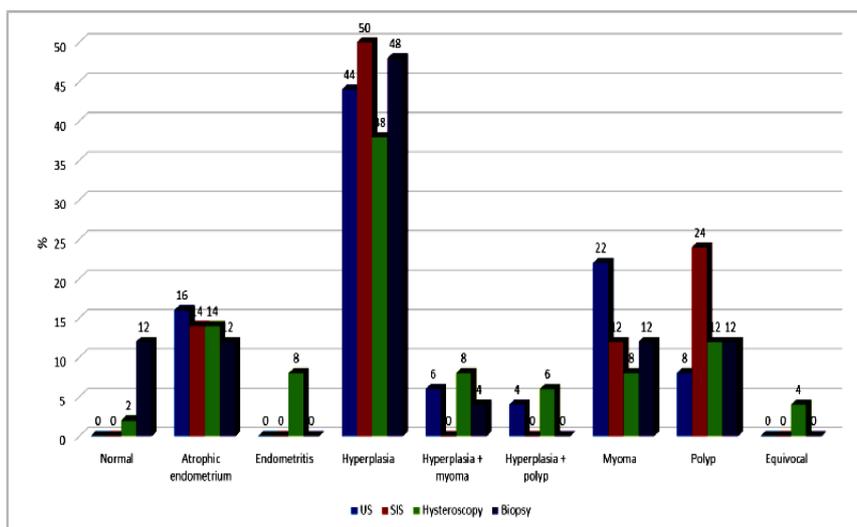


Fig (1) Frequency distribution of intrauterine abnormalities detected by US, SIS, hysteroscopy and biopsy.

Table (2) Diagnostic performance of US compared to biopsy as a gold standard test (n=50).

	Atrophic endometrium	Hyperplasia	Myoma	Polyp
Prevalence (%)	12.0	52.0	16.0	12.0
Sensitivity (%)	100.0	80.77	50.0	66.67
Specificity (%)	95.5	75.0	76.2	95.45
Positive Predictive Value (%)	75.0	77.78	28.6	66.67
Negative Predictive Value (%)	100.0	78.26	88.9	95.45
Area Under the Curve	0.9773	0.7788	0.631	0.8106
Correctly Classified (%)	96.0	78.0	72.0	92.0

Table (3) Diagnostic performance of SIS compared to biopsy as a gold standard test in postmenopausal women.

	Atrophic endometrium	Hyperplasia	Myoma	Polyp
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Prevalence (%)	12.0	52.0	16.0	12.0
Sensitivity (%)	100.0	92.31	50.0	100.0
Specificity (%)	97.7	95.83	95.24	86.4
Positive Predictive Value (%)	85.7	96.0	66.67	50.0
Negative Predictive Value (%)	100.0	92.0	90.91	100.0
Area Under the Curve	0.99	0.9407	0.7262	0.9318
Correctly Classified (%)	98.0	94.0	88.0	88.0

Table (4) Diagnostic performance of hysteroscopy compared to biopsy as a gold standard test.

	Atrophic endometrium	Hyperplasia	Myoma	Polyp
Prevalence (%)	12.0	52.0	16.0	12.0
Sensitivity (%)	100.0	88.46	100.0	100.0
Specificity (%)	97.7	87.5	100.0	95.5
Positive Predictive Value (%)	85.7	88.46	100.0	75.0
Negative Predictive Value (%)	100.0	87.5	100.0	100.0
Area Under the Curve	0.99	0.8798	1.00	0.9773
Correctly Classified (%)	98.0	88.0	100.0	96.0

