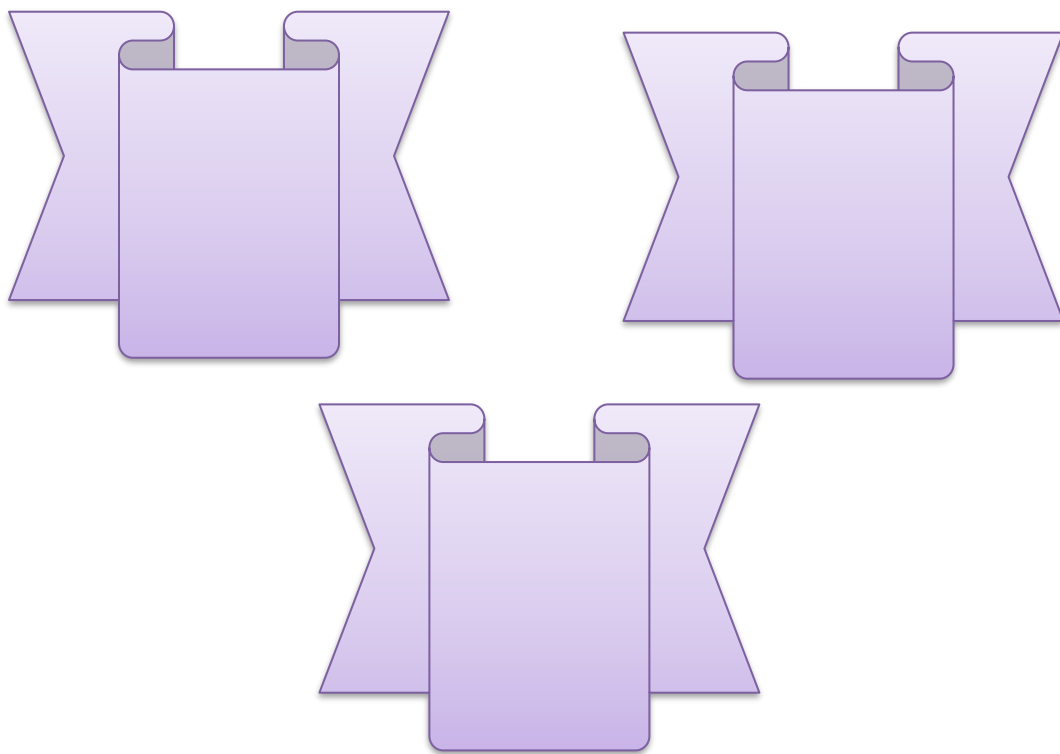


# INTERNATIONAL JOURNAL OF MEDICAL ARTS



Volume 5, Issue 3, March 2023

<https://ijma.journals.ekb.eg/>



Print ISSN: 2636-4174

Online ISSN: 2682-3780





Available online at Journal Website  
<https://ijma.journals.ekb.eg/>  
 Main Subject [Gynecology and Obstetrics]



## Original Article

# Diagnostic Hysteroscopy versus Three Dimensional [3D] Transvaginal Ultrasonography in Unexplained Infertility

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## ABSTRACT

### Article information

Received: 19-04-2023

Accepted: 11-05-2023

DOI:  
10.21608/IJMA.2023.206871.1673.

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**Citation:** Faleh AG. Abd Elfattah AT, Elsadek AM. Diagnostic Hysteroscopy versus Three Dimensional [3D] Transvaginal Ultrasonography in Unexplained Infertility. IJMA 2023 March; 5 [3]: 3119-3125. doi: 10.21608/IJMA.2023.206871.1673.

**Background:** Infertility is becoming a bigger problem in society. Since hysteroscopy, the gold standard diagnostic method, is an intrusive procedure, a study that could get around its drawbacks was necessary. Hysteroscopy might be replaced by 3D transvaginal sonography [3D TVS], which simultaneously registers all three image planes and non-invasively visualizes uterine morphology.

