



# Intrauterine interventions with the aid of ultrasonography

## Ultrasonografi eşliğinde intrauterin girişimler

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**Abstract**  
Aim: The aim of this study was to research the applicability of the surgical treatment of intrauterine pathologies with the aid of ultrasonography by passing a laparoscopic grasper or scissor through a metal sheath placed in the cervical canal, and compare this method with hysteroscopy, which is considered the gold standard in diagnosis and treatment.  
Methods: Our study was conducted with 39 cases where intrauterine pathologies were found with transvaginal ultrasonography (TVUSG). The patients were evaluated for endometrial polyp, submucosal leiomyoma/fibroid and uterine malformations using a transvaginal probe in the 6th to 12th days of the menstrual cycle. Patients with endometrial polyps and submucosal leiomyomas/fibroids were excised with a laparoscopic 5 mm grasper. A laparoscopic plain dissection scissor (5 mm) was used instead of a grasper for the uterine septum. In patients undergoing polypectomy and myomectomy, the uterine cavity was reevaluated by TVUSG about one month later (in the follicular phase after the first menstruation). Patients who underwent resection of the septum after the second menstrual bleeding, intrauterine cavity and tubal were evaluated by hysterosalpingography.  
Results: Considering the presence of intrauterine pathologies, TUSVG has sensitivity of 1 (0.87- 1.0), specificity of 0.56 (0.21-0.86), positive predictive value of 0.87 (0.71-0.96), negative predictive value of 1 (0.48-1.0), accuracy of 0.89 and positive likelihood ratio of 2.25 (1.03-4.5) for the detection endometrial polyps. When endometrial polyps were found as the intrauterine pathology during TUSVG, the chance of having endometrial polyps in hysteroscopic diagnosis was found to be 2.25 times more compared to those with no pathology. According to hysteroscopic diagnosis, TUSVG has sensitivity of 0.90 (0.74-0.98), specificity of 0.56 (0.21-0.86), positive predictive value of 0.87 (0.71-0.96), negative predictive value of 0.63 (0.25-0.92), accuracy of 0.82 and positive likelihood ratio of 2.03 (0.95-4.2) for intrauterine pathology. When the intrauterine pathology was found during TVUSG, the chance of having these pathologies in hysteroscopic diagnosis was found to be 2.03 times more compared to those with no pathology.  
Conclusion: We think that the surgical treatment of intrauterine pathologies with the aid of ultrasonography can be an alternative for hysteroscopy.  
Keywords: Endometrial polyp, Intrauterine pathologies, Hysteroscopy, Uterine septum

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**Öz**  
Amaç: Bu çalışmanın amacı, intrauterin patolojilerin transabdominal ultrasonografi eşliğinde, servikal kanala yerleştirilen metal kılıf içerisinden laparoskopik grasper veya makas geçirilerek cerrahi tedavisinin uygulanabilirliğini araştırmak, tanı ve tedavide altın standart olarak kabul edilen histeroskopi ile karşılaştırmaktır.

**Yöntemler:** Çalışmamız transvajinal ultrasonografi(TVUSG) ile intrauterin patoloji saptanan 39 olgu ile yapıldı. Hastalar menstrual siklusun 6-12. günleri arasında, transvajinal prob kullanılarak endometrial polip, submuközmyom ve uterin malformasyonlar açısından değerlendirildi. Endometrial polip ve submuköz myomu olan hastalar, laparoskopik 5 mm'lik grasper ile tutularak çıkartıldı. Uterin septum için ise grasper yerine laparoskopik 5 mm'lik düz disseksiyon makası kullanıldı. Polipektomi ve myomektomi yapılan hastalarda uterin kavite ortalama 1 ay sonra ilk menstruasyon sonrası foliküler fazda TVUSG ile tekrar değerlendirildi. Septum rezeksiyonu yapılan hastalarda işlemden sonraki ikinci menstrüel kanama sonrası HSG çekilerek intrauterin kavite ve tubalar değerlendirildi.

