Al-Azhar International Medical Journal

Volume 4 | Issue 8 Article 19

2023

Section: Obstetrics and Gynecology

Comparative Study between 3D Sonography and Hysteroscopy in Assessment of Uterine Cavity of Infertile Women

Ahmed Taha AbdElfattah
Department of Obstetrics and Gynecology, Faculty of Medicine for Boys, Al-Azhar University, Cairo, Egypt

Adel Aly ELboghdady
Department of Obstetrics and Gynecology, Faculty of Medicine for Boys, Al-Azhar University, Cairo, Egypt

Mohamed Osama Mohamed
Department of Obstetrics and Gynecology, Faculty of Medicine for Boys, Al-Azhar University, Cairo, Egypt, mossama75@gmail.com

How to Cite This Article

AbdElfattah, Ahmed Taha; ELboghdady, Adel Aly; and Mohamed, Mohamed Osama (2023) "Comparative Study between 3D Sonography and Hysteroscopy in Assessment of Uterine Cavity of Infertile Women," *Al-Azhar International Medical Journal*: Vol. 4: Iss. 8, Article 19.
DOI: https://doi.org/10.58675/2682-339X.1944

ORIGINAL ARTICLE

Comparative Study Between 3D Sonography and Hysteroscopy in Assessment of Uterine Cavity of Infertile Women

Mohamed Osama Mohamed*, Ahmed Taha AbdElfattah, Adel Aly ELboghdady

Department of Obstetrics and Gynecology, Faculty of Medicine for Boys, Al-Azhar University, Cairo, Egypt

Abstract

Introduction: **Due to uterine anatomical anomalies, primary infertility, subsequent infertility, and recurrent pregnancy loss are common in Egypt. Uterine causes of infertility including uterine anomalies are common. Both 3D ultrasonography and hysteroscopy had a diagnostic challenge for uterine anomalies.**

Aim: **From 3D ultrasound to hysteroscopy which is more accurate in assessment of uterine cavity of infertile women?**

Patients and methods: **100 women who were thought to have uterine reasons of infertility participated in this prospective randomized experiment. They were all submitted to a clinical examination, a history interview, an ultrasound, and a hysteroscopy.**

Results: **Hysteroscopic examination of the included women; 42% had abnormal hysteroscopy in the form of sepatate uterus (14%), polyp (12%), adhesions (3%), arcuate uterus (3%), complete septum (3%), supseptate (2%), Asherman S (1%), and periosteal fibrosis (1%), while, 3D ultrasonography results of the included women; as 49% had abnormal US in the form of, polyp (15%), septate uterus (14%), leiomyoma (7%), bicornuate uterus (6%), arcuate uterus (3%), unicornuate uterus (2%), adhesions (1%), and Asherman S (1%). With a *P* value of <0.001, there was statistically substantial agreement between the results of the hysteroscopy and the ultrasonography.**

Conclusion: **Investigating uterine cavity in infertile women is very important with history of frequent unexplained and unsecured pregnancy. 3DUS had good sensitivity and specificity for diagnosis of uterine cavity abnormalities. Numerous benefits of 3DUS, such as a coronal view with greater spatial orientation, precision, and painlessness, as well as its status as a viable alternative to hysteroscopy, the gold standard, for examining the uterine cavity, encourage its use. Hysteroscopy is a gold standard tool and is used as routine tool for uterine cavity but it can be reserved for operative cases or for cases with positive data seen by 3DUS. Hysteroscopy is an invasive procedure and many patients cannot tolerate it and have complications up to mortality.**

Keywords: 3D ultrasonography, Hysteroscopy, Uterine causes of infertility

1. Introduction

The World Health Organization (WHO) describes primary reproductive failure as 'a disorder of the reproductive system characterized by inability to obtain a clinical pregnancy after 12 months or more of frequent unprotected sexual intercourse'.[1]

In a healthy young couple, conception occurs in around 85% of cases within a year. Therefore, as it affects between 10% and 15% of couples, infertility is a significant aspect of therapeutic practice for many doctors. The most common causes of infertility (i.e., 40−55%) are female factors, followed by male factors (30−40%), both partners (10%), and unexplained (10%).[2]

