Usefulness of 3D ultrasound in congenital uterine anamolies in view of IVF treatment

G Yuvabalakumaran[1], V Tamil Arasan[2*]

[1]Consultant Radiologist, Department of Fetal Medicine, Madras Medical Mission Hospital, Chennai, INDIA.
[2]Assistant Professor, Department of Radiology and Imaging Sciences, Trichy SRM Medical College and Hospital, Trichy.
Email: drtamilradio@gmail.com

Abstract

Background: A Congenital uterine malformation is a heterogeneous group of anomalies with a broad spectrum of presentation. The urinary and the genital systems have a common origin and that is why anomalies of the two often exist in the association. Defective development of Mullerian duct either during fusion or during septal resorption results in uterine anomalies. **Aim of The Study:** To assess the prevalence of congenital uterine anomalies, including the arcuate uterus, and their effect on reproductive outcome in subfertile women undergoing assisted reproduction. **Materials And Methods:** Totally 75 cases Who are Attending the Out-Patient Ward Of Madras Medical Mission Hospital, Department of fetal medicine Chennai, between august 2018-may 2019 were included in the Study. here are two methods for three-dimensional volume acquisition: the freehand technique and automatic acquisition. With the freehand technique, images are obtained manually with the use of a two-dimensional transducer. Decreased accuracy of measurements and less quality of images are two possible problems when comparing the freehand technique with the automated technique. We obtained the images in this pictorial review with the use of an ACCUVIX XQ, (Medison, Korea) and three-dimensional transvaginal 3D5-8EK probes. This system employs a newly introduced technique named 3DXI, which utilizes two modes: multi-slice view and oblique view. **Results:** A total of 75 women were included in the study, of whom 55 (81.8%) had a normal uterus and 20 (18.2%) had a congenital uterine anomaly. The rate of live birth was similar between women with a uterine anomaly and those with a normal uterus (35% vs 37%; P = 0.47). The rates of clinical pregnancy, mode of delivery and sex of the newborn were also similar between the two groups. Preterm birth before 37 weeks' gestation was more common in women with uterine anomalies than in controls (22% vs14%, respectively; P = 0.03). **Conclusion:** There is also no evidence that surgical correction of an incidentally diagnosed uterine anomaly is helpful. This direction merits all efforts. 3D US represents, in our view, the most major development in ultrasound imaging, providing a unique, very different way of displaying ultrasound data in gynecology. Thus, the option of 3D TV imaging should be integrated into all US machines, and large prospective multinational studies should be carried out.
Key Words: congenital anomalies, 3D guided ultrasound, uterine volume, Mullerian duct

*Address for Correspondence:
Dr. V Tamil Arasan, Assistant Professor, Department of Radiology and Imaging Sciences, Trichy SRM Medical College And Hospital, Trichy.
Email:drtamilradio@gmail.com

Access this article online	
Quick Response Code:	Website: www.medpulse.in
	Accessed Date: 10 August 2019

INTRODUCTION

The oldest investigation used to assess the shape of the uterus is Hysterosalpingography (HSG). For decades, it was considered the gold standard, is the pillar of sterile patients' management plan.[1] As years went by, many disadvantages of HSG became apparent, and this method is nowadays considered almost entirely outdated: It has low accuracy, assessing the endoluminal contour only, and not the external contour. Thus, has no potential to discriminate between the septate and bicornuate uteri, two entities with radically different prognosis and treatment. It was reported with a 44.4% sensitivity and 55% accuracy. It has the ability to characterize patent canals

only.[2]Expose patients to ionizing radiation, ovaries receiving a small dose of radiation. Although Karande indicates that the level of radiation exposure is well within established marginsof safety, the risk to the unfertilized ova is unknown. This is important because these are typically young women and with reproductive difficulties.[3]A procedure-related pain occurs in up to 72% of patients undergoing HSG for the investigation of infertility. The procedure may be complicated by pelvic inflammatory disease, especially if there is evidence of tubal disease when the test is performed. This is present in many cases, and especially if there is immunologic evidence of Chlamydia trachomatis. It is highly operator-dependent.[4] Depending on the setting, in many cases is not performed by a gynecologist, the ideal observer for interpretation of the images. [5]According to various studies, the prevalence of CUA is difficult to establish because of the lack of a uniform classification system and the use of different diagnostic methods. It is estimated to occur in 0.4% of the population, but the percentage increase in infertile patients 4 to 10 %, or women who have repeated miscarriages 3 to 38 %. A recent revision including studies using advanced diagnostic tools shows a 7% prevalence in the general population.[6,7]

