Original Article
Diagnostic value of hysteroscopy for myomas regarding the menopausal status

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Abstract: Objective: Transvaginal ultrasonography and hysteroscopy are frequently used methods to evaluate the uterine cavity in gynecology practice. We aimed to compare the diagnostic values of transvaginal ultrasonography and hysteroscopy in detecting submucous myomas while considering menopausal status. Material and methods: Two hundred twenty-four premenopausal and postmenopausal women who underwent both transvaginal ultrasonographic examination and hysteroscopy were included in this retrospective study. Endometrial samples were obtained during the hysteroscopy session. Both premenopausal and postmenopausal patients were assigned to one of the following four groups based on histopathologic diagnosis; polyps (n=128), myomas (n=42), normal endometrium (n=44) and others (n=10). Results: Transvaginal ultrasonography showed sensitivity, specificity, positive predictive value and negative predictive value of 50%, 97.2%, 72.7%, and 92.9%, respectively, for myomas among premenopausal women and 66.67%, 98.18%, 80%, and 96.43%, respectively, among postmenopausal women. Hysteroscopy showed sensitivity, specificity, positive predictive value and negative predictive value of 100%, 98.17%, 88.24% and 100%, respectively, for myomas among premenopausal women and 57.14%, 98.18%, 80%, and 94.74%, respectively, among postmenopausal women. In premenopausal patients, transvaginal ultrasonography exhibited lower specificity and sensitivity than hysteroscopy when detecting submucous myomas. Transvaginal ultrasonography exhibited higher sensitivity than and similar specificity to hysteroscopy in postmenopausal patients. Conclusions: Hysteroscopy is an effective and sufficient method for diagnosing submucous myomas in premenopausal patients. However, hysteroscopic evaluation may not always be sufficient in postmenopausal patients.

Keywords: Hysteroscopy, menopause, myoma, ultrasonography

Introduction

Abnormal uterine bleeding (AUB), postmenopausal bleeding, thickened endometrium and infertility are the most common clinical or incidental findings encountered by gynecologists. These conditions warrant further investigation of the uterine cavity. AUB is the single most common complaint and occurs in approximately 10% to 35% of women [1]. Transvaginal ultrasonography (TVU), saline infusion sonography (SIS) and hysteroscopy (HS) are frequently used to evaluate the uterine cavity in gynecologic practice. TVU is a simple initial investigation method that is widely used to diagnose uterine pathologies in routine gynecological examinations. Despite the development of ultrasonography techniques (2D and 3D), there are several disputes about their adequacy [2, 3]. SIS is a

minimally invasive, cost-effective and acceptable diagnostic procedure [4]. SIS helps to evaluate intracavitary structures more accurately than TVU. SIS can be used as the initial uterine cavity examination in women of reproductive age, with accuracy comparable to hysteroscopy [5].

Hysteroscopy has become the gold standard method for evaluation or treatment of the endometrial cavity, and allows for direct visualization and eye-directed sampling of the uterine cavity for many uterine conditions [6-8]. This method can be performed as office hysteroscopy for diagnosis and biopsy or as operative hysteroscopy for diagnosis, endometrial sampling and treatment. However, patient discomfort, pain and the necessity of general or local anesthesia are the main disadvantages of hysterosco-

py. The modality is also not cost-effective compared to TVU or SIS [9].

Both submucous myomas and endometrial polyps are common causes of heavy, irregular and prolonged menstrual periods [10]. They are also potential causes of subfertility and recurrent pregnancy loss [11]. With the development of operative hysteroscopy, an open surgical approach is no longer performed to treat these pathologies. Currently, they can be easily treated by transcervical hysteroscopic resection. However, complete resection of submucous myomas may not always be possible. The degree of protrusion of submucous fibroids into the uterine cavity and the size of the lesion's intramural component are important predictors of complete or incomplete hysteroscopicmyoma resection. The Wamsteker classification and the Lasmar classification are two currently available classifications for the difficulty of surgically treating submucous myomas [12, 13].

Accurate preoperative diagnosis of myomas is essential to increase complete resection rates. The purpose of our study is to compare the diagnostic values of TVU and hysteroscopy in detecting submucous myomas among premenopausal and postmenopausal women.