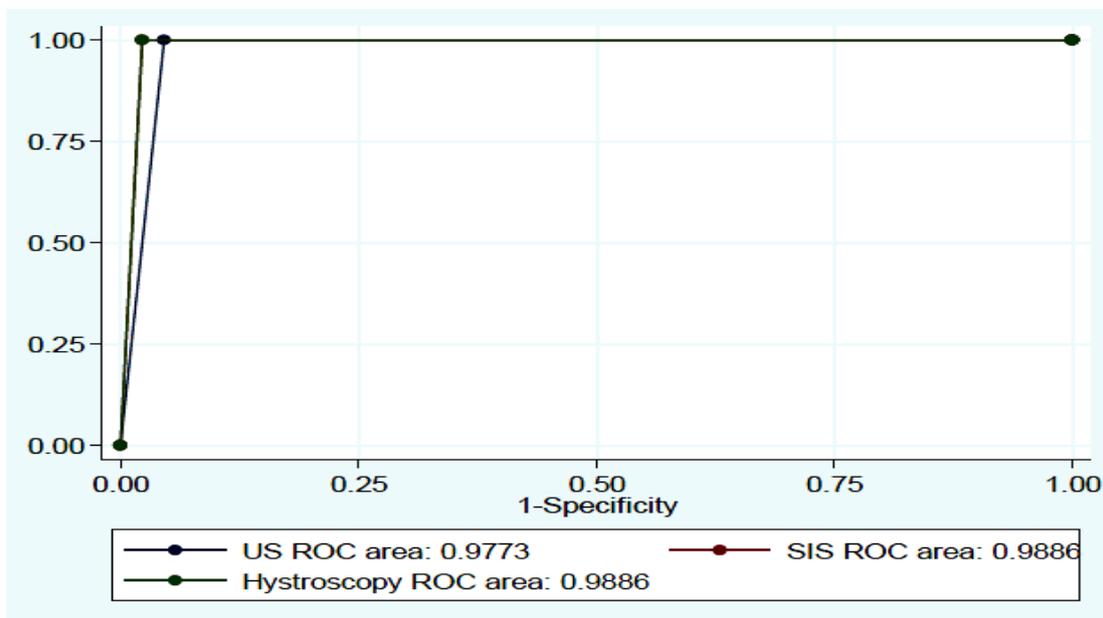


Fig (2) Receiver Operator Characteristic (ROC) curves of US, SIS and hysteroscopy for the diagnosis of Atrophic endometrium.

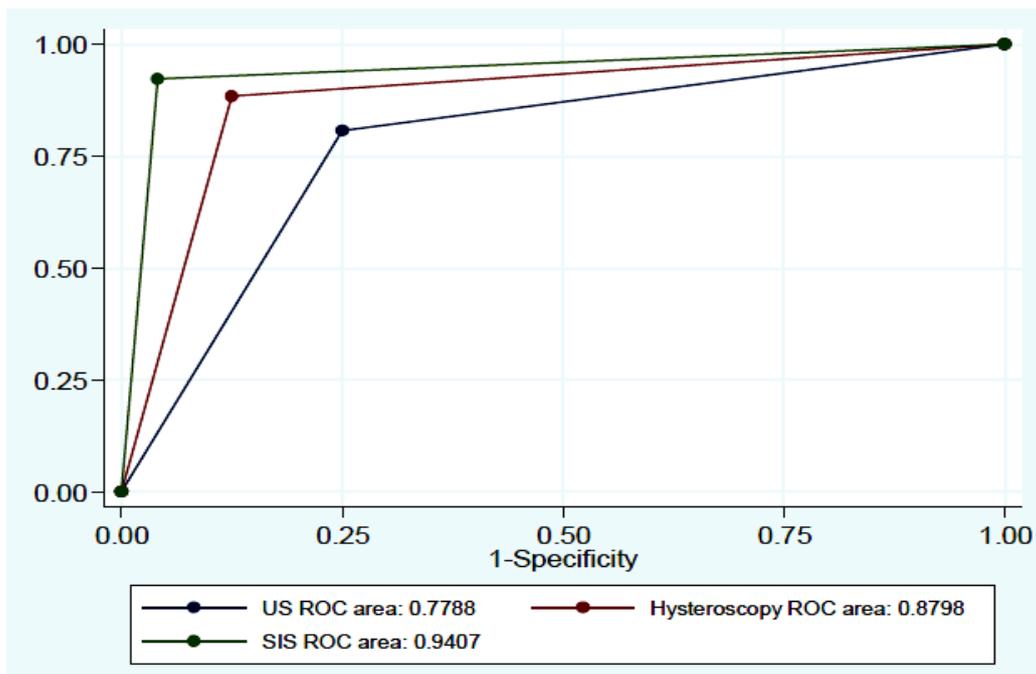


Fig (3) Receiver Operator Characteristic (ROC) curves of US, SIS and hysteroscopy for the diagnosis of uterine hyperplasia