MATERIALS AND METHODS

Totally 75 cases Who are Attending the Out-Patient Ward Of Madras Medical Mission Hospital, Department of fetal medicine Chennai, between august 2018- may 2019 were included in the Study. here are two methods for three-dimensional volume acquisition: the freehand technique and automatic acquisition. With the freehand technique, images are obtained manually with the use of a two-dimensional transducer. Decreased accuracy of measurements and less quality of images are two possible problems when comparing the freehand technique with the automated technique. We obtained the images in this pictorial review with the use of an ACCUVIX XQ, (Medison, Korea) and three-dimensional transvaginal 3D5- 8EK probes. This system employs a newly introduced technique named 3DXI, which utilizes two modes: multi-slice view and oblique view. Although using 3D in assessing the uterus has been advocated for many years now, many asymptomatic congenital uterine anomalies remain undiagnosed. Investigations such as HSG, HSK, and LSK would not be warranted in women without a particular indication. Nor is women either undergoing sterilization or being investigated for non-obstetric reasons such as pelvic pain, ovarian cancer screening, abnormal bleeding, and suspected fibroids/polyps. Until recently, 3D US has been used in selected cases, mainly infertility centers and in case of series with obstetrical unfavorable outcome (sterile, infertile and subfertile women). Many research groups have reported 3D accuracy compared to the established, well-known methods. Yet, in our view, we should do the other way around: to consider 3DUS the gold standard method, ideal for routine screening and diagnosis, and to report accuracy rates for all traditional invasive methods (HSK, HSG, LSK) against it, and using it as a gold standard.
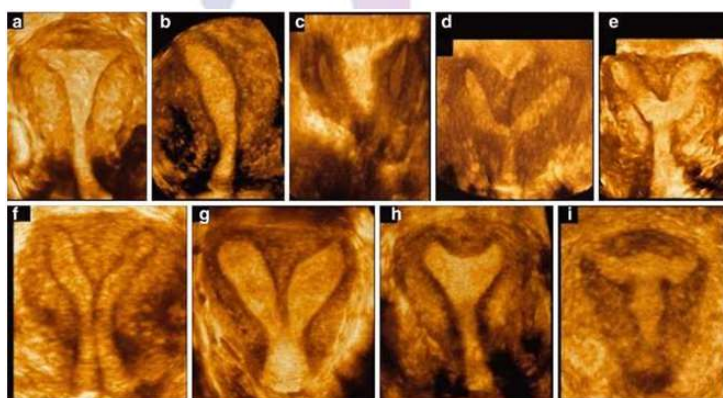
RESULTS

Figure 1: 3D US IMAGES OF UTERINE ANOMALIES

Figure:1 The mean number of good-quality embryos (Grades 1 and 2) categorized based on embryo morphology and rate of cell division were similar (1.9 ± 0.6 vs. 1.8 ± 0.5, respectively) in the study and control groups. First-trimester miscarriage rates were similar ($P = 0.81$) in the control group (20/158 (12.7%)) and in women with an arcuate uterus (5/36 (13.9%)). Women with major uterine anomalies, albeit a relatively small group, experienced a significantly higher rate of miscarriage (3/7 (42.9%)); $P = 0.05$) than the control group. The rate of miscarriage according to the type of uterine anomaly is given in. On univariate logistic regression analysis, the major uterine anomaly was a significant predictor of first-trimester miscarriage, while age, FSH level, and antral follicle count were not predictive. Major uterine anomalies remained a significant predictor on multivariate stepwise logistic regression analysis.