**Aim of the work:** Comparison between the diagnostic accuracy of 3D transvaginal ultrasound and diagnostic hysteroscopy in the evaluation of women with unexplained infertility.

**Patients and Methods:** This comparative interventional study was conducted in the infertility clinic of Al-Azhar Cairo University Hospitals [Sayed Galal and El Hussein Hospitals] between February 2021 and February 2022. A total of one hundred women with unexplained infertility were enrolled and subjected to both 3D transvaginal sonography and diagnostic hysteroscopy.

**Results:** Abnormalities that were detected by vaginal ultrasonography were intrauterine adhesions, which were detected in 20 [20%] cases; fibroid was found in 28 [28% cases]; intrauterine polyps were found in 25 [25% cases]; and septum was detected in 3 [3%] cases. By hysteroscopy, which is the gold standard in investigating the uterine cavity, abnormal findings were found in 90 cases, representing 90% of cases, whereas 10 [10%] cases were free.

**Conclusion:** Three-dimensional transvaginal sonography is increasingly being used as a standard procedure to examine infertile women since it is excellent at detecting uterine cavity defects. Transvaginal sonography findings should be confirmed by hysteroscopy, the gold standard in uterine cavity investigation, as well as when transvaginal sonography produces conflicting results.

**Keywords:** Hysteroscopy; Three-Dimensional Transvaginal Ultrasonography; Unexplained Infertility.



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## INTRODUCTION

Idiopathic infertility, additionally referred to as unexplained infertility, is infertility whose etiology is still unclear despite a reproductive work-up that typically includes testing the man's semen and the woman's ovulation and fallopian tubes. The couples underwent the typical infertility examinations, including ovulation, tubal patency, and semen analysis testing [1].

A fundamental later stage in the research on infertile women, after the standard infertility evaluation is complete, is the evaluation of the uterine cavity [2]. It is thought that crucial elements in determining receptivity for embryo implantation include the state of the uterine cavity and the endometrium [3].

Unknown intrauterine anomalies have the potential to negatively impact the uterine environment and, in turn, the likelihood of sustaining a pregnancy [4]. In order to improve the uterine conditions in people with unexplained infertility, it is advised to diagnose and treat these problems [5].

Hysteroscopy is regarded as the gold standard method for uterine cavity assessment, but it is a pricy, intrusive surgery that comes with its share of discomfort and hazards, and in 50% of women with normal uterine cavities, it is even unneeded [6].

An essential tool for examining the anatomy and pathophysiology of the uterus and ovaries of infertile women is transvaginal ultrasonography. Uterine fibroids, endometrial polyps, Asherman's syndrome, and various developmental uterine anomalies, such as a bicornuate uterus and a septate uterine shape, can all be found during a uterine ultrasound scan [7].

## PATIENTS AND METHODS

Between February 2021 and February 2022, the Al-Azhar Cairo University Hospitals' Sayed Galal and El Hussein Hospitals' infertility clinic undertook this comparative interventional study. A total of 100 women with unexplained infertility were enrolled and given diagnostic hysteroscopy as well as 3D transvaginal sonography.

**Inclusion criteria:** The study included all individuals with unexplained infertility between

the ages of 20 and 35 who had normal thyroid function and no ovulatory, uterine, tubal, male, coital, or peritoneal causes of infertility. Patients with 'regular cycles', as this means these patients are ovulating spontaneously, were included in the study.

**Exclusion criteria:** Women with abnormal day 3 serum levels of follicle-stimulating hormone, luteinizing hormone, thyroid-stimulating hormone, and prolactin; women who have had previous abdominal or pelvic surgeries; women who have had a caesarean section; women who have had a recent hysterosalpingography or diagnostic laparoscopy that revealed organic lesions, pelvic adhesions, or tubal obstruction; women who have had a history of endometriosis and women with male partners having abnormal semen analysis report.