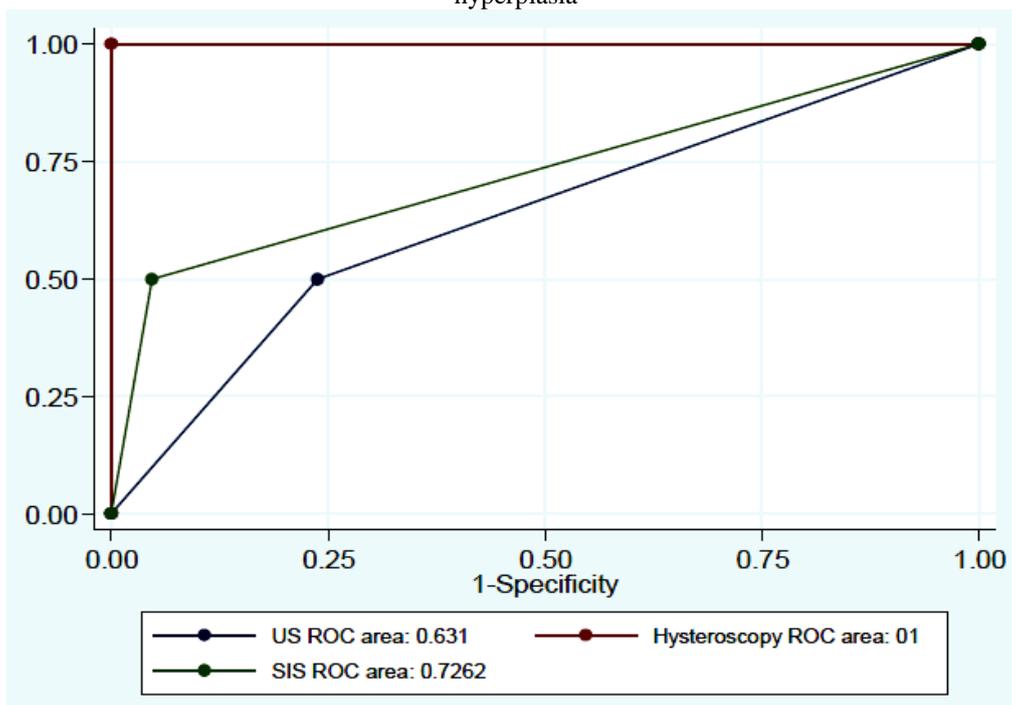


Fig (4) Receiver Operator Characteristic (ROC) curves of US, SIS and hysteroscopy for the diagnosis of myomas.

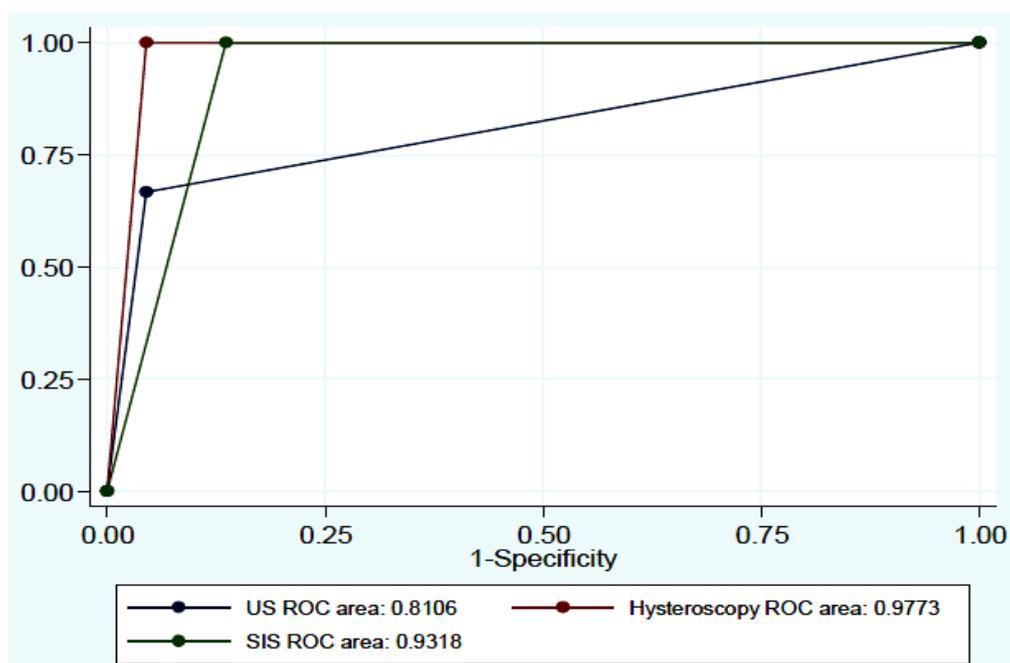


Fig (5) Receiver Operator Characteristic (ROC) curves of US, SIS and hysteroscopy for the diagnosis of uterine polyps.

4. Discussion

Use of TVS with SIS in the evaluation of thickened endometrium has been considered a useful screening tool for uterine abnormality in patients experiencing postmenopausal bleeding. Our data are in accordance with past studies reporting an agreement between SIS and hysteroscopy in the diagnosis of polypoid lesions of uterine cavity with sensitivity and specificity 100% for both, being more accurate than TVS (sensitivity and specificity of 66.67% and 95.45% respectively).

In a study done by Dimitriu et al. [6], hysteroscopy was more sensitive (98.7% vs. 97.4%), more specific (100% vs. 99.1%), and more accurate (99.5% vs. 98.4%) than SIS. In addition, hysteroscopy had higher predictive values, 100% PPV and 99.1% NPV versus 98.7% PPV and 98.2% NPV for SIS in diagnosis of uterine cavity abnormalities. However, these differences were not statistically significant.