Materials and methods

This retrospective study was conducted in the department of Obstetrics and Gynecology, Faith Sultan Mehmet Training and Research Hospital, Istanbul, Turkey and approved by the human ethics committee of the hospital. We analyzed the medical records of 224 women who underwent both TVU examination and a successfully completed diagnostic or operative hysteroscopy between January 2014 and May 2015. Patient characteristics (age, gravidity, parity, previous abortion, fertility status, menopausal status, menopausal duration, tamoxifen treatment for previous breast cancer and hormone replacement therapy) were recorded. Menopause was defined as amenorrhea for longer than one year in women above the age of 45. The complaints of the patients were abnormal/irregular uterine bleeding in premenopausal women, postmenopausal uterovaginal bleeding, incidental finding of thickened endometrium, infertility and recurrent implantation failure.

TVU examination was performed using GE Logic 200 ultrasound equipment with a 6.5 MHz transvaginal transducer to evaluate the longitudinal and transverse planes of the uterus. Endometrial thickness was measured as a double layer measurement of both endometrial surfaces at the thickest part in the longitudinal view. Normal values for endometrial thickness in premenopausal women range from 4 to 8 mm in the proliferative phase and 8 to 14 mm in the secretory phase. In postmenopausal patients, thickened endometrium was classified as thickness equal to or higher than 4 mm. Myomas were defined as nonhomogeneous echogenic masses, while polyps were defined as simply homogenous echogenic masses.

Diagnostic hysteroscopy and operative hysteroscopy (if required) were performed under general anesthesia in cases where endometrial thickness, endometrial polyp, submucous myoma and fluid in the endometrial cavity were observed using TVU. Mannitol was used to irrigate and distend the uterine cavity. Endometrial and intracavitary tissues were collected for histopathological examination and final diagnosis either by dilatation and curretage or by resection of the lesions.

Diagnostic hysteroscopy was performed using a 5 mm rigid hysteroscope and 30° optic telescope. Operative hysterescopy was performed using a 10 mm rigid hysteroscope, 30° optic telescopes and a resectoscope. Lesion resection and endometrial sampling were performed by loop electrocautery that relied on a monopolar electrical current. Appearance of endometrial polyps was defined as sessile or pedunculated mucous or fibrous lesions covered by normal endometrium. submucous myomas were defined as intracavitary irregular, sessile or pedunculated lesions that distorted the regular cavity contour and were not covered by normal endometrium.

Final diagnoses were made by histopathological examination. Patients were divided into 4 groups based on their diagnoses: polypoid lesions, submucosal myomas, normal endometrium (proliferative, secretory and atrophic endometrium) or others (premalignant and malignant pathologies).

All statistical analysis was performed using the SPSS 22.0 statistical package. The Shapiro-

Table 1. Comparison of patient demographics based on histopathological diagnosis

	Histopathological Diagnosis					
	Polyps (n=128)	Myomas (n=42)	NE (n=44)	Others (n=10)	Total (n=224)	P
[1]Age (Year)	47±10.08	43.13±9.1	42.16±8.3	46.3±7.92	45±9.61	0.048
Menopausal Status n, %						
Premenopausal	75 (58.6%)	25 (59.5%)	37 (84.1%)	6 (60%)	143 (63.8%)	0.039
Postmenopausal	53 (41.4%)	17 (40.5%)	7 (15.9%)	4 (40%)	81 (36.1%)	
[1]Menopausal duration (Years)	8.35±5.96	3.57±3.1	4.71±4.3	4.25±4.27	7.11±5.7	0.036
[1]Gravidity	3.7±2.53	2.61±1.59	2.75±2.1	2.5±1.35	3.28±2.35	0.025
[1]Parity	2.7±1.67	2.22±1.28	1.98±1.5	1.8±0.79	2.44±1.6	0.008
[1]Abortus	0.74±1.39	0.35±0.65	0.45±0.7	0.6±0.84	0.62±1.17	0.476
[2]Infertility n, %	14 (10.9%)	5 (13.0%)	7 (15.9%)	1 (10%)	27 (12.0%)	0.568
[1]Endometrial thickness (mm)	11.3±4.27	12.43±5.38	10±4.2	13±3.56	11.22±4.4	0.066
[1]Length of hospital stay (Days)	1.11±0.17	1.51±0.39	1.09±0.3	1±0	1.06±0.26	0.026

[1]Kruskal Wallis Test (Mean ± SD). [2]Chi-square test (NE: Normal Endometrium).