**Ethical considerations:** After being fully apprised of the specifics and goal of the current study, the participating women signed written informed consent. Women have the right to leave the study at any time without having their access to medical care negatively impacted. The Ethical Research Committee of the Obstetrics and Gynaecology Department and College of Medicine, Al-Azhar Cairo University, gave its approval to the study protocol.

## Study interventions and procedures

**Full history taking including:** Each patient was questioned about every aspect of her reproductive history. A thorough menstrual history, an obstetric history with a focus on previous pregnancies and the history of any abortions, and a gynaecological history with a focus on infertility and abnormal uterine bleeding were all included in this. A thorough history of contraception was also obtained. The focus of the past history was on any systemic disease history, previous operations, or PID-suggestive symptoms.

**Thorough clinical examination:** Each patient got a thorough physical examination, which included measuring their height, weight, and body build in addition to looking at their faces, necks, chests, hearts, abdomens, and backs. The size, location, and mobility of the uterus were specifically examined during the full pelvic examination, which included inspection, digital and bimanual examination, as well as speculum examination.

**3D transvaginal sonography:** The patients received transvaginal ultrasonography using a vaginal probe with a 5–9 MHz transducer and a Mindray DP 30. TVS was performed every 3–4 days starting from the first day of their menstrual cycle. Before being examined, the patient was asked to empty their bladder. A condom filled with echo gel and covered with the probe was placed over the vagina. Each patient's uterus was examined by the same probe in the longitudinal and transverse planes [two-dimensional transvaginal ultrasound] and the three-dimensional transvaginal ultrasound, with a different system to measure its diameters [length, width, height, volume, and cervical length], as well as its endometrial thickness, and any suspected focal lesions that may have been detected during the scan were identified. Adnexa was also looked at.

**Diagnostic hysteroscopy:** The clinician provided the women with advice prior to the hysteroscopy. They were informed that they might have shoulder pain following hysteroscopy as well as pelvic pain akin to

menstrual cramps after the operation. Hysteroscopy was performed every 3–4 days starting from the first day of their menstrual cycle. During counselling, the woman received details about the success, failure, and complication rates for the specific unit. General anesthesia was used for all procedures. There was a digital pelvic assessment. The cervix was cleansed after being visualized with a Cusco's speculum. In all patients, a rigid panoramic-type hysteroscopic examination was performed utilizing a continuous irrigation and suction sheath [25 cm long, 4 mm in diameter, with an outer sheath of 5.5 mm and a 30° fore-oblique lens]. The entire uterine cavity, tubal ostia, and cervical canal have to be visible, with no blood, debris, or gas bubbles blocking the view, for the image to be deemed adequate. Photographic evidence from video recordings was used to clearly and properly document hysteroscopic findings. After talking with the patient, the specifics of a management and therapy plan were decided. Women were told to anticipate postoperative spotting for a few days after their hysteroscopy [Figure 1].



**Figure [1]:** In-line operative hysteroscope with semirigid scissors

**Outcomes:** The diagnostic accuracy of 3D transvaginal ultrasound and diagnostic hysteroscopy in the evaluation of women with unexplained infertility.

**Statistical analysis:** Version 20.0 of the statistical software for social sciences was used to evaluate the recorded data [SPSS Inc., Chicago, Illinois, USA]. Quantitative information was presented as mean  $\pm$  SD. Frequency and percentage were used to express qualitative data. The subsequent tests were conducted: Using McNemar-Bowker, it was possible to evaluate the importance of each stage. If one or both sets of variables were skewed, Spearman's rank correlation coefficient

[rs] was employed to determine the degree of relationship between the two sets of variables.

## RESULTS

A total of 20 cases of adhesions were diagnosed by transvaginal ultrasonography; three of them were missed by hysteroscopy. Diagnostic accuracy was as follows: sensitivity 72.7%, specificity 94.7%, positive predictive value 88.9%, negative predictive value 85.7%, and accuracy 86.7% [table 1].

