Comparative study of transvaginal 3D sonography and transabdominal 2D sonography in the evaluation of uterus in infertile females

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Abstract

Background: Structural pathologies of the uterus such as mullerian duct anomalies and intrauterine lesions have proved to be important causes in infertility. Various imaging modalities such as hysterosalpingography, ultrasound, laparoscopy, hysteroscopy and MRI have been used in the evaluation of infertility. Recently, 3 D ultrasound has been introduced as a non-invasive modality in the diagnosis of congenital uterine anomalies and intrauterine lesions. The present study is a cross sectional study to evaluate the uterus of patients with infertility using 2D transabdominal ultrasound and 3D transvaginal ultrasound. **Aim of study:** To compare transvaginal 3D ultrasound and transabdominal ultrasound in the evaluation of uterus in infertile females**. Methods:** Study Group: 98 patients with primary infertility referred to the radiology OPD of Yenepoya Medical College Hospital, Mangalore was considered for the study for a period of 2 years from November 2014. **Results:** 3D TVS demonstrated hypoplastic uterus in 6 cases, bicornuate uterus in 4 cases, arcuate uterus in 3 cases, endometrial polyp in 3 cases, uterine fibroid in 4 cases and adenomyosis in 1 case. 2D TAS could demonstrate hypoplastic uterus in 6 cases, bicornuate uterus in 4 cases, endometrial polyp in 3 cases, uterine fibroid in 4 cases and adenomyosis in 1 case. Except in case of 3 arcuate uterus, 3D TVS and 2D TAS showed the same findings. **Discussion:** This study showed good overall agreement between 3D transvaginal ultrasound and 2D transabdominal ultrasound in the diagnosis of uterine abnormalities and other lesions in the uterus. However for evaluation of more prevalent but less severe distortions of uterus like arcuate uterus 3D TVS was found to be more sensitive the 2D TAS
Keywords: transvaginal 3D sonography, infertility

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INTRODUCTION

Infertility is "a disease of the reproductive system defined by the failure to achieve a clinical pregnancy after 12 months or more of regular unprotected sexual intercourse."[1] Infertility is the inability of a sexually active, non-contracepting couple to achieve pregnancy in one year. The male partner can be evaluated for infertility or subfertility using a variety of clinical interventions, and also from a laboratory evaluation of semen[2] Infertility in women was ranked the 5th highest serious global disability[3] (among populations under the age of 60). Primary infertility: When a woman is unable to ever bear a child, either due to the inability to become pregnant or the inability to carry a pregnancy to a live birth she can be classified as having primaryinfertility[4]. Secondary infertility: When a woman is unable to bear a child, either due to the inability to become pregnant or the inability to carry a pregnancy to a live birth following either a previous pregnancy or a previous ability to carry a pregnancy to a live birth, she would be classified as having secondary infertility[4] Structural pathologies in the uterine cavity such as mullerian duct anomalies (MDAs) and intrauterine lesions (fibroids, polyps, synechiae, adenomyosis) have proven to be important causes in

subinfertility.[5] Various imaging modalities such as hysterosalpingography, ultrasound, laparoscopy, hysteroscopy and MRI have been used in the evaluation of MDAs and intrauterine lesions in females with infertility. Recently, 3 D ultrasound has been introduced as a non-invasive, reproducible diagnostic modality with increased spatial resolution and high accuracy in the diagnosis of congenital uterine anomalies and intrauterine lesions.[5]

MATERIALS AND METHODS

Study setting: All patients referred to the radiology OPD of Yenepoya Medical College Hospital, Mangalore with primary infertility and also meeting the inclusion criteria was considered for the study.

Period of study: 24 months
Study Tools: General Electronics Voluson E8 ultrasound machine
Type of study: A cross sectional study of 98 patients with infertility was done to evaluate the uterus using 2D transabdominal ultrasound and 3D transvaginal ultrasound.
Investigation: Transabdominal 2D ultrasound Transvaginal 3D ultrasound
Inclusion Criteria: Female patients in reproductive age group with primary infertility
Exclusion Criteria: Patients with history of previous uterine surgery. Large fibroids which cannot be visualized using transvaginal scan. Secondary infertility.
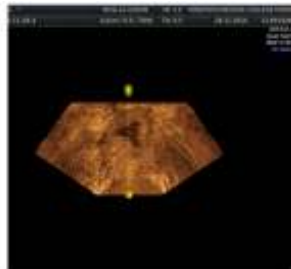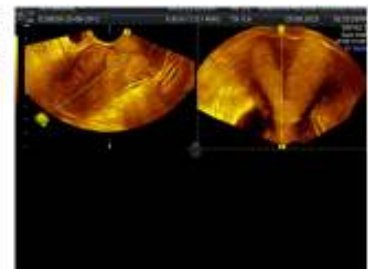