Table 2. Diagnostic value parameters of TVU, hysteroscopy and combined approach in diagnosing uterine pathologies in premenopausal women

	Sensitivity	Specificity	PPV	NPV	LR+
Myomas (n=25)					
TVU	50 (25.5-74.5)	97.2 (91.5-99.3)	72.7 (39.3-92.6)	92.9 (86.1-96.7)	18 (5.3-60.9)
HS	100 (78.20-100)	98.17 (93.53-99.78)	88.24 (63.56-98.54)	100 (96.61-100)	54.50 (13.81-215.15)
TVU+HS	100 (78.20-100)	99.07 (94.95-99.98)	93.75 (69.77-99.84)	100 (96.61-100)	108 (15.35-759.79)
P value comparing TVU with HS	0.002**	0.98			
Polyp (n=75)					
TVU	85.42 (72.24-93.93)	72.84 (61.81-82.13)	65.08 (52.03-76.66)	89.39 (79.36-95.63)	3.14 (2.16-4.58)
HS	91.67 (81.61-97.24)	95.16 (86.50-98.99)	94.83 (85.62-98.92)	92.19 (82.70-97.41)	18.94 (6.27-57.28)
TVU+HS	93.44 (84.05-98.18)	96.72 (88.65-99.60)	96.61 (88.29-99.59)	93.65 (84.53-98.24)	28.50 (7.28-111.56)
P value comparing TVU with HS	0.791	0.04*			
Normal endometrium (n=37)					
TVU	27.0 (14.4-44.4)	78.2 (67.7-86.0)	34.5 (18.6-54.3)	71.6 (61.2-80.1)	1.2 (0.6-2.4)
HS	62.2 (44.8-77.0)	80.5 (70.3-87.9)	57.5 (41.0-72.6)	83.3 (73.2-90.3)	3.2 (1.9-5.2)
TVU+HS	64.8 (47.4-79.3)	68.9 (58.0-78.2)	47.1 (33.1-61.4)	82.2 (71.1-89.8)	2.1 (1.4-3.1)
P value comparing TVU with HS	0.005**	0.852			

TVU: Transvaginal ultrasonography, HS: Hysteroscopy.

Wilk Test was performed to determine if data were sampled from a normal distribution. Descriptive data were statistically described in terms of range, mean ± SD, frequency (number of cases), and percentage when appropriate. For the quantitative variables that were not distributed normally, the Kruskal-Wallis test and Mann-Whitney U test were performed to evaluate differences between the groups. Pearson's chi-squared test, Fisher's chi-exact test and Yates correction for continuity were used to compare means between nonparametric and parametric values. Sensitivity, specificity, and positive and negative likelihood ratios were calculated for transvaginal ultrasonography, hys-

teroscopy and a combined approach in the various uterine pathologies. *P* values of <0.05 were considered to be statistically significant.

Results

A total of 224 women (n=143, 63.8% premenopausal women and n=81, 36.1% postmenopausal women) were eligible for the study. Patient characteristics are summarized in **Table 1**. Mean age was 45.38±9.61 years. Complaints of the patients were abnormal uterine bleeding (n=103, 45.9%), postmenopausal bleeding (n=51, 22.7%), incidental finding of thickened endometrium in premenopausal (n=21, 9.3%)

Table 3. Diagnostic value parameters of TVU, hysteroscopy and combined approach in diagnosing Uterine pathologies in postmenopausal women