**Bulgular:** İntrauterin patoloji dikkate alındığında TVUSG'de endometrial polip için duyarlılık 1 (0,87-1,0), özgüllük 0,56 (0,21-0,86), pozitif kestirim değeri 0,87 (0,71-0,96), negatif kestirim değeri 1 (0,48-1,0), doğruluk 0,89 LR (+) 2,25 (1,03-4,5) bulundu. İntrauterin patoloji olarak TVUSG'de endometrial polip bulunduğu histeroskopik tanıda da endometrial polip olma olasılığı patolojik olmayanlardan 2,25 kat daha fazla bulundu. Histeroskopik tanıya göre, TVUSG ile intrauterin patoloji saptanması için duyarlılık 0,90 (0,74-0,98), özgüllük 0,56 (0,21-0,86), pozitif kestirim değeri 0,87 (0,71-0,96), negatif kestirim değeri 0,63 (0,25-0,92), doğruluk 0,82 ve pozitif olasılık oranı 2,03 (0,95-4,2) bulundu. TVUSG ile intrauterin patoloji tespit edildiğinde, histeroskopik tanıda da patolojik olma olasılığı patolojik olmayanlardan 2,03 kat daha fazla bulunmuştur.

**Sonuç:** Ultrasonografi eşliğinde intrauterin patolojilerin cerrahi tedavisinin, histeroskopiye alternatif cerrahi olabileceğini düşünmekteyiz.

**Anahtar Kelimeler:** Endometrial polip, Intrauterin patolojiler, Histeroskopi, Uterus septumu

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## Introduction

Intrauterine interventions are processes such as polyp resections, synechiolysis, sterilization, septum resections, and the extraction of left-over pregnancy products [1]. Polyps are encountered in nearly 10% of women with perimenopausal and postmenopausal bleeding, and are one of the most important reasons for abnormal uterine bleeding [2]. Even though the true prevalence of Mullerian abnormalities is not exactly known, they are reported in rates changing between 0.16% and 10% [3]. The most commonly seen uterine abnormality is uterine septum (90%), and is followed by bicornuate uterus (5%) and uterine didelphys (5%) [4]. Repeating miscarriages, which are defined as spontaneous consecutive losses of 2 or more pregnancies, affect 2 to 4% of all couples in their reproductive phases throughout the world [5]. In cases where repeating miscarriage is defined as 3 or more losses of pregnancies spontaneously and consecutively, this rate is 1% [6].

The high sensitivity and effectiveness of Intrauterine Saline Infusion Sonohysterography in the diagnosis of endometrial polyps, submucous fibroids (myoma), synechia, and uterine abnormalities has been proven with studies [7]. Today, hysteroscopy is considered the gold standard in the diagnosis and treatment of intrauterine lesions [8]. The main complications faced during hysteroscopic interventions are uterine rupture, cervical/vaginal lacerations, bladder and intestine damage secondary to uterine rupture, secondary problems to distension medium (fluid load, fluid electrolyte imbalance, vasovagal syncope, lung edema, gas emboli), and endomyometritis [9].

The aim of this study was to research the applicability of the surgical treatment of intrauterine pathologies i.e. endometrial polyp, submucous myoma, synechia, uterine septum with the aid of ultrasonography by passing a laparoscopic grasper or scissor through a metal sheath placed in the cervical canal, and compare this method with hysteroscopy, which is considered the gold standard in diagnosis and treatment.

## Material and methods

Our study was conducted between December 2009 and November 2010 in Istanbul Suleymaniye Women's Diseases and Obstetrics Training and Research Hospital Gynecology service and operating room. 39 patients that presented at our hospital and were diagnosed with intrauterine pathologies through transvaginal ultrasonography (TVUSG) were included in the study after the approval of the planning and ethics board of the hospital and signing an informed consent form. This study has been conducted in accordance with the declaration of Helsinki.

The patients were evaluated for endometrial polyp, submucosal leiomyoma and uterine malformations using a transvaginal probe in the 6th to 12th days of the menstrual cycle using a GE Voluson 730 Expert ultrasonography (USG) device and a 2D B-Mode 5-9 Mhz transvaginal probe. Our study was a retrospective study using a prospectively held database. Patients who were diagnosed with endometrial polyps (Figure 1), submucosal leiomyoma, and uterine septum were included in the study. The maximum diameter of the endometrial polyps were measured and recorded. The veins feeding the endometrial polyp tissue were recorded in the patients where the Resistance Index value could be measured. The inclusion criteria for submucosal leiomyoma cases were a myoma having a pedicle and the maximum diameter of the myoma being less than 2.5 cm, and submucosal leiomyoma patients who didn't meet the criteria were excluded from the study. Cases with a septum maximum depth over 2 cm were included in the study. Cases with a septum maximum depth under 2 cm were excluded from the study.