DISCUSSION

The data in this study suggest that women who are referred for investigation of subfertility have a high prevalence of congenital uterine anomalies (13.3%). The most common anomaly is an arcuate uterus, a minor anomaly only subtly different from the normal uterus, with a prevalence of 11.8%. Major uterine anomalies were identified in only 1.4% of the subfertile population. The presence of a minor or major uterine anomaly did not reduce the chance of pregnancy after ART.[8] Subclassification of the anomalies into minor and major revealed that while there was no evidence of an increased risk of miscarriage in women with arcuate uteri, women with a major uterine anomaly were more likely to miscarry in the first trimester.[9] It is important to note that our study was primarily designed to assess the prevalence of uterine anomalies, and any conclusions about the effects of major anomalies on conception and miscarriage are limited by the relatively small number of women involved and by the short period of follow-up during pregnancy.[10] The use of this modality, which offers a simultaneous display of the internal and external contours of the uterus, enables accurate diagnosis and classification of uterine anomalies. [11]The prevalence of uterine anomalies in the current study (13.3%) is higher than that reported in a recently published systematic review, which suggested that 7.3% of women with subfertility have a uterine anomaly.[12] This meta-analysis was restricted to studies employing investigations considered to be sufficiently sensitive and specific for the identification and classification of the subtypes of a uterine anomaly, and included 3D ultrasound but also combined hysteroscopy and laparoscopy, sono-hysterography and hysteroscopy alone. 3D ultrasound is likely to identify more subtle anomalies, such as an arcuate uterus, which is easily missed at hysteroscopy, and to correctly subclassify the major anomalies.[13] Interestingly, the prevalence of uterine anomalies in the individual studies included in the meta-analysis by Chan YY *et al*. varied widely from 1% to 66% This degree of heterogeneity is likely to reflect the different diagnostic modalities and/or the criteria used to define the study population, but there is no consensus on the overall prevalence of uterine anomalies in women with subfertility or abnormal reproductive outcome. [14]The prevalence of uterine anomalies in our study is also much higher than that reported in the three studies performed in general populations (5.3, 9.7 and 9.5%, respectively) including women with confirmed or presumed fertility. The pregnancy rate following ART was not compromised in women with uterine anomalies in this study, which suggests that any interference with implantation, as suggested by Taylor and Gomel is unlikely to account for the apparent impairment of fertility in women with uterine anomalies.[15] Women with major uterine anomalies experienced a significantly higher miscarriage rate of 42.9% (3/7) than did those with a normal uterus (12.7%), albeit the sample size was small. However, women with arcuate uteri had a miscarriage rate of 14%, which was similar to that of the control group (12.7%). While the presence of an arcuate uterus does not appear to increase the risk of early miscarriage, the other, and more anatomically significant, major uterine anomalies may[16] Barbanti S *et al*. hypothesized that any negative impact of the more subtle uterine anomalies may be delayed until later in pregnancy, as they also noted an increase in both second-trimester pregnancy loss and preterm labor in women with arcuate uteri. As already mentioned, the outcome data in our study are limited by the relatively small number of women who conceived and the length of follow-up. [17]Although hysteroscopic metroplasty is offered to women with septate and subseptate uteri who have a history of miscarriage, its exact role and potential risks remain to be ascertained. [18,19,20]

CONCLUSION

To summarise, 3D US is a highly sensitive and specific tool for accurately diagnosing congenital uterine anomalies. It is non – invasive, fast, reproducible, readily available, relatively cost-effective tool and has now surpassed other modalities in the detection of congenital Mullerian duct anomalies. Though the advantage of 3D ultrasound is well documented in the past, it has not been put in routine practice for the workup of infertility and recurrent pregnancy loss. This paper gives the significance of transvaginal 3D ultrasound in detecting uterine anomalies. This would provide clinicians clarity in offering appropriate treatment options or referral to higher centers for advanced surgeries when necessary. We recommend the routine use of 3D ultrasound in the diagnostic workup of infertility and recurrent pregnancy loss, thereby the need for a diagnostic hysterolaparoscopy can virtually be eliminated in the near future.

REFERENCES.

1. El Huseiny AM. Ahmad RA, Sadek SM, Gouhar GM, Dawood HA. Role of three- dimensional ultrasound in the diagnosis of double uterine cavity anomalies and concordance with the laparoscopic and hysteroscopic diagnosis. The Egyptian Journal of Radiology and Nuclear Medicine. 2014;45(2): 555 – 60.
2. Dewan KA, Hefeda MM, ElKholy DG. Septate or bicornuate uterus: Accuracy of three- dimensional transvaginal ultrasound and pelvic magnetic resonance imaging. The Egyptian Journal of Radiology and Nuclear Medicine. 2014;45 (3): 987 – 95.