A prevalent cause of infertility, first-trimester abortions, and fetal malpresentations is congenital Mullerian duct abnormality.[2] Among the general population, its estimated frequency ranges from 0.1% to −3%, and in individuals who have had several spontaneous miscarriages or infertility, it ranges from 3% to 38%.[3,4]

Accepted 30 January 2023.
Available online 30 November 2023

* Corresponding author at: Resident of Obstetrics and Gynecology at Damietta General Hospital, Damietta, Egypt.
E-mail address: mossama75@gmail.com (M.O. Mohamed).

https://doi.org/10.58675/2682-339X.1944

There are a number of methods for evaluating Mullerian duct anomalies, but the most used method worldwide is classical hysterosalpingography, which has limitations due to its inability to identify the uterus' outer surface. Consequently, the gold standard for making a definitive diagnosis has been recommended as an intrusive technique that combines hysteroscopy and laparoscopy.[3]

A reliable tool for diagnosing uterine abnormalities that is less costly and more tolerated by patients is three-dimensional ultrasonography, which offers picture quality comparable to that of magnetic resonance imaging.[5]

The uterine cavity may be seen well during a hysteroscope, and endometrial samples can be obtained for histological analysis. The concept was inspired by the discovery of tiny physiological fluid laminae that permit a precise examination of the cavity through the injection of a contrast agent into the uterine cavity while using echography to distend and create an artificial contrast that improves the ability to see endometrium and endocavitary abnormalities.[6]

Although 3DTVS had good specificity, they had a low sensitivity, particularly when it came to finding endometrial polyps. Hysteroscopy may be the preferable treatment for the precise identification and diagnosis of uterine cavity lesions since a sizable proportion of infertile individuals has signs of uterine cavity disease.[7]

Role of assessment of the uterine cavity of infertile women by 3D sonography versus hysteroscopy which is more accurate.

2. Patients and methods

This was a prospective randomized clinical trial conducted at Al- Hussein hospital & Al-Azhar University hospitals for 8 months from April 2021 to December 2021.

Inclusion criteria: Age $^{3}18$ years, BMI< 30, informed consent form signed, primary or secondary infertility, lack of current STDs, PID, hysteroscopy history, and active vaginal bleeding.

Exclusion criteria: Patient >42 years, other causes of infertility like hormonal causes, any known cardiovascular, renal, or liver disorders, severe hemorrhagic disease, any contraindications to hysteroscopy (e.g., congestive heart failure).

At the time of initial enrollment, 95 patients were suspected to have uterine cavity abnormalities identified by two-dimensional ultrasonography or HSG. Patients who qualified for study inclusion underwent a thorough entry history and physical assessment, as is customary for all patients with infertility.

Two outpatient diagnostic blinded procedures were performed on each patient to evaluate their uterine cavities. The sonographer who conducted the 3D scan in cases when the two procedures were carried out independently did not know what was suspected by the 2DUS or HSG, and he provided a report for each instance. Then, a different operator who was not aware of the specifics of the ultrasonography report or the anomaly that 2DUS or HSG had detected performed an office hysteroscopy operation.

2.1. Methods

Ethical approval: approval of the ethical committee was obtained as well as written consent was signed from all cases before participation in this study.

All women in the clinic were submitted to: Detailed complete history taking: Personal history: Name, age, profession, place of residence, and period history, Obstetric history: the presence of gestational diabetes or preeclampsia in any prior pregnancies, parity, previous delivery method, or gravidity, past history: Health conditions, including diabetes and hypertensive illnesses, as well as surgical and gynecological histories.

Clinical assessment: Vital indicators such as weight and height, chest and heart assessment, lower limb edema, blood pressure, pulse, and temperature.

Lab investigation: Random blood sugar, urine tests, and a baseline complete blood count.

Statistical analysis: Statistical Package for Social Sciences was used to computerize and statistically analyze the gathered data (SPSS 24 Inc. Chicago, IL, USA). Utilizing the Shapiro Walk test, the distribution of the data was examined for normality. Frequencies and relative percentages were used to depict qualitative data. The variance between the qualitative variables was calculated using the chi square test ($\chi 2$) and Fisher exact, as shown. Quantitative information was presented as mean ± SD (Standard deviation). The agreement between two diagnostic techniques was assessed using the Kappa test.