After a detailed anamnesis and physical examination, the demographic information of the patients were recorded and patients were prepared for operation by requesting tests for complete blood count, blood type, full urine analysis, biochemistry, and serology. Daily treatment of 0.03 mg ethynil estradiol and 0.15 mg desogestrel (Desolett®, Merck Sharp Dohme, Netherlands) were started from the 1st day of menstruation to the day of the operation to get better preoperative endometrial visibility. All patients were taken into the operation between the 8th and 13th days of the menstrual cycle.

In the day of the operation, the necessary materials in the surgery room for intrauterine intervention with the aid of ultrasonography were prepared: USG device (Shimadzu® SDU 2200 Pro 2-5 Mhz abdominal probe), DVD recorder (Toshiba® RD-XS27 160 GB HDD), speculum, two-way Foley catheter, atraumatic clamp, tenaculum, Hegar plugs (until No:10), Two-way 5 mm. metal trocar sheath and blunt ended trocar (Karl Storz®, Tuttingen, Germany), distension medium (Glycine %1.5 Sol.), pump system (Glycine solution fluid bag attached to a coupled infusion pump), laparoscopic 5 mm. 360° rotating shaft curved dissection scissor (EndoSurg®, Laparoscopic 5 mm., 360° rotating shaft grasper (EndoGrasp®), StorzHysteroscope (Karl Storz®, Tuttingen, Germany).

The operations were performed under general anesthesia in two phases in the same session: 1- Intrauterine intervention with the aid of ultrasonography, 2- Hysteroscopic control or operative hysteroscopy. The number of steps and the intervals between the trocar entries and exits were recorded in all intrauterine intervention cases.

In patients who underwent polypectomy (Figure 2, 3) and myomectomy, the uterine cavity was evaluated again after approximately 1 month after the first menstruation via TVUSG. In patients who underwent septum resection, the intrauterine cavity and the Fallopian tubes were evaluated via hysterosalpingography (HSG) after the second menstrual bleeding after the process.

Data analysis was performed using the Statistical Package for Social Sciences (SPSS Inc, Chicago, Illinois, USA) 10,0 program. Continuous data was written as mean  $\pm$  standard deviation (SD). Sensitivity, specificity, positive and negative predictive values, likelihood ratios and overall accuracy were calculated for the results of the diagnoses after TVUSG based on the hysteroscopic diagnosis.

## Results

The mean age of 39 patients included in the study was  $37.1 \pm 9.11$  years with a range of 25 to 60. Their mean height was  $160.38 \pm 6.34$  cm with a minimum of 150 cm and a maximum of 172, and their mean weight was  $65.38 \pm 11.31$  kg with a minimum of 49 and a maximum of 100. Demographic characteristics are given in Table 1.

The distribution of the complaints during the presentation of the patients were as follows: irregular menstruation in five (12.8%), intense vaginal bleeding in seven (17.9%), pain during sexual intercourse in one (2.6%), desire to have children in 19 (48.7%), groin pain in one (2.6%), routine checkup in one (2.6%), repeating miscarriages in one (2.6%), and vaginal bleeding in four (10.3%). 12 patients (30.8%) had a previous history of intrauterine interventions. There were hysteroscopic polypectomy, hysteroscopic setup resection and fractioned curettage (F/C) for postmenopausal bleeding in each patient (2.6%). Nine patients (23.0%) underwent revision curettage for miscarriage.

The distribution of patients diagnosed with intrauterine pathologies via hysteroscopy and TVUSG is given in Table 2.