3. Saravelos SH, Cocksedge KA, Li TC. Prevalence and diagnosis of congenital uterine anomalies in women with reproductive failure: a critical appraisal. Hum Reprod Update.2008;14:415-29.

4. Ribeiro SC, Yamakami LY, Tormena RA, Pinheiro WD, Almeida JA, Baracat EC. Septate uterus with cervical duplication and longitudinal vaginal septum. Revista da Associa,cäo Médica Brasileira. 2010;56(2):254 – 6.

5. Troiano RN ,McCarthy SM. Mullerian duct anomalies: imaging and clinical issues. Radiology. 2004;56(2): 254 – 6.

6. Li S, Qayyum A, Coakley FV, Hricak H. Association of renal agenesis and Mullerian duct anomalies. J Comput Assist Tomogr. 2000;6:829 – 34.

7. Kimberley N, Hutson JM, Southwell BR, Grover SR.Vaginal agenesis, the hymen, and associated anomalies. J Pediatr Adolesc Gynecol. 2012;25(1):54-8.

8. Gell JS.Mullerian anomalies. Semin Reprod Med. 2003;21 (4): 375 – 88.

9. American Fertility Society. The American Fertility Society classifications of adnexal adhesions, distal tubal occlusion, tubal occlusion secondary to tubal ligation, tubal pregnancies, Mullerian anomalies, and intrauterine adhesions. Fertil. Steril. 1988;49:944 – 55.

10. Bocca SM, Abuhamad AZ. Use of 3 – dimensional sonography to assess uterine anomalies. Journal of Ultrasound in Medicine. 2013;32(1):1 – 6.

11. Devi Wold AS, Pham N, Arici A. Anatomic factors in recurrent pregnancy loss. Semin Reprod Med. 2006;24(1): 25 – 32.

12. Wolfer B, Salim R, Banerjee S, Elson J, Regan L, Jurkovic D. Reproductive outcomes in women with congenital uterine anomalies detected by three – dimensional ultrasound screening. Obstet Gynecol. 2001;98:1099 – 103.

13. Turkgeldi E, Urman B, Ata B. Role of Three – Dimensional Ultrasound in Gynecology. The Journal of Obstetrics and Gynecology of India. 2015;65(3):146 – 54.

14. Chan YY, Jayaprakasan K, Zamora J, Thornton JG, Raine-Fenning N, Coomarasamy A.The prevalence of congenital uterine anomalies in unselected and high-risk populations: a systematic review. Hum Reprod Update.2011;17:761 – 71.

15. Ludwin A, Ludwin I, Pitynski K, Banas T, Jach R. Differentiating between a double cervix or cervical duplication and a complete septate uterus with the longitudinal vaginal septum. Taiwanese Journal of Obstetrics and Gynecology. 2013; 52 (2): 308– 10.

16. Practice Committee of the American Society for Reproductive Medicine. Uterine septum: a guideline. Fertility and sterility. 2016.

17. Barbanti S, Chaimulera N, Botelho B. Vaginal Septoplasty in Septate Uterus with Double Cervix. Case reports in Obstetrics and Gynecology. 2014.

18. Ludwin A, Ludwin I, Pitynski K, Banas T, Jach R. Role of morphologic characteristics of the uterine septum in the prediction and prevention of abnormal healing outcomes after hysteroscopic metroplasty. Human Reproduction 2014;29 (7): 1420 – 31.

19. Jurkovic D, Geipel A, Gruboeck K, et al. Three-dimensional ultrasound for the assessment of uterine anatomy and detection of congenital anomalies: a comparison with hysterosalpingography and two-dimensional sonography. Ultrasound Obstet Gynecol. 1995;5:233 – 7.

20. Salim R, Jurkovic D. Assessing congenital uterine anomalies: the role of three – dimensional ultrasonography. Best Pract Res Clinical Obstet Gynecol. 2004;18:29 – 36.