	Sensitivity	Specificity	PPV	NPV	LR+
Myomas (n=17)					
TVU	66.67 (22.28-95.67)	98.18 (90.28-99.95)	80.00 (28.36-99.49)	96.43 (87.69-99.56)	36.67 (4.85-277.19)
HS	57.14 (18.41-90.1)	98.18 (90.28-99.95)	80.00 (28.36-99.49)	94.74 (85.38-98.90)	31.43 (4.06-243.00)
TVU+HS	71.43 (29.04-96.33)	98.18 (90.28-99.95)	83.33 (35.88-99.58)	96.43 (87.69-99.56)	39.29 (5.33-289.65)
P value comparing TVU with HS	0.857	1.00			
Polyp (n=53)					
TVU	62.79 (46.73-77.02)	75 (53.29-90.23)	81.82 (64.54-93.02)	52.94 (35.13-70.22)	2.51 (1.21-5.21)
HS	90.7 (77.86-97.41)	90.00 (68.30-98.77)	95.12 (83.47-99.40)	81.82 (59.72-94.81)	9.07 (2.43-33.89)
TVU+HS	90.7 (77.86-97.41)	77.78 (52.36-93.59)	90.70 (77.86-97.41)	77.78 (52.36-93.59)	4.08 (1.71-9.74)
P value comparing TVU with HS	0.005**	0.228			
Normal endometrium (n=7)					
TVU	85.7 (42.0-99.2)	66.7 (52.4-78.5)	25.0 (10.6-47.0)	97.3 (84.2-99.8)	2.6 (1.6-4.2)
HS	100 (56.1-100)	85.2 (72.3-92.9)	46.7 (22.3-72.6)	100 (90.4-100)	6.7 (3.5-12.8)
TVU+HS	100 (56.1-100)	61.1 (46.8-73.7)	25.0 (11.4-45.2)	100 (87.0-100)	2.6 (1.8-3.6)
P value comparing TVU with HS	1.00	0.043*			

TVU: Transvaginal ultrasonography, HS: Hysteroscopy. *P<0.05; **P<0.01.

and postmenopausal women (n=30, 13.3%), infertility (n=15, 6.6%) and recurrent implantation failure (n=4, 1.7%). Four groups were formed according to histopathologic diagnosis: polyps (n=128), myomas (n=42), normal endometrium (n=44) and others (n=10). The "others" group consisted of patients with histopathologically diagnosed endometrial carcinoma (n=3), hyperplasia without atypia (n=4), cervical polyp (n=2) and chronic endometritis (n=1). **Tables 2** and **3** indicate the sensitivity, specificity, positive and negative predictive values and positive likelihood ratios of TVU, HS and a combined approach according to menopausal status and histopathological results.

HS showed significantly higher sensitivity (P<0.01) than and similar specificity to TVU in diagnosing myomas in premenopausal patients. HS showed higher sensitivity than and equal specificity to TVU in diagnosing myomas in postmenopausal women. However, there was no statistically significant difference in sensitivity between HSK and TVU in postmenopausal women.

Discussion

In this retrospective study, we aimed to compare the diagnostic value of transvaginal ultrasonography and hysteroscopy for detecting uterine submucous myomas in pre- and postmenopausal women. TVU had a sensitivity, specificity, positive predictive value and negative predictive value of 50%, 97.2%, 72.7% and 92.9%, respectively, for myomas among premenopausal women and 66.67%, 98.18%, 80%, 96.43%, respectively, among postmenopausal women. Hysteroscopy had a sensitivity, specificity, positive predictive value and negative predictive value of 100%, 98.17%, 88.24% and 100%, respectively, for myomas among premenopausal women and 57.14%, 98.18%, 80%, 94.74%, respectively, among postmenopausal women. Our results indicate that when diagnosing myomas, TVU has lower specificity and sensitivity rates in premenopausal patients than postmenopausal patients. Hysteroscopy has similar specificity and higher sensitivity in premenopausal patients than postmenopausal patients for diagnosing myomas.

We believe that HS is the gold standard method for treating intrauterine pathologies but not for diagnosing them, on account of the fact that specificity and sensitivity of HS and a combined approach (HS&TVU) were not 100% in our study of premenopausal and postmenopausal patients. We conclude that histopathological assessment, as used in our study and similar to prior studies, remains the gold standard for diagnosing intrauterine pathologies.