Figure 1

Figure 2

Figure 3
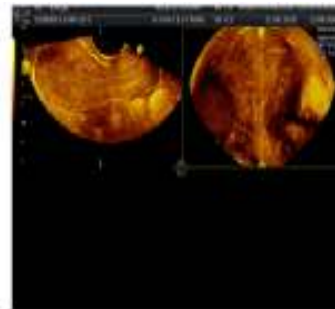

Figure 4

Figure 5

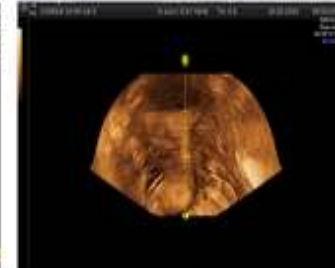Figure 6

Figure 7

Figure 8

Figure 9

Figure 10

Figure 11

Legend
Figure 1: 3D TVS of the same patient; **Figure 2:** 2D TAS showing bicornuate uterus; **Figure 3:** 3D TVS showing bicornuate uterus;
Figure 4: 2D TAS showed normal uterine morphololgy; **Figure 5:** 3D TVS showing arcuate uterus; **Figure 6:** 2D TAS showing endometrial polyp; **Figure 7:** 3 D TVs showing endometrial polyp; **Figure 8:** 2D TAS showing adenomyosis; **Figure 9:** 3D TVS showing adenomyosis;
Figure 10: 2d TAS showing uterine fibroid; **Figure 11:** 3 D TVS showing uterine fibroid

RESULTS AND ANALYSIS

In our study, the study population consists of 98 females patients with history of primary infertility who came to the department on OP basis. The mean age of the study population was 27.33 (the age range of 21 to 37 years) 2D TAS using and 3DTVS scanning was done for all the 98 patients. Among the 98 patients, few had experienced discomfort during TVS scanning. But majority of the patient could tolerate the procedure. Out of 98 patients, positive findings in uterus were obtained in 22 and negative findings were obtained in 76 patients in 3D TVS. In 2D TAS positive findings were seen in 19 cases and negative findings were seen in 79 patients. 3D TVS demonstrated hypoplastic uterus in 6 cases, bicornuate uterus in 4 cases, arcuate uterus in 3 cases, endometrial polyp in 3 cases, uterine fibroid in 4 cases and adenomyosis in 1 case. 2D TAS could demonstrate hypoplastic uterus in 6 cases, bicornuate uterus in 4 cases, endometrial polyp in 3 cases, uterine fibroid in 4 cases and adenomyosis in 1 case. Except in case of 3 arcuate uterus, 3D TVS and 2D TAS showed the same findings. Additional findings which were observed in the adenexa included polycystic ovaries in 13 cases, hydrosalpinx in 2 cases, haemorrhagic cyst in 4 cases, endometriotic cysts in 8 cases and dominant follicles in 4 cases.
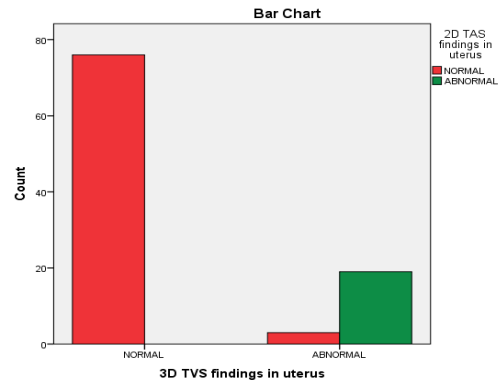

Figure 1: Bar diagram for normal and abnormal findings in 3D TVS and 2D TAS

Table 4: frequency distribution of 3D TVS findings

	3D TVS findings in uterus	Valid Percent
Adenomyosis	1	1
Arcuate uterus	3	3.1
Bicornuate Uterus	4	4.1
Endometrial polyp	3	3.1
Fibroid	4	4.1
Hypoplastic uterus	6	6.1
Normal	77	78.6
Total	**98**	**100**

Table 1: Description of age

Statistics	
	Age
N	98
Mean	27.33
Std. Deviation	3.475
Minimum	21
Maximum	37

Mean age of the study population is 27.33. Minimum age of the patients was 21 and maximum age of the study population was 37

Table 2: Kappa Statistics for agreement of the 3d And 2d

		2D TAS findings in uterus		Total
		NORMAL	ABNORMAL	
3D TVS findings in uterus	NORMAL	76	0	76
3D TVS findings in uterus	NORMAL	76	0	76
	ABNORMAL	3	19	22
Total		**79**	**19**	**98**

Table 3: Symmetric measures

Symmetric Measures			
		Value	Approx. Sig.
Measure of Agreement	Kappa	.908	.000
N of Valid Cases		98	
a. Not assuming the null hypothesis.			