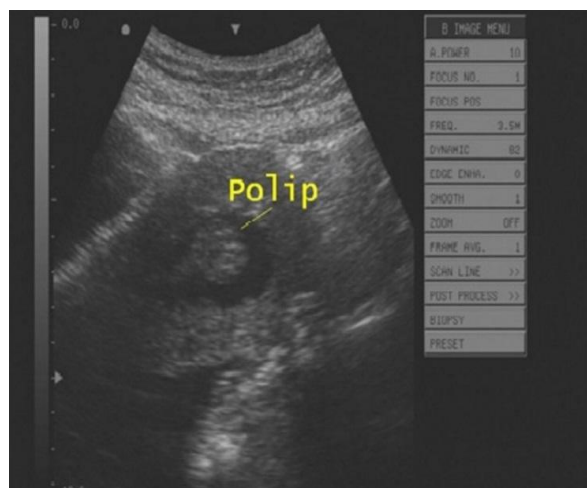


Figure 1: Intrauterine intervention under ultrasound guidance; polyp appearance.



Figure 2: Intrauterine intervention under ultrasound guidance (Endometrial polypectomy); polyp, grasper and metal case localizations.



Figure 3: Intrauterine intervention under ultrasound guidance; endometrial cavity appearance after polyp removal.

During the second phase of the operation, hysteroscopy, the cases in which their intrauterine pathologies were detected through TVUSG were compared to hysteroscopy with regard to diagnosis and treatment outcomes. In 33 patients diagnosed with endometrial polyps via TVUSG, 26 had the same diagnosis (78.7%), four had normal endometrial tissue pieces (12.1%), and

three had submucosal leiomyoma (9.0%). The hysteroscopic diagnosis of one patient diagnosed with submucosal leiomyoma via TVUSG was again submucosal leiomyoma. The hysteroscopic diagnoses of five patients diagnosed with uterine septum via TVUSG were again uterine septum (Table 3).

Table 1: Demographic characteristics of the patients.

	n	Min	Max	Mean	SD
Age (year)	39	25	60	37.1	9.1
Height (cm)	39	150	172	160.4	6.3
Weight (kg)	39	49	100	65.4	11.3
Partus	39	0	9	1.6	1.9
Abortus	39	0	4	0.4	0.9

n: Number of patients, SD: standart deviation, Min: minimum, Max: Maximum

The preoperative diagnoses of the patients were endometrial polyp in three (7.7%), menometroragia in six (15.4%), polymenorrhea in three (7.7%), postmenopausal bleeding in four (10.3%), primary infertility in 12 (30.8%), secondary infertility in 7 (17.9%), and repeating miscarriages in one patient (2.6%).

The number of moves with the grasper or scissor during the operation phase of the intrauterine intervention with USG was found to have an average of  $4.13 \pm 2.41$ , with a minimum of 1 and a maximum of 10. The total length of the process was found to have a minimum of 4 minutes and a maximum of 25 minutes, with an average of  $12.74 \pm 5.59$ . The amount of glycine solution used during the operation was found to have a minimum of 600 cc and a maximum of 3500 cc, with an average of  $1812.82 \pm 630.45$  cc.

Table 2: The distribution of patients diagnosed with intrauterine pathologies via hysteroscopy and transvaginal ultrasonography.

Group	Pathology	n	%
Intrauterine pathology	Endometrial polyp	33	84.6
	Uterine septum	5	12.8
	Submucous myoma	1	2.6
Hysteroscopic diagnosis	Endometrial polyp	26	66.7
	Normal endometrium tissue pieces	4	10.3
	Uterine septum	5	12.8
	Submucous myoma	4	10.3

When the technical problems encountered during intrauterine intervention with USG were examined, it was found that there were five pathologies that could not be held with a grasper in hysteroscopy as two endometrial polyps, one endometrial tissue piece, and two submucous myomas. In addition, two pathologies that could not be clearly defined with regard to pathological borders were both endometrial tissue pieces. The pathologies in which the distension of the uterine cavity was insufficient and the grasper couldn't open were endometrial polyp in one and endometrial tissue piece in one. In two cases with endometrial polyps, the pathology in the uterine cavity could not be seen clearly. In 32 patients (82.0%), the intrauterine pathology was operated fully with the aid of USG, and the operation did not require additional hysteroscopic resection. Among the patients who underwent additional processes, one patient underwent H/S myomectomy (25% of all submucosal leiomyoma), five patients underwent H/S polypectomy (19.2% of all endometrial polyps), and one patient underwent H/S septum resection (20% of all uterine septum).