Several studies have compared the diagnostic values of transvaginal ultrasonography and hysteroscopy in diagnosing submucosal myomas and endometrial polyps. Those studies have been primarily performed when diagnos-

ing polyps or intracavitary masses (polyp+ myoma). Most of those studies included fewer patients with myomas than the present study. In addition, we found no articles in the literature with subgroup analysis of both premenopausal and postmenopausal patients. A recent study by Soguktas et al. reported higher sensitivity (100%) and equal specificity using hysteroscopy to diagnose submucosal myomas compared to TVU [14]. Eighty-nine premenopausal women were included and only four patients had a histopathological diagnosis of myoma. Another study by Vitner et al. included 128 patients, 41 with myomas. They reported that hysteroscopy had higher sensitivity (100%) and specificity (86.9%) than TVU for diagnosing uterine myomas; however, no distinction was made based on menopausal status [15]. Similar findings were reported by Cepni et al., who reported high sensitivity (90.9%) and specificity (95.8%) when using hysteroscopy to diagnose submucous myomas. That study included 165 premenopausal women, and 22 had submucous myomas [16].

Using hysteroscopy, Bingol et al. reported slightly higher sensitivity (70%) and higher specificity (94%) than the present study [17]. That study included only postmenopausal patients with vaginal bleeding, and the statistical data included 14 myoma patients out of 137 total patients. We conclude that different indications and their nonhomogenous patient group explain the divergence between our studies.

Our study distinguishes itself from the literature as it distinguishes patients according to menopausal status. We think that premenopausal patients need to be considered differently from postmenopausal patients, with the possible necessity of additional sessions for the procedure, longer hospital length of stay and a higher expectation of reconstructive treatment. Although hysterectomy may be an easier option in postmenopausal patients, it is almost impossible to approve especially by the infertile and younger premenopausal patients.

A systematic review reported that the positive likelihood ratios (LR+) and negative likelihood ratios (LR-) of hysteroscopy were 8.3 and 0.11, respectively, for detecting endometrial abnormalities. LR+ and LR- of hysteroscopy were 16.6 and 0.17, respectively, for submucosal

myomas. For the diagnosis of submucous myomas, the pooled sensitivity was 0.87 (95% CI 0.81-0.92), and the specificity was 0.95 (95% CI 0.93-0.97) [8]. In our study, the diagnostic performance of hysteroscopy was better in premenopausal patients than the systematic review and worse in postmenopausal patients. When diagnosing of intracavitary masses, Krampl et al. [18], Bonnamy et al. [19] and Grimbizis et al. [20] reported that hysteroscopy had higher sensitivity (100, 88 and 100%, respectively) and specificity (87, 85 and 98,8%, respectively) than transvaginal ultrasonography. Out of 100 histopathologically diagnosed patients, Krampl et al. included 13 polyp and 8 intrauterine myoma patients. Bonnamy et al. included 16 polyp and 16 myoma patients out of 81 total histopathologically diagnosed patients. We calculated specificity and sensitivity separately for polyps and myomas, but not as intracavitary masses.

The sensitivity and specificity of hysteroscopy are higher than TVU for the diagnosis of myomas in almost all such articles. However, sensitivity and specificity values were most commonly calculated only in premenopausal woman or by ignoring the menopausal status, which was not the case in the present study.

In our study, hysteroscopy showed higher sensitivity and specificity than TVU in premenopausal patients. However, TVU showed higher sensitivity and similar specificity compared to hysteroscopy in postmenopausal patients.

Polyps are the most identified intracavitary masses. We think that type 1 and particularly type 0 myomas (as described by The International Federation of Gynecology and Obstetrics (FIGO) [21]) are mostly misdiagnosed as polyps. The relatively low specificity and sensitivity of TVU may be the result of these misdiagnoses because polyps are often prediagnosed in daily practice.

Even using a combined approach (TVU plus HS), we could not fully diagnose all postmenopausal patients who were later histopathologically diagnosed with myomas.

Hysteroscopy allows subjective assessment of myoma size and indirect information regarding the depth of myometrial elongations in type 0 myomas, particularly for premenopausal patients.

Ultrasound and sonohysterography are superior to hysteroscopy for predicting myoma size, particularly for types 1 and 2. We found that HS shows high specificity and sensitivity for myomas in premenopausal patients. Office hysteroscopy may also be useful for visual diagnosis with high accuracy. However, it is hard to accept the same management for postmenopausal patients. We found that HS has lower sensitivity (57.14%) but higher specificity (98.18%) in diagnosing myomas. We suggest that missing small type 1 and type 2 myomas due to the degenerative alterations of submucous myomas and a focus on excluding malignancy in patients with endometrial thickness and uterine bleeding may be reasons for the lower sensitivity of HS in postmenopausal patients.