A total of 23 cases of fibroids were diagnosed by transvaginal ultrasonography; six

of them were missed by hysteroscopy as they were intramural. Diagnostic accuracy was as follows: sensitivity was 100%, specificity was 92%, positive predictive value was 71.4%, negative predictive value was 100%, and accuracy was 93.3% [table 2].

Moreover, we found 24 cases of endometrial polyps diagnosed by hysteroscopy. Three of them were missed by transvaginal ultrasonography. Diagnostic accuracy was as follows: sensitivity was 71.4%, specificity was 95.7%, positive predictive value was 83.3%, negative predictive value was 91.7%, and accuracy was 90% [table 3].

For the septum, we detected 6 cases by hysteroscopy; 3 of them were missed by transvaginal ultrasonography. Diagnostic accuracy was as follows: sensitivity 50%, specificity 100%, positive predictive value 100%, negative predictive value 96.6%, and accuracy 96.7% [table 4].

Table [5] showed the relation between hysteroscopy and transvaginal ultrasonography according to diagnosis. Out of 90 cases detected by hysteroscopy, there was 86 [95.5%] of them detected by positive transvaginal ultrasonography. Three cases [30%] were neither detected by hysteroscopy nor transvaginal ultrasonography.

**Table [1]:** Relation between hysteroscopy and transvaginal ultrasonography according to adhesions

Transvaginal ultrasonography	Hysteroscopy [n [%]]		McNemar test [P value]	Kappa test k P value
	Positive [A/=37]	Negative [A/=63]		
<b>Positive [A/=20]</b>	17 [45.9]	3 [4.7]	0.625	0.701 <0.001
<b>Negative [A/=80]</b>	20 [54.05]	60 [95.3]		

**Table [2]:** Relation between hysteroscopy and transvaginal ultrasonography according to fibroids

Transvaginal ultrasonography	Hysteroscopy [n [%]]		McNemar test [P value]	Kappa test k P value
	Positive [A/=17]	Negative [A/=83]		
<b>Positive [A/=23]</b>	17 [100]	6 [7.2]	0.500	0.793 <0.001**
<b>Negative [A/=77]</b>	0	77 [92.8]		

\*\*The inter-method agreement between hysteroscopy and ultrasonography according fibroids, with Kappa = 0.793 perfect agreement for participant females, with P-value <0.001 significant

**Table [3]:** Relation between hysteroscopy and transvaginal ultrasonography according to polyps

Transvaginal ultrasonography	Hysteroscopy [n [%]]		McNemar test [P value]	Kappa test k P value
	Positive [N=24]	Negative [A/=76]		
Positive [A/=20]	17 [70.8]	3 [3.9]	0.971	0.706 <0.001**
Negative [A/=80]	7 [29.2]	73 [96.1]		

\*\*The inter-method agreement between hysteroscopy and ultrasonography according polyps, with Kappa = 0.706 perfect agreement for participant females, with P-value <0.001 significant.

**Table [4]:** Relation between hysteroscopy and transvaginal ultrasonography according to septum

Transvaginal ultrasonography	Hysteroscopy [n [%]]		McNemar test [P value]	Kappa test k P value
	Positive [N=6]	Negative [A/=94]		
<b>Positive [A/=3]</b>	3 [50.0]	0	0.814	0.641 <0.001**
<b>Negative [A/=97]</b>	3 [50.0]	94 [100.0]		

\*\*The inter-method agreement between hysteroscopy and ultrasonography according septum, with Kappa = 0.641 perfect agreement for participant females, with p-value <0.001 significant

**Table [5]:** Relation between hysteroscopy and transvaginal ultrasonography according to septum

Transvaginal ultrasonography	Hysteroscopy [n [%]]		
	Positive [A/=90]	Negative [N=10]	Total [N=100]
<b>Positive [N=93]</b>	86 [95.5]	7 [70]	93 [93]
<b>Negative [N=7]</b>	4 [4.5]	3 [30]	7 [7]
<b>Total [A/=100]</b>	90 [100.0]	10 [100.0]	100 [100.0]

## DISCUSSION

In a 2005 study, the effectiveness of using a 3D ultrasound and the maximal implantation potential [MIP] point during embryo transfers to speed up transfers and boost pregnancy rates

was assessed. They concurred with the findings of the current study and proposed that the uterine cavity could be clearly seen using 3D ultrasonography, the MIP point could be precisely located, and embryo transfers made at the MIP were linked to high percentages of successful implantation and pregnancy [8].