Table 3: The comparison of the diagnosis distributions of the intrauterine pathologies via TVUSG and hysteroscopy

		Hysteroscopic diagnosis <sup>β</sup>				Total
		Endometrial polyp	Normal endometrium tissue pieces	Uterine septum	Submucosal leiomyoma	
Intrauterine pathology by TVUSG <sup>β</sup>	Endometrial polyp	26 (100)	4 (100)	0 (0)	3 (75)	33 (84.6)
	Uterine septum	0 (0)	0 (0)	5 (100)	0 (0)	5 (12.8)
	Submucosal leiomyoma	0 (0)	0 (0)	0	1 (25)	1 (2.6)
	Total	26	4	5	4	39

TVUSG: Trans vaginal ultrasonography, <sup>β</sup>: n(%)

Table 4: The diagnostic values of TVUSG for intrauterine pathologies and endometrial polyps based on the hysteroscopic diagnosis.

	Sensitivity	Specificity	PPV	NPV	Accuracy	LR (+)	LR (-)
All intrauterine pathologies	0.90 (0.74-0.98)	0.56 (0.21-0.86)	0.87 (0.71-0.96)	0.63 (0.25-0.92)	0.82	2.03 (0.95-4.2)	0.18
Endometrial polyp	1.00 (0.87- 1.0)	0.56 (0.21-0.86)	0.87 (0.69-0.96)	1.00 (0.48-1.0)	0.89	2.25 (1.03-4.5)	0.00

TVUSG: Trans vaginal ultrasonography, PPV: positive predictive value, NPV: negative predictive value, LR: likelihood ratio

Among the patients included in the study, those who were diagnosed with endometrial polyp and submucosal leiomyoma hysteroscopically (n=34) were called to the hospital after their first menstruation in the follicular phase for TVUSG, and those who were diagnosed with uterine septum uteri were called to the hospital for control HSG. In the control USG, repeating endometrial polyps were found in two patients (5.9%), one patient had irregular endometrium (2.6%) and 31 patients (91.5%) had normal endometrium. Control HSG was performed in five patients, and four patients were found to be normal (75.0%) while one patient had subseptus (25.0%).

According to hysteroscopic diagnosis, considering the presence of intrauterine pathologies, TUSVG has sensitivity of 1 (0.87-1.0), specificity of 0.56 (0.21-0.86), positive predictive value of 0.87 (0.71-0.96), negative predictive value of 1 (0.48-1.0), accuracy of 0.89 and positive likelihood ratio of 2.25 (1.03-4.5) for the detection endometrial polyps. When endometrial polyps were found in the intrauterine pathology during TUSVG, the chance of having endometrial polyps in hysteroscopic diagnosis was found to be 2.25 times more compared to those with no pathology. According to hysteroscopic diagnosis, TUSVG has sensitivity of 0.90 (0.74-0.98), specificity of 0.56 (0.21-0.86), positive predictive value of 0.87 (0.71-0.96), negative predictive value of 0.63 (0.25-0.92), accuracy of 0.82 and positive likelihood ratio of LR 2.03 (0.95-4.2) for intrauterine pathology. When the intrauterine pathology during TUSVG was found to be pathological, the chance of having pathologies in hysteroscopic diagnosis was found to be 2.03 times more compared to those with no pathology (Table 4).

**Discussion**

In infertile couples, uterine cavity abnormalities have a high rate as an etiological factor between 10 and 15% [10]. There is almost complete agreement in the literature that symptomatic patients with history of infertility or bed obstetric histories should be treated and that the preferred method should be the hysteroscopic approach [11].

Transvaginal ultrasonography can detect uterine myomas, malformations, and intrauterine synechia, and is also very successful in determining tubal patens, tubal blockage, and inner surface contours. TVUSG is a noninvasive test that can be easily applied and is among the first order diagnosis methods for infertility work ups [12, 13].

Williams et al [14] among the 104 patients they compared with regard to transvaginal ultrasound and diagnostic H/S, diagnosed intrauterine pathology in 52 (53%), at least one polyp in 25 patients, submucosal leiomyoma in 17 patients, endometrial hyperplasia in 7 patients, and endometrial cancer in 3 patients. In our study, we determined the endometrial pathology completely in 32 patients out of 39 (82.0%).