HS is a gold standard method for visualizing and assessing the uterine cavity. HS has some specific application challenges separate from general complications. Failure of the intervention due to cervical stenosis is a common situation, and another disadvantage is that HS is more expensive than TVU.

We conclude that HS is not always sufficient for finding the etiology of postmenopausal bleeding and other endometrial pathologies, particularly in type 1 and type 2 myomas. Considering the lower sensitivity of HS in postmenopausal patients and the difficulties associated with its application in cervical stenosis, it is important to combine HS with additional screening methods to make an accurate diagnosis and reduce patient anxiety.

Magnetic resonance imaging (MRI) is the best diagnostic procedure for determining both the size and location of myomas [22]. 3D ultrasonographical examination can also be useful [23-25]. MRI and 3D ultrasonography can be helpful for further management in patients with insufficient hysteroscopy or in postmenopausal patients prediagnosed with myoma due to the lower sensitivity of HS in postmenopausal patients. However, these methods are inferior to histopathological assessment.

In conclusion, hysteroscopy is an effective and sufficient method for diagnosing submucous myomas in premenopausal patients, and provides high sensitivity and specificity. Hysteroscopic evaluation may not always be sufficient in postmenopausal patients, as it provides lower sensitivity than and similar specificity to TVU due to the degenerative alterations in myomas and the endometrium.

Disclosure of conflict of interest

None.

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References

[1] Santer M, Warner P, Wyke S. A Scottish postal survey suggested that the prevailing clinical preoccupation with heavy periods does not reflect the epidemiology of reported symptoms and problems. J Clin Epidemiol 2005; 58: 1206-1210.

[2] Giannella L, Mfuta K, Setti T, Boselli F, Bergamini E, Cerami LB. Diagnostic accuracy of endometrial thickness for the detection of intra-uterine pathologies and appropriateness of performed hysteroscopies among asymptomatic postmenopausal women. Eur J Obstet Gynecol Reprod Biol 2014; 177: 29-33.

[3] Babacan A, Gun I, Kizilaslan C, Ozden O, Muhcu M, Mungen E, Atay V. Comparison of transvaginal ultrasonography and hysteroscopy in the diagnosis of uterine pathologies. Int J Clin Exp Med 2014; 7: 764-769.

[4] Hajishaiha M, Ghasemi-rad M, Karimpour N, Mladkova N, Boromand F. Transvaginal sonographic evaluation at different menstrual cycle phases in diagnosis of uterine lesions. Int J Womens Health 2011; 3: 353-357.

[5] El-Sherbiny W, El-Mazny A, Abou-Salem N, Mostafa WS. The diagnostic accuracy of two-vs three-dimensional sonohysterography for evaluation of the uterine cavity in the reproductive age. J Minim Invasive Gynecol 2015; 22: 127-131.

[6] Gan DE, Jawan RA, Moy FM. Concordance between hysteroscopic impression and endometrial histopathological diagnosis. Prev Med 2013; 57: 21-23.

[7] Gkrozou F, Dimakopoulos G, Vrekoussis T, Lavasidis L, Koutlas A, Navrozoglou I, Stefos T, Paschopoulos M. Hysteroscopy in women with abnormal uterine bleeding: a meta-analysis on four major endometrial pathologies. Arch Gynecol Obstet 2015; 291: 1347-1354.

[8] Van Dongen H, De Kroon CD, Jacobi CE, Trimbos JB, Jansen FW. Diagnostic hysteros-

copy in abnormal uterine bleeding: a systematic review and meta-analysis. BJOG 2007; 114: 664-675.

[9] Aston B, Weaver E. Risks and benefits of hysteroscopy and endometrial sampling as a standard procedure for assessing serendipitous findings of endometrial thickening in postmenopausal women. Aust N Z J Obstet Gynaecol 2014; 54: 597-599.