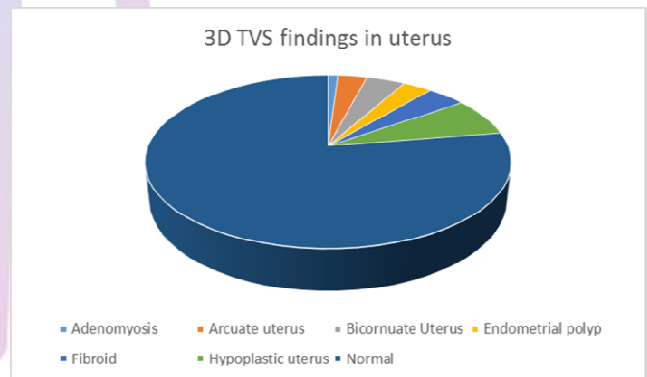The measurement of agreement is more than 0.9

Figure 2: Showing the frequency distribution of 3D TVS findings

3D TVS demonstrated 1 adenomyosis, 3 arcuate uterus, 4 bicornuate uterus, 3 endometrial polyp, 4 fibroid, 6 hypoplastic uterus and 77 normal uterus

Table 5: Percentage of positive and negative findings in 3D TVS

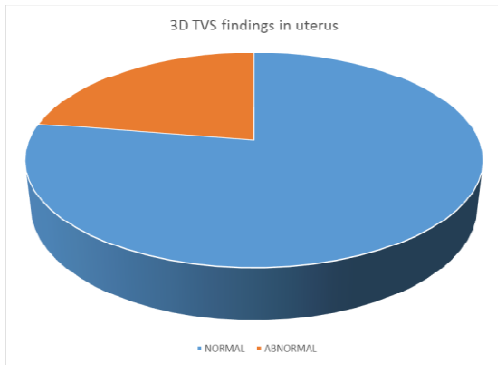|	3D TVS findings in uterus	Valid Percent
NORMAL	77	78.6
ABNORMAL	21	21.4
Total	**98**	**100**

Figure 3: Positive and negative findings in uterus in 3DTVS

3D TVS demonstrated 77 normal uterus and 21 uterus with positive findings

Table 6: Frequency distribution in 2D TAS

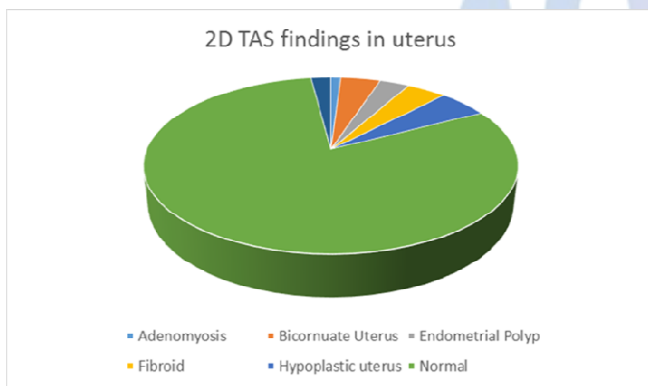|	2D TAS findings in uterus	Valid Percent
Adenomyosis	1	1
Bicornuate Uterus	4	4.1
Endometrial Polyp	3	3.1
Fibroid	4	4.1
Hypoplastic uterus	6	6.1
Normal	80	81.6
Total	**98**	**100**

Figure 4: Frequency distribution in 2D TAS

2D TAS demonstrated 1 adenomyosis, 4 bicornuate uterus, 3 endometrial polyp, 4 fibroid, 6 hypoplastic uterus and 80 normal uterus