3. Results

This research was conducted on 100 women suspected to have uterine causes of infertility; their demographic characteristics are presented in table Table 1.

This table showed the median age of the studied women was 29 ± 2 years; most of them diagnosed to have primary causes of infertility (70%) Table 2.

This table showed obstetric history of the included women; 73% had gravida 0, 70% had parity 0, 22%

Table 1. Clinical features of the population under study (N = 100).

	Value	
Age	29 ± 2	
Type		
Primary	70	70.0%
Secondary	30	30.0%
Duration	4 ± 1	

Table 2. Obstetric characteristics of the studied population (N = 100).

	N (%)
Gravity	
0	73 (73.0%)
1	19 (19.0%)
2	8 (8.0%)
Parity	
0	70 (70.0%)
1	26 (26.0%)
2	4 (4.0%)
Mode of previous delivery	
No	70 (70.0%)
Cesarean	22 (22.0%)
Vaginal	8 (8.0%)
Preeclampsia	
No	90 (90.0%)
Yes	10 (10.0%)
Gestational Diabetes	
No	90 (90.0%)
Yes	10 (10.0%)

had cesarian delivery, 10% had history of preclampsia and 10% had gestational diabetes Table 3.

This table showed hysteroscopic examination of the included women; 42% had abnormal hysteroscopy in the form of sepatate uterus (14%), polyp (12%), adhesions (3%), arcuate uterus (3%), complete septum (3%), supseptate (2%), Asherman S (1%), and periosteal fibrosis (1%) Table 4.

This table showed 3D ultrasonsography results of the included women; as 49% had abnormal US in the form of, polyp (15%), septate uterus (14%), leiomyoma (7%), bicornuate uterus (6%), arcuate uterus (3%), unicornuate uterus (2%), adhesions (1%), and Asherman S (1%) Table 5.

Table 3. Hysteroscopic Data of the studied population (N = 100).

Hysteroscopy	*N* (%)
Normal	58 (58.0%)
Septate Uterus	14 (14.0%)
Polyp	12 (12.0%)
Adhesions	3 (3.0%)
Arcuate Uterus	3 (3.0%)
Complete Septum	3 (3.0%)
Unicorniate Uterus	3 (3.0%)
Supseptate Uterus	2 (2.0%)
Asherman S	1 (1.0%)
Periosteal Fibrosis	1 (1.0%)

Table 4. Sonographic Data of the studied population (N = 100).

Sonography	*N* (%)
Normal	51 (51.0%)
Polyp	15 (15.0%)
Septate Uterus	14 (14.0%)
Leiomyoma	7 (7.0%)
Bicorniate Uterus	6 (6.0%)
Arcuate Uterus	3 (3.0%)
Unicorniate Uterus	2 (2.0%)
Adhesions	1 (1.0%)
Asherman S	1 (1.0%)

4. Discussion

Due to uterine anatomical anomalies, primary infertility, subsequent infertility, and recurrent pregnancy loss are common in Egypt.[1]

The current study found that the majority of the included women had 1ry infertility (70%) and 30% had secondary infertility. The same was reported by **Aggarwal *et al.*,**[8] who reported also 70% had 1ry infertility.

In the current study most of detected uterine pathologies were septate uterus, polyps, and adhesions by hysteroscopy while polyp and septate uterus were the commonest findings with US. This goes in run with Naredi et al. study which revealed that endometrial polyp and uterine septum were the most common uterine pathologies encountered.[9]

Aggarwal *et al.*,[8] reported statistically significant increased diagnosed polyps by hysteroscopy more than 3DUS with *P* value = 0.04 as 3DUS missed 13 cases of 20 with endometrial polyps and abnormal findings detected by hysteroscopy was 32.5% while 20% with 3DUS.

The current study revealed that 3D US had 71.43% sensitivity, 67.24% specificity with 76.47% NPP and 61.22% PPV.

In comparison to **Naredi *et al.*,**[9] In 154 infertile women, the sensitivity and specificity of 3D ultrasound were compared to determine whether it could replace hysteroscopy in the diagnosis of uterine anomalies. The results showed that 3DTVS had a PPV and NPV of 95.83% and 97.4% as it detected 24 lesions with 3D US and hysteroscopy was in agreement with 21 lesions.