In order to determine the degree of agreement between 3D-SHG and vaginal hysteroscopy [VH] in detecting uterine cavity anomalies, 143 patients with recurrent implantation failure were enrolled for in vitro fertilization cycles in a 2012 study. They confirmed recent research and claimed that 3D-SHG and VH diagnose uterine cavity defects with a high degree of agreement. The researchers discovered that 3D-SHG required much less time and caused less pain in patients than VH. They recommended that the first option for an outpatient examination of the uterine cavity be 3D-SHG [9].

Women who had abnormal uterine bleeding, dysmenorrhea, abdominal masses, or dyspareunia or who had been diagnosed with either disease participated in a 2015 study. The specificity and sensitivity of 3D ultrasound in the diagnosis of leiomyoma and adenomyosis were subsequently demonstrated by correlating the radiological diagnosis with the intra-operative and histological diagnoses. According to them, 3D ultrasound was 93.4% sensitive and 95.6% specific in detecting leiomyoma and 95.6% sensitive and 93.4% specific in diagnosing adenomyosis. These results were in agreement with the current study [10].

In a 2016 study, 139 instances of unexplained uterine hemorrhage or infertility that had had 2D and 3D ultrasounds prior to hysteroscopy were included. They agreed with the current research and claimed that 3D ultrasound is a helpful tool for diagnosing uterine cavity defects and may eventually take on the role of diagnostic hysteroscopy in some circumstances. For identifying uterine cavity anomalies, three-dimensional ultrasonography showed a sensitivity of 88%, a specificity of 94%, a positive predictive value of 96%, a negative predictive value of 84%, a likelihood ratio of 5.5, and an accuracy of 90%. In contrast to uterine synechia, which had poor sensitivity and high specificity, three-dimensional ultrasonography exhibited high sensitivity and specificity for polyps [97% and 97%, respectively], congenital uterine malformations [100% and 99%, respectively], and submucous myoma [87% and 100%, respectively] [11].

A retrospective investigation was carried out in 2016 to see if there was any disagreement between the measurements of the mid fundal length of arcuate uterine anomalies or modest incomplete uterine septa on hysteroscopy and

on transvaginal 3D ultrasound scans [TV 3D US] with or without saline infusion [SIH]. On hysteroscopy [2010–2015], 263 patients with a subtly absent uterine septum [30.0%] or an arcuate uterine abnormality [70.0%] were examined. They disapproved of the findings of the current research and asserted that diagnostic hysteroscopy is the only method that can reliably identify these defects. The overall mean fundal length on TV 3D US was substantially less than the mean real length on hysteroscopy [13.5 + 3.3 cm],  $p < 0.001$  [6.4 + 2.9 cm vs. 13.5 + 3.3 cm]. A moderate overall correlation [ $r = 0.40$ ,  $p < 0.001$ ], a larger connection for an incomplete septum [ $r = 0.58$ ,  $p < 0.001$ ], and a lack of association for an arcuate uterine abnormality were seen when the results of TV 3D US and hysteroscopy were compared [12].