Balić and Balić [7] concluded that the specificity of hysteroscopy in the diagnosis of endometrial polyp was 92.3% compared to 56.4% TVS, while the sensitivity was identical (100%). They concluded that the sensitivity of TVS in the diagnosis of endometrial hyperplasia was 86.4% compared to 22.7% for hysteroscopy, while the specificity was identical (100%). In addition, they concluded that hysteroscopy is more reliable in diagnosis of uterine cavity abnormalities than TVS.

The diagnostic accuracy of hysteroscopy in the detection of submucosal myoma (diagnostic performance of 100%) was better than SIS (sensitivity of 50%, specificity of 95.24%) and TVS (sensitivity of 50% and specificity of 76.2%) with respect to pathological diagnosis.

Likewise, the diagnostic accuracy of SIS in the detection of endometrial hyperplasia (sensitivity of 92.31%, PPV of 96%) was better than hysteroscopy

(sensitivity and PPV of 88.46%) and better than TVS (sensitivity of 80.77% and PPV of 77.78%) with respect to pathological diagnosis.

Concerning endometrial atrophy, sensitivity and NPV were 100% for each method, while specificity was 95.5% for TVS and 97.7% for SIS and Hysteroscopy. PPV was 75% for TVS and 85.7% for both SIS and Hysteroscopy.

Due to the relative ease and accuracy of observing endometrial thickness and regularity, the use of hysteroscopy has been considered to evaluate endometrial thickness.

TVS has been reported to fail in differentiating between submucous myoma, endometrial polyp and proliferative endometrium or endometrial hyperplasia.

SIS goes well beyond TVS and is considered to be accurate and well tolerated. It allows more detailed visualization of the uterine cavity, in both longitudinal and transverse planes, for the presence of polyps, submucous fibroid, intrauterine synechia and foreign bodies.

In agreement with these statement, transvaginal sonography related sensitivity and PPV rates were markedly worse than those of SIS in the detection of polypoid lesions, myoma and the hyperplasia in our study, which may be associated with the difficulty of using TVS to define the diagnosis in case of thick, echogenic or heterogeneous endometrium.

TVS misdiagnosed uterine abnormalities leading to remarkable false negative results concerning polypoid lesions and also false positive results concerning hyperplasia compared with hysteroscopy and SIS. Accordingly the reliability of TVS to distinguish between many causes of thickened endometrium such as polyp, hyperplasia or even normal thickened endometrium has been questionable.

Data regarding the accuracy of SIS in the detection of submucosal myomas was not high. A study by Alborzi et al. [8] reported 100% sensitivity and negative predictive value for myoma by SIS.

Also, Karsidag et al. [9] found similar result for women with recurrent postmenopausal dilatation and curettage for intracavitary lesions and recommended SIS for initial evaluation.

Hysteroscopy as stated by Karsidag et al. [9] provided accurate description of the endometrial cavity, since a total agreement was shown between hysteroscopy and the biopsy as the gold standard in the diagnosis of polypoid lesions of the uterine cavity, with 100% accuracy.

However, as far as our results are concerned, SIS seems to be effective as hysteroscopy in the detection of endometrial abnormalities among postmenopausal women including endometrial atrophy, hyperplasia, myoma and polypoid lesions with the superiority to hysteroscopy.

When introducing an additional technique for improving diagnosis, the new technique must meet certain criteria including obvious advantage, comparable or superior results, lower risk and/or greater benefit and also mastery by the practicing physician. In this vein, meeting a criterion essential for a screening test, SIS has NPVs for endometrial hyperplasia 99.5% and polypoid lesions 95.7%, with diagnostic accuracy markedly superior to TVS but quite similar to hysteroscopy with respect to biopsy as the gold standard [10].

The accuracy of hysteroscopy and SIS in the detection of polypoid lesions was comparable and significantly better than TVS with respect to endometrial biopsy as a gold standard.

In addition, La Sala et al. [11] concluded that TVS could be used as a first step investigation to exclude uterine pathologies, and could reduce the number of hysteroscopies performed in women with a normal uterine cavity.

In conclusion, as an easy to perform, safe and well tolerated procedure yielding high diagnostic accuracy, saline infusion sonohysterography (SIS) via Foley catheter seems to be superior to TVS.

It may be regarded as a primary method in the detection of uterine abnormalities among postmenopausal women with abnormal uterine bleeding, including polypoid lesions, endometrial hyperplasia and submucosal myoma with respect to endometrial biopsy as the gold standard.

5. Conclusion

Among TVS, SIS and hysteroscopy, hysteroscopy has the highest diagnostic accuracy for diagnosing endometrial pathology. SIS is easy to perform, cheap, safe, can be quickly performed with minimal extra equipment as part of ultrasound examination and better tolerated by patients with high diagnostic accuracy, superior to TVS and close to hysteroscopy.

SIS can help in decision making regarding selection of cases for hysteroscopy and directed biopsy.

SIS may be used as the primary method for the detection of uterine abnormalities among postmenopausal women with abnormal uterine bleeding.

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