Midan *et al.*,[10] performed research to compare the diagnostic efficacy of 3DUS with hysteroscopy, and the results showed that 3DUS had a diagnostic accuracy of 97.57% compared to hysteroscopy's 93.71%. They discovered that the diagnostic accuracy of 3DUS is noticeably higher than that of hysteroscopy in patients with Mulleranian anomalies because 3DUS has good capacity for assessing the surface contours and the myometrium, whereas in

Table 5. Measure of Kappa Agreement between Sonographic and Hysteroscopic utility in detecting Abnormalities of the studied population (N = 100).

	Hysteroscopic Abnormality		Chi-Square Test	Kappa Measure of Agreement	*P*
	Abnormal *N* (%)	Normal *N* (%)			
Sonographic Abnormality					
Abnormal	30 (71.4%)	19 (32.8%)	14.5	0.378	<0.001
Normal	12 (28.6%)	39 (67.2%)			

This table showed statistically substantial agreement between hysteroscopy findings and ultrasonography findings with *P* value < 0.001.

cases with intracavitary lesions, hysteroscopy had the advantage over 3DUS.

Also, **Naredi** *et al.*,[9] revealed that Hysteroscopy missed a bicornuate uterus that was detected by 3DUS.

We did not assess the sensitivity and specificity for particular diseases in our investigation. However, 15 endometrial polyps were found by 3DUS, and 12 were found by hysteroscopy, resulting in excellent diagnosis accuracy.

Another study by **Faivre** *et al.*,[11] was conducted on 31 patients suspected of septate uterus (20) and bicornuate uterus (11) and revealed that 25 uterine septa and 5 bicornuate uterus were identified by hysteroscopy and hysteroscopic diagnosis was correct in 27/30 patients while 3DUS diagnosed septate uterus in 29 patients and bicornuate in 2 patients and concluded that 3DUS appeared to be extremely accurate more than hysteroscopy for congenital anomalies.

Similarly, **Ebrashy** *et al.*,[12] found that 3DUS had a great value than hysteroscopy.

Another study by Karasu and Metwally found that Great sensitivity (3DUS) for detecting a septate uterus and poor sensitivity (52%), respectively, for detecting intrauterine adhesions.[13]

Similarly, **Fang** *et al.*,[14] revealed a 3DUS identification of endometrial polyp with a sensitivity of 65.6% and a specificity of 89%.

Midan *et al.*,[10] reported that 90% of endometrial polyps were detected by 3DUS while 100% by hysteroscope although 3dUS had lower sensitivity and PPV than hysteroscopy (57.14%) vs 100% and 76.67% vs 100%, respectively.

These findings may be explained by hysteroscopy's capacity to identify instances of localized endometrial thickness that were misdiagnosed by 3DUS because of direct vision with high resolution of hysteroscopy and excellent delineation of the outer borders of these lesions by the distention.

A previous Egyptian study by **ElKashef** *et al.*,[1] 42 patients who were admitted to Minia University Hospital in Egypt with suspicions of having uterine structural abnormalities revealed that 3DUS had 100% sensitivity for double system, submucous fibroid, subseptate uterus, unicornuate uterus, and bicornuate arcuate uterus, but only 50% sensitivity for Asherman Syndrome and 67% sensitivity for polyp.

Another study by **Al-Zinaty** *et al.*[15] was performed on 66 women to compared 3DUS and hysteroscopy for evaluation of intrauterine cavity and revealed that 3DUS had 70.59% sensitivity, 62.5% specicificity with *P* value = 0.026, so they assumed that 3DUS is equivalent to hysteroscopy in sensitivity and specificity so 3DUS can be used being noninvasive tool.

4.1. Limitations

Although the lack of 3DUS in all infertility centers may be a limitation, its use is too important to ignore.

4.2. Conclusion

Investigating uterine cavity in infertile women is very important with history of frequent unexplained and unsecured pregnancy. 3DUS had good sensitivity and specicificity for diagnosis of uterine cavity abnormalities.