Table 7: Percentage of positive and negative findings in 2D TAS

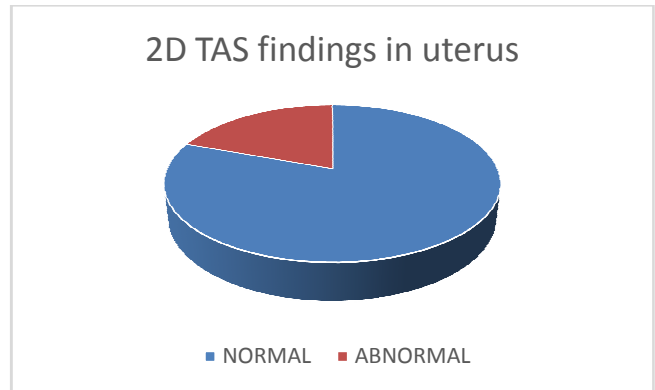|	2D TAS findings in uterus	Valid Percent
NORMAL	80	81.6
ABNORMAL	18	18.4
Total	**98**	**100**

Figure 5: Percentage of positive and negative findings in 2D TAS

2D TAS demonstrated 80 normal uterus and 18 uterus with positive findings
ADDITIONAL FINDINGS OBSERVED ON BOTH 3DTVS AND 2D TAS

Table 8: Additional findings in 2D TAS and 3D TVS

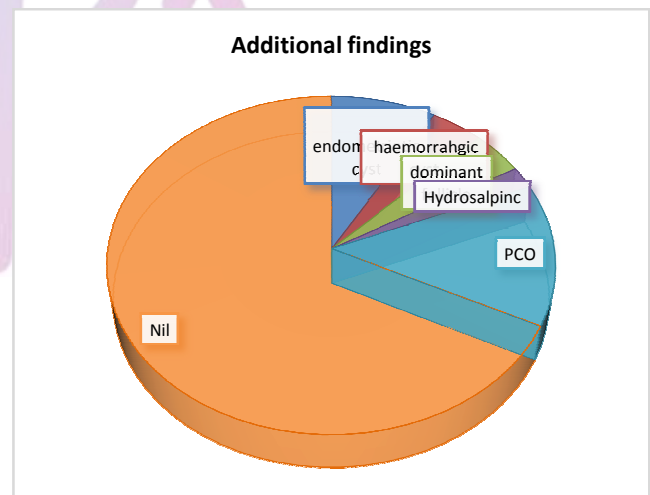|	Additional findings	Valid Percent
Endometriotic cyst	8	8.1
Haemorrahgic cyst	4	4
Dominant follicle	4	4
Hydrsalpinx	2	2
PCO	13	13.3
Nil	65	66.4
Total	**98**	**100**

Figure 6: Additional findings in 2D TAS and 3D TVS

DISCUSSION

3D ultrasound is a very useful modality for the differentiation between subseptate uterus and bicornuate. And also in the diagnosis of a less important malformation like arcuate uterus which is difficult to identity with 2D ultrasound. 3D ultrasound shows provides a perfect visualization of the border between endometrium and myometrium and the slight convexity

of the uterine fundus. And 3D ultrasound is a reproducible method for the diagnosis of congenital uterine anomalies. The 2D ultrasound provides a good image of the uterine outline and endometrium as well. To identify the correct morphology of the uterus the coronal section of the uterus is important. In non ideal patients it might be difficult to obtain all the sections especially the coronal section using 2D ultrasound which is its main disadvantage. In this particular subgroup of patients, 3D TVS was found to be more sensitive than 2D TAS in diagnosing less severe distortions like arcuate uterus. However they showed overall good agreement in the rest of the cases. Out of 98 patients, positive findings in uterus were obtained in 22 and negative findings were obtained in 76 patients in 3D TVS. And in 2D TAS positive findings were seen in 19 cases and negative findings were seen in 79 patients. 3D TVS demonstrated hypoplastic uterus in 7 cases, bicornuate uterus in 4 cases, arcuate uterus in 3 cases, endometrial polyp in 3 cases, uterine fibroid in 4 cases and adenomyosis in 1 case. 2D TAS could demonstrate hypoplastic uterus in 7 cases, bicornuate uterus in 4 cases, endometrial polyp in 3 cases, uterine fibroid in 4 cases and adenomyosis in 1 case. Except in case of 3 arcuate uterus, 3D TAS and 2D TAS showed the same findings.

CONCLUSION

This was a cross sectional study in 98 patients, cases of primary infertility. The aim of the study was evaluation of the uterus with 3D transvaginal and 2D transabdominal ultrasound. The results are as follows

1. This study showed good overall agreement between 3D transvaginal ultrasound and 2D transabdominal ultrasound in the diagnosis of uterine abnormalities and other lesions in the uterus
2. However for evaluation of more prevalent but less severe distortions of uterus like arcuate uterus 3D TVS was found to be more sensitive the 2D TAS

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