In order to compare the diagnostic effectiveness of 3DUS and hysteroscopy in the detection of lesions [polyps, submucous leiomyomas, and synechiae] in infertile women, a prospective observational study was conducted on infertile women [ $n = 155$ ] with indications for hysteroscopy who were scheduled to undergo 3DUS prior to hysteroscopy. They concurred with the findings of the current study and noted that 3DUS has dependable diagnosis accuracy for intrauterine lesions, which may save patients with normal results from undergoing unnecessary hysteroscopy. According to hysteroscopic findings, 50 of the 155 women had an intracavitary abnormality, 36 had polyps, 12 had myomas, and 7 had synechiae. The accuracy of the 3DUS examination in the diagnosis of intrauterine lesions was 94%, and the sensitivity and specificity were 92.15 and 96.9%, respectively. 83.9% of predictions were positive, whereas 91.3% of predictions were negative [ $LR+ = 10.75$ ,  $LR+ = 0.065$ ] [13].

A retrospective observational study from 2018 evaluated the effectiveness of office hysteroscopy and 3D ultrasonography for detecting uterine anomalies following a late baby loss. They agreed with a recent study and said that office hysteroscopy and 3D TVUS are both beneficial for evaluating the uterine cavity following a late foetal loss. The application of these two exams is crucial since 3D ultrasound is typically used to determine the precise kind of uterine malformation and for the inspection of the myometrium and annexes, whilst hysteroscopy is typically used for assessment of the uterine cavity and endometrium. Eighty

women, with a mean age of 29.8 years, were included [28.2–31.4]. A uterine cavity anomaly [such as a bicornuate uterus, a T-shaped uterus, or a septate uterus] was discovered in 10 of the 47 women who underwent both an office hysteroscopy and a 3D ultrasound. With a kappa of 0.83, the concordance between the two examinations was excellent. In three cases, hysteroscopy revealed an abnormality in the uterine cavity despite normal sonography. In 27.6% of instances, ultrasounds revealed anomalies in the uterine cavity, the myometrium, or the ovary [14].

In a 2018 study, a prospective, blinded, controlled clinical trial comparative study was carried out to compare hysteroscopy and three-dimensional ultrasound [3D USS] for evaluation of the intrauterine cavity after the trial of ICSI and to study the accuracy of diagnostic tests in a tertiary care facility. They concurred with the findings of the current study and said that 3D USS might be used as a first line of investigation for intrauterine lesions before hysteroscopy because it has excellent sensitivity and specificity for the detection of uterine cavity abnormalities. There were no intracavitary or cervical lesions in seventeen cases. Out of all the cases that were analyzed, 66 lesions [n = 66] were discovered through hysteroscopy or 3D USS, while 24 lesions [n = 24] were discovered via hysteroscopy and ultrasonography. Hysteroscopy revealed 34 lesions. Ultrasound was used to identify lesions [n=36]. Kappa's agreement index was 0.273. Total 3D USS sensitivity was 70.59%, specificity was 62.50%, accuracy was 66.67%, positive predictive value [PPV] and negative predictive value [NPV] were each 66.67%, and positive likelihood ratio [LR+ve] and negative likelihood ratio [LR-ve] were both 1.88%. Statistics show that the p-value of 0.026 is significant [15].

A prospective study was undertaken in 2020 to assess the roles of hysteroscopy and ultrasonography in recurrent miscarriage. There were 100 patients in total who had a history of two or more RPL. They argued that hysteroscopy is superior to three-dimensional ultrasonography in the diagnosis of intracavitary lesions, rejecting the findings of the current investigation. In 80 patients [80%], hysteroscopy showed normal findings; in 7%, endometrial polyps; in 3%, submucous myomas; in 6%, the uterine septum; and in 4%, uterine synechiae. Contrarily, normal results were found in 83 instances [83%], endometrial

polyps were found in 6% of cases, submucous myomas were found in 3% of cases, uterine septums were found in 5% of cases, bicornuate uteri were found in 1% of cases, and uterine synechiae were found in 2% of cases. The two methods had a statistically significant association when it came to detecting uterine abnormalities in RPL instances [p = 0.001] [16].