Numerous benefits of 3DUS, such as a coronal view with greater spatial orientation, precision, and painlessness, as well as its status as a viable alternative to hysteroscopy, the gold standard, for examining the uterine cavity, encourage its use. Hysteroscopy is a gold standard tool and is used as routine tool for uterine cavity but it can be reserved for operative cases or for cases with positive data seen by 3DUS. Hysteroscopy is an invasive procedure and many patients cannot tolerate it and have complications up to mortality.

Acknowledgements

Disclosure

The authors have no financial interest to declare in relation to the content of this article.

Authorship

All authors have a substantial contribution to the article.

Sources of funding

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Conflicts of interest

The authors declared that there were NO conflicts of Interest.

References

1. Elkashef AY, Shawki HE, Sanad AS, Mahran AE. The role of the three-dimensional ultrasound in uterine evaluation in patients with reproductive failure: a comparative study. *J Gynecol Res Obstet*. 2020;6:54.
2. Kantharia N. *Evaluation of Infertile Couple Having Normal Male Factor*; 2018 (Doctoral.dissertation,.Sumandeep,Vidyapeeth) http://14.139.121.113:8083/jspui/bitstream/123456789/3573/1/8991_pdf.pdf.
3. Bhagavath B, Greiner E, Griffiths KM, et al. Uterine malformations: an update of diagnosis, management, and outcomes. *Obstet Gynecol Surv*. 2017;72:377–392.
4. van Dijk MM, Kolte AM, Limpens J, et al. Recurrent pregnancy loss: diagnostic workup after two or three pregnancy losses? A systematic review of the literature and meta-analysis. *Hum Reprod Update*. 2020;26:356–367.
5. Graupera B, Pascual M, Hereter L, et al. Diagnosis of septate uterus by 3D US using the ESHRE-ESGE consensus on classification of congenital anomalies in the female genital tract. *Ultrasound Obstet Gynecol*. 2015;46:OC24, 4.
6. Briki R. Evaluation of uterine cavity in infertile women: comparison of transvaginal ultrasound, saline contrast hystero-sonography and hysteroscopy. *A Tunisian Series. Open Access Lib J*. 2018;5:1.
7. El Tagy P, Hassan A, Abd El Motaal D, Osama A, Awaly D. Comparison between 3D-transvaginal ultrasound and hysteroscopy in detecting uterine cavity abnormalities. *Egypt J Hosp Med*. 2018;73:7160–7164.
8. Aggarwal A, Bagri N. Response to the article 'The relationship between hysterosalpingography findings and female infertility in a Nigerian population. *Pol J Radiol*. 2020;85:e188–e195.
9. Naredi N, Sharma R, Gurmeet P. Can three-dimensional transvaginal sonography replace office hysteroscopy in detecting uterine abnormalities in infertility patients? *J Hum Reprod Sci*. 2021;14:392.
10. Midan MF, Eid SM, ElSherbiny AM. Comparative study between three dimensional ultrasonography and office hysteroscopy in infertile women with uterine cavity abnormalities. *Middle East Fertil Soc J*. 2017;22:329–332.
11. Faivre E, Fernandez H, Deffieux X, Gervaise A, Frydman R, Levaillant JM. Accuracy of three-dimensional ultrasonography in differential diagnosis of septate and bicornuate uterus compared with office hysteroscopy and pelvic magnetic resonance imaging. *J Minim Invasive Gynecol*. 2012;19:101–106.
12. Ebrashy AN, Momtaz M, Shawky OA, Soliman EM, Maaty ZA. Three Dimensional Transvaginal ultrasound in the assessment of uterine lesions: when do we really need it? *Middle East Fertility Soc J*. 2004;9:1.
13. Karasu T, Metwally M. Pre-conception risk assessment: gynaecological problems. In: Jayaprakasan K, Kean L, eds. *Clinical Management of Pregnancies Following ART*. Cham: Springer; 2017. https://doi.org/10.1007/978-3-319-42858-1_2.
14. Fang L, Su Y, Guo Y, Sun Y. Value of 3-dimensional and power Doppler sonography for diagnosis of endometrial polyps. *J Ultrasound Med*. 2013;32:247–255.
15. Al-Zinaty FM, Ali MA, Al Sherbeeny MM, Raafat TA. 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;72:4565–4571.