[10] Puri K, Famuyide AO, Erwin PJ, Stewart EA, Laughlin-Tommaso SK. Submucosal fibroids and the relation to heavy menstrual bleeding and anemia. Am J Obstet Gynecol 2014; 210; 38.e17.

[11] Bosteels J, Kasius J, Weyers S, Broekmans FJ, Mol BWJ, D'Hooghe TM. Hysteroscopy for treating subfertility associated with suspected major uterine cavity abnormalities. Cochrane Database Syst Rev 2015; 2: CD009461.

[12] Wamsteker K, Emanuel MH, Kruif JH. Transcervical hysteroscopic resection of submucous fibroids for abnormal uterine bleeding: results regarding the degree of intramural extension. Obstet Gynecol 1993; 82: 736-740.

[13] Lasmar RB, Barrozo PRM, Dias R, Oliveira MA. Submucousmyomas: a new presurgical classification to evaluate the viability of hysteroscopic surgical treatment-preliminary report. J Minim Invasive Gynecol 2005; 12: 308-311.

[14] Soguktas S, Cogendez E, Kayatas SE, Asoglu MR, Selcuk S, Ertekin A. Comparison of saline infusion sonohysterography and hysteroscopy in diagnosis of premenopausal women with abnormal uterine bleeding. Eur J Obstet Gynecol Reprod Biol 2012; 161: 66-70.

[15] Vitner D, Filmer S, Goldstein I, Khatib N, Weiner Z. A comparison between ultrasonography and hysteroscopy in the diagnosis of uterine pathology. Eur J Obstet Gynecol Reprod Biol 2013; 171: 143-145.

[16] Cepni I, Ocal P, Erkan S, Saricali FS, Akbas H, Demirkiran F, Idil M, Bese T. Comparison of transvaginal sonography, saline infusion sonography and hysteroscopy in the evaluation of uterine cavity pathologies. Aust N Z J Obstet Gynaecol 2005; 45: 30-35.

[17] Bingol B, Gunenc MZ, Gedikbasi A, Guner H, Tasdemir S, Tiras B. Comparison of diagnostic accuracy of saline infusion sonohysterography, transvaginal sonography and hysteroscopy in postmenopausal bleeding. Arch Gynecol Obstet 2011; 284: 111-117.

[18] Krampl E, Bourne T, Hurlen-Solbakken H, Istre O. Transvaginal ultrasonography sonohysterography and operative hysteroscopy for the evaluation of abnormal uterine bleeding. Acta Obstet Gynecol Scand 2001; 80: 616-622.

[19] Bonnamy L, Marret H, Perrotin F, Body G, Berger C, Lansac J. Sonohysterography: a prospective survey of results and complications in 81 patients. Eur J Obstet Gynecol Reprod Biol 2002; 102: 42-47.

[20] Grimbizis GF, Campo R. Congenital malformations of the female genital tract: the need for a new classification system. Fertil Steril 2010; 94: 401-407.

[21] Munro MG, Critchley HO, Fraser IS; FIGO Menstrual Disorders Working Group. The FIGO classification of causes of abnormal uterine bleeding in the reproductive years. Fertil Steril 2011; 95: 2204-2208.

[22] Parker WH. The utility of MRI for the surgical treatment of women with uterine fibroid tumors. Am J Obstet Gynecol 2012; 206: 31-36.

[23] Camanni M, Bonino L, Tessarolo M, Migliaretti G, Ferrero B, Deltetto F. Is it possible to obtain a presurgicalLasmar score for hysteroscopic myomectomy by ultrasound alone? Ultrasound Obstet Gynecol 2012; 40: 106-111.

[24] Nieuwenhuis LL, de Vaate MAB, Hehenkamp WJ, Heymans MW, van Baal MW, Brölmann HA, Huirne JA. Reproducibility of three-dimensional gel installation sonohysterography in the assessment and classification of intrauterine abnormalities. Eur J Obstet Gynecol Reprod Biol 2014; 179: 141-146.

[25] Rossi A, Forzano L, Romanello I, Fachechi G, Marchesoni D. Assessment of endometrial volume and vascularization using transvaginal 3D power Doppler angiography in women with postmenopausal bleeding. Int J Gynaecol Obstet 2012; 119: 14-17.