In a 2020 study, 60 participants were used to compare the sensitivity and diagnostic accuracy of hysteroscopy versus TV3D in evaluating uterine anomalies in infertile women prior to ICSI. They concurred with the findings of the current study and noted that, while 3D ultrasonography is simply a diagnostic tool, it is superior to hysteroscopy in some lesions, such as [subserous and intramural fibroid]. In terms of overall accuracy, 3D sonography scored 98.3%, whereas hysteroscopy scored 100% and other modalities scored 93.3% when it came to detecting endometrial polyps. During 3D sonography and hysteroscopy, the accuracy of various modalities in the detection of a septate uterus was 100%. The detection of intrauterine adhesions using various modalities was 100% accurate using 3D and hysteroscopy [17].

**Limitation:** Although a limitation of the study, the small subject population and lack of use of laparoscopy in conjunction with hysteroscopy for uterine anomalies are consistent with earlier studies about its status as the preferred method for evaluating uterine lesions. Secondly, TVS reports of the patients were determined prior to performing the hysteroscopies. Thus, it seemed that the study introduces some bias. To eliminate this problem, if the TVS reveals a healthy uterine cavity, additional testing may be skipped, and the woman can begin receiving medical care for her symptoms. Then, additional assessment with hysteroscopy or sonohysterography should be investigated if the patient doesn't improve after receiving medical care. If the initial TVS reveals any abnormalities, it can guide the next treatment in the right direction. For instance, if TVS indicates an endometrial polyp, one might immediately organize an operation hysteroscopy. A 3D TVS's lack of availability in all infertility units may be a limitation, but the benefits of using one outweigh the drawbacks. In order to ensure that both physicians and patients feel at ease using this non-invasive mode of assessment, we must continue to evaluate it prospectively and consider its optimum application in a clinical situation.



**Conclusion:** Three-dimensional transvaginal sonography is increasingly being used as a standard procedure to examine infertile women since it is excellent at detecting uterine cavity defects. Transvaginal sonography findings should be confirmed by hysteroscopy, the gold standard in uterine cavity investigation, as well as when transvaginal sonography produces conflicting results.