Kamil et al [15] compared the diagnostic accuracy values of ultrasound and sonohysterography for detecting endometrial polyps in 106 women with uterine bleeding complaints. The false positive and false negative velocities of the ultrasound were found to be 25.8% and 36.2%, respectively. The sensitivity and specificity of ultrasound was 64.5% and 75.5% respectively, and in sonohysterography, these values were raised to respectively 93.1% and 93.9%, which was found statistically significant. In our study, the sensitivity and specificity of TVUSG in detecting endometrial pathologies were found to be respectively 100% and 56%.

Lindheim et al [16] extracted endometrial polyps with diameters between 7 and 15 mm transcervically with USG. In our study, we dilated the cervix to 6 mm and used a 5.5mm grasper. Additionally, in our study, we were able to extract larger polyps or submucous myomas with a 5.5 mm grasper (maximum diameter 19mm).

In order to perform intrauterine interventions hysteroscopically, the cervix needs to be dilated to 10-11 mm. Cervix dilation, especially in patients that have lesions that take up intrauterine space in the postmenopausal period, is very difficult. In our method, the dilation of the cervix to 6 mm is sufficient.

The complications that are seen in hysteroscopy are fluid load, uterine perforation, and bleeding, and present in the respective rates of 5%, 1%, and 3%, especially during operative hysteroscopy [17]. Generally, the rates of complication are reported as 0.1% and 1.35% [18,19].When compared with regard to costs, endometrial polypectomy performed with USG is cheaper than hysteroscopic polypectomy.

Lee et al [20] used TVUSG probe for endometrial polypectomy with USG in 37 patients. In 32 patients out of 39 (86.5%) endometrial polypectomy with USG was successful. In our study, success was achieved in 21 out of 26 endometrial polyp patients (80.7%). Differing from our study, this study didn't have a metal sheath placed in the cervix. In the same study, in the ultrasonographies of the patients performed after menstruation, residual polyps could not be found. In our study, in

the control ultrasonography performed after the first menstruation, endometrial polyps were seen in two cases.

Today, two important indications cause uterine septum to be surgically corrected: repeating miscarriages and the prevention of premature birth [21]. Among the five patients in our study diagnosed with uterine septum, one had repeating miscarriages. In our study, the aim of septum resections was the same. Out of five patients we performed septum resections, 1 one was resected because of repeating miscarriages, and four were resected because of primary infertility.

In a study by Ohl and Bettahar [22], septum resection with USG was stated to be appropriate for all uterine septum types. In wide based septum, they stated that the scissor could be easily moved to the left and right on the transversal plane in the uterine cavity to perform septum resections, and that deep septum could be easily resected using this method.

In our study, we succeeded in four patients out of five patients we applied septum resection to, and no additional resections were seen to be necessary in the control with hysteroscopy. In one patient, a complete resection could not be performed since the septum base was wide (3.2 cm).

When there is blood or endometrium tissue in the uterine cavity in intrauterine interventions performed with hysteroscopy, the operation can be limited or outright impossible. In septum resections performed with USG, such a timing issue cannot be experienced and the method can be applied in every period of the menstrual cycle. Blood or endometrial tissue pieces in the uterine cavity doesn't affect ultrasonographic septum visibility.

There is no much bleeding in septum resections. In some publications, in fact, hysteroscopic septum resection is suggested to be performed with the aid of ultrasonography [23]. In our study, during septum resection with USG, no uterine perforation complications were experienced.

In a study by Jurkovic et al. [24], the use of 3D ultrasonography in the diagnosis of congenital uterine abnormalities was examined. The diagnoses of septum or other congenital uterine abnormalities can be performed with 3D USG without needing HSG. In our study, uterine septum diagnoses were performed with 3-D USG (GE Voluson 730 Expert) and confirmed through HSG.

In conclusion, since the surgical technique we applied is cheaper and simpler to use compared to hysteroscopy, we think that the surgical treatment of intrauterine pathologies with the aid of ultrasonography can be an alternative for hysteroscopy.

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