**Funding:** No funding sources

**Conflict of interest:** None declared

## REFERENCES

- Mol BW, Tjon-Kon-Fat R, Kamphuis E, van Wely M. Unexplained infertility: Is it over-diagnosed and over-treated? *Best Pract Res Clin Obstet Gynaecol.* 2018;53:20-9. doi: 10.1016/j.bpobgyn.2018.09.006.
- Dimitriu G, Abdelazim IA, Svetlana S, Zhurabekova G, Alrbeihat RS, Taso OA. Saline infusion sonography compared to hysteroscopy for uterine cavity evaluation in abnormal uterine bleeding. *J Gynecol Obstet Invest.* 2018;1[1]:35-40. doi: 10.5114/jogi.2018.77765.
- Munro MG. Uterine polyps, adenomyosis, leiomyomas, and endometrial receptivity. *Fertil Steril.* 2019;111[4]:629-40. doi: 10.1016/j.fertnstert.2019.02.008.
- Staff AC. The two-stage placental model of preeclampsia: an update. *J Reprod Immunol.* 2019;134:1-10. doi: 10.1016/j.jri.2019.07.004.
- Abd-Elaziz E-D, Mahmoud E-R, Badawy M, Mohammad HA. Comparative study between hysteroscopy and transvaginal ultrasound in evaluation of unexplained infertility. *Al-Azhar Assiut Med J.* 2021;19[1]:192-9. doi: 10.4103/AZMJ.AZMJ\_42\_20.
- Vitale SG, Alonso Pacheco L, Haimovich S, Riemma G, De Angelis MC, Carugno J, Lasmar RB, Di Spiezio Sardo A. Pain management for in-office hysteroscopy. A practical decalogue for the operator. *J Gynecol Obstet Hum Reprod.* 2021 Jan; 50[1]:101976. doi: 10.1016/j.jogoh.2020.101976.
- Chavda M, Patel R. Role of Ultrasound in Female Infertility: Ultrasound in Female Infertility. *GAIMS J Med Sci.* 2021;1[1 [December]]:45-8.
- Gergely RZ, DeUgarte CM, Danzer H, Surrey M, Hill D, DeCherney AH. Three dimensional/four dimensional ultrasound-guided embryo transfer using the maximal implantation potential point. *Fertil Steril.* 2005;84[2]:500-3. doi: 10.1016/j.fertnstert.2005.01.141.
- Negm SM, Kamel RA, Abuhamila FA. Three-dimensional sonohysterography compared with vaginoscopic hysteroscopy for evaluation of the uterine cavity in patients with recurrent implantation failure in in vitro fertilization cycles. *J Minim Invasive Gynecol.* 2012;19[4]:503-8. doi: 10.1016/j.jmig.2012.03.021.
- Sharma K, Bora MK, Venkatesh BP, Barman P, Roy SK, Jayagurunathan U, Sellamuthu E, Moidu F. Role of 3D Ultrasound and Doppler in Differentiating Clinically Suspected Cases of Leiomyoma and Adenomyosis of Uterus. *J Clin Diagn Res.* 2015 Apr;9[4]:QC08-12. doi: 10.7860/JCDR/2015/12240.5846.
- Grigore M, Pristavu A, Iordache F, Gafitanu D, Ursulescu C. Comparative Study of Hysteroscopy and 3D Ultrasound for Diagnosing Uterine Cavity Abnormalities. *Revista Medico-Chirurgicala a Societati De Medici Si Naturalisti Din Iasi.* 2016;120[4]:866-73.
- Abuzeid O, Zaghmout O, Corrado J, Hebert J, Abuzeid M. Comparison Between the Findings on Transvaginal 3D Ultrasound Scan and Hysteroscopy in Patients Diagnosed with Subtle Incomplete Uterine Septum/Arcuate Uterine Anomaly on Hysteroscopy. *J Minim Invasive Gynecol.* 2016;23[7]:S111-S2. doi: 10.1016/j.fertnstert.2015.07.085.
- Ahmadi F, Akhbari F, Niknejad F, Haghighi H, Ghahremani Z, Ramezani F, Chehrazhi M. Diagnostic accuracy of three-dimensional ultrasonography in detection of endometrial lesions compared with hysteroscopy in infertile women. *Donald School J Ultrasound Obstet Gynecol.* 2016;10[4]:393-7. doi: 10.5005/jp-journals.
- Thellier E, Levailant J-M, Pourcelot A-G, Houllier M, Fernandez H, Capmas P. Are 3D ultrasound and office hysteroscopy useful for the assessment of uterine cavity after late foetal loss? *J Gynecol Obstet Hum Reprod.* 2018;47[5]:183-6. doi: 10.1016/j.jogoh.2018.02.002
- Al-Zinaty FMI, Raafat TA, Ali MS, Sherbeeney A, Mahmoud M. Three-Dimensional Ultrasound versus Hysteroscopy in Uterine Cavity Assessment after Failed Intracytoplasmic Sperm Injection: a study for accuracy of a diagnostic test. *Egypt J Hosp Med.* 2018;72[5]:4565-71. doi: 10.21608/EJHM.2018.9548.
- Farag MA, Mahmoud MS, Rashed RM. Office hysteroscopy versus three-dimensional ultrasound in assessment of uterine cavity in recurrent pregnancy loss. *Int J Med Arts.* 2020;2[3]:542-6. doi: 10.21608/IJMA.2020.25674.1110.
- Alsherbiny M, Riad A, Hamdoun H. Diagnostic Accuracy of 3D-transvaginal Ultrasound Compared to Hysteroscopy in Detecting Uterine Abnormalities Before ICSI. *QJM: Int J Med.* 2020;113[Supplement\_1]:hcaa056. 34. doi: 10.1093/qjmed/hcaa056.034.



# International Journal

<https://ijma.journals.ekb.eg/>

Print ISSN: 2636-4174

Online ISSN: 2682-3780

# of Medical Arts